Review of Ozone Modeling for the Proposed CF Industries Blue Point Facility

Final Report

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Contents

Figures

Tables

The purpose of this report is to review the modeling analysis for ground level ozone submitted for the proposed CF Industries (CFI) Blue Point ammonia production facility in Ascension Parish, Louisiana. This work is carried out under contract with the Environmental Integrity Project in support of their ongoing public advocacy efforts regarding the permit for the proposed facility.

The proposed facility location is in a region of elevated ground level ozone. The most recent 8-hour ozone design value for the nearest monitor in Dutchtown, about 5.3 miles from the proposed plant site, is 68 parts per billion (ppb). This is very close to the 70 ppb National Ambient Air Quality Standard (NAAQS) for ozone. Four other nearby monitors also have elevated design values for ozone: 74 ppb at the Carville monitor, 6 miles distant from the proposed plant site; 65 ppb at Convent, about 13 miles distant; 68 ppb at French Settlement, about 16 miles distant; and 70 ppb at Bayou Plaquemines, about 17 miles distant.[1]

These elevated levels of ground level ozone stem from extensive industrial activity in the surrounding area, producing a region of dense emissions of ozone precursor – nitrogen oxides (NO_X) and volatile organic compounds (VOC). Permits have been issued for a number of other facilities to be built in this region, which will add to the emissions of NO_X and VOC. The proposed CFI plant would further add to these emissions. Section 1 of this report reviews the ozone impact analysis submitted by CFI, the permit applicant. Section 2 analyzes the impact of the proposed facility in combination with the other nearby facilities which have been permitted but not yet built. Section 3 summarizes the findings of this review.

Section 1. Review of Ozone Impact Analysis Submitted by the Applicant

The applicant's ozone impact analysis is documented in the Air Quality Dispersion Modeling Report by CK Associates, in Section 4.4.[2] The applicant's analysis uses the EPA's Tier 1 screening methodology for estimating the contribution of new sources to the formation of tropospheric ozone based on Modeled Emission Rates for Precursors (MERPs). The MERPs methodology is used under EPA's protocol for Prevention of Significant Deterioration (PSD) of air quality for ozone and fine particulate matter ($PM_{2.5}$). In the case of ozone, the methodology entails modeling of the production of ozone in a given region under current emission conditions, and then remodeling the region with an additional new hypothetical source of emissions. Increases in VOC and NO_X are modeled separately. The MERP is defined as the calculated emission rate that would be expected to produce an increased ozone concentration in excess of a Significant Impact Level (SIL), which for ozone is defined as 1 ppb. Thus, the MERP is calculated as follows:

$$\text{MERP} = \text{EMOD} \times \text{SIL} / (\Delta O_3\text{MOD})$$

Where EMOD is the annual emission rate of the precursor pollutant (VOC or NO_X) from the hypothetical emission source (tons/year), SIL is the significant impact level (ppb), and (ΔO_3MOD) is the predicted change in the maximum 8-hour ozone concentration (ppb). MERPs are calculated separately for NO_X and VOC.

[1] Ozone design values using 2022–2024 data are from EPA's 2024 Ozone Design Value Report available at https://www.epa.gov/air-trends/air-quality-design-values#report.

[2] CK Associates. Air Quality Dispersion Modeling Report – CF Industries Blue Point, LLC, Ascension Parish, Louisiana. Agency Interest Number 149544, TEMPO Activity Number PER20230002, CK Project Number PJ000003. April 2025.

To facilitate implementation of the MERPs screening methodology for ozone, EPA has developed a library of modeling results for hypothetical facilities. These hypothetical facility results are binned by region, state, county or parish, facility emission rate (500, 1000 or 3000 tons per year), and emission height (10 or 90 meters).[3]

The applicant has used the smallest hypothetical facility size, 500 tons per year (tpy), in its calculations for the proposed facility, both for NO_X emissions and VOC emissions.[4] This is appropriate, since the proposed facility will emit less than 500 tpy of both NO_X and VOC. The applicant has indicated that a stack height of 90 meters will be used for NO_X, and 10 meters for VOC.[5] These are also appropriate, since the bulk of proposed NO_X emissions would be elevated, and the bulk of VOC emissions would be at ground level. However, the applicant appears to have inadvertently computed its NO_X MERP using 10-meter stack data rather than 90-meter stack data.[6]

EPA's MERPs library does not explicitly include Ascension Parish, where the proposed facility will be located. The library includes results for three hypothetical facilities in Louisiana, located in Orleans Parish, Acadia Parish, and Lincoln Parish. Table 1 compares the MERPs that would be obtained using the modeling results for these three hypothetical facilities. The Orleans model facility about 70 miles East of the proposed CFI plant; the Acadia model facility is about 94 miles to the West; and the Lincoln model facility is about 186 miles to the North.

Table 1. Calculation of MERPs for Louisiana

Precursor pollutant	Model plant size (tpy)	Stack height bin (m)	Parish	Modeled ozone impact (ppb)	MERP (tpy)[a]
NO_X	500	90	Acadia	2.512	199
			Lincoln	1.912	261
			Orleans	1.332	375
NO_X	500	10	Acadia	2.533	197
			Lincoln	1.397	358
			Orleans	1.116	448
VOC	500	10[b]	Acadia	0.114	4,378
			Lincoln	0.043	11,551
			Orleans	0.201	2,491

[a] Incremental emission rate expected to produce an increase of 1 ppb in the maximum 8-hour average ozone concentration.
[b] EPA did not model the 90 meter stack bin for the 500 tpy hypothetical facility.

[3] U.S. Environmental Protection Agency. MERPs View Qlik. MERPs View Qlik | US EPA. Retrieved November 13, 2025.
[4] Reference 2 at page 15 (PDF pg. 18).
[5] *Id.*
[6] *Id.*

For its ozone analysis, the applicant has selected the nearest model facility in Orleans Parish.[7] Aside from the model's proximity, no rationale for this selection is given in the applicant's modeling report.

Figure 1 shows a map of Southern Louisiana, showing the location of the proposed CFI Blue Point facility in relation to the two hypothetical model facility locations in Acadia and Orleans Parishes. The figure also maps ozone design values for monitor sites in the region, showing a pattern of declining ozone levels in the Eastern sector of the region, near the Orleans model plant.

The Orleans model facility is located at the eastern edge of New Orleans, on a narrow strip of land between Lake Pontchartrain and an arm of the Gulf of Mexico. This location in proximity to so much water has complex impacts on the formation of ozone, potentially reducing ozone formation in close proximity to the source. The proposed CFI plant location is also less urbanized than the Orleans model plant location. The Acadia Parish model facility, not much farther to the West, is about the same distance from the Gulf of Mexico as the proposed facility. It is also less urbanized.

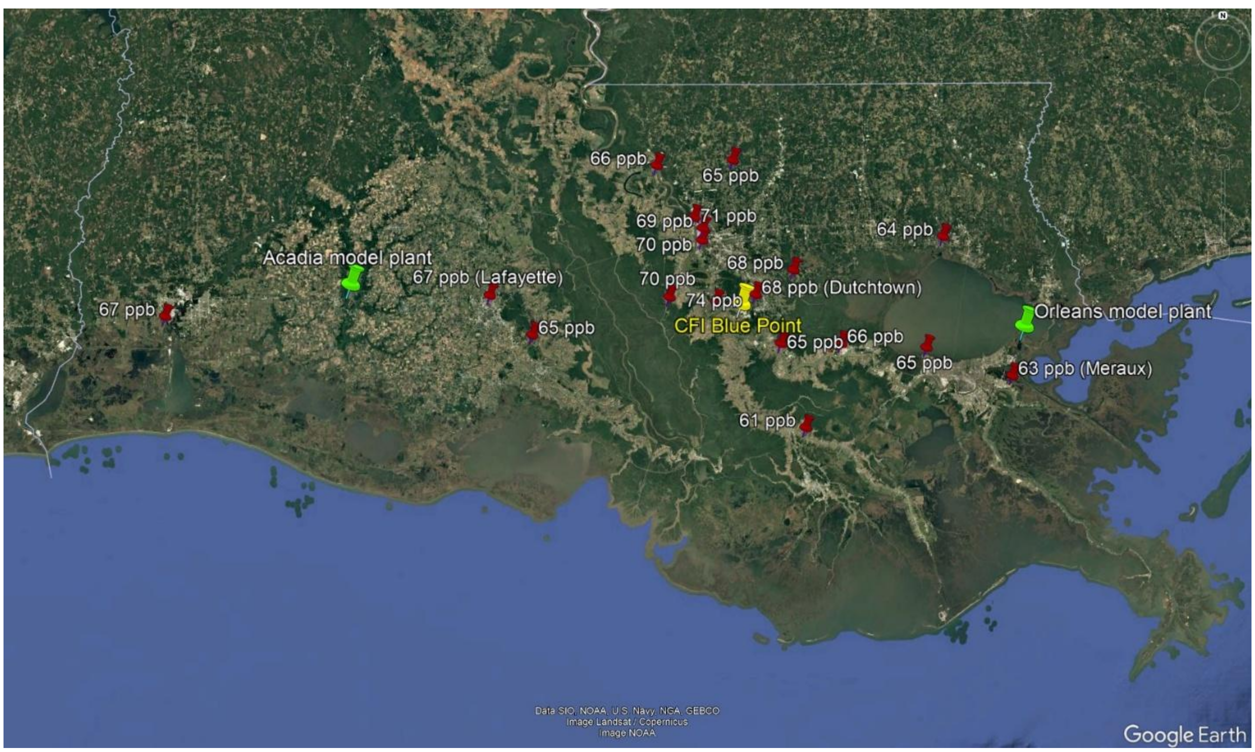

Figure 1. Location of the Acadia and Orleans model facilities in relation to the proposed CFI Blue Point site, also showing ozone design values (2020-2022) for area monitors.

[7] *Id.*

Table 2 shows potential ozone impacts for the CF Industries Blue Point facility calculated using MERPs derived from the Orleans Parish hypothetical facility, and also using MERPs derived from the Arcadia Parish hypothetical facility. Impacts are computed as follows:

$$\Delta O_3CALC = SIL \times EMIS/MERP$$

Where (ΔO_3CALC) is the anticipated increase in the highest 8-hour ozone concentration, EMIS is the expected emission rate of either VOC or NO_X for the facility (tons/yr), and SIL is the significant impact level which was used to calculate the MERP (1 ppb of ozone). (The calculation of the MERP has been shown above.)

Table 2 shows that the Orleans Parish calculation produces a higher result for the ozone impact of VOC emissions, while the Acadia Parish calculation produces a higher result for the ozone of NO_X emissions, and the Acadia Parish calculation produces a higher result overall.

Table 2. Calculation of expected ozone impacts for the CF Industries Blue Point facility

Precursor pollutant	Stack height bin (m)	Expected emission rate (tpy)	Calculated ozone impacts (ppb)	
			Orleans model	Acadia model
NO_X	90	244.63	0.652	1.229
NO_X	10	52.04	0.116	0.264
VOC	10	37.30	0.015	0.009
Total			0.783	1.501

EPA guidance suggests using the more conservative MERPs for a given modeling region, in the absence of more appropriate source-specific values.[8] The fact that this is a screening analysis argues for the more conservative choice of MERP values, corresponding with the hypothetical plant modeled in Acadia Parish. It must also be noted that the ozone concentration measured at the monitor nearest to the proposed facility is 68 ppb, which is very close to the standard of 70 ppb. This fact also argues for a more conservative approach in computing ozone impacts. Using the Acadia model facility, the proposed CF Industries Blue Point facility would produce an ozone concentration impact of 1.501 ppb, exceeding the SIL of 1 ppb.

Section 2. Ozone Impacts in Context with the Impacts of Other Potential Sources Which Are Permitted but Have Not Yet Been Built

Within the last 16 months, three new facilities have been permitted within 8 miles of the proposed CFI Blue Point facility. A Mitsubishi Chemical facility was permitted in July 2024 across the Mississippi River from the proposed CFI site. In June 2025, an Air Products Blue Energy facility was permitted, about 7.7 miles distant; and a Clean Hydrogen Works facility was permitted in October 2025,

[8] U.S. Environmental Protection Agency. Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program. EPA-454/R-19-003. April 2019.

about 2.5 miles distant. Figure 2 shows the location of these facilities in relation to the proposed CFI Blue Point facility. Together, the three already-permitted facilities are slated to emit about 432 tons per year of NO_X and 153 tons per year of VOC. The proposed CFI Blue Point permit application proposed additional emissions of about 297 tons per year of NO_X and 37 tons per year of VOC. In addition, the U.S. EPA has estimated that NO_X emissions from mobile sources in Ascension Parish increased by about 414 tons per year between 2020 and 2022.[9]

Table 3 shows predicted ozone impacts for the three permitted-but-not-yet-built neighboring facilities, and for the proposed CFI Blue Point facility. Impacts are calculated using both the Orleans and Acadia MERPS. With the Acadia MERPS, the combined expected impact for the four facilities would be about 3.7 ppb. When added to the design value for the nearest monitor, Dutchtown at 68 ppb, this would result in an ozone concentration of 71.7 ppb, exceeding the ozone NAAQS at 70 ppb.

Figure 2. Location of the proposed CFI Blue Point facility in relation to other facilities which have already been permitted but not yet built.

[9] U.S. Environmental Protection Agency. 2020-2022 Air Emissions Modeling Platforms – County Monthly Report Tables. https://www.epa.gov/air-emissions-modeling/2020-2022-air-emissions-modeling-platforms. Retrieved November 17, 2025.

Table 3. Ozone impacts of the CF Industry Blue Point facility in combination with proposed neighboring facilities which are permitted but not yet built

Facility	Pollutant	Stack height bin (m)	Permitted emission rate (tons/yr)[a]	Calculated ozone impacts (ppb)	
				Orleans model	Acadia model
Mitsubishi Chemical America Inc. - MCA Geismar Site	NO_x	90	30.86	0.082	0.155
	NO_x	10	98.53	0.220	0.499
	VOC	10	69.79	0.028	0.016
	Subtotal			0.330	0.670
Air Products Blue Energy	NO_x	90	33.93	0.090	0.170
	NO_x	10	52.87	0.118	0.268
	VOC	10	61.94	0.025	0.014
	Subtotal			0.233	0.452
Clean Hydrogen Works	NO_x	90	91.20	0.243	0.458
	NO_x	10	124.39	0.278	0.630
	VOC	10	21.29	0.009	0.005
	Subtotal			0.529	1.093
CF Industries Blue Point	NO_x	90	244.63	0.652	1.229
	NO_x	10	52.04	0.116	0.264
	VOC	10	37.30	0.015	0.009
	Subtotal			0.783	1.501
Total				1.875	3.717

[a]Emission figures provided by the Environmental Integrity Project based on permit information.

Section 3. Summary and Conclusions

- The proposed CFI Ascension Parish plant is located between two hypothetical model facilities for selecting ozone MERPs. The applicant has selected the Orleans Parish model plant, but provided no analysis justifying this selection. The Acadia Parish model plant gives a more conservative estimate of ozone formation. Although somewhat more distant from the CFI site, it appears to be more similar in character.
- Using the MERPs for the Acadia model facility, the estimated incremental ozone impact from the proposed CFI facility 1.501 ppb. This exceeds the SIL of 1 ppb.
- Within 8 miles of the proposed CFI facility, there are three other proposed facilities which have been permitted but have not yet been built. When the expected emissions of these facilities are added to the expected emissions of the proposed CFI facility, the resulting predicted incremental ozone impact is 3.7 ppb. This incremental impact would result in an ozone concentration of 71.7 ppb at the nearest ozone monitor, exceeding the 70 ppb ozone NAAQS.

WILLIAM BATTYE, P.E., Ph.D.

Education

Ph.D.	Marine, Earth, and Atmospheric Sciences, North Carolina State University, 2018
M.S.	Chemical Engineering, Massachusetts Institute of Technology, 1977
B.S.	Chemical Engineering, Massachusetts Institute of Technology, 1977

Professional Summary

Dr. Battye has over four decades of experience in developing and reviewing the inputs to various air pollution and exposure models and in refining these models. He has expertise in engineering cost analysis and in evaluating least-cost strategies. He also has extensive expertise in exposure assessment, including a broad range of geographic information systems (GIS) and Census analyses. He led the development of the U.S. Environmental Protection Agency's (EPA's) Human Exposure Model – Version 3 (HEM-3) for hazardous air pollutants (HAPs) and other toxic air pollutants. This model is currently a mainstay of EPA's technical analysis efforts under both the National-Scale Air Toxics Assessment (NATA) and the Residual Risk and Technology Review (RTR) Program.

Professional Experience

2018–present	NC State University, Adjunct Professor, Marine, Earth and Atmospheric Sciences
2015–present	SC&A Incorporated, Senior Engineer
1989–2015	EC/R, Incorporated, Managing Partner
1989–1991	EC/R, Incorporated, President
1979–1989	GCA/Technology Division, Head, Engineering and Modeling Section
1977–1979	GCA/Technology Division, Chemical Engineer and Project Manager

Summary of Professional Accomplishments

Support for EPA's RTR Program. Provided senior level technical support under RTR engineering analyses to EPA to evaluate emissions, existing emission controls, and emission control options for a number of industrial categories. Supervised population exposure and risk modeling efforts for EPA for a wide array of industrial source categories. Developed approaches to streamline the analysis and thereby allow the use of the HEM-3/AERMOD modeling system to thousands of facilities under very tight time schedules.

Support for EPA NATA Programs. Supervised risk modeling for EPA's 2002, 2005, and 2011 NATA programs. Modeled cancer and noncancer risks for 189 HAPs from about 65,000 industrial facilities. Modeled onroad and nonroad mobile source impacts for 60,000 census tracts. Developed the HEM-3 model framework allowing rapid application of EPA's state-of-the-science AERMOD dispersion model on an unprecedented scale. Developed query tools to allow quick access to detailed results. Query tools were used to provide quick response support for the development of EPA's school monitoring program. Helped EPA develop techniques for interlacing AERMOD results with Community Multi-Scale Air Quality modeling system results for reactive HAPs. Developed web-based outreach tools for distributing NATA results and assisted in preparing documentation for the NATA program.

Agricultural Ammonia (NH_3) Emissions Assessment. Ph.D research involved using satellite measurements of atmospheric NH_3 to assess the predictions of CMAQ using current NH_3 emissions inventories. Supervised graduate students analyzing the impacts of NH_3 emissions from Confined Animal Feeding Operations (CAFOs). Previously, evaluated the uncertainties of NH emissions inventories for the Coordinating Research Council (CRC). This analysis included CAFOs, fertilizer emissions, and other sources. Reviewed measurements of NH_3 emissions from natural landscapes for the National Oceanic and Atmospheric Administration (NOAA). Served as a peer reviewer of the National Research Council (NRC) report on "Air Emissions from Animal Feeding Operations." Participated in workshops on agricultural emissions.

CenRank Environmental Justice Analysis Tool. Led development of EPA CenRank, a GIS-based tool commissioned by the EPA Office of Air Quality Planning and Standards (OAQPS), to help regulation writers in evaluating the environmental justice impacts of air pollution control programs. Involved compilation and analysis of extensive databases on demographics, poverty, education, language, and disability at the census block and block-group levels and on a national scale. Combined these data with ozone and fine particulate matter (PM2.5) concentration data and HAP exposure information from NATA. Developed user friendly, GIS-based software for proximity analyses of demographics and other environmental justice parameters within a user-specified distance of emission sources.

Reasonable Progress for Class I Areas in the Northern Midwest – Factor Analysis. Managed a project for the Lake Michigan Air Directors Consortium to evaluate the potential control measures to mitigate regional haze in the Midwest. The control measures were primarily sector-based cap-and-trade programs for sulfur dioxide (SO_2) and nitrogen oxides (NOx). Source categories included electric generating units (EGUs), industrial boilers, other stationary sources, and mobile sources. Control measures were also evaluated for agricultural sources of ammonia emissions. A "four-factor" analysis was conducted, addressing costs, time required for implementation, energy impacts and other environmental impacts, and remaining equipment life.

Analysis of Regional Haze Control Measures for Montana Sources. Providing technical assistance in the analysis of costs and environmental impacts for potential measures controls. This analysis addressed SO_2 and NOx emissions from petroleum refineries and other major sources.

Long-Range Transport of Air Pollution. Provided technical assistance in the analysis of potential future emissions of criteria pollutants on a global basis. Compiled and reviewed future emission projections prepared by various research groups evaluating future climate change scenarios.

Development of HEM-3. Led development of EPA's HEM-3, a model for assessing air pollution concentrations, population exposures, cancer risks, non-cancer risks, and population exposures from HAP emissions. HEM-3 is being provided by EPA as a tool to assist industrial sources, states, and local agencies in determining whether emissions meet residual risk targets. Provided training for model users at state and local agencies in the Midwest. Assisted in development of class materials for EPA trainers in other regions. HEM-3 model incorporates EPA's state-of-the-science atmospheric dispersion model, AERMOD, and upgrades to AERMOD can be readily substituted into HEM-3. The single-plant version of HEM-3 is a user-friendly, downloadable tool to assist industrial sources, states, and local agencies in determining whether emissions meet residual risk targets. A "Community and Sector" version has also been developed to efficiently assess thousands of facilities and has been used extensively for the NATA and RTR programs. Microenvironment Factors. Updated microenvironment factors used to quantify air concentrations in the indoor air and other microenvironments in EPA's HAPEM5 model. Microenvironment factors were developed for 30 types of buildings and outdoor spaces.

Multimedia Risk Assessments for Secondary Lead and Coke Ovens. Provided senior-level technical support for the secondary lead residual risk assessment, an EPA pilot study for Science Advisory Board review of methods for multimedia assessment. Assisted in the design of approaches for estimating fugitive emissions based on measured fenceline air pollution concentrations and development of methodologies for quantifying variability and uncertainty. Also supervised multiple exposure pathway risk analysis for coke ovens, in support of EPA's post-Maximum Achievable Control Technology residual risk analysis that included health and ecological risks and accounted for the potential for some HAPs to bioaccumulate in the food chain and persist in the environment. Compiled a set of pollutant benchmarks to be used in ecological assessments of species living near coke ovens. Supervised water body simulations used to evaluate bioaccumulation of HAPs in fish.

Cost and Economic Analysis of Revised Hearing Protection Rules. Managed a project for the EPA Office of Policy Analysis and Review to estimate costs and economic impacts of planned revisions to EPA's regulations for the testing and labeling of hearing protective devices. Testing costs, recordkeeping costs, and labeling costs were evaluated for various segments of the industry, including earplugs, earmuffs, noise cancelling headsets, and nonlinear noise reduction devices. The economic analysis addresses the impacts of the proposed rules on overall device costs, the likelihood that these costs will be passed on to consumers, the potential for plant closure, and the impacts on small business entities.

Evaluation of Daily Emissions from EGUs Under Different Meteorological Conditions. Developed algorithms to be used by the National Oceanic and Atmospheric Administration (NOAA) to improve daily emissions estimates for EGUs used in regional modeling of ozone and fine particulate matter under the joint EPA/NOAA National Air Quality Forecast System. The algorithms adjust daily emissions from EGUs in different metropolitan areas to reflect the changes in electricity demand resulting from such factors as increased air conditioner usage during short term heat waves. Time-series analyses and other statistical analyses and regression analyses were conducted using continuous emissions monitoring systems for different fuel types and at different levels of geographic aggregation.

Multi-Pollutant Strategies. Provided support to a project to help OAQPS evaluate multipollutant impacts of industry sectors that significantly affect nationwide air quality and to develop appropriate emission reduction strategies. Identified potential multi-pollutant emission reduction strategies, including traditional regulatory approaches along with innovative and voluntary approaches.

Control Measures for Port Emissions. Evaluated potential voluntary control approaches for emissions of diesel particulate matter and NOx from the Port of Philadelphia. This project involved a detailed assessment of diesel emissions from cargo-handling equipment such as forklifts and cranes, as well as ocean-going vessels, tugboats and towboats. Potential control technologies were identified, and their costs and emissions impacts were evaluated. This project focused on diesel emissions; however, collateral reductions of NOx were also estimated.

Fire Emissions Workshop. Provided support for a series of consensus-building teleconferences leading up to a stakeholder workshop to improve emissions estimates methods for wildfire, prescribed fire, and agricultural burning. Participants included representatives of EPA, Forest Service, U.S. Department of the Interior, and Regional Planning Organizations. Facilitated a stakeholder process for developing new ammonia, NOx, and SO_2 emission factors for wildland fire and improving volatile organic compound emission factors and speciation factors.

Transboundary Transport Analysis. Compiled and evaluated back-trajectory analyses that relate to U.S.-Canada trans-boundary impacts for PM2.5 and regional haze. Summarized cross-border transport, sources and impacts, for different border regions of the United States and Canada. Assessed various techniques for back-trajectory analysis and ensemble back-trajectory analysis and compared the results of different techniques. Made recommendations for additional trajectory analyses that would fill current knowledge gaps regarding trans-boundary impacts of PM2.5.

Registrations

Registered Professional Chemical Engineer (NC #11881)

Publications

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November 24, 2025

Contents

Figures

Tables

The purpose of this report is to review the modeling analysis for ammonia (NH_3) submitted for the proposed CF Industries (CFI) Blue Point ammonia production facility in Ascension Parish, Louisiana. This work is carried out under contract with the Environmental Integrity Project in support of their ongoing public advocacy efforts regarding the permit for the proposed facility.

CFI has used the AERMOD dispersion model to analyze the atmospheric transport and dispersion of NH_3 emissions from the proposed facility, and to predict NH_3 concentrations in the ambient air that would result from these emissions. AERMOD is the American Meteorological Society – U.S. Environmental Protection Agency (EPA) Regulatory Model for atmospheric plume dispersion.

As part of this current review, AERMOD has been used independently to model NH_3 emissions from the proposed facility, and also to model NH_3 emissions from existing plants in the vicinity of the proposed CFI Blue Point site. The proposed facility site is in a locally heavily industrialized area, with a number of nearby existing facilities that emit NH_3.

Section 1 of this report reviews the NH_3 modeling analysis submitted by CFI, the permit applicant. Section 2 gives the results of independent modeling of NH_3 emissions from the proposed CFI Blue Point facility. Section 3 evaluates the impacts of NH_3 emissions from nearby facilities. Section 4 compares the modeling results to various short-term and chronic benchmarks for NH_3 in the atmosphere. Section 5 provides a summary of results and conclusions of this analysis.

Section 1. Review of Ammonia Modeling by the Applicant

Louisiana ambient air standards (AAS) set a threshold level of concern for NH_3 at 640 $\mu g/m^3$ on an 8-hour average basis.[1] CFI estimates that the highest incremental increase in the 8-hour ambient average NH_3 concentration as a result of emissions from the proposed facility would be about 168 $\mu g/m^3$, based on its AERMOD modeling.[2] As part of its permit application, the applicant supplied the AERMOD input files used to estimate NH_3 impacts. These were obtained and provided by the Environmental Integrity Project. Emission calculations for the applicant's NH_3 impact analysis are documented in a report entitled "Revised Initial Prevention of Significant Deterioration and Part 70 Permit Application" by CK Associates, in Appendix D.[3]

Meteorology Data, Receptor Network, and Modeling Approach

In its AERMOD modeling, the applicant used meteorological data from Baton Rouge, about 42 kilometers from the proposed plant site. The data were from 2022, the most recent available processed data. This selection is appropriate.

The applicant has estimated ambient NH_3 concentration impacts for a network of receptors surrounding the proposed plant site, extending to about 10 kilometers from the plant boundary. The network is generally rectilinear, with the density of receptors varying with distance from the boundary. Receptors are located along the boundary, with a distance of about 60 meters between them. Outside

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[1] LAC 33:III.5112.

[2] CK Associates. Air Quality Dispersion Modeling Report – CF Industries Blue Point, LLC, Ascension Parish, Louisiana. Agency Interest Number 149544, TEMPO Activity Number PER20230002, CK Project Number PJ000003. April 2025.

[3] CK Associates. Revised Initial Prevention of Significant Deterioration and Part 70 Permit Application – CF Industries Blue Point, LLC, Ascension Parish, Louisiana. Agency Interest Number 149544, TEMPO Activity Number PER20230002, CK Project Number PJ000003. February 2025.

the boundary, receptors are located every 100 meters to a distance of about one kilometer. The inter-receptor distance is then expanded to 500 meters for the ring between 1 and 5 kilometers from the boundary. Outside the 5 kilometer ring, the separation between receptors is 1 kilometer. This is a good receptor network for analyzing the facility impacts.

The modeling analysis was conducted assuming no deposition of NH_3 to the ground within the modeling domain. This is a conservative assumption and is appropriate for this analysis. Maximum ambient impacts will generally occur in relatively close proximity to the facility, before the attenuation due to deposition becomes important.

Emissions Estimates

CFI has estimated that the proposed Blue Point facility will emit about 144 tons per year of NH_3. Table 1 shows how the different emission sources at the proposed facility contribute to this total. The applicant has used higher emissions estimates in its AERMOD modeling analysis, especially for flares. These modeling rates are also shown in Table 1, along with the modeled NH_3 ambient concentration impact for each emission source. In general, the higher emission rates provide a conservative estimate of the ambient impact from the proposed facility with the exception of fugitive emissions, which will be discussed below.

Table 1. Contributions of individual emission sources to the overall emissions from the proposed CFI facility, and ambient concentration impacts estimated in CFI's modeling analysis.

Emission source	Modeling ID	Permit emission rate (tpy)	Modeled emission rate (tpy)	CFI's modeled maximum NH_3 impact (µg/m3)[a]
Auxiliary boiler	23U510	8.0	22.3	1.5
Ammonia flare	FA_ST	39.9	873.4	3.7
Wastewater treatment	WWT	0.6	0.6	9.0
Syngas flare	FS_ST	0.6	70.0	0.1
Fired heaters	13U501	10.2	12.8	0.5
Ammonia storage tank flares	TKFL_AST	63.3	700.1	33.3
Aqua ammonia storage tank	TK_NH3	0.1	0.1	0.8
Ammonia ship loading fugitives	SL1	5.4	7.3	116.1
Process fugitives	FUG	15.5	19.6	163.2
Facility total		143.6		168.13[b]

[a] 8-hour average concentration in ambient air.

[b] Impacts of individual emission sources do not sum to the facility total, because the maximum impacts from the sources occur at different places and times.

Because they occur near ground level, fugitive sources produce an ambient impact that is disproportionate to their contribution to overall emissions. As Table 1 shows, process fugitive emissions and fugitive emissions from ship loading produce the highest ambient NH_3 impact of any emission sources, despite their moderate contribution to total plant NH_3 emissions. These emissions consist of leaks from pumps, valves, flanges, compressors, and pressure relief valves in NH_3 service.

The applicant has used the U.S. EPA's Protocol for Leak Emission Estimates from the Synthetic Organic Chemicals Manufacturing Industry (SOCMI) as its basis for estimating fugitive NH_3 emissions from its process equipment.[4] The SOCMI protocol was developed with a focus on volatile organic chemical (VOC) emissions, but also allows estimation of fugitive emissions of some inorganic compounds, including NH_3, sulfur dioxide, and hydrochloric acid.[5] The protocol provides guidance for computing emissions from process streams that are not pure ammonia, and the applicant has implemented this guidance correctly.[6]

The applicant has also applied a molecular weight factor of 0.243, which is the ratio of the molecular weight of NH_3, 17 grams/mole, to the molecular weight of a typical VOC, 70 g/mole. No justification or rationale is given for making this adjustment, and the SOCMI protocol does not provide any suggestion that a molecular weight adjustment is needed. SOCMI emission factors reflect mass fluxes, and are applied to VOCs that can have a wide range of molecular weights. No indication is given in the SOCMI protocol that emissions should be adjusted for the molecular weight of the VOC emitted.[7] The Texas Commission on Environmental Quality has provided guidance where emission factors for ethylene are distinguished from other VOC. But this differentiation is not based on a molecular weight adjustment. In fact, while ethylene is a comparably light VOC – with a molecular weight of 26 g/mole – the emission factors given by TCEQ for ethylene are ***higher*** than emission factors for other VOC.[8] This would imply that emission factors for NH_3 emissions from fugitive sources could be higher than typical VOC, rather than lower.

Short Term Episodic Emissions

Short term fluctuations in emissions are important in evaluating impacts relative to the 8-hour NH_3 air quality threshold. In its analyses under the Residual Risk and Technology Review (RTR) program, the U.S. EPA multiplies annual emissions by a short-term temporal adjustment factor (STAF) when evaluating potential acute impacts. EPA's default multiplier when converting from annual emissions to maximum short-term emissions is a factor of 10. For industries where emissions are dominated by fugitive sources, the multipliers are lower, typically a factor of 2.[9]

For most of its emission sources, CFI's modeled emission factors incorporate a margin of safety similar to or higher than EPA's short term emission adjustment factors. However, CFI's modeled

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[4] U.S. Environmental Protection Agency. Protocol for Leak Emission Estimates. EPA-453/R-95-017. November 1995. Available at https://www.epa.gov/sites/default/files/2020-09/documents/protocol_for_equipment_leak_emission_estimates.pdf.

[5] Reference 4, page 2-53 (PDF pg. 69).

[6] Reference 3. Appendix D, page 54 (PDF pg. 171).

[7] Reference 4.

[8] Air Permits Division Texas Commission on Environmental Quality. Air Permit Technical Guidance for Chemical Sources, Fugitive Guidance, APDG 6422. https://www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/fugitive-guidance.pdf. June 2018

[9] U.S. Environmental Protection Agency. Review of National Emission Standards for Hazardous Air Pollutants for Polyether Polyols Production Industry. Federal Register, vol. 89, no. 248, Friday, December 27, 2024. pg. 105996 (PDF pg. 11). Available at https://www.govinfo.gov/content/pkg/FR-2024-12-27/pdf/2024-29466.pdf.

emissions for fugitive emissions are only 26% higher than the estimated annual average emission rate (Table 1), corresponding to a short-term adjustment factor of 1.26. Based on EPA's approach to other fugitive emission sources, a more conservative short term adjustment factor of 2 would be more appropriate. This would increase the predicted maximum 8-hour average impact of the fugitive emission source by about 60%, or a factor of 1.6.

Section 2. Independent Modeling of Ammonia Emissions from the Proposed CFI Blue Point Plant

In the current study, the AERMOD model was run independently to assess the impacts of emissions from the CFI plant. In addition to the maximum 8-hour average impacts, maximum 1-hour average impacts and annual average impacts were evaluated. The same meteorological data and receptor network were used as in the CFI modeling study. In addition, CFI's modeled emission rates were retained for most of the proposed emission sources. For process fugitive emissions and ship loading fugitive emissions, emissions estimates were based on the SOCMI protocol document, ***without*** the molecular weight adjustment used by CFI. Table 2 summarizes the results of independent modeling of the proposed CFI plant.

Table 2. Estimated ambient NH_3 impacts for the proposed CF Industries Blue Point plant based on independent modeling

		Maximum ambient NH_3 impacts (µg/m^3)		
Emission source	Modeling ID	8-hour average	1-hour average	Annual average
Auxiliary boiler	23U510	1.54	2.46	0.07
Ammonia flare	FA_ST	3.71	8.94	0.11
Wastewater treatment	WWT	9.02	13.10	0.46
Syngas flare	FS_ST	0.10	0.29	0.00
Fired heaters	13U501	0.46	0.64	0.02
Ammonia storage tank flares	TKFL_AST	33.3	43.5	0.97
Aqua ammonia storage tank	TK_NH3	0.77	2.07	0.02
Ammonia ship loading fugitives	SL1	478	647	48.5
Process fugitives	FUG	672	1336	17.8
Facility total		677[a]	1342[a]	50.3[a]

[a]Source impacts to not sum to the facility total because the maximum impacts for different sources occur at different places; and, in the case of 1-hour and 8-hour averages, at different times.

The table shows that when unadjusted SOCMI emission factors are used, the maximum predicted 8-hour average ambient NH_3 impact at the fenceline of the proposed CFI Blue Point is 677 µg/m^3. This concentration exceeds Louisiana's 640 µg/m^3 8-hour AAS for NH_3. It should be noted that the impacts presented in Table 2 for fugitive emissions use the same short term adjustment factor as that used by CFI in its modeling – a factor of 1.26 higher than estimated annual emissions. The applicant does not provide a basis for selecting this adjustment factor for short-term fugitive emissions. Based on EPA's treatment of other fugitive emission sources in its acute risk modeling under the RTR program, a more conservative short term adjustment factor of 2 would be more appropriate. This would increase the predicted maximum 8-hour impact for the process fugitive source category in Table 2 to about 1,066 µg/m^3, and the predicted facility total 8-hour impact to about 1,070 µg/m^3.

Section 3. Modeling of Ammonia Emissions from Nearby Facilities

Within 18 kilometers of the proposed CFI Blue Point facility, there are 24 existing plants that emit NH_3, and another three facilities that have been permitted but have not yet been built. Table 3 gives a list of these facilities, along with their expected average annual emissions and maximum annual emissions of NH_3. Figure 1 shows the locations of these facilities relative to the proposed CFI Blue Point site.

The Environmental Integrity Project compiled source-specific NH_3 emission rates, stack parameters, and other emission release parameter for the nearby facilities from the LDEQ Emissions

Table 3. NH_3 emissions from existing and permitted facilities near the proposed CFI Blue Point site

Plant	Permit emissions (tpy)a	
	Average annual	Maximum
Air Liquide Large Industries US LP - Geismar Utility Services	1.92	6.96
Air Products Blue Energy LLC - Clean Energy Production Facility	39.95	5,040.94
Air Products and Chemicals Inc - Geismar 3 HyCO SMR Plant	7.27	8.72
Air Products & Chemicals Inc - Geismar 1 SMR Facility	0.88	0.88
BASF Corp - Geismar Site	69.09	54.46
CF Industries Nitrogen LLC - Donaldsonville Nitrogen Complex	16,857.00	16,450.12
Clean Hydrogen Works - Ascension Clean Energy	143.51	243.09
FloPam Inc - Flopam Facility	5.21	2,795.93
Honeywell International Inc - Geismar Plant	0.03	0.47
Hexion Inc - Geismar Facility	0.09	0.04
Lion Copolymer Geismar LLC - Geismar Facility	0.04	0.09
Linde Inc - Geismar Facility	-	50.90
Mitsubishi Chemical America Inc - MCA Geismar Site	21.25	24.97
Mosaic Fertilizer LLC - Faustina Plant	276.99	6,622.56
Methanex USA Services LLC - Geismar Methanol Plant	845.82	1,596.38
Nachurs Alpine Solutions LLC - St. Gabriel Facility	4.95	14.85
NOVA Chemicals Olefins LLC - Geismar Ethylene Plant	8.06	12.88
PCS Nitrogen Fertilizer LP - Geismar Facility	5,223.46	11,300.80
REG Geismar LLC	5.74	7.18
Rubicon LLC - Geismar Facility	14.82	13.27
Shell Chemical LP - Geismar Plant	93.99	102.01
Shintech Louisiana LLC - Shintech Plaquemine Plant	94.73	680.47
Syngenta Crop Protection LLC - St Gabriel Plant	105.30	956.95
Taminco US LLC - St Gabriel Plant	1.07	23.66
Team Industrial Services Inc	0.26	0.26
TotalEnergies Petrochemicals & Refining USA Inc - Cos-Mar Styrene Monomer Plant	7.75	7.80
Westlake Vinyls Co LP	6.31	7.45

[a]Emissions were compiled and provided by the Environmental Integrity Project.

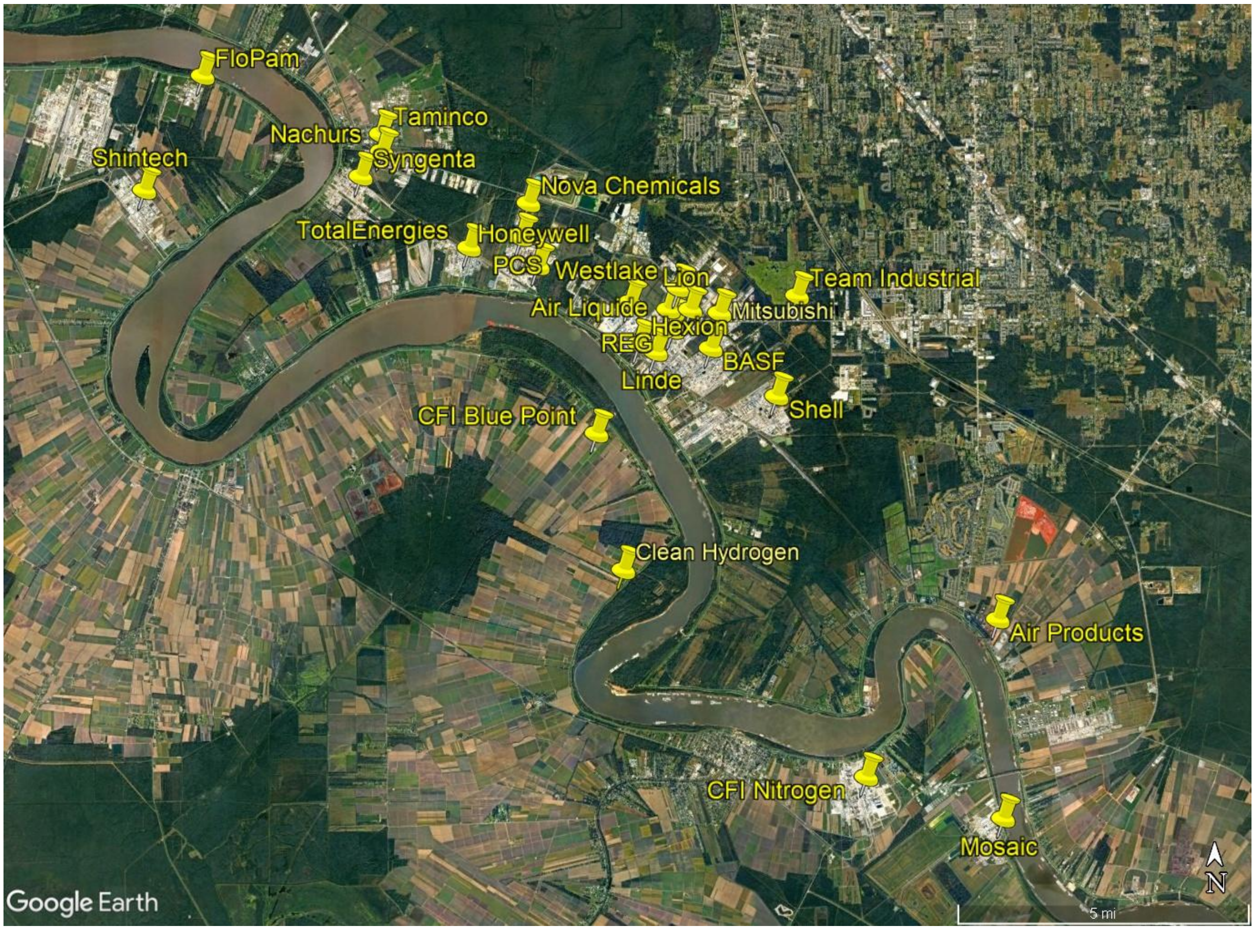

Figure 1. Existing and permitted NH_3 emission sources near the Proposed CFI Blue Point Facility

Reporting and Inventory Center's Permitted/Actual Emissions By Radius Report Tool.[10] These data were used to carry out AERMOD modeling of NH_3 ambient impacts from the nearby facilities. Impacts were estimated on an 8-hour average basis using maximum and average emission rates, on a 1-hour average basis using maximum emission rates, and on an annual average basis using average emission rates.

The CFI model receptor network was used, with two modifications. First, aerial imagery was reviewed using Google Earth in order to identify receptors located on the property of the nearby chemical facilities. These sites were removed from the modeling receptor network. Second, the coarse outer portion of the network was extended by about 2 kilometers to the Northwest and Southeast in order to better compute impacts of facilities in those areas.

Table 4 summarizes the results of AERMOD modeling for existing and permitted facilities located near the proposed CFI Blue Point project. Modeled impacts of the proposed CFI Blue Point project are also included. The largest estimated impacts are from the PCS Nitrogen Fertilizer facility, located a few kilometers to the Northwest of the proposed CFI Blue Point site, across the Mississippi River. The largest modeled 8-hour NH_3 impact from the PCS facility, excluding areas over roads, railroads, and waterways, in 1,295 µg/m^3. This modeled impact exceeds the Louisiana 8-hour standard (640 µg/m^3) by a

[10] Louisiana Department of Environmental Quality, Emissions Reporting and Inventory Center, Permitted/Actual Emissions by Radius Report Tool, last accessed on November 14, 2025. Available at https://business.deq.louisiana.gov/Eric/EricReports/RadiusReportSelector.

substantial margin. However, it must be noted that the AERMOD analysis of the nearby facilities was somewhat cursory, drawing only on information available in the emissions inventory. Factors such as building downwash and obstructions were not incorporated into the analysis.

In any case, the modeled NH_3 impact analysis for nearby facilities shows that the area around the proposed Blue Point Project is already subject to large ambient NH_3 impacts. The proposed CFI Blue Point project would broaden and increase the ambient NH_3 impacts.

Figure 2 shows the predicted ambient NH_3 impacts in the immediate vicinity of CFI Blue Point facility, based on combined emissions from the proposed facility and nearby facilities. The figure focuses on the area where NH_3 concentrations are currently estimated to exceed 640 $\mu g/m^3$ or would be projected to exceed this level with the addition of emissions from the proposed new CFI facility. Concentrations show in the figure are based on AERMOD model using the maximum permitted emissions for the nearby facilities (Table 3). The highest predicted impacts are located in a region between the PCS Nitrogen plant and the proposed CFI Blue Point site, and result mainly from emissions from the PCS Nitrogen plant.

The highest estimated impacts from the proposed CFI Blue Point facility are along the southeast boundary of the proposed facility site, in the areas nearest the process fugitive emission source and the ship loading emission source. The figure shows the boundary of the proposed Blue Point facility, and the location of the process fugitive emission source, which is characterized in AERMOD as an area source, dispersed over a rectangular region.

Table 4. Estimated NH_3 concentration impacts for facilities in the area of the proposed CFI Blue Point site, including the proposed CFI Blue Point plant itself

Facility	Maximum predicted NH3 concentration impacts (µg/m3)			
	8-hour averages		1–hour average (maximum emissions)	Annual average (average emissions)
	Average emissions	Maximum emissions		
Air Liquide	0.1	0.5	0.8	0.01
Air Products Blue Energy	1.3	184	431	0.07
Air Products 3 HyCO	0.3	0.4	0.6	0.02
Air Products 1 SMR	1.4	1.4	3.5	0.07
BASF	2.9	57.9	200	0.27
CFI Nitrogen	308	532	1,498	33.6
Clean Hydrogen Works	17.0	17.0	20.6	3.70
FloPam	8.2	219	362	0.46
Honeywell	0.05	0.8	1.7	0.00
Hexion	0.6	0.6	0.4	0.05
Lion Copolymer	0.01	0.02	0.07	0.00
Linde		3.4	5.3	
Mitsubishi	1.1	16.4	34.7	0.07
Mosaic Fertilizer	14.1	472	608	0.69
Methanex	43.3	47.9	60.6	2.17
Nachurs	0.8	2.4	4.0	0.04
NOVA Chemicals	0.4	0.6	1.1	0.02
PCS Nitrogen	1,295[a]	1,298[a]	3,074[a]	49.6[a]
REG	0.5	0.7	1.0	0.03
Rubicon	8.1	8.1	10.9	0.68
Shell	10.6	10.6	4.3	1.19
Shintech	3.0	26.2	41.3	0.37
Syngenta	29.1	108	188	1.12
Taminco	4.3	103	248	0.41
Team Industrial			0.02	
TotalEnergies	0.7	0.7	1.1	0.03
Westlake	14.4	16.8	55.9	0.94
CFI Blue Point	677	677	1,342	50.3
Overall maximum	1,295	1,299	3,075	59.0

[a] Estimated impacts exclude receptors located on roads, railroads, and waterways.

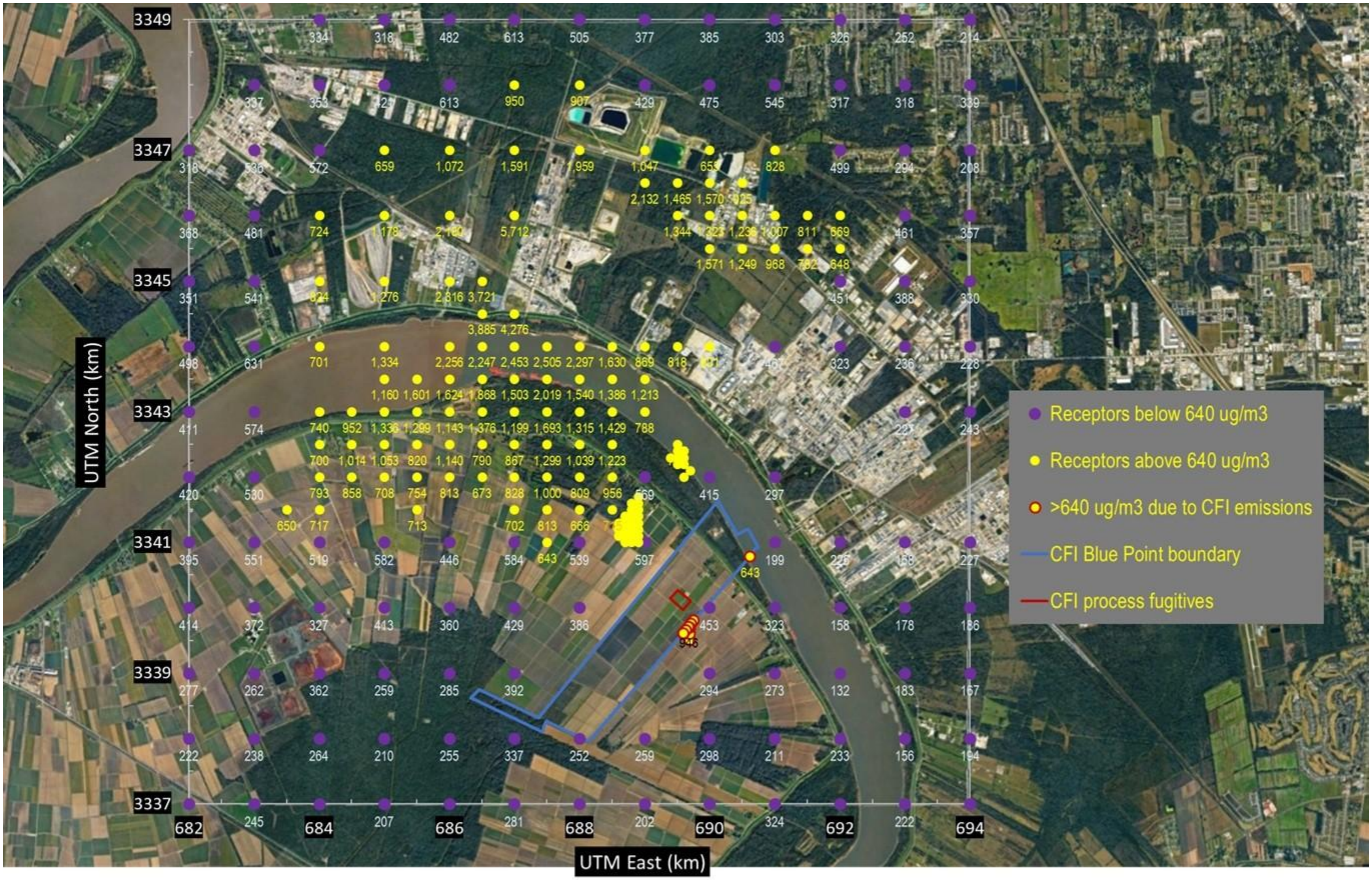

Figure 2. Estimated ambient maximum 8-hour average NH_3 impacts due to combined emissions from the proposed CFI Blue Point facility and nearby facilities. Estimated NH_3 concentration impacts are given as numerical values (in µg/m^3) below the receptor location. For clarity, receptors are shown with a spacing of 1 kilometer in regions where the NH3 concentration is not predicted to exceed 640 in µg/m^3.

Section 4. Comparison of Ammonia Modeling Results with Benchmark Concentrations

As has been discussed earlier, Louisiana has established a threshold level of concern for NH_3 at 640 µg/m^3 on an 8-hour average basis. The maximum predicted 8-hour average ambient NH_3 impact at the fenceline of the proposed CFI Blue Point is estimated at 677 µg/m^3 (Table 3), which exceeds the Louisiana 8-hour average threshold. The estimated impact from the nearby PCS Nitrogen Fertilizer plant, 5,719 µg/m^3 (Table 4) also exceeds this threshold.

The EPA Integrated Risk Information System (IRIS) database sets the NH_3 Reference Concentration (RfC) at 500 µg/m^3 for chronic exposure.[11] The California Office of Environmental Health Hazard Assessment (OEHHA) gives a Reference Exposure Level (REL) of 200 µg/m^3 for chronic exposure.[12] The highest predicted annual impact from the CFI Blue Point facility is estimated at 50.3 µg/m^3, which is below both of these levels. The estimated annual average impact from the nearby PCS Nitrogen Fertilizer facility is about 255 µg/m^3, below the chronic IRIS RfC but above the California OEHHA chronic REL.

The National Institute for Occupational Safety and Health (NIOSH) has set a Short Term Exposure Level of 35 ppm, or about 25,000 µg/m^3, for acute NH_3 exposure, about 15 minutes.[13] The California OEHHA REL is 3,200 µg/m^3 for acute exposure.[14] The maximum 1-hour average predicted impact from the proposed CFI Blue Point facility is about 1,342 µg/m^3, below both of these levels. The estimated maximum 1-hour average impact from the nearby PCS Nitrogen Fertilizer facility is about 18,735 µg/m^3, below the NIOSH STEL, but above the California OEHHA acute REL.

The Texas Commission on Environmental Quality (TCEQ) acute Effects Screening Level (ESL) of 3,600 µg/m^3 for nuisance due to odor.[15] The maximum predicted 1-hour impact from the CFI Blue Point facility (1,342 µg/m^3) is below this level. The maximum 1-hour impact from the PCS Nitrogen facility exceeds the Texas odor threshold.

Section 5. Summary and Conclusions

- In general, the modeling approach, selection of meteorology data, receptor network, and level of detail of the applicant's AERMOD analysis were good. One issue was identified in the calculation of fugitive NH_3 emissions, which is discussed below.

- The applicant has used the U.S. EPA SOCMI Protocol to estimate fugitive NH emissions from process equipment, but has made an adjustment to the SOCMI factors, based on the molecular weight of NH_3 compared with VOC. The applicant does not explain the rationale for this

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[11] U.S. Environmental Protection Agency. Toxicological Review of Ammonia Noncancer Inhalation: Executive Summary. EPA/635/R-16/163Fc. https://iris.epa.gov/static/pdfs/0422_summary.pdf. September 2016.
[12] OEHHA. Appendix D.3 Chronic RELs and toxicity summaries using the previous version of the Hot Spots Risk Assessment guidelines (OEHHA 1999). https://oehha.ca.gov/air/chemicals/ammonia.
[13] Occupational Safety and Health Administration, Ammonia, last accessed November 25, 2025. Available at https://www.osha.gov/chemicaldata/623.
[14] Reference 12.
[15] Texas Commission on Environmental Quality. Ammonia, Revised Odor Value, September 14, 2015. https://www.tceq.texas.gov/downloads/toxicology/dsd/final/ammonia.pdf.

adjustment. Furthermore, the SOCMI Protocol does not recommend such an adjustment, either for different weights of VOC, or for inorganic gases such as NH_3.[16]

- When unadjusted SOCMI emission factors are used, the maximum predicted 8-hour average ambient NH_3 impact at the fenceline of the proposed CFI Blue Point is 677 µg/m^3. This concentration exceeds Louisiana's 640 µg/m^3 8-hour AAS for NH_3.

- The proposed CFI Blue Point facility would be located in a region of locally dense industrial development, where existing facilities produce elevated ambient concentrations of NH_3. The proposed facility would add to these NH_3 impacts.

- Short term fluctuations in emissions are important in evaluating impacts relative to the 8-hour NH_3 air quality threshold. For most of its emission sources, CFI's modeled emission factors incorporate a margin of safety to reflect potential short-term fluctuations. For fugitive emissions, however, CFI's modeled emissions are only 26% higher than the estimated annual average emission rate, corresponding to a short-term adjustment factor of 1.26. The applicant does not provide a basis for selecting this short-term adjustment factor for fugitive emissions. Based on EPA's treatment of other fugitive emission sources in its acute risk modeling under the under the Residual Risk and Technology Review (RTR) program, a more conservative short-term adjustment factor of 2 would be more appropriate. This would increase the estimated maximum 8-hour average ambient impact of the facility to about 1,070 µg/m^3.

[16] Reference 4.

WILLIAM BATTYE, P.E., Ph.D.

Education

Ph.D.	Marine, Earth, and Atmospheric Sciences, North Carolina State University, 2018
M.S.	Chemical Engineering, Massachusetts Institute of Technology, 1977
B.S.	Chemical Engineering, Massachusetts Institute of Technology, 1977

Professional Summary

Dr. Battye has over four decades of experience in developing and reviewing the inputs to various air pollution and exposure models and in refining these models. He has expertise in engineering cost analysis and in evaluating least-cost strategies. He also has extensive expertise in exposure assessment, including a broad range of geographic information systems (GIS) and Census analyses. He led the development of the U.S. Environmental Protection Agency's (EPA's) Human Exposure Model – Version 3 (HEM-3) for hazardous air pollutants (HAPs) and other toxic air pollutants. This model is currently a mainstay of EPA's technical analysis efforts under both the National-Scale Air Toxics Assessment (NATA) and the Residual Risk and Technology Review (RTR) Program.

Professional Experience

2018–present	NC State University, Adjunct Professor, Marine, Earth and Atmospheric Sciences
2015–present	SC&A Incorporated, Senior Engineer
1989–2015	EC/R, Incorporated, Managing Partner
1989–1991	EC/R, Incorporated, President
1979–1989	GCA/Technology Division, Head, Engineering and Modeling Section
1977–1979	GCA/Technology Division, Chemical Engineer and Project Manager

Summary of Professional Accomplishments

Support for EPA's RTR Program. Provided senior level technical support under RTR engineering analyses to EPA to evaluate emissions, existing emission controls, and emission control options for a number of industrial categories. Supervised population exposure and risk modeling efforts for EPA for a wide array of industrial source categories. Developed approaches to streamline the analysis and thereby allow the use of the HEM-3/AERMOD modeling system to thousands of facilities under very tight time schedules.

Support for EPA NATA Programs. Supervised risk modeling for EPA's 2002, 2005, and 2011 NATA programs. Modeled cancer and noncancer risks for 189 HAPs from about 65,000 industrial facilities. Modeled onroad and nonroad mobile source impacts for 60,000 census tracts. Developed the HEM-3 model framework allowing rapid application of EPA's state-of-the-science AERMOD dispersion model on an unprecedented scale. Developed query tools to allow quick access to detailed results. Query tools were used to provide quick response support for the development of EPA's school monitoring program. Helped EPA develop techniques for interlacing AERMOD results with Community Multi-Scale Air Quality modeling system results for reactive HAPs. Developed web-based outreach tools for distributing NATA results and assisted in preparing documentation for the NATA program.

Agricultural Ammonia (NH_3) Emissions Assessment. Ph.D research involved using satellite measurements of atmospheric NH_3 to assess the predictions of CMAQ using current NH_3 emissions inventories. Supervised graduate students analyzing the impacts of NH_3 emissions from Confined Animal Feeding Operations (CAFOs). Previously, evaluated the uncertainties of NH emissions inventories for the Coordinating Research Council (CRC). This analysis included CAFOs, fertilizer emissions, and other sources. Reviewed measurements of NH_3 emissions from natural landscapes for the National Oceanic and Atmospheric Administration (NOAA). Served as a peer reviewer of the National Research Council (NRC) report on "Air Emissions from Animal Feeding Operations." Participated in workshops on agricultural emissions.

CenRank Environmental Justice Analysis Tool. Led development of EPA CenRank, a GIS-based tool commissioned by the EPA Office of Air Quality Planning and Standards (OAQPS), to help regulation writers in evaluating the environmental justice impacts of air pollution control programs. Involved compilation and analysis of extensive databases on demographics, poverty, education, language, and disability at the census block and block-group levels and on a national scale. Combined these data with ozone and fine particulate matter (PM2.5) concentration data and HAP exposure information from NATA. Developed user friendly, GIS-based software for proximity analyses of demographics and other environmental justice parameters within a user-specified distance of emission sources.

Reasonable Progress for Class I Areas in the Northern Midwest – Factor Analysis. Managed a project for the Lake Michigan Air Directors Consortium to evaluate the potential control measures to mitigate regional haze in the Midwest. The control measures were primarily sector-based cap-and-trade programs for sulfur dioxide (SO_2) and nitrogen oxides (NOx). Source categories included electric generating units (EGUs), industrial boilers, other stationary sources, and mobile sources. Control measures were also evaluated for agricultural sources of ammonia emissions. A "four-factor" analysis was conducted, addressing costs, time required for implementation, energy impacts and other environmental impacts, and remaining equipment life.

Analysis of Regional Haze Control Measures for Montana Sources. Providing technical assistance in the analysis of costs and environmental impacts for potential measures controls. This analysis addressed SO_2 and NOx emissions from petroleum refineries and other major sources.

Long-Range Transport of Air Pollution. Provided technical assistance in the analysis of potential future emissions of criteria pollutants on a global basis. Compiled and reviewed future emission projections prepared by various research groups evaluating future climate change scenarios.

Development of HEM-3. Led development of EPA's HEM-3, a model for assessing air pollution concentrations, population exposures, cancer risks, non-cancer risks, and population exposures from HAP emissions. HEM-3 is being provided by EPA as a tool to assist industrial sources, states, and local agencies in determining whether emissions meet residual risk targets. Provided training for model users at state and local agencies in the Midwest. Assisted in development of class materials for EPA trainers in other regions. HEM-3 model incorporates EPA's state-of-the-

science atmospheric dispersion model, AERMOD, and upgrades to AERMOD can be readily substituted into HEM-3. The single-plant version of HEM-3 is a user-friendly, downloadable tool to assist industrial sources, states, and local agencies in determining whether emissions meet residual risk targets. A "Community and Sector" version has also been developed to efficiently assess thousands of facilities and has been used extensively for the NATA and RTR programs.
Microenvironment Factors. Updated microenvironment factors used to quantify air concentrations in the indoor air and other microenvironments in EPA's HAPEM5 model. Microenvironment factors were developed for 30 types of buildings and outdoor spaces.

Multimedia Risk Assessments for Secondary Lead and Coke Ovens. Provided senior-level technical support for the secondary lead residual risk assessment, an EPA pilot study for Science Advisory Board review of methods for multimedia assessment. Assisted in the design of approaches for estimating fugitive emissions based on measured fenceline air pollution concentrations and development of methodologies for quantifying variability and uncertainty. Also supervised multiple exposure pathway risk analysis for coke ovens, in support of EPA's post-Maximum Achievable Control Technology residual risk analysis that included health and ecological risks and accounted for the potential for some HAPs to bioaccumulate in the food chain and persist in the environment. Compiled a set of pollutant benchmarks to be used in ecological assessments of species living near coke ovens. Supervised water body simulations used to evaluate bioaccumulation of HAPs in fish.

Cost and Economic Analysis of Revised Hearing Protection Rules. Managed a project for the EPA Office of Policy Analysis and Review to estimate costs and economic impacts of planned revisions to EPA's regulations for the testing and labeling of hearing protective devices. Testing costs, recordkeeping costs, and labeling costs were evaluated for various segments of the industry, including earplugs, earmuffs, noise cancelling headsets, and nonlinear noise reduction devices. The economic analysis addresses the impacts of the proposed rules on overall device costs, the likelihood that these costs will be passed on to consumers, the potential for plant closure, and the impacts on small business entities.

Evaluation of Daily Emissions from EGUs Under Different Meteorological Conditions. Developed algorithms to be used by the National Oceanic and Atmospheric Administration (NOAA) to improve daily emissions estimates for EGUs used in regional modeling of ozone and fine particulate matter under the joint EPA/NOAA National Air Quality Forecast System. The algorithms adjust daily emissions from EGUs in different metropolitan areas to reflect the changes in electricity demand resulting from such factors as increased air conditioner usage during short term heat waves. Time-series analyses and other statistical analyses and regression analyses were conducted using continuous emissions monitoring systems for different fuel types and at different levels of geographic aggregation.

Multi-Pollutant Strategies. Provided support to a project to help OAQPS evaluate multipollutant impacts of industry sectors that significantly affect nationwide air quality and to develop appropriate emission reduction strategies. Identified potential multi-pollutant emission reduction strategies, including traditional regulatory approaches along with innovative and voluntary approaches.

Control Measures for Port Emissions. Evaluated potential voluntary control approaches for emissions of diesel particulate matter and NOx from the Port of Philadelphia. This project involved a detailed assessment of diesel emissions from cargo-handling equipment such as forklifts and cranes, as well as ocean-going vessels, tugboats and towboats. Potential control technologies were identified, and their costs and emissions impacts were evaluated. This project focused on diesel emissions; however, collateral reductions of NOx were also estimated.

Fire Emissions Workshop. Provided support for a series of consensus-building teleconferences leading up to a stakeholder workshop to improve emissions estimates methods for wildfire, prescribed fire, and agricultural burning. Participants included representatives of EPA, Forest Service, U.S. Department of the Interior, and Regional Planning Organizations. Facilitated a stakeholder process for developing new ammonia, NOx, and SO_2 emission factors for wildland fire and improving volatile organic compound emission factors and speciation factors.

Transboundary Transport Analysis. Compiled and evaluated back-trajectory analyses that relate to U.S.-Canada trans-boundary impacts for PM2.5 and regional haze. Summarized cross-border transport, sources and impacts, for different border regions of the United States and Canada. Assessed various techniques for back-trajectory analysis and ensemble back-trajectory analysis and compared the results of different techniques. Made recommendations for additional trajectory analyses that would fill current knowledge gaps regarding trans-boundary impacts of PM2.5.

Registrations

Registered Professional Chemical Engineer (NC #11881)

Publications

Battye, W., C.D. Bray, V.P. Aneja, D. Tong, P. Lee, and Y. Tang. (2019). Evaluating ammonia (NH_3) predictions in the NOAA National Air Quality Forecast Capability (NAQFC) for eastern North Carolina using ground level and satellite measurements. In review.

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