Illinois Environmental Protection Agency
2520 West Iles Avenue • P.O. Box 19276 • Springfield, Illinois • 62794-9276 • 217-782-3397

JB Pritzker, Governor **James Jennings**, Acting Director

MEMORANDUM

Date: September 9th, 2025

To: Mohamed Otry, FESOP/State Permits/BOA

From: Jada Strother, Modeling Unit, Permits/BOA

Subject: EdgeConneX Chicago Holdings, LLC, ID 031804ABS, Permit Application #24080001

EdgeConneX Chicago Holdings, LLC (EdgeConneX) owns and operates a data center that currently operates under a Federally Enforceable State Operating Permit (FESOP) #18020010. The proposed project would be located at 2055 Lunt Avenue, Elk Grove Village, Illinois, Cook County, IL, 60007. The center of the Elk Grove Village facility is in Universal Transverse Mercator (UTM) Zone 16, at approximately 4,650,297 meters (m) Northing and 421,262 m Easting.

EdgeConneX submitted a permit application on August 2nd, 2024, for the proposed installation of 14 – 2,750 kilowatts (kW) diesel emergency generators and two 1,250 kW diesel emergency generators. The 1,250 kW generators are intended to support auxiliary facility functions. The proposed project would involve the installation of a total of 16 diesel-powered emergency generators at the Elk Grove Village facility and has been designated as project CHI03 by EdgeConneX. Two earlier construction projects, CHI01 and CHI02, have taken place at the existing Elk Grove Village facility. This application seeks to expand the Elk Grove Village facility.

Since the Elk Grove Village facility, as of the date of this modeling memorandum, is located in an Environmental Justice (EJ) community and is proposing an increase in emissions of particulate matter (PM_{10} and $PM_{2.5}$), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2) and volatile organic material (VOM), the Illinois Environmental Protection Agency (Illinois EPA) Modeling Unit requested that EdgeConneX perform an air quality modeling analysis in support of its construction permit application to confirm the project would not threaten or compromise existing National Ambient Air Quality Standards (NAAQS). While VOM was not directly modeled, to confirm that the project would not threaten or compromise existing NAAQS, the proposed emissions were evaluated using Modeled Emission Rates for Precursors (MERPs) to assess potential air quality impacts.

In response to the Illinois EPA's request, EdgeConneX retained Trinity Consultants Inc. (Trinity) to conduct an air quality review of $PM_{2.5}$, PM_{10}, SO_2, NO_x, CO, and secondary Ozone (O_3). In addition to modeling the pollutants, the Modeling Unit also evaluated the secondary O_3 and secondary $PM_{2.5}$ impacts that would occur due to the chemical reaction in the atmosphere of emission increases of VOM, NO_x, and SO_2, from the proposed project.

Modeling Unit Review

On June 13th, 2025, Trinity submitted an air quality analysis report for the proposed project, CHI03, to the Modeling Unit, including accompanying modeling files.

The following main dot entries identify key aspects of the modeling methodology used in this analysis:

- Trinity used AERMOD, AERMAP, and AERMET (v. 24142). AERMOD is a federally approved regulatory model appropriate for use in an air quality analysis of this nature. The audit runs done by the Modeling Unit, also, used this version.
- Modeling inputs utilized the Illinois EPA and U.S. Environmental Protection Agency (U.S. EPA) recommended default regulatory options, which simulate phenomena such as atmospheric stability, plume rise, and downwash. The modeling analysis incorporated five years of locally representative meteorology. The Modeling Unit obtained National Weather Service (NWS) meteorological data files for years 2020 through 2024 from the National Centers for Environmental Information (NCEI), which consisted of surface data collected at the O'Hare International Airport in Chicago, Illinois, and upper air data collected at Davenport Municipal Airport in Davenport, Iowa. Surface and upper air stations were selected because of their proximity to the project site in Elk Grove Village.
- Trinity processed National Elevation Data (NED) terrain elevations from the U.S. Geological Survey (USGS) using AERMAP (v. 24142) to develop the receptor terrain elevations and hill height scales required by AERMOD. The elevation at the project site is approximately 205 meters above mean sea level.

- Trinity used a Cartesian grid in their distribution of 16,141 receptors. The following receptor grid densities were used:
  - 50 m spacing of receptors from the proposed facility's boundary out to 1 kilometer (km).
  - 100 m spacing of receptors from 1 km out to 2 km.
  - 250 m spacing of receptors from 2 km to 5 km.
  - 500 m spacing of receptors from 5 km to 10 km.
  - 1000 m spacing of receptors from 10 km to 50 km.
- Trinity selected the urban modeling option in their analysis. The Modeling Unit conducted an Auer's Analysis, as part of its review, to characterize the area surrounding the Elk Grove Village facility and to determine whether the AERMOD urban option should be implemented. The Modeling Unit developed its Auer's Analysis using 2021 National Land Cover Data (NLCD) within a 3-km radius of the site. Results of the analysis showed the surrounding area is approximately 5 percent rural and 95 percent urban.
- Trinity used U.S. EPA's Building Profile Input Program (BPIPPRM) to account for downwash effects of on-site structures. All on-site nearby buildings were included in the modeling analysis.
- NO_2 modeling options consisted of multiple tiers. Tier 1 assumed that all NO_x emissions at the source would convert to NO_2. Tier 2 is based upon a representative atmospheric equilibrium default value that was developed using conversion ratios generated from monitored concentrations of NO_x and NO_2. Tier 3 allows the user to perform a detailed analysis using either the Ozone Limiting Method (OLM) or the Plume Volume Molar Ratio Method (PVMRM) regulatory screening options in AERMOD. These options consider the chemical mechanism of ozone titration and the resulting NO_2 concentrations. The tiered approach is consistent with Appendix W to 40 CFR Part 51, which outlines the acceptable methods for estimating ambient NO_2 concentrations in Prevention of Significant Deterioration (PSD) modeling.[1]

[1] Appendix W to Part 51, *Guideline on Air Quality Models*, 40 CFR 51 (2024).

- Trinity selected the Tier 3 , Plume Volume Molar Ratio Method (PVMRM) option in AERMOD which uses in stack ratios[2] (ISR), with 0.5 as the nearby sources and 0.1 as the project's sources, along with ozone background concentrations.[3]

Operating Runtime

Any maintenance or readiness testing of each proposed generator, would be limited to the daytime hours of 7 a.m. to 6 p.m. In addition, the maximum number of generators that could operate in a 24-hour period would be limited to six.[4] The maintenance and readiness testing of each generator would be limited to two hours per event and, only one generator would be authorized to operate at a time. Each generator would be limited to no more than a total of 45 hours of operation per year. **Table 1** provides the details.

Table 1
Maintenance/Routine from 7 a.m. to 6 p.m.

Maximum Generators Operating in a 24-hour period	**Maximum Generators Operating Simultaneously**	**Event Duration** (hours/generator/event)	**Annual Duration** (hours/generator/year)
6	1	2	45

The allowable emission rates were based on the following scenarios:

- 24-hour: $PM_{2.5}$ and PM_{10}, used the daily average emission rate at two hours per day for the 2,750 kW generators and four hours per day for the 1,250 kW generators. In an abundance of conservatism, modeling assumed that the 1,250 kW generators would operate four hours per day. However, operations of the 1,250 kW generators would be restricted in the permit to two hours per day.

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[2] U.S. EPA (2025). Nitrogen Dioxide/Nitrogen Oxide In-Stack Ratio (ISR) Database. *Support Center for Regulatory Atmospheric Modeling (SCRAM).* Retrieved from: https://www.epa.gov/scram/nitrogen-dioxidenitrogen-oxide-stack-ratio-isr-database

[3] Trinity used two ozone monitor stations concentration, for years 2020 to 2024, because the primary station had incomplete data. The Schiller Park monitor station (AQS ID 17-031-3103) was the primary station chosen, due to the location proximity. The second station, Northbrook monitor (AQS ID 17-031-4201), was used to substitute the incomplete data.

[4] Trinity modeled six 2,750 kW generators because these would have higher emission rates compared to the 1,250 kW generators.

- Annual: $PM_{2.5}$ and PM_{10}, used the annualized average emission rate at 45 hours per year for each proposed generator.
- CO: 8-hour and 1-hour, used the average emission rate for each proposed generator.
- SO_2: 3-hour and Annual, used the average emission rate for each proposed generator.
- NO_2: 1-hour and Annual, used the annualized average emission rate at 45 hours per year for each proposed generator.

Source Impact Analysis

Trinity conducted a source impact analysis to assess whether further modeling was necessary for $PM_{2.5}$, PM_{10}, SO_2, NO_x, and CO. The analysis was based on the operation of the proposed generators. Modeled concentrations were compared to the significant impact levels (SILs) for each pollutant and averaging period. A summary of the findings is provided in **Table 2** and **Table 3** below.

Table 2
EdgeConneX's Source Impact Analysis Results

Pollutant	Averaging Period	Maximum Modeled Impact ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)
SO_2	3-hour	3.18	25
	1-hour	6.86	7.8
CO	8-hour	362.41	500
	1-hour	795.14	2000
$PM_{2.5}$	Annual	0.05	0.13
	24-hour	0.81	1.2
PM_{10}	Annual	0.05	1
	24-hour	1.80	5
NO_2	Annual	2.18	1
	1-hour	4.39	7.5

Table 3
Modeling Unit's Source Impact Analysis Results

Pollutant	Averaging Period	Maximum Modeled Impact ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)
SO_2	3-hour	3.21	25
	1-hour	6.93	7.8
CO	8-hour	367.53	500
	1-hour	806.60	2000
$PM_{2.5}$	Annual[1]	0.05	0.13
	24-hour[1]	0.82	1.2
PM_{10}	Annual	0.05	1
	24-hour	1.80	5
NO_2	Annual	2.18	1
	1-hour	4.40	7.5

(1) The maximum model impact also includes secondary $PM_{2.5}$ concentrations.

The results from both Trinity's analysis and the Modeling Unit's audit found that impacts for annual NO_2 would be above its SIL, and further analysis was necessary.

Ozone and Secondary $PM_{2.5}$ Formation

Precursor emissions of NO_x, SO_2, and VOM chemically react with the atmosphere to form secondary $PM_{2.5}$ and O_3. The AERMOD dispersion model cannot estimate secondary formation of pollutants due to the complex chemistry and meteorological conditions involved. Secondary formation of pollutants requires complex photochemical modeling techniques.

- To analyze the formation of secondarily formed $PM_{2.5}$ and O_3 on their respective NAAQS, the Modeling Unit conducted its own analysis of both secondary $PM_{2.5}$ and secondary O_3 formation to ensure a comprehensive review.

- The Modeling Unit followed the methodology outlined in the U.S. EPA memorandum[5,6,7] for secondary $PM_{2.5}$ and O_3. Trinity followed the methodology for secondary O_3.
- Trinity's and the Modeling Unit's approach incorporated model results from hypothetical photochemical modeling analyses, which are available through the U.S. EPA's Modeled Emission Rates for Precursors (MERPs) View Qlik tool.[8] These modeling results from hypothetical sources with precursor emission estimates are used to evaluate the project's impacts to determine if further analysis should be completed.
- The Modeling Unit used a representative hypothetical source located in Stephenson County, Illinois at approximately 145 kilometers away from the Elk Grove facility.

$PM_{2.5}$ Impacts

Table 4 shows the estimated secondary $PM_{2.5}$ impacts. The calculated concentrations were based on project emissions of 14.96 tons per year (tpy) of NO_x and 0.0163 tpy of SO_2.

Table 4
Modeling Unit's MERPs Analysis for Secondary $PM_{2.5}$

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)
$PM_{2.5}$	24-hour	0.004601
	Annual	0.000269

The total secondary $PM_{2.5}$ concentrations was added to the primary $PM_{2.5}$ impacts modeled with AERMOD, for each respective averaging period for a combined total comparison to the $PM_{2.5}$ SIL. The combined primary and secondary results are shown in **Table 3** and further analysis against the NAAQS was not required.

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[5] U.S. EPA (2024). *Clarification on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program*. Office of Air Quality Planning and Standards, Research Triangle Park, NC.
[6] U.S. EPA (2019). *Guidance on the Use of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program*. Publication No. EPA 454/R–19–003. Office of Air Quality Planning and Standards, Research Triangle Park, NC.
[7] U.S. EPA (2022). *Guidance for Ozone and Fine Particulate Matter Permit Modeling*. Publication No. EPA 454/R–22–005. Office of Air Quality Planning and Standards, Research Triangle Park, NC.
[8] U.S. EPA (2019). MERPs View Qlik. *Support Center for Regulatory Atmospheric Modeling (SCRAM).* Retrieved from: https://www.epa.gov/scram/merps-view-qlik

Ozone Impacts

Table 5 shows estimated O_3 impacts in ppb (parts per billion) compared to the SIL. The calculated concentrations were based on project emissions of 14.96 tpy of NO_x and 0.263 tpy of VOMs.

Table 5
Modeling Unit's MERPs Analysis for Ozone

Pollutant	**Averaging Period**	**Concentration** (ppb)	**SIL** (ppb)
O_3	8-hour	0.052	1.0

The proposed project has estimated O_3 impacts below the 1.0 parts per billion (ppb) SIL, which is further reflective that project emissions of NO_x and VOM would not impact the O_3 NAAQS.

NAAQS Analysis

A cumulative NAAQS analysis was conducted by Trinity and the Modeling Unit for annual NO_x. The cumulative analysis incorporated background design values for its averaging period, along with including nearby emission inventory sources.

The selection of background monitors, **Table 6**, was based on the facility's location and the similarities in surrounding terrain. The following monitor was selected for use in this analysis:

- For annual NO_x, the Modeling Unit and Trinity used data collected from Schiller Park (AQS ID 17-031-3103). The monitor was chosen due to its proximity at approximately seven km away from the Elk Grove Village facility. The monitor is also in an urban region where concentrations are expected to be representative of background for the site location.

Table 6
Background Design Values

AQS ID	Pollutant	Averaging Period	2022	2023	2024	Units
17-031-3103	NO_2	Annual	17.21	17.01	18.82	ppb

The receptors with modeled concentration exceedances were utilized from the SIL analysis for annual NO_x. **Table 7** and **Table 8** shows the details.

Table 7
EdgeConneX's NAAQS Modeling Results

Pollutant	Averaging Period	Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)
NO_2	Annual	41.68[(1)]	32.34[(a)]	74.02	100

(1) Highest annual average out of five years.
(a) Highest annual concentration over three years of data

Table 8
Modeling Unit's NAAQS Modeling Results

Pollutant	Averaging Period	Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)
NO_2	Annual	41.71[(1)]	35.42[(a)]	77.12	100

(1) Highest annual average out of five years.
(a) Highest annual concentration over three years of data

The Modeling Unit audit confirms that the combined model-predicted impacts with background concentrations would be below the annual NO_2 NAAQS.

Hazardous Air Pollutants (HAPs) Analysis

The Modeling Unit performed a HAPs screening analysis using the Air Emissions Risk Analysis (AERA) Guidance.[9] After inputting the HAPs emissions from the proposed facility and corresponding dispersion values (e.g. stack heights and distance to the fence line) into the Minnesota Pollution Control Agency (MPCA) Risk Assessment Screening Spreadsheet (RASS), the Modeling Unit calculated the risks from HAPs emissions from the proposed facility. Additional HAPs modeling is appropriate if calculated individual or cumulative risk values exceed a threshold of 1.0. In this case, all modeled risk values were calculated below this threshold. Therefore, no further HAPs-specific dispersion modeling was necessary.

Summary

The Modeling Unit has reviewed the air quality analysis submitted by Trinity Consultants on behalf of EdgeConneX. The audit confirms that EdgeConneX's proposed project would not exceed the SILs for any $PM_{2.5}$, PM_{10}, SO_2, CO, or 1-hour NO_2 averaging periods, **Table 4**, and would not exceed the NAAQS for NO_2 annual averaging period, **Table 8**. The operating scenario, as summarized in **Table 1**, was evaluated according to each applicable averaging time, and no exceedances for the NAAQS were identified.

Additionally, the audit confirmed that emissions of SO_2, NO_2, and VOM are not expected to contribute significantly to the formation of secondary $PM_{2.5}$ or O_3. A screening analysis for HAPs was also conducted, and the results indicated that no further HAPs modeling was necessary.

Based upon the applicant's submittal and the Modeling Unit's review of the modeling results, the air quality analysis demonstrates the proposed operations for maintenance and readiness testing will comply with all NAAQS so long as the operations are restricted in the permit as outlined in this memorandum.

- Each generator to not operate any more than two hours per 24-hour period, for a total of no more than 45 hours annually per generator.
- Only one generator to operate at time and no more than six generators to operate in any 24-hour period.
- Operations of each generator to be limited to the daytime hours of 7 a.m. to 6 p.m.

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[9] Minnesota Pollution Control Agency (2024). Air Emissions Risk Analysis (AERA) Guidance. Retrieved from https://www.pca.state.mn.us/sites/default/files/aq9-18.pdf.

cc: Bill Marr, Section Manager, Permits/BOA
Azael Ramirez, FESOP/LOP Section Manager, Permits/BOA
Jocelyn Stakely, FESOP/LOP Working Supervisor, Permits/BOA
Tamara Stewart, Modeling Unit Working Supervisor, Permits/BOA