Illinois Environmental Protection Agency
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JB Pritzker, Governor **James Jennings**, Director

MEMORANDUM

DATE: October 16, 2026

TO: Joseph Odele, Environmental Protection Engineer, State/FESOP Unit, Permits/BOA

FROM: Jada Strother and David Coy, Modeling Unit, Permits/BOA

SUBJECT: Stream Data Center - Elk Grove Village, Illinois - 031440AWO, Permit Application No. 25120023

Introduction

Stream Data Centers CHI III, LLC ("SDC;" BOA I.D. No. 031440AWO) submitted a construction permit application (No. 25120023) on December 1, 2025 for construction of 126 2.5-megawatt (MW) diesel emergency generators with integrated diesel fuel belly tanks at a proposed data center campus that would be located at 2000 Landmeier Road, Elk Grove Village, Illinois.[1] These generators would provide backup electricity to the data center during emergencies, such as power outages. Centering coordinates for the Facility are Universal Transverse Mercator (UTM) Zone 16, coordinates 421154.03 meters (m) Easting and 4651378.70 meters (m) Northing.

The proposed facility is in an area of Environmental Justice (EJ) concern, as identified using information available on Illinois EPA's EJ Start mapping tool. The issued construction permit would provide for increases in permitted emission of nitrogen oxides (NOx), carbon monoxide (CO), volatile organic materials (VOM), particulate matter smaller than 10 and 2.5 microns (PM_{10} and $PM_{2.5}$), and sulfur dioxide (SO_2). Consequently, the Illinois EPA requested SDC submit an air quality analysis as part of its permit application to evaluate compliance with National Ambient Air Quality Standards (NAAQS) for the applicable criteria pollutants. In addition, emissions of selected hazardous air pollutants (HAPs), i.e., acetaldehyde and benzene, were evaluated separately in accordance with Illinois EPA permitting requirements.

In response to Illinois EPA's request, SDC retained Ramboll Americas Engineering Solutions, Inc (Ramboll) to conduct an air quality review on its behalf for NO_2, CO, PM_{10}, $PM_{2.5}$, SO_2, and Ozone (O_3) emissions, along with acetaldehyde and benzene.

Modeling Unit Analysis

Ramboll submitted an initial air quality analysis report on December 30, 2025. Modeling files were transmitted electronically to the Modeling Unit on December 30, 2025. Ramboll submitted a revised modeling report and modeling files on June 12, 2026. The revised modeling report consisted of updated emission rates for the emergency generators. The following identifies key aspects of the modeling methodology used in this analysis:

- Ramboll used AERMOD (v. 24142), the American Meteorological Society (AMS)/USEPA Regulatory Model. AERMOD is a federally approved regulatory model appropriate for use in air quality analysis of this nature. The audit runs conducted by the Modeling Unit also used this version.

[1] The diesel generators would be certified to meet USEPA's Tier 2 emission standards for compression ignition, i.e., diesel-fired, engines.

- Modeling inputs utilized Illinois EPA- and USEPA-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 calendar years 2020 through 2024 from the National Centers for Environmental Information (NCEI) which consisted of surface data collected at O'Hare International Airport in Chicago, Illinois, and upper air data collected at Davenport Municipal Airport in Davenport, Iowa. These surface and upper air stations were selected because of their proximity and representativeness to the project site in Cook County. The Modeling Unit and Ramboll used 2020 through 2024 files, processed with AERMET (v. 24142) in its review.
- Ramboll processed National Elevation Data (NED) terrain elevations retrieved from U.S. Geological Survey (USGS) using the most recent version of AERMAP (v. 24142) to develop the receptor terrain elevations and hill height scales required by AERMOD. The site elevation at the facility is approximately 202.69 meters above mean sea level.
- Ramboll used a Cartesian grid of 2333 receptors. The following grid densities in **Table 1** were used:

Table 1:
Receptor Grid

Minimum Discrete Receptor Spacing	
Distance from Face Line	**Receptor Spacing**
Along Fenceline	25 meters
Fenceline - 500 meters	50 meters
500 - 1,500 meters	100 meters
1,500 - 3,000 meters	250 meters
3,000 - 5,000 meters	500 meters
5,000 - 10,000 meters	1000 meters

- Consistent with Appendix W to 40 CFR part 51, the Illinois EPA conducted an Auer's analysis using information from the 2019 National Land Cover Database (NLCD) which provides data on land use and vegetation cover. The Illinois EPA evaluated land use within a 3-kilometer (km) radius of the facility. The analysis founds that the area is approximately 81.36% urban and 18.64% rural, as summarized in **Tables 2** and **3**.

Table 2:
Auer's Analysis Summary, By Auer's Code

NLCD Value	NLCD Description	Auer's Code	Auer's Class	Cell Count	Percentage (%)
23	Developed, Medium Intensity Residential	R2, R3	Urban	9,331	29.71
24	Developed, High Intensity Industrial or Commercial	I1, I2, C1	Urban	16,223	51.65
11	Open Water	A5	Rural	94	0.30
21	Developed, Open Space	A1, R4	Rural	615	1.96
22	Developed, Low Intensity	R1	Rural	4,927	15.69
31	Barren Land (Rock/Sand/Clay)	A3	Rural	4	0.01
41	Deciduous Forest	A4	Rural	22	0.07
42	Evergreen Forest	A4	Rural	5	0.02
43	Mixed Forest	A4	Rural	0	0.00
52	Shrub/Scrub	A4	Rural	0	0.00
71	Grassland/Herbaceous	A3	Rural	38	0.12
81	Pasture/Hay	A3	Rural	68	0.22
82	Cultivated Crops	A2	Rural	83	0.26
90	Wood Wetlands	A4	Rural	0	0.00
95	Emergent Herbaceous Wetlands	A3	Rural	0	0.00

Table 3:
Auer's Analysis Summary, Overall Urban and Rural Land Use

Auer's Class	Total Cell Count	Percentage (%)
Urban	25,554	81.36
Rural	5,856	18.64
Total	31,410	100

As provided in Section 7.2.1.1 (b)(I)(2) of Appendix W to 40 CFR Part 51, The urban modeling option is appropriate when land-use type I1, I2, C1, R2, and R3 account for 50% or more of the total area. As summarized in Table 2, these land-use types account for 81.36% of the study area, exceeding the 50% threshold. Therefore, the Illinois EPA's Auer's analysis supports the use of the urban modeling option, consistent with the option selected by the applicant.

- Ramboll used USEPA's Building Profile Input Program (BPIPPRM) to account for downwash effects of on-site structures. All on-site buildings nearby were included in the modeling analysis.
- NO_2 modeling options consist of three tiers. Tier 1 assumes that all NOx emitted from emission units at the source are converted 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 NOx and NO_2. Tier 3 allows the user to perform a detailed analysis using either 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. Based on the submitted modeling files, Ramboll used a Tier 2 approach to model NO_2. Ramboll selected the regulatory default Ambient Ratio Method (ARM2) option in AERMOD which uses a range of ambient NO_2/NOx ratios, with 0.5 as the lower limit and 0.9 as the upper limit.

Operating Scenarios

The following operating scenarios were applied to both the Significant Impact Analysis and the Cumulative Analysis:

- The facility would only operate the engines for testing and maintenance purposes between 0700 and 1900 hours.
- Each emergency generator would be operated no more than ten hours per year for non-emergency use.
- The model used three scenarios in conjunction with the above:
  - Monthly Maintenance: 10% load at 15 minutes per generator per month.
  - Extended Maintenance: One generator lineup of one to five generators can operate at a time.
    - CO and SO_2: Maximum emission rate at any load.
    - 24-hour benzene and acetaldehyde: Maximum emission rate at any load.
    - 24-hour $PM_{2.5}$ and PM_{10}: 75% load at six hours per generator per 24-hour period.
    - 1-hour NO_2: 100% load annualized at ten hours per generator per year.
  - Annual: Annualized emission rates:
    - Annual $PM_{2.5}$[2]: 75% load at 12 hours per generator per year.
    - Annual NO_2, benzene, and acetaldehyde: 100% load at 10 hours per generator per year.

Significant Impact Analysis

Ramboll performed a source Significant Impact Analysis to determine if more detailed modeling would be required for NO_2, SO_2, $PM_{2.5}$, PM_{10} or CO. The analysis modeled for emission increases, as limited by the construction permit. Ramboll initially submitted the modeling analysis on December 30th, 2025. Ramboll

[2] The worst-case load scenario for PM is at 75% load. Ramboll modeled with 12 hours of operation instead of 10 hours to make the analysis conservative.

updated the modeled emission rates following a reassessment of the emission rate calculation methodology. The revised calculations were incorporated into the modeling, and an updated modeling report was submitted on June 12th, 2026. The results from the updated modeling report are presented in **Table 4**. The table includes a comparison of modeled concentrations against the significant impact levels (SIL) for each criteria pollutant and averaging period.

Table 4:
Significant Impact Modeling Results

Criteria Pollutant	Model Scenario		Significant Impact Analysis				
	Averaging Period	Operating Scenario	SIL ($\mu g/m^3$)	SIL Average Form	SDC Maximum Concentration ($\mu g/m^3$)	Illinois EPA Maximum Concentration ($\mu g/m^3$)	Greater Than SIL?
NO_2	1-Hour	Monthly Maintenance	7.52	Avg – 1H	6.3	6.38	No
		Extended Maintenance			31.96	32.46	Yes
	Annual	Annual	1	High	2.38	2.55	Yes
CO	1-Hour	Monthly Maintenance	2000	H1H[b]	694.46	703	No
		Extended Maintenance			378.48	411	No
	8-Hour	Monthly Maintenance	500	H1H	298.22	301	No
		Extended Maintenance			275.43	308	No
PM_{10}	24-Hour	Monthly Maintenance	5	H1H	0.77	0.68	No
		Extended Maintenance			10.47	10.56	Yes
$PM_{2.5}$[a]	24-Hour	Monthly Maintenance	1.2	Avg - 1H	0.7	0.68	No
		Extended Maintenance			8.99	8.98	Yes
	Annual	Annual	0.13	Avg - High	0.12	0.12	No
SO_2	1-Hour	Monthly Maintenance	7.85	Avg - 1H	0.11	1.12	No
		Extended Maintenance			4.58	4.35	No
	3-Hour	Monthly Maintenance	25	H1H	0.95	0.95	No
		Extended Maintenance			3.96	3.95	No

Table 4 Notes:

a. The maximum model impact also includes secondary $PM_{2.5}$ concentrations.
b. Highest 1-hour (H1H)

Secondary Ozone and $PM_{2.5}$ Impacts

Precursors emissions of NOx and VOM chemically react with the atmosphere to form secondary ozone (O_3). Precursor emissions of NOx and SO_2 chemically react with the atmosphere to form secondary $PM_{2.5}$.

For secondary $PM_{2.5}$ emissions, Ramboll followed the USEPA memorandum, *Classification on the Development of Modeling Emissions Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ Under*

the PSD Permitting Programs.[3] Ramboll's utilization of this methodology incorporates model results from hypothetical photochemical modeling analyses, which are available through the USEPA's MERPs View Qlik tool.[4]

Ramboll utilized a hypothetical source located in Porter, Indiana as it produced the worst-case scenario estimated of secondary O_3 and $PM_{2.5}$. In particular, the hypothetical source included a stack height of 10 m and sources of 500 tons per year (tpy) for NOx, VOM, and SO_2. Ramboll's results were based upon SDC emissions of 49.00 tpy of NOx, 0.06 tpy of SO_2, and 16.69 tpy of VOM.

Secondary Ozone Impacts

Table 5 summarizes the ozone impacts calculated by Ramboll for the facility.

Table 5:
MERPs Analysis for Ozone

Criteria Pollutant	Model Scenario		Significant Impact Analysis				
	Average Period	Operating Scenario	SIL (ppb)	SIL Average Form	SDC Maximum Concentration (ppb)	Illinois EPA Maximum Concentration (ppb)	Greater Than SIL?
Ozone	8-hour	Routine Maintenance	1	H1H	0.10	0.128	No

SDC estimated O_3 impacts below the 1 part per billion (ppb) SIL, which supports that emissions of NOx and VOM would not impact the O_3 NAAQS.

Secondary $PM_{2.5}$ Impacts

The secondary $PM_{2.5}$ results displayed in **Table 6** summarize the MERPs calculations from Ramboll.

Table 6:
MERPs Analysis for Secondary $PM_{2.5}$

Criteria Pollutant	Model Scenario		Significant Impact Analysis			
	Average Period	Operating Scenario	SIL (µg/m^3)	SDC Maximum Concentration (µg/m^3)	Illinois EPA Maximum Concentration (µg/m^3)	Greater Than SIL?
$PM_{2.5}$	24-Hour	Monthly Maintenance	1.2	0.0188	0.02306	No
		Extended Maintenance				
	Annual	Annual	0.13	0.0009	0.0009	No

The total secondary $PM_{2.5}$ concentrations were added to the primary $PM_{2.5}$ concentration for each applicable averaging period and operating scenario prior to the comparison with the $PM_{2.5}$ SILs.

[3] USEPA (2019). *Guidance on the Use of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program.* Publication No. EPA 454/R–19–003. Office of Air Quality Planning and Standards, Research Triangle Park, NC.
[4] USEPA (2019). MERPs View Qlik. *Support Center for Regulatory Atmospheric Modeling (SCRAM)*. Retrieved from: https://www.epa.gov/scram/merps-view-qlik

For the 24-hour averaging period, the combined primary and secondary $PM_{2.5}$ concentration exceeded the SIL only under the Extended Maintenance operating scenario. For the annual averaging period, the combined concentration of $PM_{2.5}$ exceeded the SIL.

As the modeled concentrations of $PM_{2.5}$ exceed the applicable SIL for the Extended Maintenance scenario for 1-hour NO_2, 24-hour $PM_{2.5}$, and 24-hour PM_{10}, along with the annual NO_2, additional cumulative modeling was performed to demonstrate the emissions from the facility would not cause or contribute to an exceedance of the applicable NAAQS.

Cumulative Impact Analysis

The results of the significant impact analysis in **Table 4** show further analysis is required to evaluate project's impact against the 1-hour and Annual NO_2, 24-hour PM_{10}, and 24-hour $PM_{2.5}$ NAAQS. Ramboll developed a cumulative modeling analysis that incorporated background concentrations from monitored concentrations and nearby emissions inventory sources that were not accounted for in the monitoring data.

The background monitors were selected based on their proximity and representativeness of the surroundings of the proposed facility. The background concentrations are presented in **Table 7**.

Table 7:
Monitored Background Concentrations

AQS ID	Location	Pollutant	Averaging Period	Design Values (2022-2024)	Units
17-031-4201	Northbrook, Illinois	PM_{10}	24-hour	40.00	$\mu g/m^3$
		$PM_{2.5}$	24-hour	19.80	$\mu g/m^3$
17-031-3103	Schiller Park, Illinois	NO_2	1-hour	54.27	ppb
			Annual	18.82	ppb

Ramboll was provided with an inventory of sources from the Modeling Unit that included sources located within 10 km radius from the proposed facility. For the 1-hour NO_2 analysis and 24-hour $PM_{2.5}$, intermittent sources were excluded from the nearby sources inventory based on guidance issued by USEPA.[5]

Table 8 summarizes Ramboll's results for the cumulative NAAQS analysis for NO_2, $PM_{2.5}$, and PM_{10} for Extended Maintenance and Annual operating scenarios.

[5] U.S. EPA (2011) *Additional Clarification Regarding Application of Appendix W Modeling Guidance for 1-hour NO2 National Ambient Air Quality Standard*. (*https://www.epa.gov/sites/default/files/2020-10/documents/clarificationmemo_appendixw_hourly-no2-naaqs_final_06-28-2010.pdf*)

Table 8:
Modeled Results for NAAQS Analysis

Criteria Pollutant	Model Scenario		Cumulative Impact Analysis						
	Average Period	Operating Scenario	NAAQS Level ($\mu g/m^3$)	NAAQS Average Form	SDC Modeled Impact ($\mu g/m^3$)	IEPA Modeled Impact ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Additional Analysis Performed?
NO_2	1-hour	Extended Maintenance	188	Avg - 8H	66.51	69.81	102.03	168.54	No
	Annual	Annual	100	High	14.11	14.06	35.38	49.49	No
PM_{10}	24-hour	Extended Maintenance	150	H6H	31.43	31.77	40	71.43	No
$PM_{2.5}$	24-hour	Extended Maintenance	35	High	14.72	14.7	19.8	34.52	Yes, but MAXDCONT analysis

NAAQS Modeling Results

The Modeling Unit audit confirmed that results of Ramboll's NAAQS analysis. For the cumulative analysis, modeled project impacts were combined with background concentrations obtained from the local air monitoring stations at Northbrook and Schiller Park, which were selected based on their proximity to the project site and the availability of NO_2, PM_{10}, and $PM_{2.5}$ data. Design values from 2022 through 2024 were used in the analysis.

The cumulative analysis demonstrated that the combined modeled and background concentrations for 1-hour and annual NO_2, as well as 24-hour PM_{10}, remain below the applicable NAAQS. As an additional conservative evaluation, a MAXDCOUNT analysis was performed for the 24-hour $PM_{2.5}$ results to further assess source contributions.

Generator Group Selection and Analysis

Based on the modeling results, the on-site sources group would exceed the 24-hour $PM_{2.5}$ SIL of 1.2 $\mu g/m^3$ when the engines are operated in the Extended Maintenance Scenario. The source groups were evaluated independently to identify the group resulting in the highest modeled SIL impacts for further NAAQS and MAXDCONT analyses. The SIL analysis represents an operating scenario in which the applicable generators within each source group are assumed to operate simultaneously.

To evaluate a more representative operating scenario, AERMOD modeling was performed using only the highest modeled impact selected generator group (Group O2_P4). The results of this modeling are presented in **Table 9**.

For the 24-hour $PM_{2.5}$ Extended Maintenance scenario, cumulative concentrations were calculated at each receptor within the significant impact area by summing the modeled direct $PM_{2.5}$ concentration (8.99 $\mu g/m^3$), the secondary $PM_{2.5}$ concentration (0.0188 $\mu g/m^3$), and the representative background concentration (19.80 $\mu g/m^3$). Receptors with predicted cumulative concentrations exceeding 90% of the 24-hour $PM_{2.5}$ NAAQS (31.5 $\mu g/m^3$) were identified for a causation and contribution (MAXDCONT) analysis, consistent with USEPA guidance. The MAXDCONT analysis evaluates the project's contribution to cumulative concentrations that exceed 90% of the NAAQS by pairing modeled impacts in both time and space. Receptors with predicted cumulative concentrations below 90% of the NAAQS were not included in the MAXDCONT analysis, as a causation and contribution evaluation is not required for those receptors.

Table 9
Modeled Results MAXDCONT Analysis

Criteria Pollutant	Model Scenario		Cumulative Impact Analysis		
	Average Period	Operating Scenario	Modeled Concentration MAXDCONT ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Greater Than SIL?
$PM_{2.5}$	24-hour	Extended Maintenance	0.013	1.2	No

The maximum on-site source contribution to the total concentration would not exceed the SIL threshold of 1.2 $\mu g/m^3$ of 24-hour $PM_{2.5}$, as shown in **Table 7**.

Air Toxics Analysis

Ramboll conducted a modeling analysis for air toxics emissions from the generators. In particular, Ramboll modeled for emissions of acetaldehyde and benzene. The total annual emissions of each of these two substances would exceed all other hazardous air pollutants (HAPs). The modeled impacts were then compared to reference concentrations from the Minnesota Department of Health-Based Guidance for Air Site Assessment and Consultation Unit, as well as USEPA's Integrated Risk Information System (IRIS).

The results of Ramboll's analysis are summarized in **Table 10** for Monthly Maintenance, Extended Maintenance and Annual. All modelled concentration were below their respective reference concentration.

Table 10
Modeled Results for HAPs

Hazardous Air Pollutant	Model Scenario		Modeled Concentration ($\mu g/m^3$)	Risk	Standard/Reference Exposure Level ($\mu g/m^3$)	Greater Than Standard?	Reference
	Average Period	Operating Scenario					
Benzene	24-hour	Monthly Maintenance	0.121	Acute	30	No	[a]
		Extended Maintenance	2.87				
	Annual	Annual	0.00168	Chronic	8	No	[b]
Acetaldehyde	24-hour	Monthly Maintenance	0.00394	Acute	250	No	[a]
		Extended Maintenance	0.0933				
	Annual	Annual	0.0000545	Chronic	9	No	[b]

Table 10 Notes:

a. Minnesota Department of Health (MDH) Reference Exposure Levels (REL) are established for pollutants based on exposure durations.
b. USEPA Integrated Risk Information System (IRIS)

Summary

SDC proposed the following operational limits. SDC would only perform testing and maintenance routines between 0700 and 1900 hours. Monthly maintenance events would only occur for 15 minutes at 10% load per generator per month. Extended maintenance would only occur for a generator set of one to five generators at 75% load for 6 hours in a 24-hour period or at 100% load for no more than 10 hours of operation per year. Each generator would be allowed to operate for maintenance and routine testing for a maximum of ten hours per year.

Based on the SDC's submittal and the Modeling Unit's review of Ramboll air quality modeling report, the analysis confirms that the proposed operations would not exceed the NAAQS for NO_2, SO_2, CO, PM_{10}, $PM_{2.5}$ (24-hour, Monthly Maintenance), and ozone; or the toxic-based HAP standards for acetaldehyde and benzene.

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