Air Quality Impacts Analysis (AQIA)
for
Applied Digital Corporation

9663 87th Ave. SE
Ellendale, ND 58436

Permit No.: ACP-18296 v1.0
Draft Report Date: September 11, 2025
Final Report Date:

North Dakota Department of Environmental Quality
Division of Air Quality

Report By:

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Contents

1 Executive Summary

Applied Digital Corporation (Applied Digital) submitted a synthetic minor construction permit application for the construction of 60 diesel-fueled emergency generators for a proposed Facility near Ellendale, ND. A modeling analysis was conducted to demonstrate compliance with the 1-hour nitrogen dioxide (NO_2) National Ambient Air Quality Standard (NAAQS) during non-emergency operations. Based on the data provided in the analysis and the Department's independent review, it is demonstrated that the proposed project will comply with the applicable NAAQS during non-emergency operations. The results of the analysis are outlined in Table 1.

Table 1- Results Summary

Load Scenario	Building	Median Design Value (µg/m^3)	Background (µg/m^3)	Cumulative Impact (µg/m^3)	NAAQS (µg/m^3)
LOW	A	9.9	35	44.9	188
	B	9.7	35	44.7	
	C	10.1	35	45.1	
	D	13.4	35	48.4	
MAX	A	19.6	35	54.6	
	B	18.8	35	53.8	
	C	20.7	35	55.7	
	D	25.4	35	60.4	

2 Introduction

On December 3rd, 2024, the North Dakota Department of Environmental Quality, Division of Air Quality (Department) received an application for a Permit to Construct from Applied Digital for its facility located near Ellendale, ND, in Dickey County. The Department requested that a modeling analysis be conducted to demonstrate that when non-emergency operating scenarios occur, they will maintain compliance with the 1-hour NO_2 NAAQS. This Air Quality Impacts Analysis (AQIA) summarizes the Department's findings based on a thorough review and independent analysis of the Project.

3 Project Background

Applied Digital is proposing the construction of 60 diesel-fueled emergency generators to be located at its data center approximately 2 miles northwest of Ellendale, ND. The site primarily operates on grid power but relies on generators as a back-up in the instance of lost power supply. The facility has requested to be established as a synthetic minor source with respect to Prevention of Significant Deterioration (PSD) and Title V permitting.

4 Model Requirements

Applied Digital is a non-PSD source with respect to the PSD rules.[1,2] Per the October 6, 2014, Department Memo[3], sources not subject to the PSD rules will require dispersion modeling for criteria pollutants prior to the issuance of a Permit to Construct (PTC) if the proposed changes in emissions exceed "non-PSD significant emission rate (SER)" (see Table 2). All other potential emissions are less than the SERs.

Additionally, non-PSD sources that are within 50 kilometers (~31 miles) of a Class I area shall be evaluated for Class I impacts if the non-PSD SERs are exceeded. Applied Digital is a non-PSD source located over 380 km from the nearest Class I areas, Theodore Roosevelt and Badlands National Parks. Due to proximity to the nearest Class I area, no Class I Increment analysis was required.

Emergency units are not typically modeled as they are intermittent sources, but due to the size and number of engines involved in the project a modeling analysis was conducted to demonstrate compliance with the 1-hour NO_2 NAAQS during non-emergency operations.

Table 2 - Significant Emission Rates (SERs) in Tons per Year

POLLUTANT	NON-PSD SER (<1.5 stack)	PROJECT EMISSIONS (TPY)
NO_x	40	99.5

5 Model Input Values

5.1 Model Version

The U.S. Environmental Protection Agency (EPA) has developed the *Guideline on Air Quality Models*[4] (40 CFR 51 Appendix W) wherein they list preferred models for pre-construction permitting reviews. At the time of the application submittal, Appendix W (2024) was the most current revision in use. EPA's preferred model is AERMOD. Applied Digital and the Department utilized version 24142 for the analysis and review.

5.2 Meteorological Data (MET)

In the modeling process, both surface and upper-air meteorological (met) data are pre-processed through

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[1] *NDAC 33.1-15-15*. Available at: https://www.ndlegis.gov/information/acdata/pdf/33.1-15-15.pdf (Last visited August 14, 2025)
[2] *40 CFR §52.21*. Available at: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-52/subpart-A/section-52.21 (Last visited August 14, 2025)
[3] *Criteria Pollutant Modeling Requirements for a Permit to Construct.* Available at: https://deq.nd.gov/publications/AQ/policy/Modeling/Criteria_Modeling_Memo.pdf (Last visited August 14, 2025)
[4] Available at: https://www.epa.gov/system/files/documents/2024-11/appendix_w-2024.pdf (Last visited August 14, 2025)

AERMET. This pre-processing generates the boundary layer parameters required by AERMOD to estimate plume dispersion. AERMET processes hourly meteorological data to determine plume transport and dispersion downwind from a source.

Per Appendix W (2024) 8.4.2.e, the choice of meteorological data should be based on ensuring a sufficiently conservative and representative result, considering hourly and seasonal variations in meteorological conditions throughout the year, which directly influence plume movement due to atmospheric conditions. The options for selecting meteorological data include:

1. One year of site-specific data: This involves using data collected onsite from a monitoring station.
2. Five years of representative National Weather Service (NWS) data: This data source typically provides long-term, historical weather information.
3. At least 3 years of prognostic meteorological data: This type of data involves using predictive meteorological models to estimate future conditions.

The analysis used the second option, five years of representative NWS data. This MET data was provided to Applied Digital on January 13, 2025. The specific MET stations used for input in AERMET for this analysis are listed in Table 3. AERMET processes hourly surface observations, including parameters such as wind speed and direction, ambient temperature, sky cover (opacity), and local air pressure (optionally). It combines these observations with the pre-processed AERSURFACE output values (Table 4) to compile the necessary surface met inputs for AERMOD.

Table 3 - MET Data Used

MET DATA	LOCATION	STATION NO.	YEARS	DISTANCE FROM SOURCE*	SOURCE OF DATA
Surface Air	Gwinner Municipal Airfield, ND	150	2019 - 2023	75 km NE	NDDEQ
Upper Air	Aberdeen, SD	14929	2019 - 2023	60 km S	NDDEQ

* Approximate distances using Google Earth's measuring tool.

5.3 Surface Inputs

AERMET relies on certain key values, including surface roughness length, albedo, and Bowen ratio when pre-processing met data for use in AERMOD.

AERSURFACE allows users to generate these values based on inputs related to seasonal variation in the vegetative landscape (e.g., landcover). To facilitate this process, the Department has compiled a set of recommended inputs specifically designed for various regions within the state. These recommendations are outlined in the document titled *"Recommended AERSURFACE Inputs North Dakota* (March 2017)".[5]

[5] Available at: https://deq.nd.gov/publications/AQ/policy/Modeling/AERSURFACE_InputsND.pdf (Last visited August 14, 2025)

Table 4 - AERSURFACE Input Values

PARAMETER	VALUE USED
Radius of study area used for surface roughness:	1.0 km
Define the surface roughness length for multiple sectors?	Yes
Number of sectors:	12
Temporal resolution of surface characteristics	Monthly
Continuous snow cover for at least one month?	Yes
Reassign the months to different seasons?	Yes
Specify months for each season:	Yes
Late autumn after frost and harvest, or winter with no snow	Nov, Mar
Winter with continuous snow cover	Jan, Feb, Dec
Transitional spring	Apr, May
Midsummer with lush vegetation	Jun, Jul, Aug
Autumn with unharvested cropland	Sep, Oct
Is this site at an airport?	Yes
Is the site in an arid region?	No
Surface moisture condition at the site:	Average

5.4 Receptor Grid

Receptors serve as the designated locations where the air quality model calculates ground-level pollutant concentrations. These receptors are strategically placed within a receptor grid, and their distribution is determined by factors such as terrain characteristics and pollutant emission rates. While the exact configuration may vary, it typically forms a rectangular pattern radiating outward from the emission source. The goal is to ensure that the receptor grid effectively captures the maximum project impacts due to the dispersion and distribution of pollutants in the vicinity of the facility.

Further specifics on the receptor grid are shown in Table 5.

Table 5 - Receptor Grid Spacing

DISTANCE OUT FROM SOURCE	DISTANCE BETWEEN RECEPTORS
Fence line	25 meters
0 to 1000 meters (0 to 1.0 km)	50 meters
1,001 to 3,000 (1 to 2 km)	100 meters
3,001 to 5,000 meters (2 to 5 km)	250 meters
5,001 to 10,000 meters (5 to 10 km)	500 meters
TOTAL NUMBER OF RECEPTORS	5,610
Terrain Data	NED 2017, 1/3 arcsecond (10-meter)

The receptor points are placed at ground level, and their elevation is determined using the United States Geological Survey (USGS) National Elevation Dataset (NED) terrain and land-use data. The Universal Transverse Mercator (UTM) map projection with the North American Datum of 1983 (NAD83) is used for both the source input locations and the receptor grid location. To ensure accurate placement at ground level, the USGS NED 2017 data at a 1/3 arcsecond (10-meter) resolution is processed through the AERMAP pre-processor. This pre-processor adjusts the receptor points' elevations based on terrain data, aligning them with the actual topography of the area.

Receptor points located within the plant boundary are not modeled, as they do not represent ambient air.[6] Ambient air is defined as air situated outside of a boundary (e.g., a fence), which restricts general public access to a facility or source. Applied Digital will utilize a security fence, signs, security cameras and will be monitored from a security booth around the plant boundary to preclude access to the public. This exclusion ensures that the modeling analysis focuses on assessing the impact of emissions on the air quality in areas accessible to the public.

5.5 Background

Applied Digital used a fixed background concentration to predict the cumulative impact of the project. The fixed background concentration was not included as an input in the modeling process, and as a result, is not included in the values output for concentrations (i.e., not included in Median Design Value, but added in after under the Cumulative Impact in Table 1 and Table 10). The fixed background concentration shown in Table 6 is considered conservatively representative of the entire state and plays a significant role in ensuring a comprehensive and conservative assessment of the total ambient effect on ambient air quality standards (AAQS) due to emissions from the facility. To demonstrate the conservative nature of the fixed values the Department evaluated ambient concentrations from the Theodore Roosevelt National Park (TRNP) and the Lostwood National Wildlife Refuge (NWR) ambient monitors. While these areas will

[6] *§40 CFR 50.1(e).* Available at: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-50/section-50.1 (Last visited August 14, 2025)

include some anthropogenic contributions, they are low population areas that are closest to true representations of background concentrations in North Dakota and the project area. Ambient data was acquired from the EPA Outdoor Air Quality data[7] and averaged over the 5-year period from 2018-2022. An average of the ambient data is most representative of a background concentration. Table 7 shows that the Department's fixed ambient background concentrations are conservative in comparison to the ambient air concentrations.

Table 6 - Fixed Background Concentrations[8]

POLLUTANT	AVERAGING TIME	BACKGROUND ($\mu g/m^3$)
NO_2	1-HR	35

Table 7: Ambient air concentrations 2018-2022

Parameter	**PM_{10}**	**$PM_{2.5}$**		**SO_2**		**CO**	**NO_2**	
Averaging Period	24-hr	24-hr	Annual	1-hr	Annual	8-hr	1-hr	Annual
Monitoring Stations in North Dakota's Highest Population Areas – 5-Year Average (2018-2022)								
Fargo	12.44	7.54	5.58	3.11	0.84	-	33.61	4.17
Bismarck	19.45	6.99	6.46	11.11	0.41	221.28	34.56	4.71
Monitoring Stations in North Dakota's Lower Population Areas – 5-Year Average (2018-2022)								
TRNP	-	4.35	4.35	4.33	1.35	-	9.89	1.46
Lostwood NWR	11.36	-	-	-	-	-	-	-
Background	**30**	**13**	**4.75**	**13**	**3**	**1149**	**35**	**5**

Sources: https://www.epa.gov/outdoor-air-quality-data/download-daily-data
https://www.epa.gov/outdoor-air-quality-data/monitor-values-report

5.5.1 Nearby Sources

The Department reviewed records pertaining to sources that could potentially share a significant concentration gradient with the Applied Digital facility in North Dakota. No sources were identified within a 50 km radius of the facility.

5.6 Emission Source Modeling Parameters

AERMOD requires specific source data to model air pollutant dispersion accurately. This data includes:

1. Type and location of each emission point
2. Base elevation of each stack
3. Emission height and rate

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[7] Available at: https://www.epa.gov/outdoor-air-quality-data/download-daily-data (Last visited August 14, 2025)
[8] Available at: https://deq.nd.gov/publications/AQ/policy/Modeling/ND_Air_Dispersion_Modeling_Guide.pdf (Last visited August 14, 2025)

4. Gas exit velocity and temperature
5. Other stack/emission parameters depending upon source type

To ensure the accuracy of model input values, a comparison was made between the emission rates and stack parameters provided in the application and the corresponding information for each emission unit. The modeling parameters for point sources are shown in Table 8 and Table 9.

Table 8 - Point Source Parameters lists the model input parameters at the Applied Digital facility for location (UTM X-Y coordinates), elevation, stack height, and stack exit diameter. Each unit has a vertical stack orientation.

Table 9 – Point Source Parameters for Max and Low Loads lists the NO_x emission rates, stack exit velocity and stack temperature for the max and low load scenarios at the Applied Digital facility.

Table 8 - Point Source Parameters

Building	Source ID	UTM X (m)	UTM Y (m)	Elevation (m)	Stack Height (m)	Stack Diameter (m)
A	STK_A_1	533308.40	5095878.00	450.60	9.86	0.61
	STK_A_2	533308.30	5095873.10	450.60	9.86	0.61
	STK_A_3	533308.20	5095868.40	450.60	9.86	0.61
	STK_A_4	533308.10	5095863.40	450.60	9.86	0.61
	STK_A_5	533308.00	5095858.60	450.60	9.86	0.61
	STK_A_6	533308.00	5095853.70	450.60	9.86	0.61
	STK_A_7	533307.90	5095848.80	450.60	9.86	0.61
	STK_A_8	533307.80	5095844.00	450.60	9.86	0.61
	STK_A_9	533307.40	5095828.00	450.60	9.86	0.61
	STK_A_10	533307.40	5095823.20	450.60	9.86	0.61
	STK_A_11	533307.30	5095818.30	450.60	9.86	0.61
	STK_A_12	533307.20	5095813.50	450.60	9.86	0.61
	STK_A_13	533307.10	5095808.60	450.60	9.86	0.61
	STK_A_14	533307.00	5095803.70	450.60	9.86	0.61
	STK_A_15	533306.90	5095798.80	450.60	9.86	0.61
B	STK_B_1	533314.80	5095798.70	450.60	9.86	0.61
	STK_B_2	533314.90	5095803.50	450.60	9.86	0.61
	STK_B_3	533315.10	5095808.40	450.60	9.86	0.61
	STK_B_4	533315.10	5095813.30	450.60	9.86	0.61
	STK_B_5	533315.20	5095818.20	450.60	9.86	0.61
	STK_B_6	533315.40	5095823.10	450.60	9.86	0.61
	STK_B_7	533315.40	5095827.80	450.60	9.86	0.61
	STK_B_8	533315.50	5095832.90	450.60	9.86	0.61
	STK_B_9	533315.80	5095848.80	450.60	9.86	0.61
	STK_B_10	533315.90	5095853.70	450.60	9.86	0.61
	STK_B_11	533316.00	5095858.40	450.60	9.86	0.61
	STK_B_12	533316.10	5095863.30	450.60	9.86	0.61
	STK_B_13	533316.20	5095868.20	450.60	9.86	0.61
	STK_B_14	533316.30	5095873.10	450.60	9.86	0.61
	STK_B_15	533316.40	5095877.90	450.60	9.86	0.61

Building	Source ID	UTM X (m)	UTM Y (m)	Elevation (m)	Stack Height (m)	Stack Diameter (m)
C	STK_C_1	533306.60	5095787.40	450.60	9.86	0.61
	STK_C_2	533306.60	5095782.50	450.60	9.86	0.61
	STK_C_3	533306.50	5095777.60	450.60	9.86	0.61
	STK_C_4	533306.40	5095772.70	450.60	9.86	0.61
	STK_C_5	533306.30	5095767.90	450.60	9.86	0.61
	STK_C_6	533306.20	5095763.00	450.60	9.86	0.61
	STK_C_7	533306.10	5095758.10	450.60	9.86	0.61
	STK_C_8	533306.00	5095753.30	450.60	9.86	0.61
	STK_C_9	533305.70	5095737.40	450.60	9.86	0.61
	STK_C_10	533305.60	5095732.50	450.60	9.86	0.61
	STK_C_11	533305.50	5095727.60	450.60	9.86	0.61
	STK_C_12	533305.40	5095722.70	450.60	9.86	0.61
	STK_C_13	533305.30	5095717.80	450.60	9.86	0.61
	STK_C_14	533305.30	5095712.90	450.60	9.86	0.61
	STK_C_15	533305.10	5095708.10	450.60	9.86	0.61
D	STK_D_1	533313.10	5095708.10	450.60	9.86	0.61
	STK_D_2	533313.20	5095713.00	450.60	9.86	0.61
	STK_D_3	533313.30	5095717.70	450.60	9.86	0.61
	STK_D_4	533313.40	5095722.70	450.60	9.86	0.61
	STK_D_5	533313.50	5095727.60	450.60	9.86	0.61
	STK_D_6	533313.60	5095732.40	450.60	9.86	0.61
	STK_D_7	533313.70	5095737.20	450.60	9.86	0.61
	STK_D_8	533313.70	5095742.10	450.60	9.86	0.61
	STK_D_9	533314.10	5095758.10	450.60	9.86	0.61
	STK_D_10	533314.20	5095762.90	450.60	9.86	0.61
	STK_D_11	533314.30	5095767.70	450.60	9.86	0.61
	STK_D_12	533314.40	5095772.70	450.60	9.86	0.61
	STK_D_13	533314.40	5095777.50	450.60	9.86	0.61
	STK_D_14	533314.50	5095782.30	450.60	9.86	0.61
	STK_D_15	533314.60	5095787.20	450.60	9.86	0.61

Table 9 – Point Source Parameters for Max and Low Loads

Load	Emission Rate (g/s)	Stack Exit Velocity (m/s)	Stack Temp. (Deg. K)
Max	6.87	36.87	756
Low	0.88	7.35	629

6 Model Execution and Results

6.1 Model Methodology

The non-emergency operating scenario utilized for the modeling is as follows:

- Each building (15 generators) tested once per month
- Each building tested separately (15 generators at once, 12 times per year)

This scenario was repeated for both low and maximum load cases. Each building was modeled in a separate AERMOD run with the parameters detailed in Table 8 and Table 9. AERMOD was run assuming continuous operation of the generators to generate an annual distribution of maximum daily impacts (MAXDAILY) at each receptor. The generated MAXDAILY output files were separately processed using the Monte Carlo R script developed by the State of Washington's Department of Ecology. The script was set up to randomly sample each MAXDAILY file once per month, for 1,000 iterations. The standard output of the script was the 98th percentile (8th highest) maximum daily 1-hour NO_2 concentrations at each receptor. The median of the 1,000 design values at each receptor was compared to the air quality standard. These results are shown in Table 10.

Table 10 – Median Design Value 1-hour NO_2 Impacts

Load Scenario	Building	Median Design Value (µg/m^3)	Background (µg/m^3)	Cumulative Impact (µg/m^3)
LOW	A	9.9	35	44.9
	B	9.7	35	44.7
	C	10.1	35	45.1
	D	13.4	35	48.4
MAX	A	19.6	35	54.6
	B	18.8	35	53.8
	C	20.7	35	55.7
	D	25.4	35	60.4

The highest cumulative impact was from building D at max load with a concentration of 60.4 µg/m^3, compared to the NAAQS standard of 188 µg/m^3.

6.1.1 1-HR NO_2 Modeling Methodology (Tier III)

EPA has a three-tier approach to modeling NO_2 concentrations. Tier I is the most conservative and assumes a total conversion of NO to NO_2. Tier 2 is less conservative than Tier 1 but designed by EPA to be more conservative than Tier III. The Tier III methods consist of several detailed screening techniques that account for ambient ozone and the relative amount of NO and NO_2 emitted from a source. For this project, Applied Digital used the ozone limiting method (OLM) Tier III approach. OLM is commonly used for the Tier III approach since it is stable and theoretically more conservative than other options such as the Plume Volume Molar Ratio Method (PVMRM), which only uses the amount of ozone within the plume rather than all available ozone like OLM. This approach requires the use of in-stack NO_2/NO_X ratios (ISR) and hourly ozone data. An ISR of 0.1 was used for all generators, based on the EPA ISR database.[9] This value is representative of diesel-fired engines. The default maximum equilibrium NO_2/NO_X ratio of 0.90 was used. Hourly ozone data from Fargo, North Dakota was downloaded from the EPA Air Quality System. Missing ozone data was filled with the maximum hourly value from any of the five years for that hour.

7 Summary & Conclusions

Upon the Department's review and independent analysis of the modeling submitted by Applied Digital, the following is concluded:

Applied Digital followed all applicable State and Federal guidance in their modeling protocol.

Applied Digital's dispersion modeling and analysis were conducted to demonstrate that non-emergency emissions from the Project will comply with state and federal Ambient Air Quality Standards (AAQS). Modeled emissions associated with the scenarios presented did not cause or contribute to a violation of the NAAQS and NDAAQS as listed in NDAC 33.1-15-02-04. Results of the modeled impacts and analysis for the AAQS are displayed in Table 1 and Table 10.

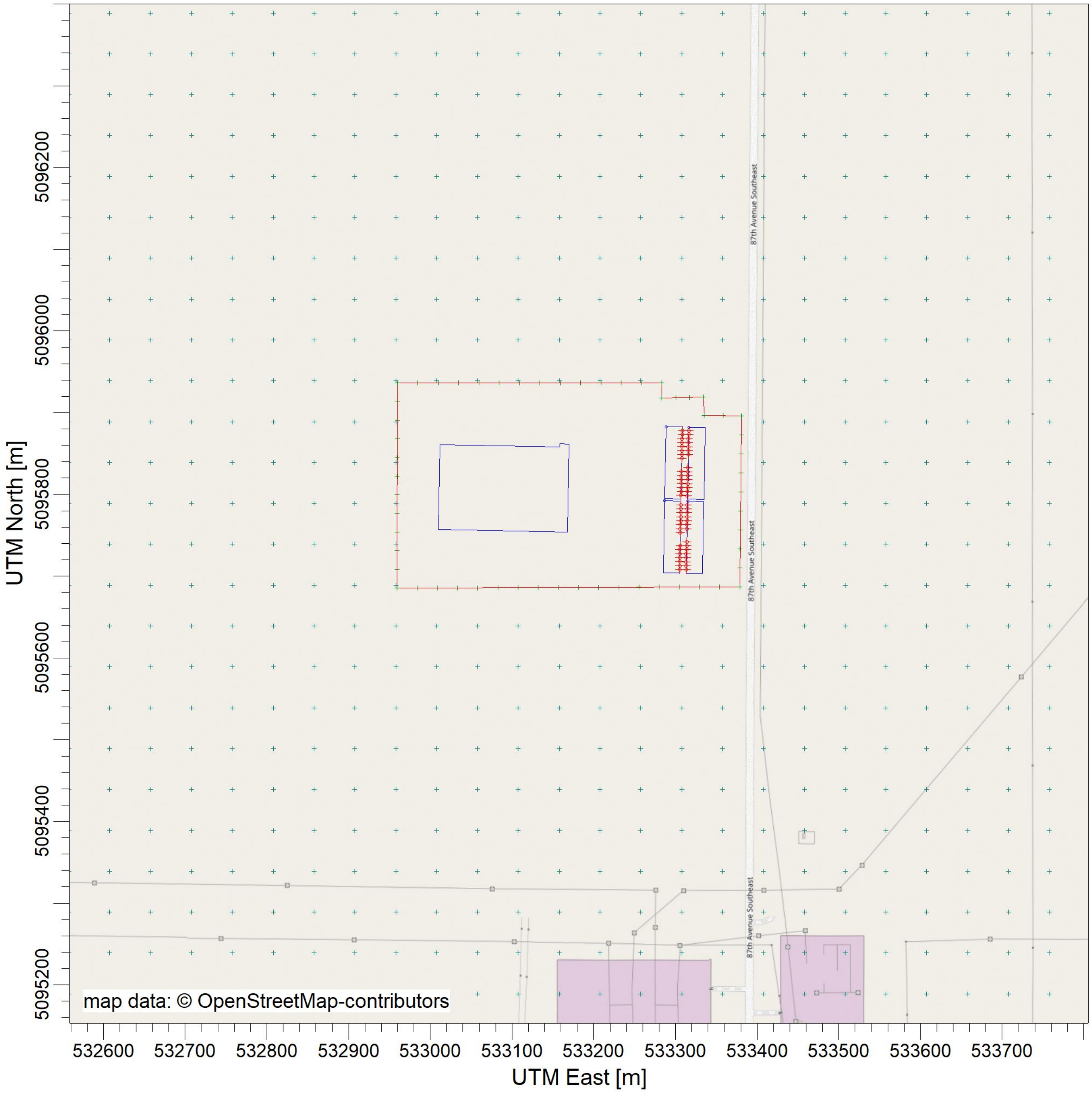
[9] Available at: https://www.epa.gov/scram/nitrogen-dioxidenitrogen-oxide-stack-ratio-isr-database (Last visited August 14, 2025).

8 Plots

Model Set-Up

PROJECT TITLE:

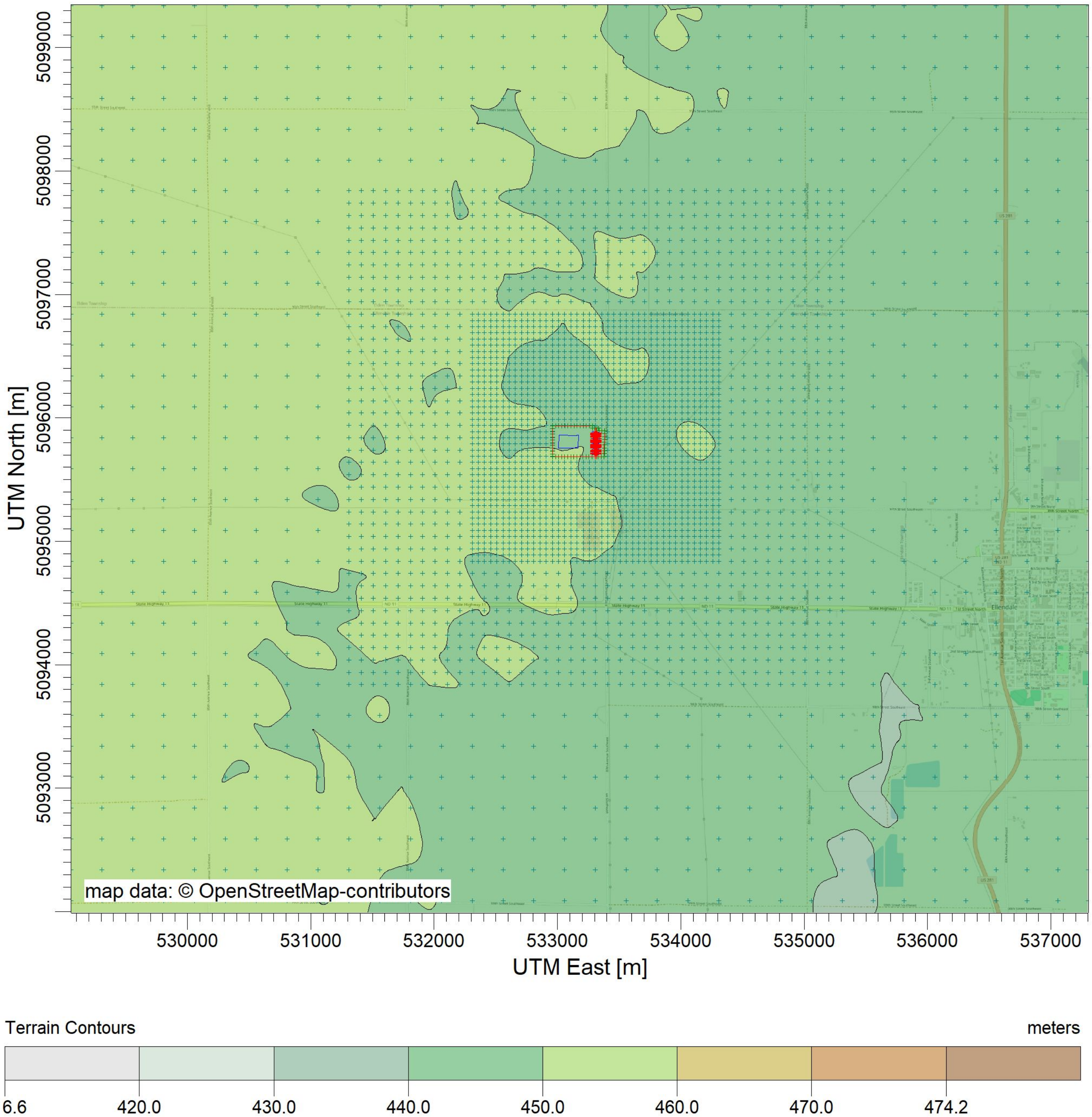
Applied Digital Corporation
Plot 1 - Site



COMMENTS:	SOURCES:	COMPANY NAME:	
	60	**North Dakota Department of Environmental Quality**	
	RECEPTORS:	MODELER:	
	5610	**Rhannon Thorton**	NORTH Dakota Be Legendary. | Environmental Quality
		SCALE: 1:7,843 0 — 0.2 km	
		DATE: **9/9/2025**	PROJECT NO.: **ACP-18296 v1.0**

PROJECT TITLE:

Applied Digital Corporation
Plot 2 - Terrain



COMMENTS:

SOURCES:

60

COMPANY NAME:

North Dakota Department of Environmental Quality

RECEPTORS:

5610

MODELER:

Rhannon Thorton

SCALE: 1:51,862

0 2 km

DATE:

9/9/2025

PROJECT NO.:

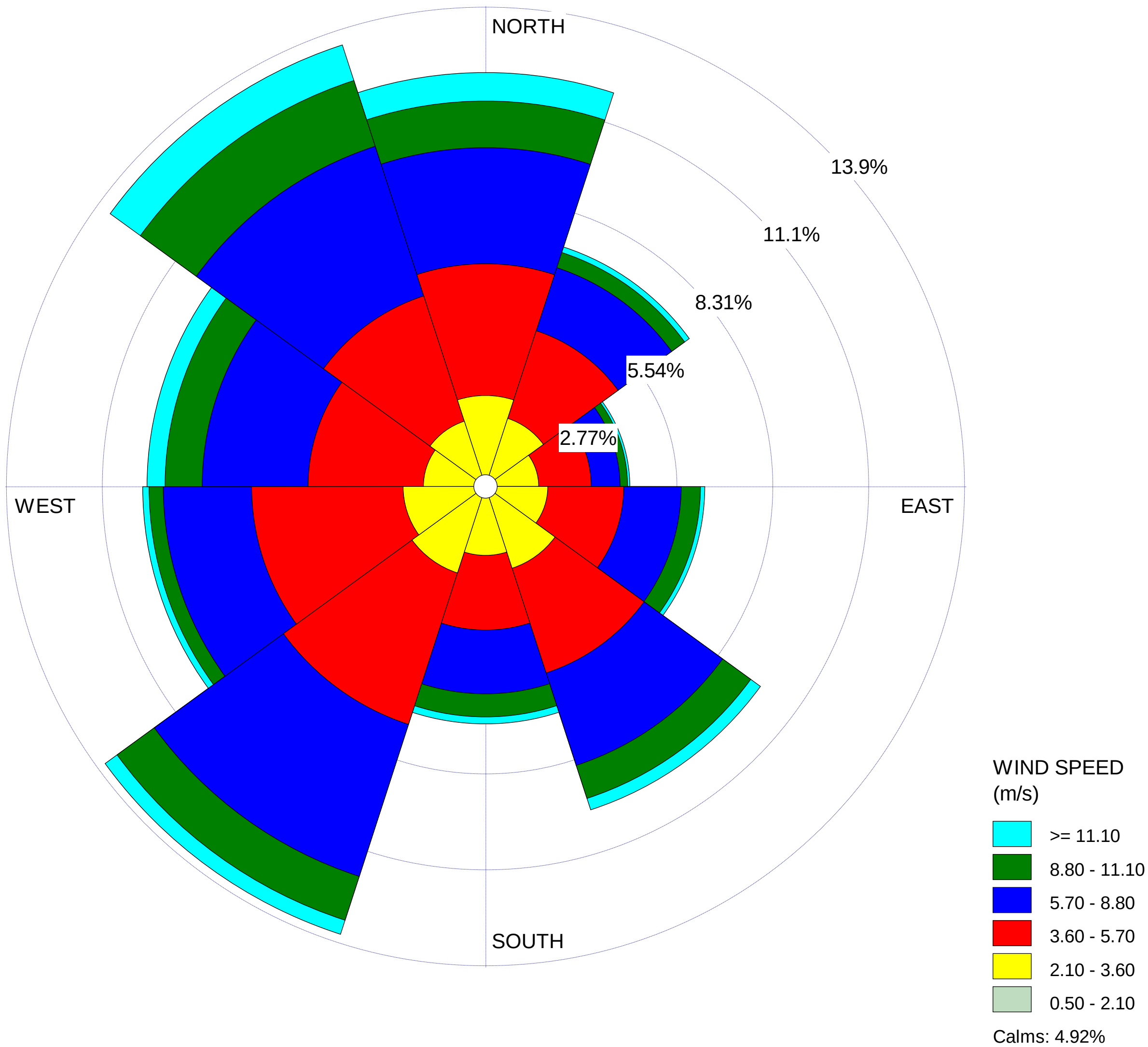
ACP-18296 v1.0

WIND ROSE PLOT:

Applied Digital Corporation
Plot 3 - Wind Rose

DISPLAY:

Wind Speed
Direction (blowing from)

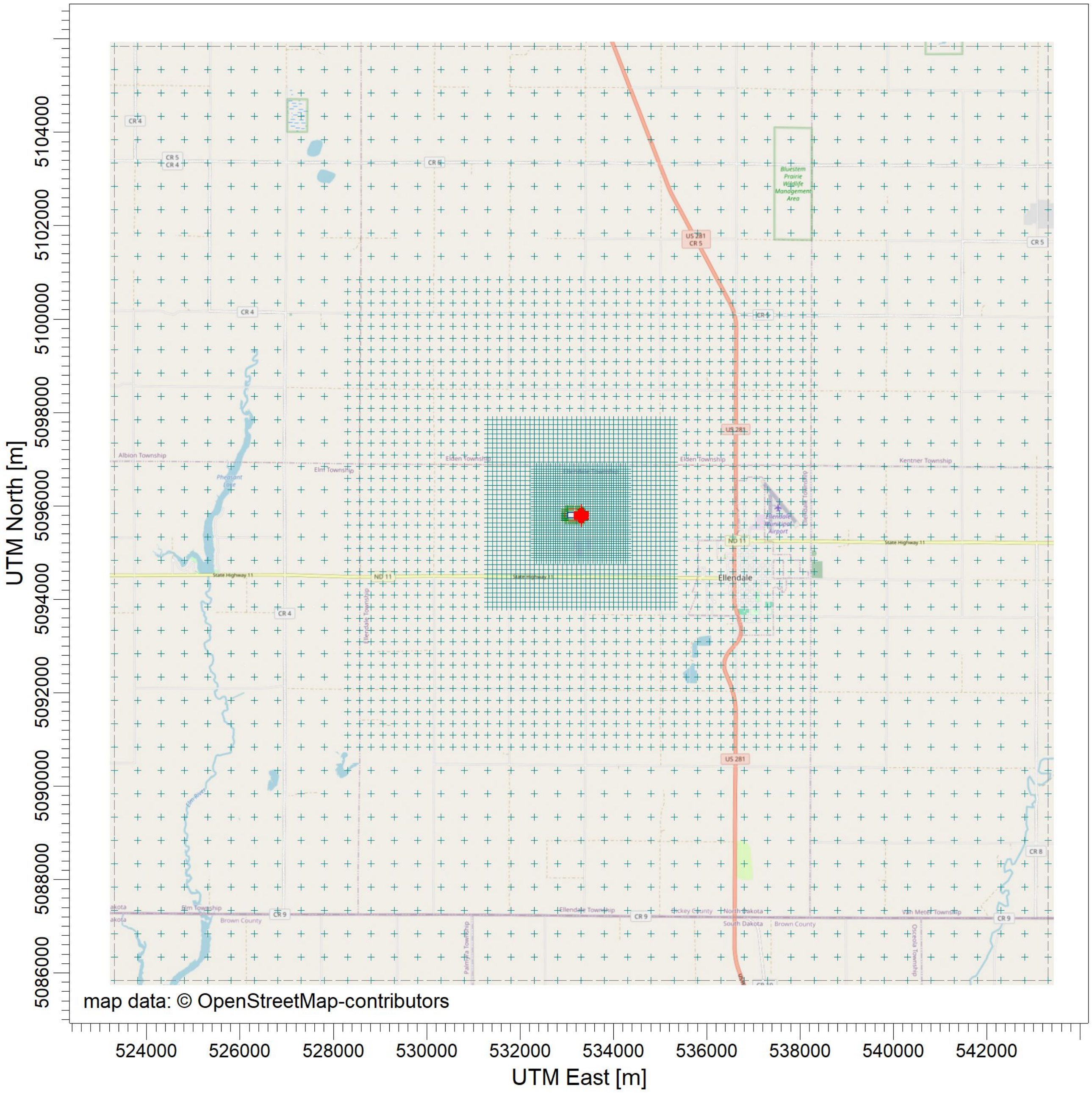


COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Gwinner Municipal Airfield, ND Station No. 150 Year: 2019-2023	**Start Date: 1/1/2019 - 00:00** **End Date: 12/31/2023 - 23:59**	**North Dakota Department of Environmental Quality**	
		MODELER: **Rhannon Thorton**	North Dakota Be Legendary. | Environmental Quality
	CALM WINDS: **4.92%**	TOTAL COUNT: **85787 hrs.**	
	AVG. WIND SPEED: **5.45 m/s**	DATE: **9/9/2025**	PROJECT NO.: **ACP-18296 v1.0**

WRPLOT View - Lakes Environmental Software

PROJECT TITLE:

Applied Digital Corporation
Plot 4 - Receptor Grid



COMMENTS:

SOURCES:
60

COMPANY NAME:
North Dakota Department of Environmental Quality

RECEPTORS:
5610

MODELER:
Rhannon Thorton

SCALE: 1:137,281

0 5 km

NORTH Dakota Be Legendary.™ | Environmental Quality

DATE:
9/9/2025

PROJECT NO.:
ACP-18296 v1.0

AERMOD View - Lakes Environmental Software