TETRA TECH

May 11, 2023

Mr. Mark Houser
Bridge Industrial Acquisition, LLC
9525 Bryn Mawr Avenue, Suite 700
Rosemont, Illinois 60018

RE: Limited Emissions Assessment for Commercial Development
1 Baxter Parkway, Deerfield, Illinois

Dear Mr. Houser:

Bridge Industrial Acquisition, LLC (Bridge) retained Tetra Tech, Inc. (Tetra Tech) to advise on environmental matters associated with redevelopment of the 101-acre commercial property at 1 Baxter Parkway in Deerfield, Illinois (the site). This includes an assessment of vehicle emissions associated with a planned warehouse/distribution center at the site. This letter presents site background information, procedures used to assess vehicle emissions, and our conclusions.

BACKGROUND INFORMATION

The site is currently developed with ten mid-rise office buildings occupying 645,000 square feet (SF) and three 4-story parking garages. The site has served as the headquarters for Baxter International, Inc.; buildings at the site were constructed in 1972. The site is bordered by commercial properties to the north and south, Interstate 94 (I-94, also known as the Edens Expressway) to the east, and a residential subdivision to the west, across Saunders Road.

Redevelopment plans call for site clearing and construction of two warehouse buildings, 900,000 SF and 228,000 SF in size (herein referred to as the "warehouse development") and outdoor athletic fields. The proximity of the residential subdivision to the site and the I-94 are shown in **Figure 1**.

Tetra Tech previously conducted environmental studies at the site, including soil, groundwater, and soil-gas sampling/analyses. Subsurface exploration shows the site is underlain by 130 feet of clay soil over limestone bedrock. Analysis of environmental samples of various media collected at the site did not detect chemical impacts at concentrations exceeding remediation objectives cited by the Illinois EPA.

OBJECTIVES AND SCOPE OF WORK

Bridge retained Tetra Tech to assess the air quality impact at a residential subdivision from site-related vehicle emissions. To meet his objective, we considered the current site use as an office campus compared to the proposed use as a warehouse development. Our assessment considers the volume of traffic, the number and type of vehicles, and emissions from I-94 vehicles, and the results of air dispersion modeling, discussed in the following sections.

AIR DISPERSION MODELING

As described by the USEPA, dispersion modeling uses mathematical formulas to characterize the atmospheric processes where pollution emitted from a source is transported downwind. Based on emissions and meteorological inputs[1], a dispersion model can be used to predict ambient air concentrations at selected downwind receptor locations. These air quality models are used to determine compliance with National Ambient Air Quality Standards (NAAQS), and other regulatory requirements. (Source: www.epa.gov/scram/air-quality-dispersion-modeling.)

Tetra Tech conducted air dispersion modeling (AERMOD) to assess potential impacts from vehicle emissions on the residential subdivision. Input parameters included (1) the frequency and type of vehicles described in the traffic study by Kenig, Lindgren, O'Hara, Aboona, Inc. (KLOA)[2]; (2) prominent air pollutants identified by USEPA; (3) Bureau of Transportation estimates for vehicle emissions[3]; and (4) a five-year hourly meteorological data set obtained from a nearby meteorological station[4]. The modeling also considers average traffic flow over a 24-hour period, and truck routes on Saunders Road and I-94 shown in **Figure 2**.

Frequency and Type of Vehicles. The traffic study was used to determine the traffic volumes and vehicle types (passenger vehicles verses semi-tucks) to compare the peak use to the proposed use. Input parameters assumed traffic flow over a 24-hour period.

The traffic study shows a peak employee occupancy for the office campus use, with 4,440 daily trips (2,220 trips incoming and 2,220 trips outgoing). The traffic study also projects a reduced volume of vehicle traffic for the proposed use as a warehouse development, with 2,102 daily trips (1,051 trips incoming and 1,051 trips outgoing).

Pollutants of Concern. The pollutants of concern include nitrogen oxides (NO, NO2), carbon monoxide (CO), and particulate matter (PM). These pollutants are produced by the high temperature combustion of fuel.

Compound	Comments
Nitrogen Oxides (NO_X)	NO_X are gas molecules that react in the atmosphere and contribute to both formation of and depletion of ground-level ozone (smog) depending on the presence of sunlight.
Carbon Monoxide (CO)	CO is a common pollutant emitted from fuel combustion and can be an asphyxiant at high levels (i.e., generators or cars running in closed garages pose a serious health risk).
Particulate Matter (PM)	Particulates are microscopic solids or liquid droplets generated by combustion. Particulates include dust, dirt, smoke, soot, etc.

[1] www.epa.gov/scram/air-modeling-observational-meteorological-data

[2]KLOA, *Traffic Impact Study, Proposed Industrial Development, Deerfield, Illinois*, report dated March 23, 2023.

[3] Estimated U.S. Average Vehicle Emissions Rates per Vehicle by Vehicle Type Using Gasoline and Diesel | Bureau of Transportation Statistics (bts.gov)

[4] USEPA Meteorological Station # 17-031-4201, Northbrook, Illinois, Coordinates 42°08'24.0"N 87°47'57.2"W

The model uses USEPA National Average Vehicle Emission Rates for the pollutants of concern listed in **Table 1**.

Estimates for Site Vehicle Emissions. The Bureau of Transportation estimates vehicle emissions based upon vehicle type[5]. We used the US Department of Transportation's *compound-specific emission factor*s to calculate vehicle emissions for cars and semi-trucks for both the current and proposed use scenarios.

Use	Vehicle Type	Daily Trips	Calculated Emissions (lb./day)		
			NOx	CO	PM
Current Use	Light-Duty Gasoline (Cars)	4,440	2.10	53.80	0.117
Proposed Use	Light-Duty Gasoline (Cars)	1,200	0.57	14.54	0.032
	Heavy Duty Diesel (Trucks)	616	6.66	3.63	0.159
	Total	**1,816**	**7.23**	**18.17**	**0.191**

The data indicates that increased truck traffic will result in

- A net emission decrease in carbon monoxide
- A net emission increase in nitrogen oxides and particulate matter

The calculated emissions are used as input parameters in the model; these emissions are representative of warehouse developments of a similar scale.

Estimates for Interstate 94 Vehicle Emissions. Tetra Tech also considered vehicle emissions from I-94. The Illinois Department of Transportation[6] indicates I-94 serves 180,000 vehicles per day, approximately 163,800 cars and 16,200 trucks traverse the eastern frontage each day. Traffic routes used in our assessment are shown in **Figure 2**. For comparison purposes, the following summarizes the daily vehicle emissions from I-94:

Use	Vehicle Type	Daily Trips	Calculated Emissions (lb./day)		
			NOx	CO	PM
Interstate 94	Light-Duty Gasoline (Cars)	163,800	51.64	1,323.13	2.889
	Heavy Duty Diesel (Trucks)	16,200	116.75	63.68	2.786
	Total	**180,000**	**168.39**	**1,386.81**	**5.675**

[5] Estimated U.S. Average Vehicle Emissions Rates per Vehicle by Vehicle Type Using Gasoline and Diesel | Bureau of Transportation Statistics (bts.gov)

[6] Source: email message from Adam Lintner, April 25, 2023, alintner@getipass.com

Based on these data, vehicle emissions from I-94 will far exceed site vehicle emissions for the proposed use. Further, vehicle emissions from I-94 will disperse across the site; therefore, the relatively low emissions generated from the proposed site use will not be discernable from those associated with I-94.

Meteorologic Data. Atmospheric conditions affect how vehicle emissions disperse. For atmospheric dispersion modeling, meteorological conditions (wind speed and direction, temperature, humidity, pressure and air stability class) are considered.

Tetra Tech obtained meteorological data from a nearby station in Northbrook, Illinois (source: https://www.epa.gov/aqs). The data consists of wind speed and wind direction measurements collected at one-hour increments over a five-year period. The weather station data demonstrate that prevailing wind directions are southwest to northeast, northeast to southwest, and broadly west-northwest to east-southeast. The wind speed and direction data collected over a five-year period is illustrated in a wind rose diagram included as **Attachment 1**.

Model Input Parameters & Procedures. Tetra Tech applied site-specific input parameters including (1) the frequency and type of vehicles described in the traffic study; (2) the pollutants of concern; (3) the Bureau of Transportation estimates for vehicle emissions; (4) site-specific calculated emissions; and (5) meteorological data.

To assess potential impacts on the east and west sides of the residential subdivision, our analysis considers

- Average traffic flow over a 24-hour duration
- Truck routes on Saunders Road
- Vehicle emissions from I-94

The site-related traffic routes on Saunders Road and I-94 are shown in **Figure 2**.

Modeling Results. Receptors are positioned along the east and west sides of the residential subdivision. The model runs consider two sources of emissions: Saunders Road (specifically traffic induced by the warehouse development) and I-94.

Emission Source	Averaging Period: 24 hours					
	NO_2		CO		PM	
	(ug/m^3)		(ug/m^3)		(ug/m^3)	
	East	West	East	West	East	West
Saunders Road	13.30	0.83	33.44	2.10	0.35	0.02
Interstate-94	18.03	11.34	148.52	93.39	0.61	0.38

ug/m^3 = micrograms per cubic meter

Our calculations show that at the eastern side of the subdivision, 24-hour average ambient air concentrations attributable to I-94 vehicle emissions *exceed* that attributable to vehicle emissions generated by the project on the site and on Saunders Road. The calculated Vehicle Tailpipe Emissions and the AERMOD model results are summarized in **Tables 2 and 3**, respectively.

Modeling results are also compared to the National Ambient Air Quality Standards (40 CFR Part 51) using appropriate averaging periods (1-hour and 24-hour averages) per the NAAQS as indicated below.

Emission Source	NO_2,1-Hour Average (ug/m^3)		CO, 1-Hour Average (ug/m^3)		PM, 24-Hour Average (ug/m^3)	
	East	West	East	West	East	West
Saunders Road	60.15	2.79	151.15	7.02	0.35	0.02
I-94	57.08	40.67	470.08	334.96	0.61	0.38
NAAQS	188		40,000		35	

ug/m^3 = micrograms per cubic meter

The calculated site-generated vehicle emissions are not expected to appreciably change ambient air quality, which based on modeling, will continue to meet USEPA's standards. The results of the dispersion modeling are summarized in **Table 3**.

SUMMARY AND CONCLUSION

Bridge Industrial Acquisition, LLC retained Tetra Tech to advise on environmental matters associated with redevelopment of the 101-acre commercial property at 1 Baxter Parkway in Deerfield, Illinois (the site). This includes ambient air quality assessment of vehicle emissions associated with a planned warehouse development at the site.

- The site is currently developed with ten mid-rise office buildings that served as the corporate headquarters for Baxter International, Inc. Buildings at the site were constructed in 1972. The site is bordered to the north and south by commercial properties, to the east by Interstate 94 and to the west by a residential subdivision, across Saunders Road. Redevelopment plans call for site clearing and construction of two warehouse buildings and outdoor athletic fields.
- Bridge retained Tetra Tech to assess the potential for site-related vehicle emissions to impact air quality at the residential subdivision. Our assessment considered the volume of traffic, the type of vehicles, and emissions from I-94 vehicles. It is worth noting that meteorological data indicate prevailing winds blow from the west to the east, from the residential subdivision towards the site.
- Tetra Tech conducted air dispersion modeling to assess impacts from vehicle emissions. Input parameters included (1) the frequency and type of vehicles described in the traffic study; (2) pollutants of concern (3) Bureau of Transportation estimates for vehicle emissions; and (4) meteorologic data obtained from a nearby meteorological station. The dispersion modeling also considers traffic flow over a 24-hour duration, and truck routes on Saunders Road associated with the proposed site use and on I-94.
- The data indicates increased truck traffic will result in a net emission decrease in carbon monoxide and net emission increase in nitrogen oxides and particulate emissions.

Based on the results of limited emissions assessment, Tetra Tech concludes that while the proposed development will significantly reduce overall traffic volume, the associated truck traffic will result in a net emission increase for some pollutants of concern. Notwithstanding, the modeling demonstrates compliance with the National Ambient Air Quality Standards for nitrogen oxides, carbon monoxide and particulate emissions.

Thank you for requesting our assistance with this matter.

Respectfully Submitted,

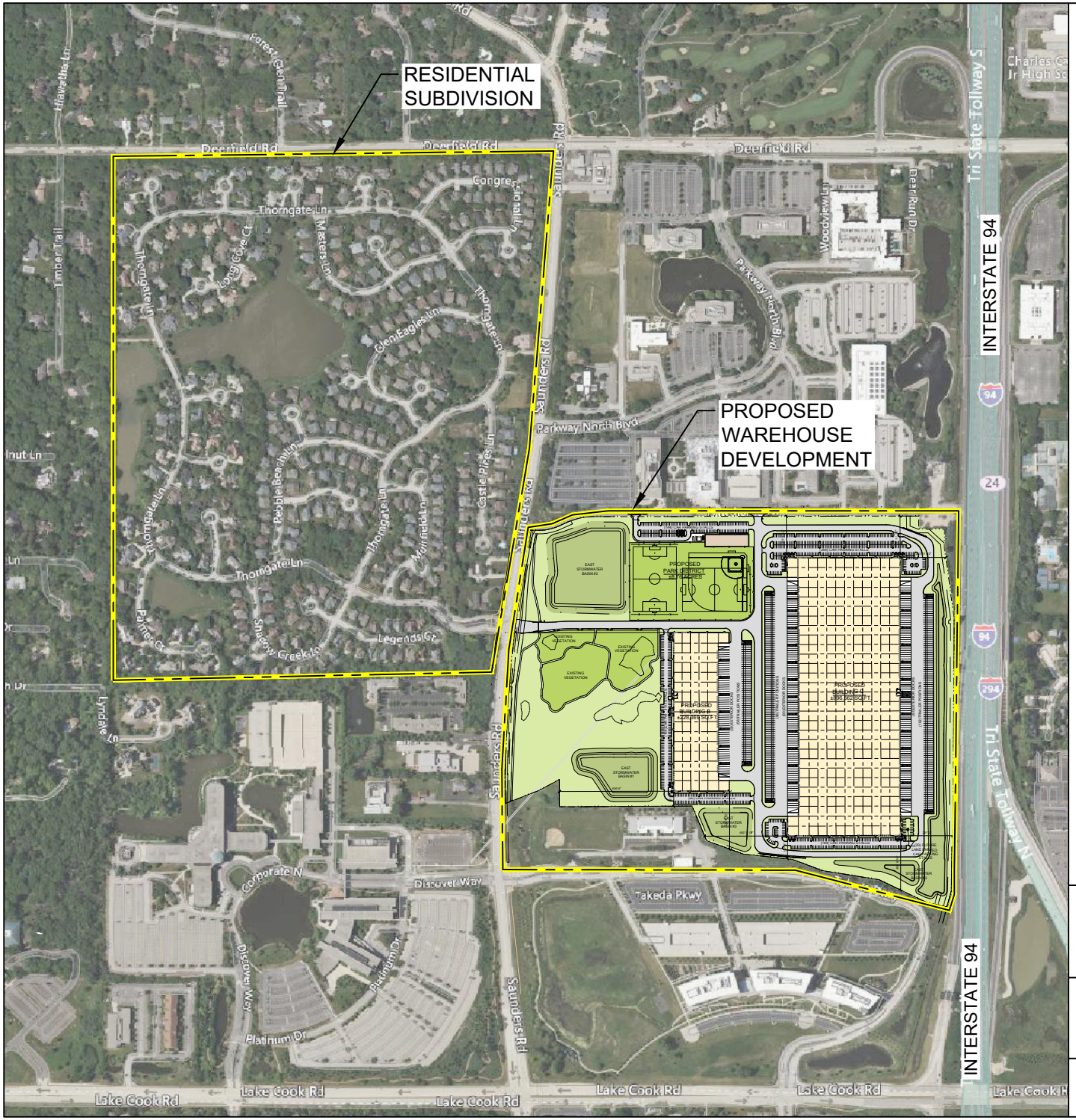
Stephen G. Torres, P.G.
Senior Engineering Geologist

Attachments:

Figure 1: Site Plan Showing the Redevelopment Site and Vicinity
Figure 2: Aerial Photograph Showing Dispersion Model Source and Receptor Locations

Table 1: Estimated National Average Vehicle Emission Rates
Table 2: Calculated Vehicle Tailpipe Emissions
Table 3: AEROMOD Results

Attachment 1, Wind Rose Diagram



1 Baxter Parkway
Deerfield, Illinois

Figure 1
Site Plan Showing the Redevelopment Site and Vicinity

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SCALE IN FEET

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Figure 2
Aerial Photograph Showing Dispersion Model Source and Receptor Locations

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Table 1: Estimated National Average Vehicle Emissions Rates per Vehicle by Vehicle Type using Gasoline and Diesel (Grams per mile)

	(P) 2023	(P) 2024	(P) 2025	(P) 2026	(P) 2027	(P) 2028	(P) 2029	(P) 2030
GASOLINE								
Light-duty vehicles								
Total HC	0.241	0.228	0.218	0.195	0.187	0.175	0.166	0.159
Exhaust CO	3.664	3.534	3.359	3.171	3.005	2.845	2.668	2.508
Exhaust NOx	0.143	0.117	0.103	0.088	0.081	0.070	0.063	0.054
Exhaust PM2.5	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Brakewear PM2.5	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Tirewear PM2.5	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
DIESEL								
Heavy-duty vehicles								
Total HC	0.209	0.195	0.183	0.174	0.165	0.157	0.150	0.145
Exhaust CO	1.783	1.724	1.671	1.626	1.586	1.549	1.517	1.492
Exhaust NOx	3.269	3.060	2.883	2.742	2.616	2.501	2.396	2.315
Exhaust PM2.5	0.065	0.057	0.049	0.043	0.038	0.033	0.029	0.026
Brakewear PM2.5	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Tirewear PM2.5	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003

KEY: CO = carbon monoxide; HC = hydrocarbons; NOx = nitrogen oxides; P = projection; PM2.5 = particulate matter with diameter <= 2.5 micrometers; R = revised.

NOTES

Estimates are by calendar year. Vehicles types are defined as follows: light-duty vehicles (passenger cars); light-duty trucks (two axle, four tire); heavy-duty vehicles (trucks with more than two axles or four tires); motorcycle (highway only).

Emissions factors are averages based on the national average age distributions, vehicle activity (speeds, operating modes, vehicle-miles traveled fractions, starts and idling), temperatures, inspection/maintenance and antitampering programs, and average gasoline fuel properties in that calendar year. Total HC includes exhaust and evaporative emissions.

Average emissions per vehicle rates assume a fleet comprised exclusively of gasoline and diesel vehicles. Gasoline-electric hybrids are accounted for in the values for gasoline vehicles.

This table was generated using MOVES3, the U.S. Environmental Protection Agency's (EPA) mobile source emissions model. More information on MOVES is available at www.epa.gov/moves.

Data for this update are based on new estimation models and are not comparable to previous releases. MOVES3 includes updates to historical data and methods as well as updates to future year projections and thus provides the current best estimates of emissions for all calendar years. Data for 2021 and later are projections.

SOURCE U.S. Environmental Protection Agency, Office of Transportation and Air Quality, personal communication, Apr. 30, 2021.

Table 2. Calculated Vehicle Tailpipe Emissions

Use	Vehicle Type	Daily Trips	Trip Dist. (mi)	Daily VMT	2023 MOVES Emission Factor (g/VMT)			Calculated Emissions (lb/day)		
					NOx	CO	PM	NOx	CO	PM
Current Use	Light-Duty Gasoline (Cars)	4,440	1.5	6,660	0.143	3.664	0.008	2.10	53.80	0.12
Proposed Use	Light-Duty Gasoline (Cars)	1,200	1.5	1,800	0.143	3.664	0.008	0.57	14.54	0.03
	Heavy Duty Diesel (Trucks)	616	1.5	924	3.269	1.783	0.078	6.66	3.63	0.16
	Total	**1,816.0**		**2,724.0**				**7.23**	**18.17**	**0.19**
I-94	Light-Duty Gasoline (Cars)	163,800	1	163,800	0.143	3.664	0.008	51.64	1323.13	2.89
	Heavy Duty Diesel (Trucks)	16,200	1	16,200	3.269	1.783	0.078	116.75	63.68	2.79
	Total	**180,000.0**		**180,000.0**				**168.39**	**1,386.81**	**5.67**

VMT = Vehicles miles of travel

Table 3. AERMOD Results

Subdivision Location	Use	Predicted 24-Hour Average Concentration (ug/m3)		
		NOx	CO	PM
East Side Receptors	Current Use	3.86	99.00	0.22
	Proposed Use	13.30	33.44	0.35
	I-94	18.03	148.52	0.61
West Side Receptors	Current Use	0.24	6.21	0.01
	Proposed Use	0.83	2.10	0.02
	I-94	11.34	93.39	0.38

Results are the maximum predicted 24-hour average concentration at the east side and west side receptor locations over a 5-year period.

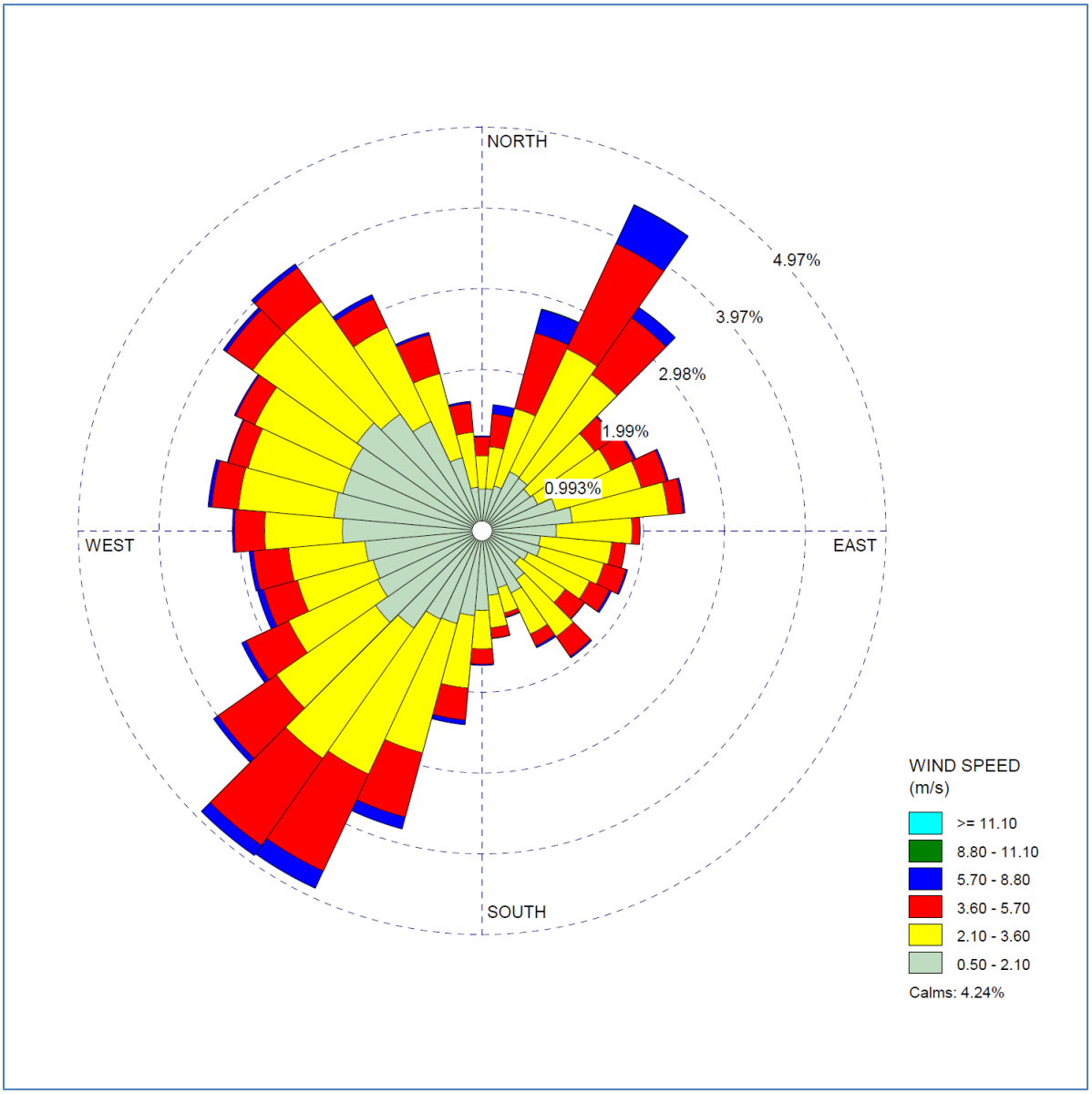
Results are based on average annual daily traffic, thus 24-hour average concentrations are estimated and presented.

Cuurent use and proposed use scenarios address only that traffic induced by the current and proposed use of the site.

Current use and proposed use traffic are assumed to conservatively transit only Saunders Road.

Attachment 1

Rose Diagram Showing Wind Speed and Direction
USEPA Weather Station 17-031-4201, Northbrook, Illinois
Hourly Measurements for the Years 2005-2006 and 2008-2010



Source: https://www.epa.gov/aqs

The wind rose shows the frequency of occurrence of wind direction and speed for the 5-year period. The circular format of the wind rose shows the direction the winds blew from and the length of each "spoke" around the circle shows how often the wind blew from that direction. The different colors of each spoke provide details on the speed, in meters per second of the wind from each direction. This wind rose demonstrates that prevailing winds are from three sectors: southwest to northeast, northeast to southwest, and broadly west-northwest to east-southeast. Generally speaking, winds are much more likely to blow from the residential subdivision towards the site much more frequently than from the site toward the residential subdivision.