August 17, 2017 Kansas Department of Health and Environment
Bureau of Air
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To whom it concerns,

Within the city limits of Wichita, Kansas there are numerous roads that remain unpaved in the Orchard Breeze area. The Kansas Department of Health and Environment's Bureau of Air has received numerous complaints regarding airborne dust created by traffic along these unpaved roads. Recent complaints have prompted the Bureau of Air to conduct dispersion modeling for a portion of the Orchard Breeze area in Wichita, Kansas.

Complaints suggested that the worst airborne dust issue occurred along North Doris Street, specifically near the 500 block. Reviewing satellite imagery and roadways details shows that North Doris Street is unpaved from approximately 300-660 North Doris Street. Conversations with the City of Wichita and their roadway gravel provider provided additional details on the road surface that was necessary to conduct accurate dispersion modeling of the North Doris Street corridor.

Following guidelines from the Environmental Protection Agency (EPA), unpaved road dust is best modeled using the steady-state dispersion model AERMOD. Emission factors for unpaved roads are described in detail within EPA's AP-42, *Compilation of Air Pollutant Emission Factors*. Section 13.2.2 within AP-42 describes the method used for fugitive dust along unpaved roads. Variables specific to this modeling effort include silt content of roadway, mean vehicle speed, surface moisture content, vehicular traffic, and meteorological data to determine number of wet days per year.

While the roadway base along North Doris Street is best described as AB-3 per ASTM standards, the city of Wichita no longer uses such gravel for resurfacing roadways. Rather a road gravel mixture from a local quarry is used on the cities unpaved secondary roads. Specification sheets from the local quarry provider indicate that approximately 0.75% of this new surface material will pass through a No. 200 sieve and can be classified as silt, and the surface moisture content of the material is calculated as approximately 3.05. The City of Wichita completed a traffic count in the Orchard Breeze area earlier in 2017. This traffic count indicated on average there are 377 vehicles per day travelling south onto North Doris Street from West Central Avenue. This average vehicle count alongside a mean vehicle speed of 30 mph was used to calculate emissions. Finally, meteorological data from Wichita Dwight D Eisenhower Airport was used to determine on average there are 87 days with 0.01" or greater of precipitation, and can be classified as 'wet' days in fugitive dust calculations.

Using the aforementioned values and the AP-42 fugitive dust formula for public roads, it was determined, that annual PM_{10} emissions along North Doris Street are approximately 4 tons per vehicle mile traveled. An emission rate for the North Doris Street corridor was established and implemented in AERMOD for the dispersion modeling. Modeling used area line sources to represent the roadways with a typical passenger vehicle dimensions, 1.53-meter vehicle height

and 2.00-meter vehicle width, used to calculate initial plume dimensions. AERMOD receptors were placed throughout the modeling domain on a 20-meter uniform Cartesian grid, and at a height of 1.5 meters. Receptors within the area source (roadway) were included to represent a worst-case scenario of being directly beside vehicular traffic. Dispersion modeling was completed for the calendar year of 2016 with meteorological data from Wichita Dwight D Eisenhower Airport and flat terrain option.

A map of the line area sources used for fugitive dust emissions is shown in Figure 1. The 600 block of North Doris Street is partially paved, thus not completely represented as an emission source. The plot of annual values of PM_{10} averaged over the year is provided in Figure 2 with a maximum impact of 17.98 µg/m^3 seen near 500 North Doris Street. This represents a typical 24-hour PM_{10} value that can be attributed to road dust in the North Doris Street corridor. It is important to note that background concentrations of PM_{10} in the Wichita area are not included in this value. Using 2014-2016 monitored values from the KDHE monitor located near Pawnee and Glenn streets in Wichita the annual mean PM_{10} value is 24.3 µg/m^3. With background and modeled values being additive, the typical 24-hour maximum value along the North Doris Street corridor is approximately 42.3 µg/m^3, which is well below the National Ambient Air Quality Standard (NAAQS) of 150 µg/m^3.

Figure 1 - Line Area Sources representing North Doris Street used in AERMOD

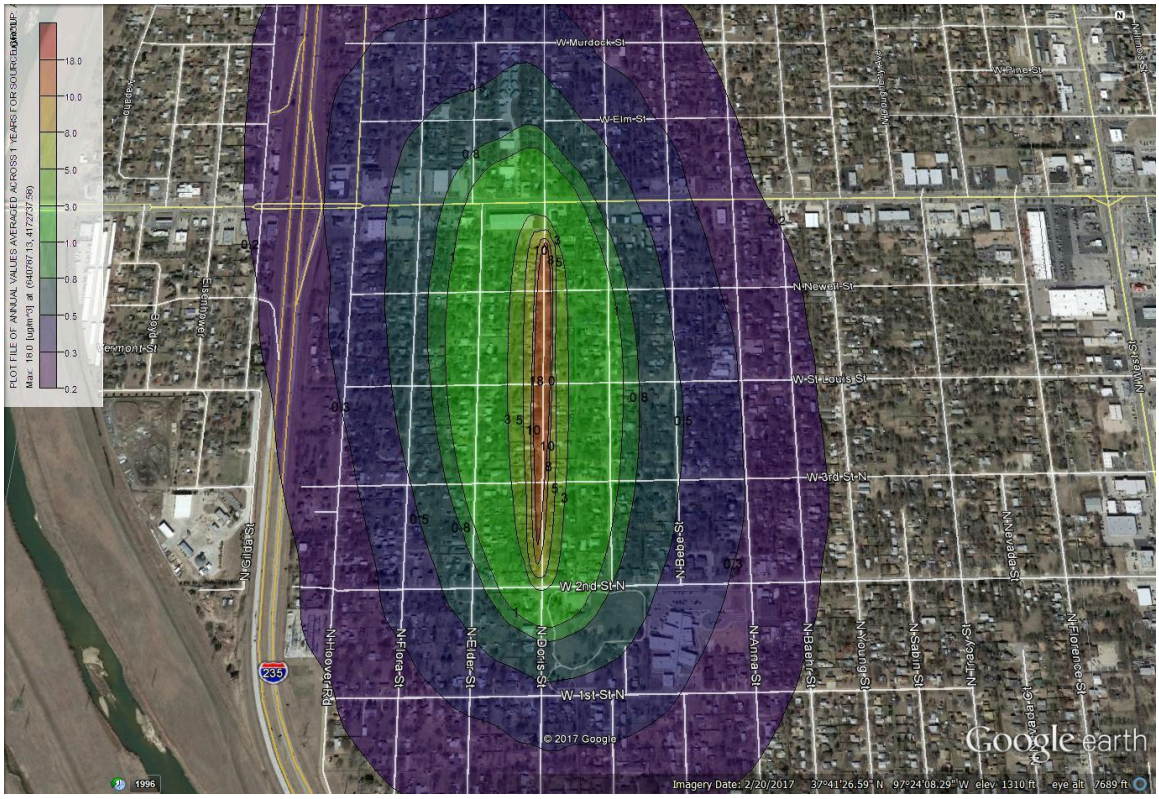

Figure 2 – AERMOD results showing annual values of PM_{10} concentrations in µg/m3

The first highest 24-hour value was also determined during the dispersion modeling to determine a 'worst' day for unpaved road dust in the North Doris Street corridor. Such a value would likely occur with calm winds, allowing dust to remain suspended and not disperse. This first highest 24-hour value is shown in Figure 3, with a zoomed-view to the maximum value shown in Figure 4. This maximum value of 75.7 µg/m^3 occurs directly on the roadway. It is important to note that under all scenarios, the maximum value occurs directly on the roadway, and values decrease dramatically as distance from the roadway increases. Even under this first highest 24-hour value determined by dispersion modeling, and accounting for typical background concentrations, the PM_{10} concentrations along North Doris Street are below the 24-hour NAAQS.

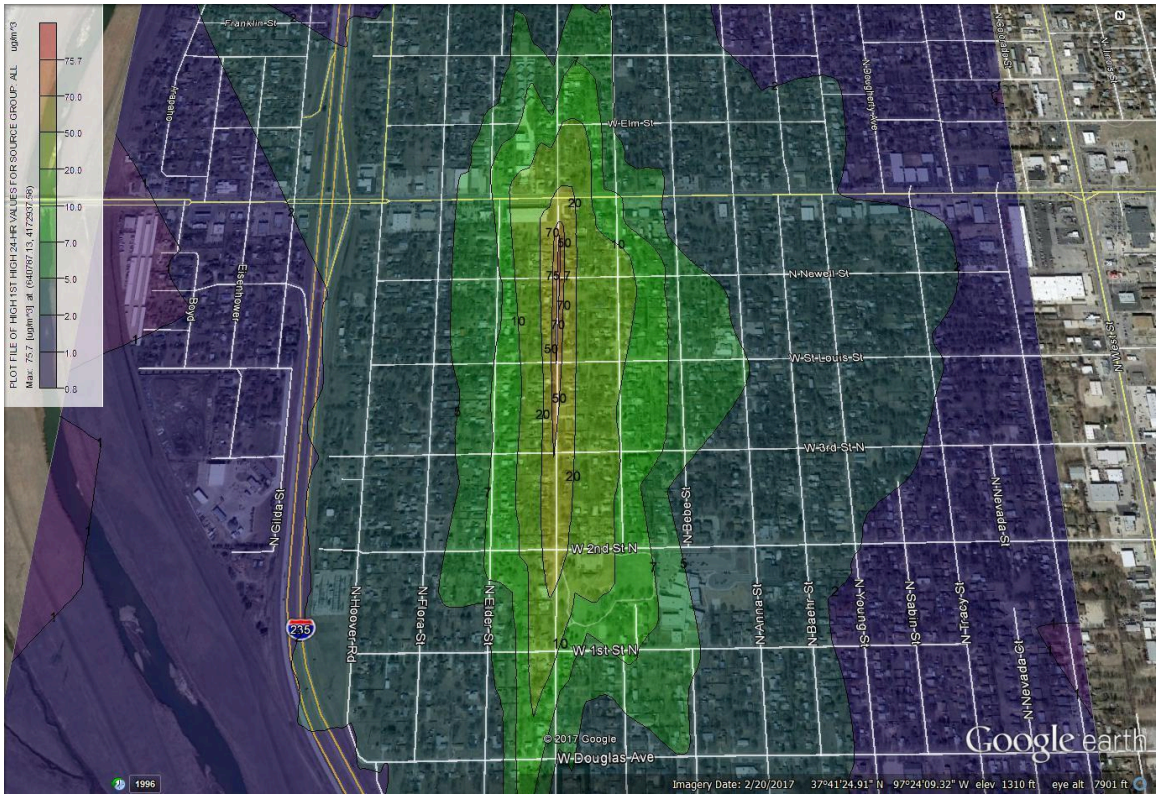

Figure 3 – AERMOD results showing 24-hour first highest PM_{10} concentrations in µg/m3

Figure 4 - AERMOD results showing 24-hour first highest PM10 concentrations in µg/m3, zoomed view of Figure 3