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1642-04

The Boutet Company
601 E 57th Street, Suite 102
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Attention: Mr. Jacques Boutet, P.E.
President

RE: Addressing the UACC Comments on the ASD Bus Barn Relocation Air Quality Modeling

Dear Mr. Boutet:

This letter responses to the January 1, 2021 comments from the University Area Community Council (UACC). The UACC presented concerns regarding the air quality modeling of the proposed Anchorage School District (ASD) Bus Barn Relocation Project by Travis/Peterson Environmental Consulting, Inc. (TPECI). The purpose of this letter is to address the UACC concerns and ensure that the air quality analysis incorporated those concerns into the model.

The main UACC concern was that TPECI did not model the Bus Barn air quality during an atmospheric inversion. Although not mentioned specifically in the analysis report, TPECI had selected meteorological variables that represented an atmospheric inversion. To simulate an atmospheric inversion, TPECI utilized an Alaska Department of Transportation and Public Facilities (DOT&PF) research report called *Implementation of Caline4*. This report recommended inputs used in Caline4, a highway dispersion model, for Alaska conditions. The Worse Case Methodology chapter in the report provided meteorological variables that model an atmospheric inversion that would generate the highest pollutant concentrations in Anchorage. Specifically, TPECI used an F atmospheric stability class and a maximum mixing height of 10 meters, which stipulated an inversion.

TPECI used the U.S. Environmental Protection Agency (EPA) model MOVES to estimate carbon monoxide (CO) emissions from the Tudor Road traffic mix and the Bus Barn fleet. MOVES provided emission rates for vehicles manufactured in 2017 and older.

The air dispersion model assumed an atmospheric inversion occurring in Anchorage during the peak rush hour traffic and the peak hour of Bus Barn operations. The CO emitted and dispersed during these coinciding events is what TPECI modeled as its worst-case scenario. Therefore,

TPECI believes that the main UACC concern of modeling the CO concentrations during an inversion was addressed.

In addition to this main concern, UACC also provided several related comments. Below (in **Bold**) are the specific UACC comments with the corresponding TPECI response to each comment below.

Why was CO the only contaminate modeled and not the other common contaminants associated with diesel emissions? (Particulate matter, NOx, HC, etc.). Wouldn't the same model provide outputs for these as well?

Air quality regulations in the United States are based on a set of air quality standards known as the National Ambient Air Quality Standards (NAAQS). The primary NAAQS are set at levels to protect the public health and are based on scientific studies conducted over many years. There are standards for six categories of pollutants. These pollutants include particulate matter less than ten and two and a half microns in diameter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), CO, and lead. Since 1992, CO was the only pollutant that exceeded the NAAQS in Anchorage. Because CO was the only pollutant in Anchorage to exceed NAAQS, TPECI chose CO as the primary pollutant of concern.

Were any other point sources of air pollutants considered in the analysis, other than the Bus Barn?

Yes. TPECI included CO emitted from vehicles on the surrounding roads (Tudor Road, Elmore Road, and Dr. Martin Luther King Jr. Avenue) during the peak hour of morning and afternoon rush hours. In addition, TPECI added a pollutant background concentration of one-part per million (ppm) (discussed in Section 6.2.3). TPECI selected a background concentration of one-ppm because that is the recommended worst-case scenario for Anchorage according to the DOT&PF research report *Implementation of CALINE4.* This report contained the worst-case scenario model inputs for Anchorage.

It appears the objective of this study was to address maintenance requirements for CO emissions. We understand that may be of use to the Muni, but as mentioned above, the analysis does not address the most significant emissions on cold winter mornings which is what was requested by UACC.

The study considered emissions emitted during cold winter mornings. Section 6.1 discusses the meteorologic variables selected by TPECI for this study. Meteorologic variables, such as wind speed and direction, stability class, and temperature, had input values that simulated an inversion event. TPECI used worst-case input values recommended by the *Implementation of CALINE4* report.

Page 2, paragraph 5: "The Bus Barn was located within CO nonattainment zone, along its boundary. Anchorage has not violated the NAAQS for CO since 1996, indicating the BUS Barn Operations have not degraded the air quality of the area." Is this necessarily the case? Just because the Muni has not been cited as in violation of something does not mean the action hasn't or isn't occurring. Our argument is that the air quality exceeds attainment

levels on inversion days when the bus barn is operating. (You would only need to be physically present one time to know.) If an air quality measurement has been not taken during an atmospheric inversion on a cold winter morning, when the buses are warming up and air quality is at its worse, there is no way anyone can actually assess whether Anchorage has violated the NAAQS for CO either before or after 1996.

The Alaska Department of Environmental Conservation (ADEC) collects air quality measurements hourly from a station near Airport Heights (Garden site). The Garden site is responsible for monitoring and reporting levels CO within the Municipality of Anchorage. This station collects air quality measurements throughout cold winter days when atmospheric inversions take place. CO has not exceeded NAAQS since 1996. Figures 1 and 2 below show the ADEC collected CO concentrations from 1972 to 2009 in Anchorage, Alaska. Figure 3 shows the CO 8-hour maximum values for Anchorage since 2000.

Based on the model, air quality for CO did not exceed attainment levels on inversion days when the Bus Barn is operating. The meteorological variables selected in the Bus Barn analysis mimicked an atmospheric inversion on a cold winter day.

Figure 1. Number of Days Exceeding the 8-Hour CO Health Standard in Anchorage, Alaska.

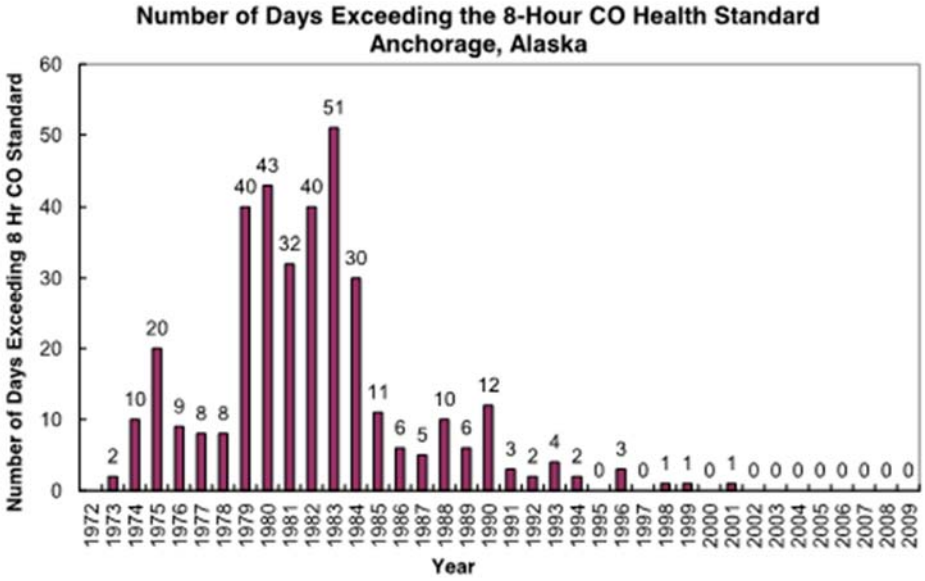


Figure 2. Number of Times the 8-Hour CO Health Standard was Exceeded in Anchorage, Alaska.

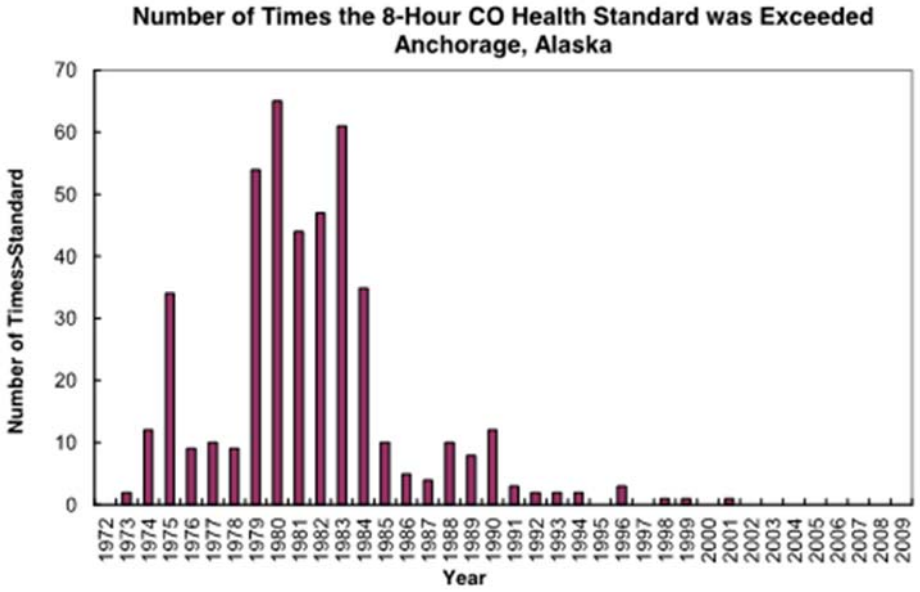
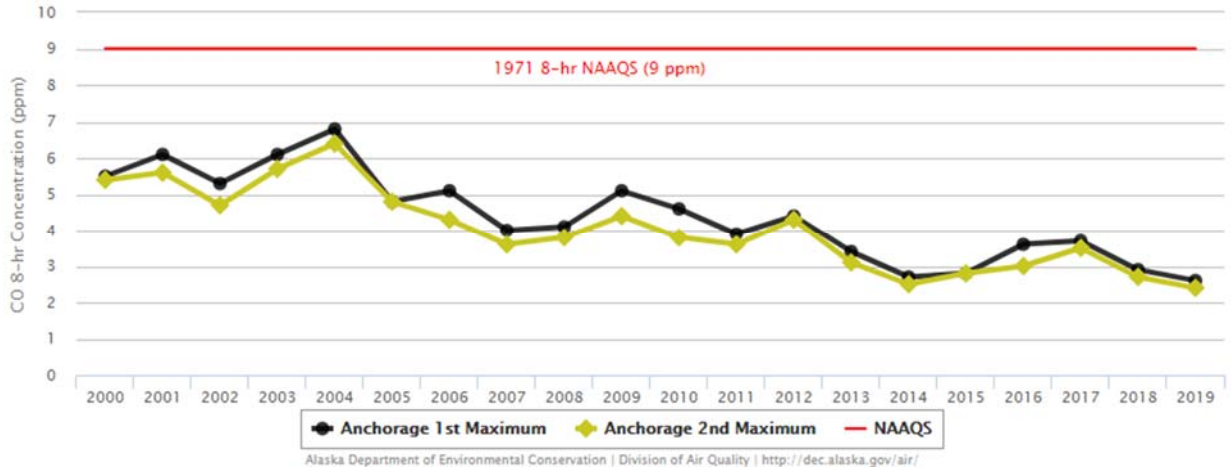


Figure 3. CO 8-hr Maximum Values for Anchorage Alaska



Does 5.2.6.1 Accurately describe the number of buses, length of time idling, and time of day?

Yes. TPECI personnel coordinated with Heather Philip, Senior Director of Transportation at the Anchorage School District. Mrs. Philip stated how many buses were stored at the Bus Barn, the number of buses used during the peak hour of the day, and the average idle time per bus. To confirm, TPECI visited the Bus Barn on February 7th, 2020. TPECI observed how many buses were in use and approximately how long buses idled before departure**.**

Same for 5.2.7.1- (what does 720 minutes represent? Is this enough?)

The 720 minutes represents Soak time. MOVES defines Soak time as the period between key off and key on when the engine is not running. Although many buses experience a soak time longer than 720 minutes, MOVES had a maximum soak time of 720 minutes. Therefore, TPECI selected 720 minutes for the model.

7.0 If under the worst-case weather conditions emissions are modeled to move towards the south, why do UACC members living in the immediate area report they have in the past and currently move west and north? Is there something different about this site? The bus barn is just moving across the street to the east and the emissions flow is to the north and west during an inversion.

During much of the winter, Anchorage is under the influence of a persistent low-pressure system in the Gulf of Alaska. Southerly or southeasterly air flows bring relatively warm, moist marine air into coastal areas, moderating surface temperatures and producing turbulent air. These conditions promote dispersion and improve air quality.

From time to time, high pressure systems located over central and northern Alaska build to sufficient strength that a northerly flow of cold, dense, arctic air pushes the marine influence away from the coast. When this occurs in the middle of winter, Anchorage experiences an episode of colder surface temperatures and radiative cooling under clear skies that creates a surface-based temperature inversion with low (or no) winds generating from the north.

To demonstrate a worst-case scenario at the Bus Barn, TPECI selected slight winds moving from the north, which is typically what happens during an inversion event. Therefore, the air dispersion models (Figures 5 and 6 in the report) shows CO concentrations moving to the south. This scenario generated the worst-case highest CO concentration.

TPECI does not believe that the Bus Barn site has any unique features that would disperse air-borne pollutants. Tudor Road produces more pollutants than the Bus Barn. Moving vehicles mechanically mix the air and disperse fumes. This source is probably what residents are experiencing.

Figure 5- Air dispersion model: The legend shows color changes in ppm however the numbers do not change. Are these simply a rounding issue?

The numbers do not change because the ranges for CO emitted from buses at the proposed Bus Barn were small.

Historically, Anchorage School District buses started their engines beginning at about 4:15 am. In the early 1990s, residential neighbors first noticed that diesel fumes started entering their residences at about 4:30 am and began to diminish after 9:00 am, when buses started out on their routes. Fumes did not fully dissipate until the winter morning sunrise after 11:00 am. The fumes traveled W, NW and N during those bus start mornings. Cold

ambient air from the Chugach Mountains air flows along Campbell Creek. On windless inversion mornings the cold air pushes fumes from the bus barn W, NW, N beginning where buses park immediately W of Elmore. The residents complained about the effects on their health:

West: Residents on Grumman St slope above former Tozier Track (sled dogs) became nauseous.
NW: Residents (including one resident's location on 42nd Ave. between Wright and Folker) reported nausea beginning 4:30A. On below zero mornings, fumes were especially intense.
North: Providence Medical Center also were impacted by diesel fumes. Thinking it was due to early hour delivery vehicles, the center ordered all delivery vehicles to shut engines off, yet the fumes persisted.

Since the early 1990s, the ASD Bus Barn has drastically reduced their CO emissions produced by school buses. ASD accomplished this reduction by plugging in on cold days, purchasing new and more modern school buses, and by retrofitting pollution-reducing technologies to the older fleet. The following describes these improvements.

The ASD has reduced CO emissions by installing electrical outlets at bus parking stalls and engine block heaters in the buses. ASD staff plug in the bus engine block heaters when temperatures fall below 25 degrees. In the past, most CO emissions were produced by vehicle cold starts and warming up. According to the EPA, plugging in vehicles reduce emissions by about 60%.

Over the years, the ASD continually updated their fleet to include more modern buses that emit less pollution while retiring older buses that generated more emissions. Currently, the ASD plans to replace six to eight buses every year.

The EPA prioritizes school bus replacement by age. According to the EPA, the top priority for school districts to lower emissions is to replace school buses that were built before 1998, which were known to generate the most pollution. The ASD Bus Barn currently does not use any buses that were built before 1998.

The next priority are buses built between 1998 and 2003. The Bus Barn contains 48 buses (approximately 41%) that were made between 1998 and 2003; however, the ASD does not use these buses every day. The next group are buses built between 2004 and 2006. The Bus Barn supports 11 buses (approximately 9%) within this time range.

The final group consists of buses built post-2007. The Bus Barn supports 59 buses, (approximately 50%) that were built after 2007. ASD primarily uses these 59 buses daily. In summary, by updating the fleet with newer buses, ASD has significantly reduced CO emissions since the early 1990s.

In addition to updating the fleet, the ASD has replaced bus models that have been known to generate more pollution. In the early 1990s, many of the buses at the Bus Barn were either All Americans or Genesis models. ASD replaced both models with the 2013 IC CORP model. This

model represents the lowest pollutant emitting school buses on the market at the time. Updating to more environmentally friendly models is another example of the ASD commitment to reducing CO levels.

Another step taken to reduce the levels of pollution emitted from the Bus Barn has been the retrofitting of their older buses with oxidative catalytic converters. The EPA established a retrofit program to assist states willing to start school bus emission-lowering projects. ASD took part in this program in 2004 as Alaska's first retrofit project. Currently, ASD has 53 school buses with catalytic converters that they use every day. Oxidative catalytic converters also reduce particulate matter, nitrogen oxides, and carbon monoxide by 20% to 50%.

Thank you for this opportunity to be of service to you. Please call me if you have any questions and I look forward to participating with next the UACC meeting to explain our modeling efforts further.

Sincerely,

Michael D. Travis

Michael D. Travis, P.E.
Principal