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October 25, 2021

Mr. Alex DiPietro
Dunkin Donuts Franchisee
LAD Management
400 Washington Street
Westwood, MA 02090

Ref. 4700

Re: 940 Boylston Street Development, Newton, MA– Drive-thru Air Quality Analysis

Dear Mr. DiPietro:

Tech Environmental, Inc. (Tech) performed a refined one-hour and eight-hour carbon monoxide (CO) air dispersion modeling assessment for the proposed Dunkin Donuts location at 940 Boylston Street in Newton, MA (herein referred to as the Project).

It is our understanding that the existing Dunkin' Donuts is 2,040 square feet with 21 standard parking spaces and 2 accessible parking spaces. The site has two driveways on Boylston Street (Route 9) and one driveway on Ramsdell Street. The coffee shop operates from 4:00 a.m. to 7:00 p.m. The proposed Dunkin' Donuts will be 1,625 square feet with the addition of a drive-thru window on the east side of the building. The site will have 8 standard parking spaces and 1 accessible parking space with a drive-thru lane that can store a 12-vehicle queue from the drive-thru window. Both of the existing driveways on Boylston Street will be maintained under proposed conditions and the driveway on Ramsdell Street will be eliminated.

Tech calculated CO emissions from moving and idling vehicles and performed an air dispersion analysis to assess compliance with one-hour and eight-hour CO National Ambient Air Quality Standards (NAAQS). Tech also modeled CO impacts from Route 9 to assess the incremental change in CO concentrations from the Project.

The emissions were determined using traffic data provided by Pare Corporation, and the U.S. Environmental Protection Agency (EPA) approved MOVES3 model. The estimated emissions were then incorporated into EPA's air dispersion model, AERMOD (version 21112). The dispersion model was executed using five years (2014-2018) of surface meteorological data from Logan Airport coupled with upper air data from Gray, ME. The CO dispersion modeling results were combined with conservative representative ambient CO concentrations from the Massachusetts Department of Environmental Protection (MassDEP) air monitoring station on Harrison Avenue in Boston.

The results of the air dispersion modeling found that the Project will not cause or contribute to a violation of the one-hour and eight-hour CO NAAQS. Therefore, the Project does not cause a public health air quality concern.

The following sections provide a description of the applicable ambient air quality standards, modeled sources, calculated emission rates, the air dispersion modeling methodology and results of the analysis. The sustainable design features to reduce the Project's carbon footprint are also discussed below.

APPLICABLE AMBIENT AIR QUALITY STANDARDS

Under the authority of the Clean Air Act, as amended, U.S. Environmental Protection Agency (EPA) established a set of National Ambient Air Quality Standards (NAAQS) for various 'criteria' air pollutants. These standards are intended to protect the public health and welfare. Primary NAAQS are established at levels intended to protect public health, including sensitive population groups, with an adequate margin of safety. Secondary NAAQS are set at levels designed to protect the public by accounting for the effects of air pollution on vegetation, soil, materials, and other aspects of the general welfare. EPA has established both one- and eight-hour CO NAAQS. The one-hour CO standard is 40,000 micrograms per cubic meter (ug/m^3) and the eight-hour CO standard is 10,000 ug/m^3.

States can develop ambient standards provided that they are at least as stringent as the federal standards. The Massachusetts ambient air quality standards (MAAQS) are identical to the NAAQS.

EMISSION SOURCES

The emissions factors were determined for idling vehicles for the Project and for moving vehicles along Route 9 using MOVES3 and Middlesex County vehicle data for year 2027. It was conservatively assumed that 12 vehicles would be within the Dunkin Donuts drive-thru and 9 vehicles would be in the proposed parking spaces and all vehicles were idling continuously. This is an ultra-worst-case scenario that likely would not occur. The potential CO emission rates were determined for Route 9 traffic using the traffic data provided by Pare Corporation. It was determined that the morning peak hour was the worst-case traffic scenario from Route 9; therefore, the dispersion modeling used morning peak hour emissions. It was determined that the potential worst-case vehicle emissions from the Project was about 2% of the emissions from morning peak hour Route 9 traffic within 1,000 feet of the project.

All of the moving and idling vehicles were represented in the model by volume sources with dimensions based on the size of a standard sedan. Table 1 below presents the traffic volumes in vehicles per hour (veh/hr), the length of modeled Route 9 traffic links in miles (mi), and MOVES3 emission factors for idling vehicles in grams per hour (g/hr) and for moving vehicles in grams per mile (g/mi). The MOVES3 emissions factors were converted to emission rate in grams per second (g/s) for each link of vehicle activity during the afternoon peak hour and used in AERMOD.

SUMMARY OF REPRESENTATIVE AIR MONITORING DATA

Existing air quality for the Project has been estimated using air monitoring data obtained from the MassDEP website for the most recent, complete three-year period (2018 – 2020).[1] The Harrison Avenue, Boston, MA monitoring station was conservatively used to represent worst-case background air quality in the Project area.

[1] https://www.mass.gov/lists/massdep-air-monitoring-plans-reports-studies

The highest, second-highest concentrations of CO during the three-year period were used to establish existing background CO concentrations as presented in Table 2.

TABLE 1

TRAFFIC VOLUMES AND CO EMISSION RATES USED IN AERMOD

Traffic Link	Vehicle Volume (veh/hr)	Length of Traffic Link (feet)	Idling Emission Factor (g/hr)	Moving Emission Factor (g/mi)	Emission Rate (g/s)
Dunkin Donuts Drive-Thru	12*	-	4.26	-	0.014
Dunkin Donuts West Parking	4*	-		-	0.0047
Dunkin Donuts North Parking	5*	-		-	0.0059
Route 9 eastbound west of Woodward	3,017	350	-	1.64 @ 40 mph	0.091
Route 9 eastbound east of Woodward	3,528	1,680	-	1.64 @ 40 mph	0.51
Route 9 westbound west of Woodward	2,485	385	-	1.56 @ 45 mph	0.078
Route 9 westbound east of Woodward	2,599	1,720	-	1.64 @ 40 mph	0.39

*Idling vehicles in drive-thru and parking spaces assumed continuous emissions at maximum capacity.

TABLE 2

MONITORED CO CONCENTRATIONS (2018 – 2020)
WITH SELECTED BACKGROUND VALUES ($\mu g/m^3$)

Pollutant	Monitoring Location	Averaging Period	2018	2019	2020	Selected Background
CO	Boston, Harrison Avenue	1-Hour	1,266	1,843	1,802	1,843
		8-Hour	802	1,146	1,260	1,260

MODEL AND METEOROLOGICAL DATA

AERMOD, Version 21112, is a steady-state plume model that incorporates air dispersion based on boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. The model was setup in refined-mode with five years (2014 – 2018) of surface meteorological data from Logan Airport, Boston, MA with upper air data from Gray, ME.

MODEL RECEPTORS

A Cartesian receptor grid was used with receptors located every 25 meters along the property line and out to 250 meters, and then at 50 meter spacing out to 500 meters, 100 meter spacing to 1 kilometer, and 250 meter spacing to 2 kilometers. This created at total of 1,023 receptors for the modeling. Figure 1 shows the receptor grid.

TERRAIN

The receptor elevations were calculated with the EPA AERMAP program, using 1 arc second National Elevation Dataset (NED) data files. These digital cartographic/geographic data files are produced by the U.S. Geological Survey (USGS) as part of the National Mapping Program and is based on 30- by 30-meter data spacing with the Universal Transverse Mercator (UTM) projection.

DISPERSION MODELING RESULTS

Dispersion modeling of CO emissions was performed for one-hour and eight-hour averaging periods. The eight-hour averaging period modeling conservatively assumed peak hour traffic occurs constantly throughout the day. The maximum predicted concentrations of CO were added to representative background concentrations to demonstrate compliance with the CO NAAQS. A summary of the modeling results are presented below.

Table 3 shows the maximum predicted one-hour and eight-hour CO concentrations. The highest Route 9 impacts were found to be receptors located along sidewalks, which were deemed not relevant for the purposes of this analysis. Therefore, the Route 9 impacts presented in Table 3 are those that occurred at the same receptor location as the maximum impact from the Project.

The highest one-hour CO impact from the Project was along the northern property line and was 627 micrograms per cubic meter (ug/m^3). The highest impact from Route 9 at this receptor was 2,019 ug/m^3. The highest total impact of 2,405 ug/m^3 is well below the one-hour CO NAAQS of 40,000 ug/m^3. The one-hour CO impact from the Project represents only 1.6% of the one-hour CO NAAQS.

The highest one-hour CO impact from the Project at a residence was 150 ug/m^3. The highest impact from Route 9 at this receptor was 1,737 ug/m^3. The highest total impact of 1,808 ug/m^3 is well below the one-hour CO NAAQS of 40,000 ug/m^3. The one-hour CO impact from the Project represents only 0.4% of the one-hour CO NAAQS.

The highest eight-hour CO impact from the Project was along the southern property line and was 352 ug/m^3. The highest impact from Route 9 at this receptor was 408 ug/m^3. The highest total impact of 760 ug/m^3 is well below the eight-hour CO NAAQS of 10,000 ug/m^3. The eight-hour CO impact from the Project represents only 3.5% of the eight-hour CO NAAQS.

The highest eight-hour CO impact from the Project at a residence was 53 ug/m^3. The highest impact from Route 9 at this receptor was 733 ug/m^3. The highest total impact of 781 ug/m^3 is well below the eight-hour air quality standard of 10,000 ug/m^3. The eight-hour CO impact from the Project represents only 0.5% of the eight-hour CO NAAQS.

All combined source impacts from the modeling were well below the one-hour and eight-hour CO NAAQS. Therefore, the Project does not cause a public health air quality concern.

TABLE 3

SUMMARY OF POTENTIAL CO IMPACTS
WITH REFINED DISPERSION MODELING (ug/m^3)

Averaging Period	Emissions Source	Max. Predicted Impact	Background Concentration	Total Max. Impact	NAAQS
1-Hour	Route 9	2,019	1,843	3,862	40,000
	Dunkin' Donuts	627	1,843	2,470	
	Total Impact*	2,405	1,843	4,248	
8-Hour	Route 9	408	1,260	1,668	10,000
	Project	352	1,260	1,612	
	Total Impact*	760	1,260	2,020	

* Note that maximum predicted impacts for different sources do not necessarily occur at the same time. Therefore, the total maximum impact is not the sum of the maximum impact from the two emission sources.

CONCLUSIONS

Tech performed refined one-hour and eight-hour CO air dispersion modeling analyses for the predicted future traffic conditions for the Project under an ultra-worst-case scenario that likely would not occur. For comparison purposes, the Project's maximum impacts were also compared to those predicted from Route 9 traffic. The modeling results indicate that the Project will not cause a violation of one- and eight-hour NAAQS for CO. Therefore, the Project does not cause a public health air quality concern.

If you have any questions or would like to discuss further, please do not hesitate to call me at 781-890-2220 x30.

Sincerely yours,

TECH ENVIRONMENTAL, INC.

Marc C. Wallace, QEP, INCE
Vice President
4700/Report

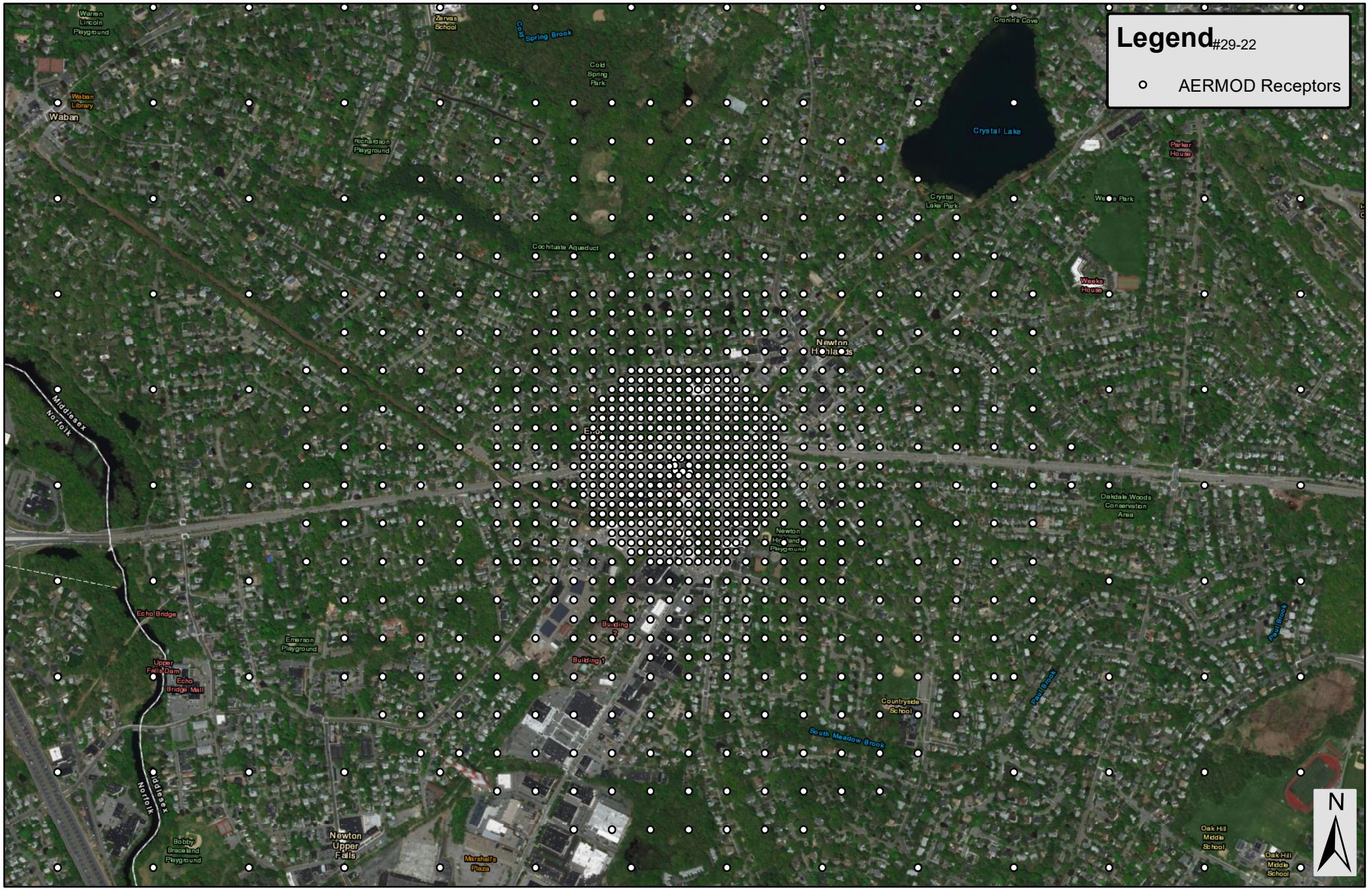

Figure 1. Modeling Receptor Grid for CO Dispersion Modeling at Dunkin' Donuts
940 Boylston Street
Newton, MA

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