Appendix B

Technical Memoranda and Reports

Disclaimer:

Technical memoranda and reports were prepared as independent documents to support the preparation of the Final Environmental Impact Statement (FEIS) for the Dallas CBD Second Light Rail Alignment (D2 Subway). Information from these documents was incorporated into the FEIS to provide information on existing conditions, and in some cases, assess potential impacts to the resources. Information contained in the FEIS is the most current and supersedes information in the technical memoranda and reports.

B-9

Air Quality Existing Conditions Technical Memorandum

Technical Memorandum

Date:	Monday, April 22, 2019
Project:	D2 Subway Project
To:	Kay Shelton, Project Manager, DART Capital Planning
From:	James Frye, GPC6 Project Manager Kristine Lloyd, GPC6 EIS Task Manager
Subject:	DART GPC VI – Contract C-2012668; D2 Subway Project Air Quality and Energy Existing Conditions; HDR PN 10024656

Air Quality

Introduction

This technical memorandum summarizes the regulatory guidance, methodology and existing conditions related to air quality along the DART D2 Corridor from Victory Station to Deep Ellum. As part of DART Board policy, environmental documentation was prepared to federal standards. This allows DART to pursue federal funding as part of its funding strategy.

The US Environmental Protection Agency (EPA) regulates air quality. The EPA delegates this authority to the governor, who has delegated authority to the Texas Commission on Environmental Quality (TCEQ) for monitoring and enforcing air quality regulations in Texas. The North Central Texas Council of Governments (NCTCOG) conducts air quality modeling for the region.

Regulatory Context

The Federal Clean Air Act (CAA) of 1970 and the Clean Air Act Amendments (CAAA) of 1977 and 1990 require that states adopt ambient air quality standards. The standards have been established to protect the public from potentially harmful amounts of pollutants. The EPA has set national ambient air quality standards (NAAQS) for the following six criteria pollutants: ozone (O_3), particulate pollution (PM10, PM2.5), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2) and lead (Pb). **Table 1** lists the NAAQS for these six pollutants. The CAA established two types of standards for these major air pollutants: primary and secondary. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation and buildings.

The CAAA requires all states to submit a list identifying those air quality regions, or portions thereof, which meet or exceed the NAAQS or cannot be classified because of insufficient data. Portions of air quality control regions that are shown by monitored data or air quality modeling to exceed the NAAQS for any criteria pollutant are designated "nonattainment" areas for that pollutant. The CAAA also establishes time schedules for the states to attain the NAAQS.

Table 1. Air Pollution Concentrations Required to Exceed the NAAQS

Pollutant	Averaging Period	Standard	Primary NAAQS	Secondary NAAQS
Ozone (O_3)	8-hour	The average of the annual fourth highest daily eight-hour maximum over a three-year period is not to be at or above this level.	0.070 ppm	0.070 ppm
Carbon Monoxide (CO)	1-hour	Not to be exceeded more than once per calendar year.	35 ppm	--
	8-hour	Not to be exceeded more than once per year calendar year.	9 ppm	--
Sulfur Dioxide (SO_2)	1-hour	Three-year average of the annual 99th percentile of the daily maximum 1-hour average is not to be at or above this level.	75 ppb	--
	3-hour	Not to be at or above this level more than once per calendar year.	--	0.5 ppm
Nitrogen Dioxide (NO_2)	1-hour	Three-year average of the annual 98th percentile of the daily maximum 1-hour average is not to be at or above this level.	100 ppb	--
	Annual	The annual mean is not to be at or above this level.	53 ppb	53 ppb
Particulate Pollution (10 microns or less) (PM_{10})	24-hour	Not to be at or above this level on more than three days over three years with daily sampling.	150 µg/m^3	150 µg/m^3
Particulate Pollution (2.5 microns or less) ($PM_{2.5}$)	24-hour	The three-year average of the annual 98th percentile for each population-oriented monitor within an area is not to be at or above this level.	35 µg/m^3	35 µg/m^3
	Annual	The three-year average of annual arithmetic mean is not to be at or above this level.	12.0 µg/m^3	15.0 µg/m^3
Lead (Pb)	3-Month	Three-month rolling average not to be at or above this level.	0.15 µg/m^3	0.15 µg/m^3

Source: USEPA, 2018

Notes: ppb = parts per billion; ppm = parts per million; µg/m^3 = microgram per cubic meter

According to the EPA, the Dallas-Fort Worth region does not meet NAAQS for ozone and is classified as a "marginal" nonattainment area for that pollutant effective August 3, 2018 (TCEQ, 2018). For ozone, the federal CAA establishes nonattainment area classifications ranked according to the severity of the area's air pollution problem. These classifications—*marginal, moderate, serious, severe* and *extreme*—translate to varying requirements with which Texas and nonattainment areas must comply. Each classification requires that certain strategies are implemented under federal law; these get more stringent as the classification escalates. State regulations that apply to emissions from the DART vehicle fleet include Section 382.201 of the *Health and Safety Code* and Chapters 451-53 of the *Texas Transportation Code*.

Conformity

The project study area is located in Dallas County, which has been designated as a "marginal" nonattainment area for eight-hour ozone (2015 Standard) by the EPA. Therefore, the transportation air quality conformity rule does apply to the region and is subject to a regional air quality analysis. Transportation conformity ensures that federal funding and approval goes to projects which are consistent with the region's air quality goals. Under Section 176(c) of the CAA [42 USC Section 7670(c)], federal agencies such as the Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) are prohibited from engaging in, supporting in any way, providing financial assistance for, licensing or permitting or approving any activity that does not conform to an approved State Implementation Plan (SIP). Because this project is located in a nonattainment area, the federal implementing agency would be responsible for ensuring that projects conform to the SIP. A conforming project definition is one that conforms to the SIP objectives of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of those standards.

Under Section 176(c) of the CAAA of 1990, Metropolitan Planning Organizations (MPOs) must conduct an air quality conformity analysis to ensure Metropolitan Transportation Plans (MTP) and Transportation Improvement Programs (TIP) are consistent with the region's air quality goals, since the area is in nonattainment for ozone (NCTCOG, 2018b). Conformity measures the amount of two pollutants which are precursors to the formation of ground-level ozone, NO_x and VOCs. The SIP establishes a Motor Vehicle Emissions Budget (MVEB) for those two pollutants to limit the formation of ozone. The EPA reviewed submitted conformity determination documentation from the NCTCOG, and as of November 16, 2018, the EPA supported the conformity finding for the DFW area. The FHWA/FTA confirmed the regional 2045 MTP and 2019-2022 TIP meet the requirements for a conformity determination on November 21, 2018. If a project is included in the emissions analysis of the MTP or TIP, and the plan or program has been approved as conforming to the SIP, then the project is presumed to conform. If the project's emissions are not analyzed in the MTP or TIP, then a separate project-level conformity determination is required. Showing that emissions under a build alternative are less than the no build alternative demonstrates project level conformity. Projects included in the region's approved MTP and TIP are projected to be below the set MVEB.

On June 14, 2018, the Regional Transportation Council of NCTCOG adopted *Mobility 2045: The Metropolitan Transportation Plan for North Central Texas* (NCTCOG, 2018a). **The D2 project is included as a recommended transit project in Mobility 2045, and is part of the 2018 Transportation Conformity**

(NCTCOG, 2018b). The Mobility 2045 and 2018 Transportation Conformity Determination were available online (NCTCOG, 2018). Mobility 2045 is intended to meet the transportation air quality conformity requirements of the CAAA, the air quality plan, the transportation conformity rule, and the transportation conformity-related provisions contained in the United States Code, Title 42 §7506.

Pollutants of Concern

Air quality is affected by pollutants that are generated by both natural and man-made sources. In general, the largest man-made contributors to air emissions are transportation vehicles and power-generating equipment, both of which typically burn fossil fuels. The main criteria pollutants of interest for transportation projects are CO, particulate matter, ozone and the ozone precursors, volatile organic compounds (VOCs) and oxides of nitrogen (NOx). Both federal and state standards regulate these pollutants, along with two other criteria pollutants, SO_2 and Pb.

The largest contributors of pollution related to transportation projects are motor vehicles. The main pollutants emitted from motor vehicles are CO, particulates, ozone, greenhouse gases and air toxic pollutants. Motor vehicles also emit pollutants that contribute to the formation of ground-level ozone. This section discusses the main pollutants of concern and their effect on public health and the environment.

Carbon Monoxide

In assessing the localized air quality impacts of transportation projects, CO is the main pollutant of concern. CO is a colorless, odorless and tasteless gas that results from the incomplete combustion of fuel. CO is ingested into the body by breathing. In low concentrations, CO can cause fatigue in healthy people and reduced oxygen levels and chest pain in people with heart conditions. At higher concentrations, CO can cause dizziness, impaired vision and coordination, confusion, headaches and nausea. In exceptionally high concentrations, CO can be fatal. Very high levels of CO are unlikely to occur outdoors. Along with the serious health effects, CO also contributes to the formation of ground level ozone (NCTCOG, 2017; EPA, 2018a).

The major source of CO is vehicular traffic, along with industry, wood stoves and slash burns. For urban areas, the internal combustion engines of motor vehicles are the principal sources of CO that cause ambient air quality levels to exceed the NAAQS. CO concentration increases occur during vehicle cold starts and winter months when meteorological conditions favor the build-up of directly emitted contaminants. CO is a pollutant whose impact is usually localized, with the highest ambient concentrations of CO occurring near congested roadways and intersections, or where topographic or meteorological characteristics inhibit diffusion.

Particulate Matter

The EPA has set standards for two different size categories of particulate matter (PM). The first standard set is for PM_{10}: particles that are larger than 2.5 micrometers and smaller than 10 micrometers in size.

These particles are considered “inhalable course particles” and can be found near roadways and dusty industries. The second set of standards is for $PM_{2.5}$: particles that measure 2.5 micrometers in size and smaller, roughly 1/28th the diameter of a human hair. These particles are called “fine particles” and can usually be found in smoke and haze. These particles are normally directly emitted from forest fires or they can be formed from gases emitted from power plants and automobiles. The EPA has also determined the health effects of fine PM and has set the standard PM of 2.5 microns or less ($PM_{2.5}$) to ensure the protection of public health. The Dallas-Fort Worth region is in attainment for $PM_{2.5}$.

Particulate matter consists of small particles of dirt, soot, metals and organic matter. PM of 10 micrometers in diameter and smaller pose the greatest health problems because it can bypass the natural filtration systems of the nose and throat and enter deep into the lungs, heart and even the bloodstream, which can cause difficulty with breathing, aggravation of asthma, irregular heartbeat, nonfatal heart attacks and death in people with heart or lung problems. Due to the size of PM_{10} and $PM_{2.5}$, the wind easily picks up the particles and transports them over long distances to settle on either the ground or water. PM that lands on the ground has the potential to deplete nutrients in the soil, damage sensitive crops and change the structure of the ecosystem. PM that lands on water can change the acidity in lakes and streams and change the nutrient balance in coastal waters and large river basins. Major sources of PM are construction activity, smokestacks, fires, power plants and automobiles (EPA, 2018b).

Ozone

Normally, ozone is not emitted directly into the air; however, at ground level, NO_x and VOCs react under the presence of sunlight to form ozone. Emissions from industrial and electric facilities, motor vehicle exhaust, gasoline vapors and chemical solvents are major sources of NO_x and VOCs.

Ground-level and stratosphere-level ozone share the same chemical structure; however, their effects differ greatly due to their positions in the atmosphere. Ground-level ozone has adverse effects due to its potential impacts to human health, while stratospheric ozone has a protective effect by shielding the earth’s surface from harmful radiation. When ozone is inhaled, it can cause a variety of health problems, such as chest pain, coughing, throat irritation and congestion. The effects can potentially worsen to bronchitis, emphysema and asthma, reducing lung function and inflaming the linings of the lungs. Repeated exposure can eventually lead to permanent scarring of the lung tissue. Not only does ozone cause negative human health effects, but it also causes damage to the environment. Ozone can cause sensitive plants to be more susceptible to certain diseases, insects and other pollutants, which can lead to reduced crop yields, forest growth and potential impacts on species diversity in ecosystems.

Ozone is also the primary element of smog. Sunlight and hot weather are the main causes of the formation of ground-level ozone. As a result, ozone is referred to as a summertime air pollutant. Many urban areas tend to have high levels of ozone, although even rural areas are subject to increased ozone levels because the wind can carry ozone and the pollutants that form ozone miles away from their original sources.

Climate Change and Greenhouse Gases

Global climate change refers to changes in average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation, storms, glacial-retreat, and sea-level rise. Global climate change is a regional and ultimately a worldwide concern. Historical records indicate that global climate changes have occurred in the past due to natural phenomena. However, data indicates that the current global conditions differ from past climate changes in rate and magnitude (NASA, 2018). Since greenhouse gas (GHG) effects are experienced on a global scale, it is impossible to discuss direct effects of a single development project with future specific climate change.

GHGs include CO_2, methane (CH_4), water vapor, nitrous oxide (N_2O), and chlorofluorocarbons (CFCs). CO_2 is a minor but very important component of the atmosphere and the primary GHG pollutant emitted by the combustion of fossil fuels. Although CO_2 is released by natural processes, the burning of fossil fuels by humans produces substantial amounts of these gases. Changes in global CO_2 emissions from fossil fuel combustion are influenced by many long-term and short-term factors, including population and economic growth, energy price fluctuations, technological changes and seasonal temperatures.

Since 1990, GHG emissions have increased by approximately two percent, but yearly emissions rise and fall due to changes in the economy, the price of fuel and other factors. US GHG emissions in 2016 decreased compared to 2015 levels largely due to a decrease in emissions from fossil fuel combustion with increased use of natural gas instead of coal in the electric power sector, and warmer winter conditions reducing the need for heating fuel (EPA, 2018c). The largest contributor to GHG emissions in the US is transportation, followed closely by energy production. The industrial, residential, commercial, and agriculture sectors also contribute to GHG emissions. In 2016, it was found that combustion of transportation fuels, the largest source of CO_2, contributed 28.5 percent of the US GHG emissions (electricity production contributed 28.4 percent of the US GHG emissions) (EPA, 2018c). From 1990 to 2016, total transportation emissions have increased, due largely to an increase in vehicle miles traveled (VMT). This increase in VMT was due to many factors including population growth, economic growth, urban sprawl, and periods of low fuel prices. Beginning in 2005, average new vehicle fuel economy began to increase after a 15-year period where average fuel economy declined (EPA, 2018c).

GHG emissions from transportation sources are directly related to energy consumption and primarily result from the combustion of fossil fuels in vehicles. Over half of the GHG emissions from transportation sources come from passenger cars and light-duty trucks, including sport utility vehicles, pickup trucks and minivans. The remainder of the GHG emissions comes from other modes of transportation including freight trucks, commercial aircraft, ships, boats and trains, as well as pipelines and lubricants. To reduce GHG emissions from transportation sources, effective planning must incorporate modes of transport that use less energy per person per mile traveled and/or use energy derived from fuels that have lower carbon content per unit of energy. For example, by changing bus fleets from diesel or gasoline to compressed natural gas, GHG emissions can be reduced through the use of a lower-carbon or non-fossil fuel, and they can be further reduced by increasing regional transit ridership, which uses less energy per person per mile traveled than single-occupant vehicles (EPA, 2018c). Currently, transit is expected to reduce the automobile use that causes a high percentage of GHG emissions.

Mobile Source Air Toxics

In addition to the criteria, air pollutants for which there are NAAQS, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes, heavy equipment, and marine vessels), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries). Air toxics are pollutants that cause or may cause cancer or other serious health effects, such as reproductive disorders (reduced fertility), damage to the immune system, neurological and developmental disorders, respiratory disorders, and other health problems. Air toxics may also cause adverse environmental and ecological effects. Mobile Source Air Toxics (MSATs) are a subset of the nearly 190 toxic air pollutants defined by the CAAA. The MSATs are compounds emitted from highway vehicles (motorcycles, passenger cars and trucks, and commercial trucks and buses) and non-road vehicles and engines (aircraft, heavy equipment, locomotives, marine vessels, recreation vehicles, and small engines and tools) (EPA, 2018c). Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead federal agency for administering the CAAA and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule for Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards (40 CFR Parts 79, 80, 85, 86, 600, 1036, 1037, 1039, 1042, 1048, 1054, 1065, and 1066 [March, 2014]). This rule established the Tier 3 program as part of a comprehensive approach to reduce the impacts of motor vehicles on air quality and public health. The program sets new vehicle emissions standards and a new gasoline sulfur standard to reduce both tailpipe and evaporative emissions from many on-road vehicles, and the new gasoline sulfur standard would enable emissions control systems to become more effective. FHWA emissions trends indicate that even with a 45 percent increase in vehicle miles traveled from 2010 to 2050 as forecasted, these programs would reduce annual emissions of the priority MSATs by 91 percent (FHWA, 2016).

The technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. Reliable methods do not exist to estimate accurately the health impacts of MSATs at the project level.

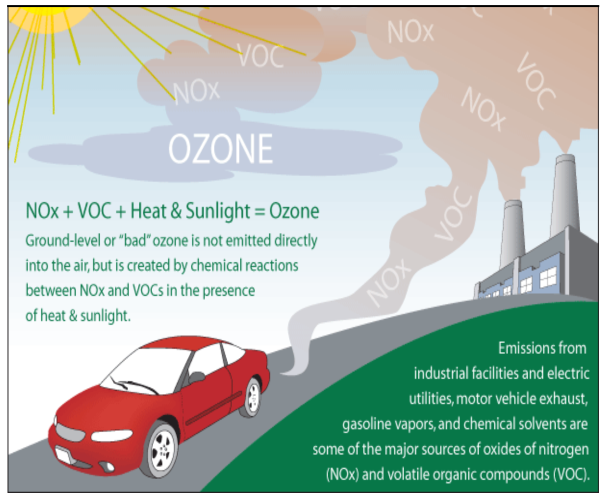
Methodology

Air monitoring station locations were identified using the NCTCOG Geographic Information System (GIS) database, and the nearest active federal air monitoring stations to the project area were determined. Specific monitor readings were obtained through the TCEQ air monitoring data web site. The NCTCOG web site for air quality identified specific programs implemented by the region to improve air quality.

Existing Conditions

Air quality is a regional concern, not a localized condition. The project study area is located in Dallas County, which has been designated as a marginal nonattainment area for eight-hour ozone (2015 Standard) by the EPA. The NCTCOG eight-hour ozone nonattainment region includes Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise counties (TCEQ, 2018). The formation of ozone is directly related to emissions from motor vehicles and point sources (**Figure 1**) (AIRNow, 2018). The primary pollutants from motor vehicles are VOCs, CO, and NOx. VOCs and NOx can combine under the right conditions in a series of photochemical reactions to form ozone. The Dallas-Fort Worth region is in attainment for CO, sulfur dioxide, nitrogen dioxide and PM.

Figure 1. Formation of Ozone



Meteorology plays an important role in determining ozone concentrations. Ozone is more readily formed on warm, sunny days with low wind, when the air is stagnant (EPA, 2018d). Conversely, ozone production is more limited on windy, cool, rainy and cloudy days. Due to this connection to the weather, daily ozone concentrations are highest in the summer months.

The modeling procedures for ozone require long-term meteorological data, detailed area-wide emission rates and activity levels for all emission sources (on-road, non-road, point and area). Accordingly, concentrations of ozone are modeled by the regional air quality planning agency for the SIP. The TCEQ monitors airborne pollutants in the Dallas-Fort Worth region on a continuous basis. Ozone is monitored every hour of the day, every day. **Table 2** lists the four highest daily maximum eight-hour ozone concentrations recorded annually from 2005 to 2018 at the Dallas Hinton Street Continuous Air Monitoring Station (CAMs 60), which is the closest active monitoring station to the study area that measures for ozone. The other air monitoring stations within proximity to the proposed project, the Convention Center, Dallas Morrell, and Dallas Earhart, do not monitor for ozone. **Figure 2** shows the locations of the air monitoring sites in relation to the study area. According to the US EPA NAAQS, attainment is reached when, at each monitor, the Design Value (three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration) is equal to or less than 70 parts per billion (ppb). **Figure 3** shows the NCTCOG region's ozone historical trends.

Table 2. Four Highest Eight-Hour Ozone Concentrations

Year	Highest		Second Highest		Third Highest		Fourth Highest	
	Date	Level*	Date	Level*	Date	Level*	Date	Level*
CAMS 60 Dallas Hinton								
2005	06/15/05	117	07/14/05	115	09/01/05	115	08/22/05	114
2006	09/01/06	110	08/31/06	102	07/18/06	97	08/22/06	97
2007	09/21/07	94	07/25/07	91	06/05/07	87	06/02/07	83
2008	09/29/08	78	05/20/08	77	09/28/08	75	06/18/08	74
2009	08/25/09	89	08/26/09	86	07/17/09	82	09/03/09	74
2010	08/23/10	96	08/18/10	92	05/05/10	89	08/06/10	86
2011	08/25/11	101	09/29/11	101	08/26/11	99	08/27/11	98
2012	06/25/12	114	06/26/12	107	08/09/12	101	05/16/12	97
2013	06/28/13	101	08/01/13	95	08/29/13	95	07/31/13	94
2014	10/17/14	90	08/14/14	77	08/25/14	76	05/03/14	75
2015	08/03/15	100	07/30/15	98	08/10/15	97	08/24/15	93
2016	06/07/16	94	09/20/16	87	09/11/16	86	09/28/16	84
2017	09/01/17	97	05/06/17	90	09/13/17	90	08/04/17	84
2018**	06/21/18	95	07/26/18	92	08/09/18	92	04/24/18	91

Source: TCEQ, 2018

* All ozone measurements are in parts per billion

** 2018 results as of September 11, 2018

Figure 2. Air Quality Monitoring Stations

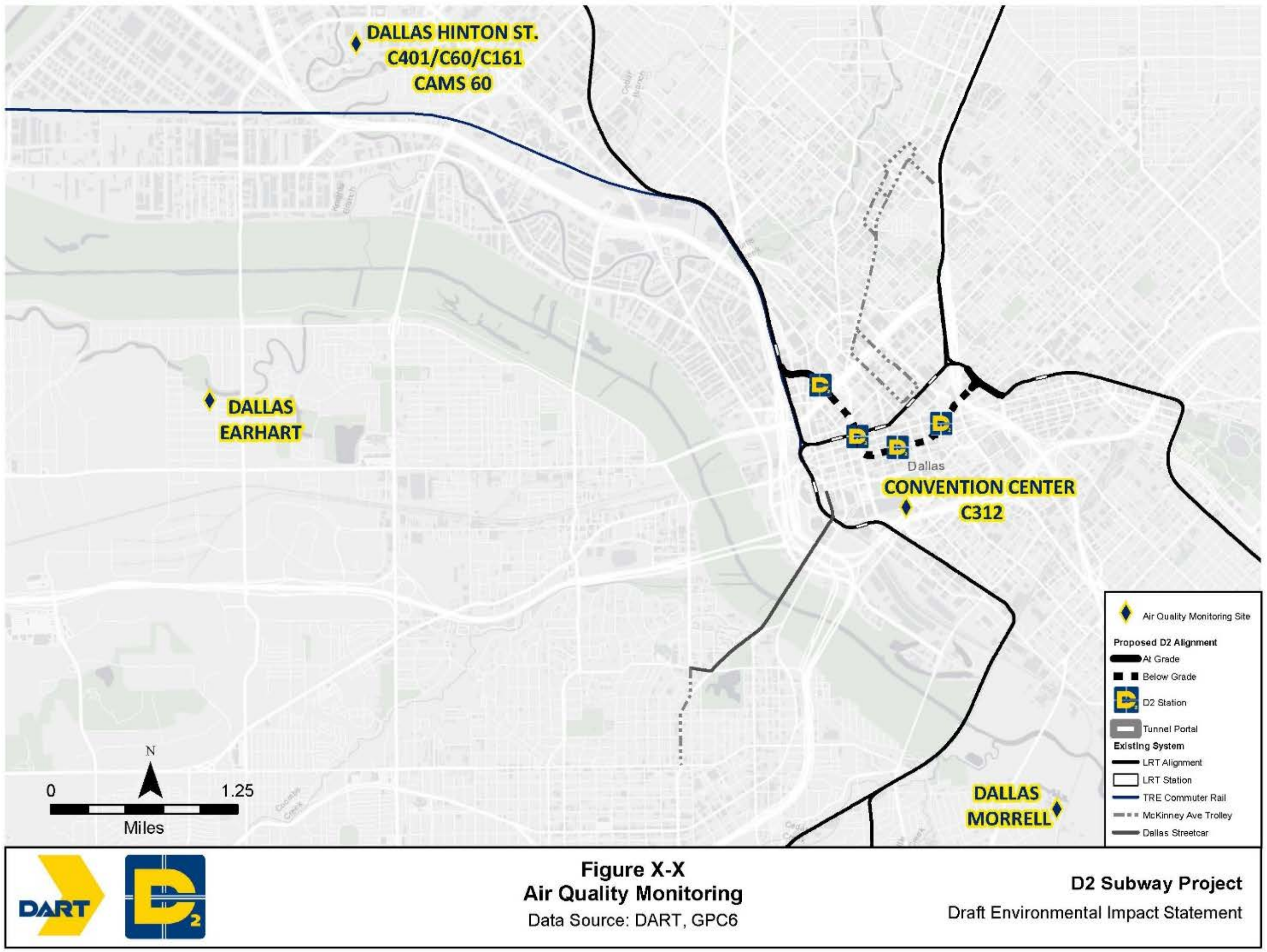
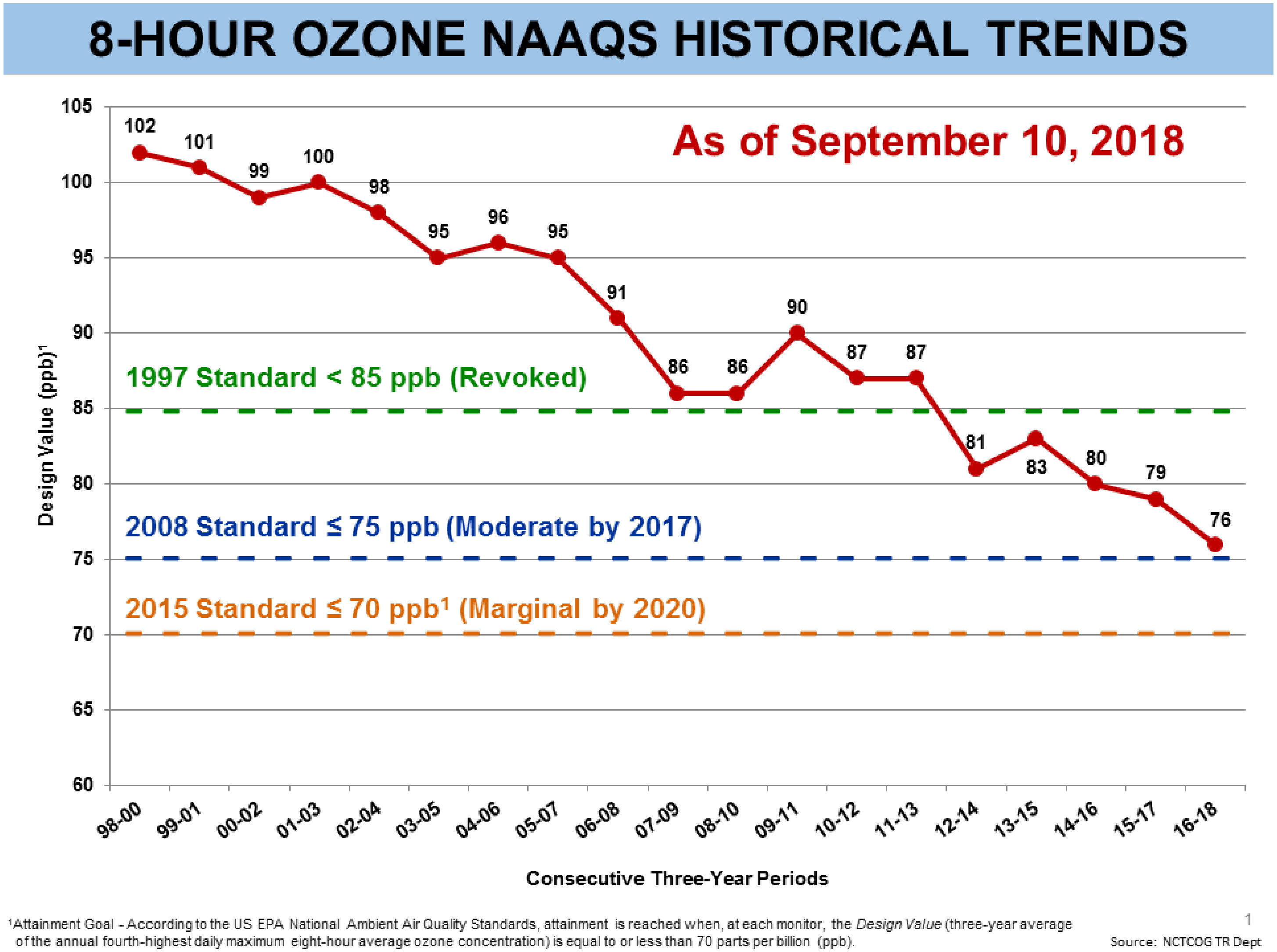


Figure 3. Eight-Hour NAAQS for Ozone Historical Trends (NCTCOG, 2018c)



In addition to controls included in the next SIP and in the MTP, several efforts have been initiated at the local level through the NCTCOG to improve air quality. The following list gives some of the major programs that NCTCOG has implemented to improve air quality (NCTCOG, 2017):

AirCheckTexas Drive a Clean Machine Program – Provides financial aid of up to $600 for vehicles failing the emissions portion of the state inspection for specific financially constrained persons and families. Also, individuals whose vehicles meet certain requirements may be eligible for a replacement voucher up to $3,500 toward a qualifying replacement vehicle.

Clean Fleet Policy – Outlines goals and provides workable, cost-effective solutions to reduce emissions from local fleets and supports regional efforts to attain federal air quality standards. Entities which adopt the policy are eligible for clean vehicle funding made available through the RTC and fleet recognition from the Dallas-Fort Worth Clean Cities coalition.

Electric Vehicles North Texas – This program encourages and supports the transition to electric vehicles through industry partnerships, fleet education, and consumer outreach. This program is intended to reduce barriers to electric vehicle adoption and supply equipment installation in the North Texas Region.

Engine Off North Texas – This is a regional initiative dedicated to reducing the impacts associated with the idling of vehicles. Efforts are focused on the adoption of anti-idling ordinances and policies, researching new technologies, and promoting various idle reduction campaigns across the region.

Go Solar Texas – In an effort to increase the use of solar across Texas, The NCTCOG has complied key resources for those interested in learning more about going solar, and developed Texas-specific resources on best management practices for local governments. This has been accomplished with support from the Texas State Energy Conservation Office and the US Department of Energy's Solar Ready II Program.

North Central Texas Clean School Bus Program – Provides grant funding for projects that reduce emissions from older, high-emitting school buses, promotes implementation and enforcement of anti-idling policies for school buses, and provides educational resources for reducing school bus emissions.

Regional Smoking Vehicle Program – Encourages drivers to voluntarily repair and maintain their vehicles through public awareness and vehicle reporting.

The ongoing improvements in vehicle emissions and industry emissions will have positive impacts on reducing air pollution for the future. Regional programs will also contribute in the decrease from NAAQS and MSATs. With the combined federal and local efforts, air quality is expected to improve in the future.

Source Information and References

AIRNow. 2018. Ozone. Accessed September 11, 2018. http://www.airnow.gov/index.cfm?action=aqibasics.ozone.

Environmental Protection Agency (EPA), 2018. NAAQS Table. Accessed September 20, 2018. https://www.epa.gov/criteria-air-pollutants/naaqs-table.

Environmental Protection Agency, 2018a. Carbon Monoxide (CO) Pollution in Outdoor Air. Accessed September 20, 2018. https://www.epa.gov/co-pollution.

EPA, 2018b. Particulate Matter (PM) Pollution. Accessed September 20, 2018. https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#effects.

Environmental Protection Agency, 2018c. Accessed September 6, 2018. https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions.

EPA, 2018d. Trends in Ozone Adjusted for Weather Conditions. Accessed September 20, 2018. https://www.epa.gov/air-trends/trends-ozone-adjusted-weather-conditions.

Federal Highway Administration (FHWA), 2016. Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents. Accessed September 20, 2018. https://www.fhwa.dot.gov/ENVIRonment/air_quality/air_toxics/policy_and_guidance/msat/.

National Aeronautical and Space Administration (NASA), 2018. Global Climate Change. Accessed September 20, 2018. https://climate.nasa.gov/.

North Central Texas Council of Governments. 2017. Air Quality Program. Accessed September 20, 2018. http://www.nctcog.org/trans/air/.

North Central Texas Council of Governments (NCTCOG), 2018a. Mobility 2045. Accessed September 20, 2018. https://www.nctcog.org/trans/plan/mtp/2045.

North Central Texas Council of Governments (NCTCOG), 2018b. 2018 Transportation Conformity. Accessed April 22, 2019. https://www.nctcog.org/trans/air/conformity/2018TransportationConformity.asp.

NCTCOG, 2018c. Current Ozone Activity. Accessed September 11, 2018. https://www.nctcog.org/trans/quality/air/ozone.

Texas Commission on Environmental Quality. 2018. CAMS webpage. Accessed September 11, 2018. http://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=report.site_list.

Texas Commission on Environmental Quality (TCEQ). 2018. Dallas-Fort Worth Current Attainment Status. Accessed June 19, 2018. https://www.tceq.texas.gov/airquality/sip/dfw/dfw-status.

US Environmental Protection Agency (USEPA), 2018. NAAQS Table. USEPA Website. Accessed June 19, 2018. https://www.epa.gov/criteria-air-pollutants/naaqs-table.

Energy

Introduction

This technical memorandum identifies the regulatory environment and existing energy conditions of the Dallas Area Rapid Transit's (DART) Downtown Dallas (D2) corridor. Impacts of the proposed D2 project will be addressed in the Environmental Impact Statement (EIS) for the project. Transportation-related energy is usually separated into two main categories: direct energy, which is fuel consumed by traveling vehicles and indirect energy, which is the energy associated with the construction, operation, and maintenance of the facility itself. According to the Federal Transit Administration (FTA), the use of public transportation can save fuel by sharing rides and reduction of congestion. Additional energy savings would be realized with the use of public transportation because of decreases in the need for constructing transportation infrastructure, manufacturing more vehicles, and producing more fossil fuels (FTA, 2016).

The 2.3-mile D2 Corridor extends from south of Victory Station and through Downtown Dallas before reconnecting with the existing Southeast corridor in Deep Ellum. The project's primary purpose is to provide passenger rail connections and service that will improve mobility, meet growing transportation demand, and provide more reliable transit schedules. The project would interface with existing Blue, Red, Green and Orange DART Light Rail Transit (LRT) lines. Once in place, it would be expected that the Green and Orange Lines would be rerouted to the D2 Subway and the Red and Blue Lines would remain on their existing corridors. This would free up capacity on both downtown lines so DART can add additional train service to meet increasing ridership demands (DART, 2018).

Regulatory Setting

The National Environmental Policy Act (NEPA) requires federal agencies to evaluate and disclose the environmental effects of their proposed actions. Impacts to energy resources are given due weight in project decision-making (FTA, 2017). DART is preparing an EIS to assess the impacts and benefits LRT passenger service on the D2 Corridor. Project oversight will be conducted by the FTA.

Under the Clean Air Act, the EPA is required to set air quality standards under National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for any pollutant deemed harmful to public health and the environment. Dallas is part of a nine-county region that is in non-compliance for ozone per the NAAQS. If air quality continues to deteriorate, it may jeopardize receiving federal funding for future transportation projects. Air quality is addressed in a separate technical memorandum.

Methodology

Addressing energy in the corridor included reviewing current statistics on energy usage of various transportation modes. An energy analysis will be conducted for the D2 project that uses "rules-of-thumb" applied to the study corridors to estimate the effect of the Build and No Build Alternatives with respect to energy expenditures.

Population Growth

North Central Texas County of Governments (NCTCOG) forecasts were used to predict the population growth rates and energy usage for the region. Energy usage for transportation is measured in VMT, modes of transportation used, and energy usage per mile. The Dallas County population is anticipated to see an increase in growth of about 45 percent from 2018 to 2045, from 2,368,139 (ACS, 2018) to 3,298,213 (NCTCOG, 2018). The population for the Metropolitan Planning Area (MPA) which includes 12 counties is expected to increase by about 45 percent within the same timeframe from 7,390,080 to 10,676,851 (NCTCOG, 2018). Increased population results in increased congestion on roadways and increased total VMT. Travel times would likely increase due to more vehicles travelling on the roadways. As VMT increases, fossil fuel consumption also increases which leads to lowered air quality.

Construction and Operation

Constructing and operating the D2 line would require the expenditure of substantial amounts of energy. Construction site equipment operation and the production and transportation of construction materials consume energy in large quantities. In considering energy usage for construction, factors to be evaluated include length of the guideway, number of stations, and the amount of underground versus at grade construction.

Description of Existing Conditions

This section describes the existing conditions with respect to energy consumption in the project study area.

Table 1 below shows the energy intensity for cars, transit bus, and LRT and their relationship between BTU use per mile. The purpose of this table is to show a relationship between the transport of cars and transit bus compared to LRT.

Table 1. Transportation Energy Intensity per Vehicle Mile

Transport Mode	BTU/Vehicle Mile	BTU/Passenger Mile
Cars	4,702	3,034
Personal Truck	6,156	3,345
Transit Bus	36,760	4,025
LRT	20,002	776

Source: Department of Energy, 2018

Table 1 also shows energy usage for the same modes of transport per passenger mile traveled. When passengers are included in the data set, the BTU per mile for the LRT is much more efficient than both cars and transit buses. This is a direct result of the number of people using LRT as compared to cars and transit buses.

Conclusion

The operation of the D2 line would cause vehicular traffic crossing the line to be stopped for short durations along the surface segments of the rail which would cause additional energy consumption due to vehicle idling at crossings. However, this is not expected to result in adverse energy resource impacts because the LRT operation would reduce the number of vehicles travelling on roadways. This would result in the reduction of energy consumption which may offset additional energy consumed from vehicles being stopped at rail crossings. Energy savings are anticipated to accompany the D2 project operations in addition to improving roadway congestion and air quality; these impacts will be discussed in the EIS for the project.

References

American Community Survey (ACS), 2018. American Fact Finder. Accessed online https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml October 4, 2018.

Bureau of Transportation Statistics (BTS), 2018. Energy Consumption by Mode of Transportation. Accessed online https://www.bts.gov/content/energy-consumption-mode-transportation October 4, 2018.

Dallas Area Rapid Transit (DART), 2018. D2 Subway: Dallas Central Business District (CBD) Second Light Rail Alignment. Accessed online https://www.dart.org/about/expansion/downtowndallas.asp October 14, 2018.

Department of Energy, 2018. Transportation Energy Data Book, 36th Edition. Accessed online https://cta.ornl.gov/data/tedbfiles/Edition36_Chapter02.pdf October 4, 2018.

Federal Transit Administration (FTA), 2016. Transit's Role in Environmental Sustainability. Accessed online https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/transit-environmental-sustainability/transit-role October 4, 2018.

Federal Transit Administration (FTA), 2017. Greenhouse Gas Emissions from Transit Projects: Programmatic Assessment. Accessed online https://www.transit.dot.gov/sites/fta.dot.gov/files/FTA_Report_No._0097.pdf October 4, 2018.

North Central Texas Council of Governments (NCTCOG), 2018. County Population Estimates. Accessed online http://data-nctcoggis.opendata.arcgis.com/ October 4, 2018.