Appendix F – Air Quality Analysis

Ann Arbor Airport
Runway 6/24 Extension
Air Quality and Climate Change Analysis

I. Background

In preparing this air quality evaluation, consideration was given to both the requirements of the Clean Air Act (CAA) and the National Environmental Policy Act (NEPA). The CAA sets the overall policy for managing air quality across the nation. Through the NEPA process, environmental effects are assessed early in the project definition to evaluate the air quality impacts that would result from federally proposed projects.

II. Regulatory Context

The Airport is in Washtenaw County which is part of the greater Detroit Area Airshed considered by the U.S. Environmental Protection Agency (USEPA) relative to the Clean Air Act requirements. At the federal level, under the CAA, the USEPA establishes the guiding principles and policies for protecting air quality conditions in this area (and throughout the nation). USEPA's primary responsibility is to promulgate and update National Ambient Air Quality Standards (NAAQS)[1] which define outdoor levels of air pollutants that are defined to protect public health and public welfare.

The following regulations guide the consideration of air quality issues:

- **Federal Clean Air Act and Clean Air Act Amendments (42 USC Chapter 85)**. The CAA authorized the USEPA to develop health-based ambient air quality standards. Areas where measurements exceed the standards for a specific pollutant are required to develop a plan for meeting the standard, called State Implementation Plans - SIP. Important elements of the Clean Air Act that could relate to federal actions addressed in this EA, described in Order 1050.1F Desk Reference, are:
  - National Ambient Air Quality Standards (NAAQS)
  - Air Quality Conformity Regulations, 42 USC §7506(c).

  In addition to the USEPA, several state agencies address air quality in the area: the Michigan Department of Environment, Great Lakes, and Energy (EGLE), and Southeast Michigan Council of Governments (SEMCOG). USEPA has delegated authority to EGLE to implement federal air quality requirements in Michigan. SEMCOG is the metropolitan planning organization (MPO) responsible for tracking requirements under the state and federal transportation conformity regulations.

  USEPA has established ambient air quality standards (see **Table II-1**). These standards are designed to protect public health and welfare.

  FAA Order 1050.1F identifies FAA's thresholds of significance for use in NEPA evaluations. The FAA's air quality threshold of significance is triggered if "The action

[1] USEPA, National Ambient Air Quality Standards (NAAQS) at https://www.epa.gov/criteria-air-pollutants/naaqs-table.

would cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards (NAAQS), as established by the USEPA under the CAA, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations."[2]

TABLE II-1:
NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant		Primary/ Secondary	Averaging Period	Standards	Form
CO		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Pb		Primary and Secondary	Rolling 3-month average	0.15 µg/m^3	Not to be exceeded
NO_2		Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and Secondary	Annual	53 ppb	Annual mean
O_3		Primary and Secondary	8-hour	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
PM	$PM_{2.5}$	Primary	Annual	12 µg/m^3	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m^3	Annual mean, averaged over 3 years
		Primary and Secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
SO_2		Primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Notes: ppb – parts per billion, µg/m^3 – micrograms per cubic meter of air, and ppm – parts per million.
Source: EPA, National Ambient Air Quality Standards (NAAQS) at https://www.epa.gov/criteria-air-pollutants/naaqs-table, March 2022.

The USEPA designates areas as having air pollutant levels that either meet/are lower than the NAAQS or exceed the NAAQS. An area with measured pollutant concentrations which meets the NAAQS is designated as an attainment area, whereas an area with pollutant concentrations that exceed the NAAQS is designated as a nonattainment area. After air pollutant concentrations in a nonattainment area are reduced to levels that meet or are below the

[2] FAA Order 1050.1F, Para 4-3.3.

NAAQS, the USEPA re-designates the area to be a maintenance area. The USEPA's other responsibilities include the approval of State Implementation Plans (SIPs). SIPs are plans developed by a state that identify how an area would be brought into attainment if a specific area exceeds the NAAQS. Finally, areas are designated as unclassifiable when there is a lack of sufficient data to determine the status of air quality conditions. **Table II-2** below shows the status of Washtenaw County relative to each of the criteria pollutants.

- **General and Transportation Conformity:** The CAA prohibits federal agencies from approving projects that occur in a nonattainment or maintenance area if they do not conform with the SIP. There are two forms of conformity: a) transportation conformity, which applies to roadway and transit projects, and b) general conformity, which applies to all other federal actions. The General Conformity Rule of the CAA prohibits the FAA from permitting or funding projects located in a nonattainment or maintenance area that do not conform to a SIP. It is important to note that areas that have been within two consecutive 10-year period maintenance designations are no longer subject to General Conformity.

Table II-2 below shows the status of Washtenaw County relative to each of the criteria pollutants. As the region is nonattainment for ozone, the general conformity regulations apply to FAA actions at ARB.

TABLE II-2
Clean Air Act Criteria Pollutant Designation

Pollutant	Designation (Washtenaw County)
Ozone (8-hour)	
2015 Standard (7 county area)	Nonattainment: marginal
2008 Standard	Attainment
1997 Standard (revoked)	Not applicable (as rule revoked)
Ozone (1-hour) – 1979 (revoked)	Not applicable (as rule revoked)
Carbon Monoxide (CO)	Attainment
PM2.5	Attainment
PM10	Attainment
Sulfur Dioxide (SO_2)	Attainment
Nitrogen Dioxide (NO_2)	Attainment
Lead (Pb)	Attainment

As of December 31, 2021 (USEPA Greenbook) - https://www.epa.gov/green-book/green-book-8-hour-ozone-2008-area-information

III. Affected Environment

As noted earlier, Ann Arbor Airport (ARB) is in Washtenaw County. The county is in the 7-county Detroit Metropolitan nonattainment area for the 2015 ozone 8-hour standard. According to the EGLE web site "Ozone nonattainment areas are classified based on the severity of their ozone concentrations. All areas in Michigan were originally classified as marginal nonattainment, which is the lowest level of classification and means that ozone concentrations are less than 10 parts per billion (ppb) above the standard. Michigan had until August 3, 2021, to bring the design values at or below the 2015 Ozone NAAQS, however, Michigan was not able to attain the standard

and will likely be "bumped-up" to a moderate nonattainment classification."[3] The term "moderate" refers to a designation under the Clean Air Act that would affect compliance with various air quality rules, including the General Conformity regulation.

EGLE measurement data for Southeast Michigan indicates that ozone measurements were taken in the 2019 and 2020 period at 26 locations in the state. Ozone measurements were taken in Ypsilanti (555 Towner Ave – site 261610008) in 2019-2020[4] The State measures Ozone and PM2.5 at this site.[5] Ozone data for this site in 2020 showed the highest value was 70 parts per billion (ppb), below the maximum allowable level of 80 ppb.[6] A review of measurement results dating back to 1992, indicate that in Ypsilanti the last noted ozone exceedance was in 2012.[7] Measurements of $PM_{2.5}$ between 2018 and 2020 indicate concentrations ranging from 8.2 to 8.4 annual mean micrograms per cubic meter (µg/m3), in comparison to the NAAQS of 12 µg/m3.

An operational emissions inventory for aviation sources was prepared for ARB using the FAA's current Aviation Environmental Design Tool (AEDT) Version 3d. **Table III-1** lists the emissions for each of the criteria pollutants. The operational emissions inventory represents the sources of equipment operating based upon the activity occurring at the Airport during 2019. This includes aircraft and ground support equipment (GSE). AEDT does not generate an emissions inventory for lead. However, as AEDT quantifies fuel use, the lead content in Avgas was used to quantify lead emissions using information from ACRP Web-Only Report 21 *Quantifying Aircraft Lead Emissions at Airports*. About half of the fuel dispensed at ARB is 100LL. Thus, AEDT was used to quantify fuel consumed in the landing and takeoff cycle and 50% of that fuel being 100LL was used to calculate lead emissions, as 100LL is the only fuel used that contains lead.

As **Table III-1** shows, the largest criteria pollutant emitted by aviation sources is carbon monoxide, at 139.4 tons per year. Ozone precursors of VOC and NOX were 4 tons and 1.7 tons respectively, Emissions of all other criteria pollutants were less than 1 ton per year.

TABLE III-1
EXISTING (2019) OPERATIONS EMISSIONS INVENTORY (TONS/YEAR)

Source	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)	Nitrogen Oxides (NOX)	Sulfur Oxides (SOX)	PM10	PM2.5	Lead (Pb)
Ground Support Equipment	3.6	0.1	0.3	0.0	<0.1	<0.1	NA
Aircraft and APU	135.8	3.9	1.4	0.4	0.1	0.1	0.1
Total	139.4	4.0	1.7	0.4	0.1	0.1	0.1

NA: Not applicable.
Source: Mead & Hunt, March 2022

[3] https://www.michigan.gov/egle/0,9429,7-135-3310_70940-515124--,00.html
[4] Table 11, Michigan's 2020 Annual Ambient Air Monitoring Network Review.
[5] EGLE, Air Quality Annual Report 2020, https://www.michigan.gov/documents/egle/air-quality-2020_733675_7.pdf
[6] https://www.michigan.gov/documents/deq/deq-aqd-mm-ozone-8hrhighestcurrent_256060_7.pdf.
[7] https://www.michigan.gov/documents/deq/deq-aqd-mm-ozone-8hrhighestprevious_256065_7.pdf

IV. Future No Action and Proposed Action Emissions Inventory

Emissions inventories were also prepared for the future conditions under the No Action and the Proposed Action conditions. Emissions are separated by construction (emissions by vehicles necessary to construct proposed development) and operational emissions (emissions once any proposed construction is completed).

a. Construction Emissions

No construction emissions would be expected with the No Action, as the Proposed Action development would not occur. Construction emissions were calculated for the Proposed Action using the USEPA MOVES3 model[8] emission factors and construction equipment use estimates from the Airport Cooperative Research Program (ACRP) Report 102 *Guidance for Estimating Airport Construction Emissions*. Construction of the Proposed Action would be expected to occur during a 90-day period in 2024; thus, emission factors for non-road equipment were obtained from the MOVES3 model for Washtenaw County for year 2024.

Table IV-1 lists the anticipated construction emissions. Construction emissions would be greatest of NOx at 12.4 tons per year, followed by CO emissions at 7.4 tons per year, with all other pollutant emissions being less than 2 tons per year per pollutant. Construction emissions would be de minimis when compared to the Clean Air Act thresholds established for under the General Conformity rule (100 tons per year per pollutant), indicating that construction emissions would not be significant.

TABLE IV-1 Construction Emissions by Construction Year (tons per year)

Construction Year	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)	Nitrogen Oxides (NOX)	Sulfur Oxides (SOX)	PM10	PM2.5	Lead| (Pb)
2024	7.4	1.7	12.4	<0.1	1.1	1.1	NA

Note construction emissions capture on-road and off-road vehicles as well as fugitive emissions. Emissions rounded to the nearest 0.1 ton. NA=Not applicable.
Source: Synergy, February 2022.

b. Operational Emissions

Aircraft and ground support equipment emissions were estimated using the FAA's Aviation Environmental Design Tool (AEDT) Version 3d. Input data used for the noise analysis was used for also estimating emissions. Both the No Action (the existing airport facilities with forecast activity levels in 2024 and 2029) and the Proposed Action alternative were considered. Impacts of the Proposed Action were assessed using the same activity levels as the No Action but reflecting operational conditions associated with the proposed improvements.

Table IV-2 lists the operational emissions for each year for both the No Action and the Proposed Action. When comparing the No Action to the Proposed Action, the project-related emissions would be expected to increase due to the slight increase in taxi distance with the Proposed Project. CO emissions would increase by 5.4 tons in 2024, and 6.1 tons in 2029.

[8] https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves. In addition, on-road vehicle emission factors for Michigan were obtained from the USEPA AFLEET2020 tool.

Ozone precursors, as well as other criteria pollutants would increase by less than 1 ton per year with the Proposed Action.

TABLE IV-2
OPERATIONAL EMISSIONS INVENTORY
(TONS/YEAR)

Alternative	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)	Nitrogen Oxides (NOX)	Sulfur Oxides (SOX)	PM10	PM2.5	Lead| (Pb)
2024							
No Action	150.0	4.3	1.7	0.4	0.2	0.2	0.14
Proposed Action	155.4	5.1	1.7	0.4	0.2	0.2	0.15
Project-related	5.4	0.8	<0.1	<0.1	<0.1	<0.1	<0.1
2029							
No Action	159.5	4.6	1.8	0.5	0.2	0.2	0.15
Proposed Action	165.6	5.4	1.8	0.5	0.2	0.2	0.16
Project-related	6.1	0.8	<0.1	<0.1	<0.1	<0.1	0.01

Note: Project-related reflects the difference between the build alternatives and the No Action (Alt 1).
Source: Mead & Hunt, March 2022.

V. General Conformity Conclusion

Because a federal approval is required for the proposed actions, the approval must be preceded by a Clean Air Act general conformity evaluation. The general conformity rule begins by the sponsor determining if the Proposed Action is on the list of actions presumed to conform as their emissions are so small. The Proposed Action is not on the FAA's list of actions presumed to conform, so an applicability analysis is conducted to determine if emissions are below the de minimis for the nonattainment/maintenance designation for the region. If above de minimis, a General Conformity Determination is required.

To identify potential air emissions from the proposed actions, an emissions inventory was prepared and contrasted with the de-minimis levels for an ozone marginal nonattainment area; per the Clean Air Act general conformity rule, the de minimis for an ozone marginal nonattainment area is 100 tons each of NOx and VOC, the precursors to ozone formation. The analysis in **Table V-1** shows, reflecting the Proposed Action, that the project-related emissions would be below the Clean Air Act defined de-minimis threshold, and thus the planned actions do not require a conformity determination. Using the project-related emissions, the peak project-related emissions would occur during construction (2024) and generate 12.4 tons of NOx and 1.7 tons of NOx. Operational related emissions would be less than 0.1 ton per year of the precursor pollutants. Collectively, the operational and construction emissions of each pollutant would be well below the 100 ton de minimis. Because emissions from the Proposed Action are lower than the de minimis for the ozone nonattainment area, no further analysis is required.

TABLE V-1
TOTAL PROJECT-RELATED IMPACTS

Year	NOx (tons/year)	VOC (tons/year)	Are Project-Related Emissions De-Minimis?
Year 2024			
Project-related construction emissions	12.4	1.7	Yes
Project-Related aircraft emissions	<0.1	<0.1	
Total	12.5	1.8	
Year 2029			
Project-related construction emissions	0	0	Yes
Project-Related aircraft emissions	<0.1	<0.1	
Total	0.1	0.1	
De-minimis (marginal non-attainment area)	**100**	**100**	

Sources reflect direct and indirect emissions. Note that project-related emissions are the emissions above that of the No Action

VI. CLIMATE

Greenhouse gases are those that trap heat in the earth's atmosphere. Greenhouse gases are produced both naturally and through anthropogenic sources, and they include water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3). Research has shown that there is a direct correlation between fuel combustion and greenhouse gas emissions. Therefore, sources that require fuel or power at an airport are the primary sources that would generate greenhouse gases.

The primary source of greenhouse gas emissions at an airport are associated with aircraft operation and the short-term emissions from construction equipment activity. **Table VI-1** summarizes the CO2 emissions in 2019 from aircraft operations at ARB, as well as a forecast of emissions in 2024 and 2029.

TABLE VI-1
SUMMARY OF AIRPORT-RELATED GREENHOUSE GAS EMISSIONS (CO_2)

Condition/year	Greenhouse Gas Emissions (CO_2) (metric tons per year)
Existing (2019)	964
Project Construction (2024)	2,935
Year 2024 Aircraft Operations	
No Action	1,043
Proposed Action	1,096
Project Related	53
Year 2029 Aircraft Operations	
No Action	1,113
Proposed Action	1,169
Project Related	56

Source: Synergy Consultants for construction, Mead & Hunt for aircraft operations, March 2022

Regulatory Setting

Although there are no federal standards for aviation-related greenhouse gas emissions, it is well established that greenhouse gas emissions affect climate.[9] According to FAA Order 1050.1F, the discussion of potential climate impacts should be documented in a separate section of the NEPA document, distinct from air quality. Where the proposed action would result in an increase in greenhouse gases emissions, the emissions should be assessed either qualitatively or quantitatively. There are no significance thresholds for aviation greenhouse gas emissions, and it is not required for the NEPA analysis to attempt to link specific climate impacts to the proposed action or alternative(s) given the small percentage of emissions that aviation projects contribute.

Following procedures detailed in FAA's 1050.1F Desk Reference, FAA's policy is that greenhouse gas emissions should be quantified in a NEPA document when there is a reason to quantify emissions for air quality purposes or when changes in the amount of aircraft fuel used are computed/reported. The FAA does not have a threshold of significance for climate, and thus, the information presented in this section is for information purposes.

Affected Environment

In terms of relative U.S. contribution, the U.S. General Accounting Office (GAO) reports that aviation accounts "for about 3% of total U.S. greenhouse gas emissions from human sources, according to USEPA data" compared with other industrial sources, including the remainder of the transportation sector (20%) and power generation (41%).[10] The International Civil Aviation Organization (ICAO) estimates that greenhouse emissions from aircraft account for roughly 3 percent of all anthropogenic greenhouse gas emissions globally. Climate change due to greenhouse gas emissions is a global phenomenon, so the affected environment is the global climate.[11]

The most recent greenhouse gas inventory prepared by the USEPA for the United States is for the year 2020.[12] In 2020, the U.S. emitted about 5,215.6 million metric tons of CO2 equivalent. Aviation emissions represented 189 million metric tons of the U.S. inventory, or about 3.6% of all greenhouse gas emissions.

The FAA's AEDT model was used to quantify aircraft CO2 emissions for 2019. That quantification found that aircraft emissions from operations at ARB represented 964 metric tons

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9 FAA, An Environmental Desk Reference for Airport Actions, October 2007. https://www.faa.gov/airports/environmental/environmental_desk_ref/.

10 IPCC Report as referenced in U.S. General Accounting Office (GAO) *Environment: Aviation's Effects on the Global Atmosphere Are Potentially Significant and Expected to Grow*; GAO/RCED-00-57, February 2000, p. 14; GAO cites available USEPA data from 1997.

11 As explained by the U.S. Environmental Protection Agency, "greenhouse gases, once emitted, become well mixed in the atmosphere, meaning U.S. emissions can affect not only the U.S. population and environment but other regions of the world as well; likewise, emissions in other countries can affect the United States." Climate Change Division, Office of Atmospheric Programs, U.S. Environmental Protection Agency, *Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act* 2-3 (2009), available at http:// USEPA.gov /climatechange/endangerment.html.

12 https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks . See page 2-36 for aviation emissions (Commercial and other aviation).

of CO2. In the context of total U.S. emissions (5,215.6 million metric tons), the total aircraft emissions in at ARB were less than 0.0002% of the total U.S. emissions.

Environmental Consequences

No Action Emissions

The No Action Alternative would retain the Airport as it exists today, as activity increases in the future. The following greenhouse gas emissions were identified.

Construction Impacts: No construction would occur with this alternative.

Operational Impacts: The Airport would continue to operate as it does today, but over time, activity would be expected to increase as reflected in the forecast. As is shown in **Table VI-1**, with this alternative, CO_2 emissions would increase over the existing conditions from 964 metric tons in 2019 to 1,043 metric tons per year by 2024 and 1,113 metric tons in 2029. This change is due to the slight increase in aircraft operations that are expected between the timeframes.

Proposed Action Emissions

With the Proposed Action, construction emissions would be generated to construct the proposed projects. Once operational, slight changes in aircraft taxi distances would occur, altering the fuel use of aircraft.

Construction Impacts: Using the same methodology deployed to calculate criteria pollutant emissions during construction (USEPA's MOVES3 model), CO_2 emissions were calculated. Construction emissions to complete the proposed development would generate about 2,935 metric tons of CO_2.

Operational Impacts: **Table VI-1** lists the emissions with the Proposed Action at 1,096 metric tons in 2024 and 1,169 metric tons by 2029. This would be an increase of 53 metric tons over the No Action in 2024, and 56 metric tons over the No Action in 2029.

Because construction of the Proposed Action is expected to occur in 2024, the project-related emissions from construction and operation were added together, and would reach 2,988 metric tons in 2024, but decrease after construction is completed to 53 to 56 metric tons per year. As total airport-related emissions would be below 0.001% of total US greenhouse gas emissions, the Proposed Action is not expected to result in significant climate forcing emissions based upon the information noted above.