APPENDIX F-1
AIR QUALITY

This appendix contains the Air Quality Technical Report prepared for the Supplement to the Final Environmental Impact Statement which provides supporting documentation for the assessment of air quality impacts.

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AIR QUALITY TECHNICAL REPORT

Updated November 2019

Prepared for:

Supplement to the Final Environmental Impact Statement
of the
Proposed Extension of Runway 13/31
at

GNOSS FIELD
NOVATO, CALIFORNIA

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1. INTRODUCTION

The purpose of this Air Quality Technical Report is to provide supporting documentation for both the Supplement to the Final Environmental Impact Statement being prepared by the FAA and Marin County for the improvement project proposed for the Marin County Airport- Gnoss Field (DVO or Airport). DVO is owned and operated by Marin County, California and is shown in **Figure 1, Marin County Airport – Gnoss Field**. The Airport is located in unincorporated Marin County north of the City of Novato, California and serves an essential regional transportation resource by providing general aviation facilities in the northern portion of the San Francisco Bay area. DVO has a single runway (Runway 13-31) oriented northwest-southeast that measures 3,300 feet long.

Figure 1
MARIN COUNTY AIRPORT - GNOSS FIELD

Source: www.airnav.com

The objective of this air quality analysis is to provide the information necessary to determine whether Alternative B Sponsor's Proposed Project or any of the alternatives under consideration would have the potential to cause significant adverse air quality impacts in Marin County. A detailed glossary of terms is provided in **Attachment 1, *Glossary***.

1.1 AGENCY COORDINATION

The air quality coordination process was initiated in April 2009 and included coordination with the FAA, the Marin County, the Bay Area Air Quality Management District (BAAQMD), California Environmental Protection Agency Air Resources Board (CARB), U.S. Environmental Protection Agency (USEPA) Region 9, the Metropolitan

Transportation Commission, and the Association of Bay Area Governments. The goal of the air quality scoping process was to:

- Familiarize agencies with the scope of the Alternative B (Sponsor's Proposed Project) and identify any issues of concern to participating agencies early in the process;
- Engage in data exchange of information necessary to complete the air quality assessment; and
- Obtain concurrence on procedure and methodology prior to the publication of the EIS/EIR.

The initial air quality scoping meeting was conducted on April 22, 2009 at the BAAQMD's offices. Materials from the meeting are provided in the Final EIS, Appendix F, Air Quality, Attachment 2*, Agency Coordination*. The BAAQMD received the Final EIS in June 2014. To date, no comments from the BAAQMD have been received regarding the air quality assessment.

1.2 MARIN COUNTY AIR QUALITY STATUS

DVO is located in Marin County which is included in the Federal San Francisco Bay Intrastate Air Quality Region.[1] The region does not currently meet the Federal eight hour standard for healthful levels of ozone and has been designated by the USEPA as a marginal nonattainment area for ozone.[2] Further, USEPA has determined the County exceeds the 24 hour standard for emissions of fine particulate matter ($PM_{2.5}$).[3]

Marin County is also located within the BAAQMD of California. California maintains more stringent standards than the USEPA for which the County must adhere called the California Ambient Air Quality Standards. Marin County has been designated by the BAAQMD as nonattainment for the eight-hour and one-hour standards for ozone, the annual arithmetic mean and the twenty four-hour standards for coarse particulate matter (PM_{10}), and the annual arithmetic mean standard for $PM_{2.5}$.[4]

The BAAQMD is responsible for assuring the National Ambient Air Quality Standards (NAAQS) and the CAAQS are attained. Under the California Environmental Quality Act (CEQA), it must be demonstrated that a proposed project would not violate any air quality standard (Federal or District) and that it may not contribute substantially to an existing or projected air quality violation.

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1 USEPA, 40 CFR Part 81, Section 81.21, *San Francisco Bay Intrastate Air Quality Control Region*, January 16, 1981.

2 USEPA website, https://www3.epa.gov/airquality/greenbook/anayo_ca.html, accessed July 2018.

3 While the County meets the 2012 24-hour standard for $PM_{2.5}$, it continues to be in nonattainment for the 2006 24-hour standard for $PM_{2.5}$. Furthermore, the USEPA issued a final rule confirming that monitoring data shows that the County currently meets the 2006 24-hour $PM_{2.5}$ national standard in January 2013. Despite this USEPA action, the County will continue to be formally designated as non-attainment for the national 24-hour PM2.5 standard until a redesignation request and a maintenance plan is submitted and approved by the USEPA. BAAQMD, *Spare the Air Cool the Climate, Final 2017 Clean Air Plan,* Bay Area Air Quality Management District, Adopted April 19, 2017. Available on-line: http://www.baaqmd.gov/~/media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a_-proposed-final-cap-vol-1-pdf.pdf?la=en

4 BAAQMD website, http://www.baaqmd.gov/pln/air_quality/ambient_air_quality.htm, accessed July 2018.

2. REGULATORY OVERVIEW

This air quality assessment of the Alternative B Sponsor's Proposed Project and the alternatives, including a General Conformity evaluation, was conducted in accordance with the guidelines provided in the most recent versions of the *Aviation Emissions and Air Quality Handbook Version 3,*[5] FAA Order 5050.4B,[6] *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, and *BAAQMD CEQA Guidelines: Accessing the Air Quality Impacts of Project and Plans*, which together with the guidelines of FAA Order 1050.1F,[7] *Environmental Impacts: Policies and Procedures*, constitute compliance with all the relevant provisions of NEPA, CEQA, and the Clean Air Act (CAA), including the 1990 Amendments.

2.1 NATIONAL AMBIENT AIR QUALITY STANDARDS

The CAA, including the 1990 Amendments, provides for the establishment of standards and programs to evaluate, achieve, and maintain acceptable air quality in the U.S. Under the CAA, the USEPA established a set of standards, or criteria, for six pollutants determined to be potentially harmful to human health and welfare.[8] The USEPA considers the presence of the following six criteria pollutants to be indicators of air quality:

Ozone (O_3);
Carbon monoxide (CO);
Nitrogen dioxide (NO_2);
Particulate matter (PM_{10} and $PM_{2.5}$);[9]
Sulfur dioxide (SO_2); and,
Lead (Pb).

A description of the criteria pollutants is found in **Attachment 1,** *Glossary*. The standards for the criteria pollutants, known as the NAAQS, are summarized in **Table 2-1**. For each of the criteria pollutants, the USEPA established primary standards intended to protect public health, and secondary standards for the protection of other aspects of public welfare, such as preventing materials damage, preventing crop and vegetation damage, and assuring good visibility. Areas of the country where air pollution levels consistently exceed these standards may be designated nonattainment by the USEPA.

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5 *Aviation Emissions and Air Quality Handbook, Version 3,* January 2015.
6 FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, April 28, 2006.
7 FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, June 2015.
8 USEPA, Code of Federal Regulations, Title 40, Part 50 (40 CFR Part 50) *National Primary and Secondary Ambient Air Quality Standards (*NAAQS), July 2011.
9 PM_{10} and $PM_{2.5}$ are airborne inhalable particles that are less than ten micrometers (coarse particles) and less than 2.5 micrometers (fine particles) in diameter, respectively.

A nonattainment area is a homogeneous geographical area[10] (usually referred to as an air quality control region) that is in violation of one or more NAAQS and has been designated as nonattainment by the USEPA as provided for under the CAA. Some regulatory provisions, for instance, the CAA conformity regulations, apply only to areas designated as nonattainment or maintenance.

Table 2-1
NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead		primary and secondary	Rolling 3 month average	0.15 μg/m3 (1)	Not to be exceeded
Nitrogen Dioxide		primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	Annual	53 ppb(2)	Annual Mean
Ozone		primary and secondary	8-hour	0.075 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate Matter	PM2.5	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
	PM10	primary and secondary	24-hour	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		primary	1-hour	75 ppb (4)	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: ppm is parts per million; ppb is parts per billion, and μg/m^3 is micrograms per cubic meter.
Sources: https://www.epa.gov/criteria-air-pollutants/naaqs-table.
(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2018) standards, and for which implementation plans to attain or maintain the current (2018) standards have not been submitted and approved, the previous standards (1.5 μg/m^3 as a calendar quarter average) also remain in effect.
(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

[10] A homogeneous geographical area, with regard to air quality, is an area, not necessarily bounded by state lines, where the air quality characteristics have been shown to be similar over the whole area. This may include several counties, encompassing more than one state, or may be a very small area within a single county.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.
(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2)any area for which an implementation plan providing for attainment of the current (2018) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a State Implementation Plan (SIP) call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is a USEPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

A maintenance area describes the air quality designation of an area previously designated nonattainment by the USEPA and subsequently redesignated attainment after emissions are reduced. Such an area remains designated as maintenance for a period up to 20 years at which time the state can apply for redesignation to attainment, provided that the NAAQS were sufficiently maintained throughout the maintenance period.

According to FAA guidelines that establish procedures to meet NEPA requirements, an air quality assessment prepared pursuant to NEPA regulations should include an analysis and conclusions of a Federal action's impacts on air quality. When a NEPA analysis is needed, the Proposed Action's impact on air quality is assessed by evaluating the impact of the Proposed Action on the NAAQS. The Proposed Action's "build" and "no-build" emissions are inventoried for each reasonable alternative. Normally, further analysis would not be required for pollutants where emissions do not exceed General Conformity [de minimis] thresholds.

At a minimum, an inventory would be prepared reflecting emissions under the baseline (no action) conditions, and a separate inventory would be prepared describing emissions due to the Alternative B Sponsor's Proposed Project conditions. The net emissions derived from the comparison of the two inventories indicate the relative impact to air quality. Generally, when a Federal action will not result in net emissions that equal or exceed the requirements under the CAA General Conformity regulations, a comparative evaluation of the Federal action to the NAAQS, which requires dispersion analysis, is not necessary, and the Federal action is assumed to comply with the NAAQS.

2.2 CALIFORNIA AMBIENT AIR QUALITY STANDARDS

The CAA requires the USEPA to set the NAAQS for the nation; however, the CAA permits states to adopt additional or more stringent standards as needed. The California Air Resources Board (CARB) established such standards, or criteria, for the same six pollutants as the NAAQS. These standards known as California Ambient Air Quality Standards (CAAQS), are summarized in **Table 2-2**. Areas of the state where air pollution levels consistently exceed these standards may be designated nonattainment by CARB.

Table 2-2
CALIFORNIA AMBIENT AIR QUALITY STANDARDS (CAAQS)

POLLUTANT	AVERAGING PERIOD	STANDARD
Carbon Monoxide (CO)	8-Hour Average 1-Hour Average	9 PPM 20 PPM
Lead (Pb)	30-Day Average	1.5 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean 1-Hour Average	0.03 PPM 0.18 PPM
Particulate Matter (PM_{10})	Annual Arithmetic Mean 24-Hour Average	20 $\mu g/m^3$ 50 $\mu g/m^3$
Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 $\mu g/m^3$
Ozone (O_3)	8-Hour Average 1-Hour Average	0.070 PPM 0.09 PPM
Sulfur Dioxide (SO_2)	24-Hour Average 1-Hour Average	0.04 PPM 0.25 PPM

Notes: PPM is parts per million; Std is Standard.
$\mu g/m^3$ is micrograms per cubic meter.
Sources: CARB Website, *Ambient Air Quality Standards*, accessed at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf, April 2009.

2.3 CLEAN AIR ACT CONFORMITY REGULATIONS

When a Federal action would not cause annual net emissions that equal or exceed the relevant *de minimis* thresholds for the pollutants of concern, the action would not apply under the General Conformity Rule and further analysis to prepare a General Conformity Determination would not be required. Further, the USEPA has determined that an action with *de minimis* annual net emissions would not cause an exceedence of the NAAQS, a dispersion analysis to show compliance to the NAAQS would not be required.[11] Under these circumstances, no further analysis under the CAA or NEPA would be required.

The USEPA promulgated the conformity regulations on November 24, 1993[12] to assist Federal agencies in complying with the State Implementation Plan by specifying rules for two categories of Federal actions: transportation actions and general actions. The two rules have separate and distinct applicability and evaluation requirements. Transportation conformity applies to highway and transit projects, and general conformity regulations apply to all other Federal actions that are not transportation projects, such as airport improvement projects.

[11] FAA, *Air Quality Procedures for Civilian Airports and Air Force Bases*, April 1997, quoted from Section 2.5.1, *National Ambient Air Quality Standards* (*NAAQS) Assessment*, "If the action is in a nonattainment or maintenance area and exempt or presumed to conform under conformity requirements, it is assumed that a NAAQS assessment is not required for an airport or air base action since it is unlikely the action's pollutant concentrations would exceed the NAAQS."

[12] 58 FR 62188, dated November 24, 1993.

2.4 STATE IMPLEMENTATION PLAN

According to the CAA, each state must provide the USEPA with a State Implementation Plan (SIP). The SIP must include a strategy for air quality improvement in local areas for each criteria pollutant that exceeds the NAAQS. The SIP must also include a plan to maintain acceptable air quality in areas that do not exceed the NAAQS.

The California SIP is made up of a series of plans for each of the major air basins in the state. The Bay Area's 2017 Clean Air Plan[13] was adopted on April 19, 2017. The 2017 Bay Area Clean Air Plan updated the 2010 Bay Area Clean Air Plan pursuant to air quality planning requirements defined in the California Health & Safety Code to fulfill ozone planning requirements. The Bay Area 2017 Clean Air Plan (CAP) provides a comprehensive plan to improve air quality, protect public health, and protect the climate. The plan proposes a control strategy to reduce four types of air pollutants – ozone, particulate matter (PM), air toxics, and greenhouse gases – in a multi-pollutant framework.

Any airport project should show consistency with the locally adopted air plan to avoid impacts under CEQA. More importantly, any airport project receiving Federal funding must show conformity with the current air plan that has been approved by the USEPA to receive those funds. The local air plan contains assumptions about population, housing, the transportation network, and the associated regional air emissions. Additionally, the local air plan contains measures and actions that will be implemented to meet the region's air emission goals. Any airport project needs to be consistent with these plans and contain the relevant actions to be considered consistent and in conformity with the SIP.

2.5 GENERAL CONFORMITY RULE APPLICABILITY

The General Conformity Rule under the CAA establishes minimum values, referred to as the *de minimis* thresholds, for the criteria and precursor pollutants[14] for the purpose of:

- Identifying Federal actions with project-related emissions that are clearly negligible (*de minimis*);
- Avoiding unreasonable administrative burdens on the sponsoring agency, and;
- Focusing efforts on key actions that would have potential for significant air quality impacts.

[13] Bay Area Air Quality Management District. Final Bay Area Clean Air Plan. September 15, 2010.

[14] Precursor pollutants are pollutants that are involved in the chemical reactions that form the resultant pollutant. Ozone precursor pollutants are NO_x, VOC, and SO_2, whereas $PM_{2.5}$ precursor pollutants include NO_x, VOC, SO_x, and ammonia (NH_3).

The *de minimis* rates vary depending on the severity of the nonattainment area and further depend on whether the general Federal action is located inside an ozone transport region.[15] California is located outside the ozone transport region. An evaluation relative to the General Conformity Rule (the Rule), published under 40 CFR Part 93,[16] is required only for general Federal actions that would cause emissions of the criteria or precursor pollutants, and are:

- Federally-funded or Federally-approved;
- Not a highway or transit project;[17]
- Not identified as an exempt project[18] under the CAA;
- Not a project identified on the approving Federal agency's Presumed to Conform list;[19] and,
- Located within a nonattainment or maintenance area.

Otherwise, if the action is demonstrated to cause emissions that are *de minimis*, the Federal action is not applicable under the Rule.

Alternative B Sponsor's Proposed Project at DVO meets all these conditions and is, therefore, subject to evaluation under the CAA General Conformity Rule. When the action requires evaluation under the General Conformity regulations, the net total direct and indirect emissions due to the Federal action may not equal or exceed the relevant *de minimis* thresholds unless:

- An analytical demonstration is provided that shows the emissions would not exceed the NAAQS; or
- Net emissions are accounted for in the SIP planning emissions budget; or
- Net emissions are otherwise accounted for by applying a solution prescribed under 40 CFR Part 93.158.

The Federal *de minimis* thresholds established under the CAA are given in **Table 2-3**. Alternative B Sponsor's Proposed Project would occur in Marin County, which is designated nonattainment for ozone and $PM_{2.5}$. Conformity to the *de minimis* thresholds is relevant only with regard to those pollutants and the

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15 The OTR is a single transport region for ozone (within the meaning of Section 176A(a) of the CAA), comprised of the States of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the Consolidated Metropolitan Statistical Area that includes the District of Columbia, as given at Section 184 of the CAA.

16 USEPA, 40 CFR Part 93, Subpart B, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, July 1, 2011.

17 Highway and transit projects are defined under Title 23 U.S. Code and the Federal Transit Act.

18 The DVO Alternative B Sponsor's Proposed Project is not listed as an action exempt from a conformity determination pursuant to 40 CFR Part 93.153(c). An exempt project is one that the USEPA has determined would clearly have no impact on air quality at the facility, and any net increase in emissions would be so small as to be considered negligible.

19 The provisions of the CAA allow a Federal agency to submit a list of actions demonstrated to have low emissions that would have no potential to cause an exceedence of the NAAQS and are presumed to conform to the CAA conformity regulations. This list would be referred to as the "Presumed to Conform" list.

precursor pollutants for which the area is nonattainment or maintenance. Notably, there are no *de minimis* thresholds to which a Federal agency would compare ozone emissions. This is because ozone is not directly emitted from a source. Rather, ozone is formed through photochemical reactions involving emissions of the precursor pollutants[20] NO_x and VOC in the presence of abundant sunlight and heat. Therefore, emissions of ozone on a project level are evaluated based on the rate of emissions of the ozone precursor pollutants, NO_x and VOC.

Although $PM_{2.5}$ is sometimes emitted directly, fine particle emissions can form resulting from chemical reactions involving emissions of the $PM_{2.5}$ precursor pollutants NO_x, VOC, SO_x, and ammonia (NH_3).[21] Therefore, the net emissions of $PM_{2.5}$ and the precursor pollutants SO_x, NO_x, and VOC would be evaluated with regard to General Conformity.

As such, the pollutants of concern for the project proposed at DVO are NO_X, VOC, $PM_{2.5}$, and SO_X. If the evaluation of the Alternative B Sponsor's Proposed Project at DVO were to show that any of these thresholds could potentially be equaled or exceeded on an annual basis, additional, more detailed analysis to demonstrate conformity would be required, which is referred to as a General Conformity Determination.[22] Conversely, if the General Conformity evaluation were to show that none of the relevant thresholds were equaled or exceeded, the Alternative B Sponsor's Proposed Project at DVO would be presumed to conform under the CAA and NEPA.

[20] In ozone maintenance areas SO_2 may be considered a precursor pollutant. The airport is included in an ozone nonattainment area, where the USEPA has not designated SO_2 as a precursor pollutant.

[21] Emissions of NH_3 are generally associated with commercial animal agriculture, including feeding operations. Therefore, emissions of NH_3 were not included in this analysis.

[22] 40 CFR Part 93.153.

Table 2-3
FEDERAL *DE MINIMIS* THRESHOLDS

CRITERIA AND PRECURSOR POLLUTANTS	TYPE AND SEVERITY OF NONATTAINMENT AREA	TONS PER YEAR THRESHOLD
Ozone (VOC or NO_x)[1]	Serious nonattainment Severe nonattainment Extreme nonattainment Other areas outside an ozone transport region	50 25 10 100
Ozone (NO_x)[1]	Marginal and moderate nonattainment inside an ozone transport regions[2] Maintenance	100 100
Ozone (VOC)[1]	Marginal and moderate nonattainment inside an ozone transport region[2] Maintenance within an ozone transport region[2] Maintenance outside an ozone transport region[2]	50 50 100
Carbon monoxide (CO)	All nonattainment & maintenance	100
Sulfur dioxide (SO_2)	All nonattainment & maintenance	100
Nitrogen dioxide (NO_2)	All nonattainment & maintenance	100
Coarse particulate matter (PM_{10})	Serious nonattainment Moderate nonattainment and maintenance	70 100
Fine particulate matter ($PM_{2.5}$) (VOC, NO_x, NH_3, and SO_x)[3]	All nonattainment and maintenance	100
Lead (Pb)	All nonattainment and maintenance	25

Notes: Federal thresholds that are shaded are applicable to this project.
Code of Federal Regulations (CFR), Title 40, *Protection of the Environment*.
USEPA defines *de minimis* as emissions that are so low as to be considered insignificant and negligible.
Volatile organic compounds (VOC); Nitrogen oxides (NO_x); Ammonia (NH_3);
Sulfur oxides (SO_x).

1 The rate of increase of ozone emissions is not evaluated for a project-level environmental review because the formation of ozone occurs on a regional level and is the result of the photochemical reaction of NO_x and VOC in the presence of abundant sunlight and heat. Therefore, USEPA considers the increasing rates of NO_x and VOC emissions to reflect the likelihood of ozone formation on a project level.

2 An OTR is a single transport region for ozone, comprised of the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the Consolidated Metropolitan Statistical Area that includes the District of Columbia.

3 For the purposes of General Conformity applicability, VOC's and NH_3 emissions are only considered $PM_{2.5}$ precursors in nonattainment areas where either a State or USEPA has made a finding that the pollutants significantly contribute to the $PM_{2.5}$ problem in the area. In addition, NO_X emissions are always considered a $PM_{2.5}$ precursor unless the State and USEPA make a finding that NO_X emissions from sources in the State do not significantly contribute to $PM_{2.5}$ in the area. Refer to 74 FR 17003, April 5, 2006.

Sources: USEPA, 40 CFR Part 93.153(b)(1) & (2), March 25, 2008.
USEPA, 40 CFR Part 51.853, March 25, 2008.

2.6 REGIONAL SIGNIFICANCE UNDER GENERAL CONFORMITY

A regionally significant Federal action under the CAA is one where the total direct and indirect emissions (net emissions) represent greater than ten percent of the total emissions of any pollutant in the nonattainment or maintenance area, as provided in the SIP emissions budget. The EPA has recently removed the requirement for the regionally significant test in the most recent change to the General Conformity Regulations effect on July 6, 2010.[23] Therefore, the regionally significant test does not apply to the alternatives under consideration at DVO.

2.7 TRANSPORTATION CONFORMITY RULE APPLICABILITY

Although airport improvement projects are usually considered under the General Conformity regulations, there can be elements of a proposed action or its alternatives that may require an analysis to demonstrate Transportation Conformity, such as actions relating to transportation plans, programs, projects developed, funded, or approved under Title 23 United States Code (U.S.C.) or the Federal Transit Act,[24] or involve Federal highways. In such case, the sponsoring Federal agency would be required to coordinate with the Federal Highway Administration (FHWA), the State Department of Transportation (DOT), and the local metropolitan planning organization (MPO) to assist in completing a Transportation Conformity evaluation.

As with General Conformity, Transportation Conformity regulations apply only to Federal actions located within a nonattainment or maintenance area. The alternatives under consideration at DVO would not have any effect on regional transportation plans or programs, and no involvement with Federal highways. Therefore, the Transportation Conformity regulations would not apply.

2.8 BAAQMD THRESHOLDS

In addition to the thresholds with respect to General Conformity, Alternatives B, D, and E would be limited by thresholds found in **Table 2-4** identified by the BAAQMD in their Air Quality Guidelines.[25] Should the emissions caused by Alternative B, D, or E exceed the annual or daily thresholds, it would be considered to have a significant air quality impact.

[23] USEPA. 6560-50-P [EPA-HQ-OAR-2006-0669; FRL-9131-7] RIN 2060-AH93 Revisions to the General Conformity regulations. 40 CFR Parts 51 and 93 pgs 52 and 53.
[24] USEPA, 40 CFR Part 93.153, *Applicability*, July 1, 2011.
[25] Bay Area Air Quality Management District, CEQA Air Quality Guidelines. June 2010.

Table 2-4
BAAQMD THRESHOLDS

POLLUTANTS	Tons/Year	Pounds/Day
Reactive Organic Gases (ROG)	10	54
Nitrogen Oxides (NO_X)	10	54
Coarse Particulate Matter (PM_{10})	15	82
Fine Particulate Matter ($PM_{2.5}$)	10	54

Note: Reactive organic gases (ROG) are a subset of total organic gases (TOG), where TOG is multiplied by the fraction of reactive organic gases (FROG) to obtain ROG. The AEDT computer program provides an accounting of TOG, the larger set of organic gases, versus ROG. Therefore, for the purposes of this analysis, TOG will be assumed to reflect ROG.
Source: BAAQMD, CEQA Air Quality Guidelines, May 2017.

The BAAQMD has thresholds of significance for construction emissions. If daily maximum construction emissions exceed the applicable thresholds provided in **Table 2-5** the proposed action would likely result in a significant cumulative impact.

Table 2-5
BAAQMD THRESHOLDS FOR CONSTRUCTION

POLLUTANTS	Daily Maximum Emissions Pounds/Day
Reactive Organic Gases (ROG)	54
Nitrogen Oxides (NO_X)	54
Coarse Particulate Matter (PM_{10})	82
Fine Particulate Matter ($PM_{2.5}$)	54

Note: The daily maximum emission thresholds for PM10 and PM2.5 applies to construction exhaust emissions only.
Source: BAAQMD, CEQA Air Quality Guidelines, May 2017.

The BAAQMD also has thresholds of significance for GHG emissions in the CEQA Guidelines. If annual emissions of operational-related GHGs would exceed 1,100 metric tons per year of CO2e, the proposed project would result in a significant cumulative impact.

2.9 CEQA THRESHOLDS

Appendix G of the *CEQA Guidelines* contains a list of effects that will normally be considered significant to climate and air quality. These include:

- A project that will "violate any ambient air quality standard or contribute substantially to an existing or projected air quality violation,"
- A project that conflicts "with or obstruct[s] implementation of the applicable air quality plan,"
- A project that results "in a cumulatively considerable net increase in any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors),"
- A project that exposes "sensitive receptors to substantial pollutant concentrations,"
- A project that creates "objectionable odors affecting a substantial number of people."

Appendix G of the *CEQA Guidelines* also addresses GHG emissions. The *CEQA Guidelines* indicate that a project could have a significant impact if it would:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment,
- Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

2.10 INDIRECT SOURCE REVIEW

Some states require an air quality review when a Federal action has the potential to cause an increase in net emissions from indirect sources. Indirect sources cause emissions that occur later in time or are farther removed from the Federal action. The state requirement is referred to as the Indirect Source Review (ISR) and each state requiring an ISR sets thresholds for increased operation of the indirect sources. When a Federal action has the potential to exceed these thresholds, an ISR is required to assess the character and impact of the additional emissions, which is separate from the analyses required under NEPA or the CAA. According to FAA, *Aviation Emissions and Air Quality Handbook Version 3,*[26] proposed projects in Marin County would not require an ISR analysis.

[26] *Aviation Emissions and Air Quality Handbook, Version 3,* January 2015.

3. ASSESSMENT METHODOLOGY

This section describes the methodology used to calculate emissions of the criteria and precursor pollutants as well as greenhouse gas emissions and hazardous air pollutants.

3.1 WEATHER

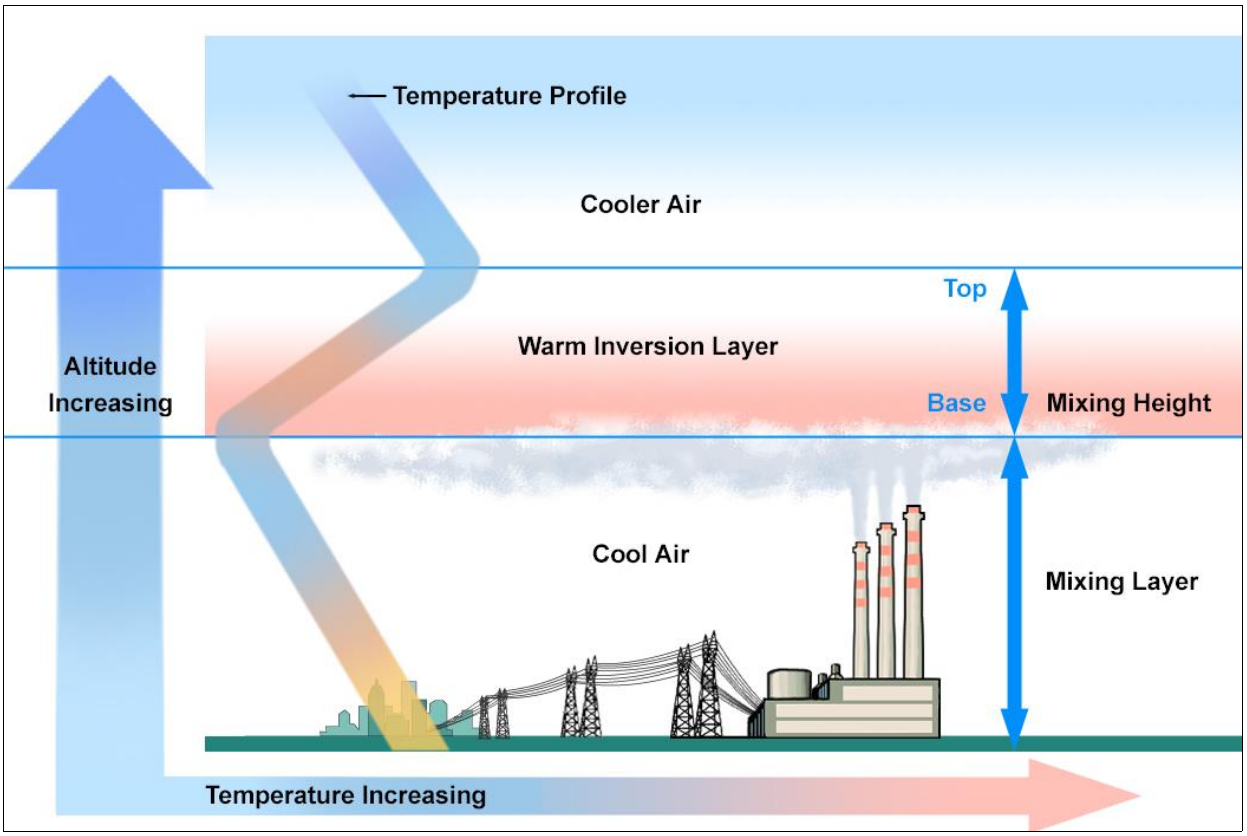
According to the BAAQMD,[27] the weather of Marin County consists of the following:

> *Marin County is bounded on the west by the Pacific Ocean, on the east by San Pablo Bay, on the south by the Golden Gate and on the north by the Petaluma Gap. Most of Marin's population lives in the eastern part of the county, in small, sheltered valleys. These valleys act like a series of miniature air basins. Although there are a few mountains above 1500 feet, most of the terrain is only 800 to 1000 feet high, which usually is not high enough to block the marine layer. Because of the wedge shape of the county, northeast Marin County is further from the ocean than is the southeastern section. This extra distance from the ocean allows the marine air to be moderated by bayside conditions as it travels to northeastern Marin County. In southern Marin the distance from the ocean is short and elevations are lower, resulting in higher incidence of maritime air in that area.*
>
> *Air pollution potential is highest in eastern Marin County, where most of population is located in semi-sheltered valleys. In the southeast, the influence of marine air keeps pollution levels low. As development moves further north, there is greater potential for air pollution to build up because the valleys are more sheltered from the sea breeze. While Marin County does not have many polluting industries, the air quality on its eastern side — especially along the U.S. 101 corridor — may be affected by emissions from increasing motor vehicle use within and through the county.*

Local meteorology can affect pollutant concentrations depending on the severity of temperature inversions that occur. A temperature inversion occurs when the upper air is warmer than the air near the ground. This causes air pollutants released at the surface to be trapped beneath the level where the air begins to warm. An illustration of a temperature inversion is shown in **Figure 2**, ***Temperature Inversion*.**

[27] Bay Area Air Quality Management District, *BAAQMD CEQA Air Quality Guidelines*. Appendix C. May 2017.

FIGURE 2
TEMPERATURE INVERSION



The FAA-required and USEPA-approved Airport Environmental Design Tool version 2d (AEDT) was used for estimating emissions from airport-specific sources. The calculation of emissions from aircraft assumes that aircraft operate only within the mixing layer, below the mixing height, where the emissions may influence ground-based pollutant concentrations. The mixing height, combined with the angle of approach (usually 3 degrees above the horizon) and the departure angle, determines the total time an aircraft operates during approach and climbout.

In order to properly estimate the emissions inventories, information regarding the weather must be obtained, particularly the mixing height, temperature, barometric pressure, wind direction, ceiling height and visibility. For this air quality analysis at DVO, the closest weather station with mixing height data was determined to be at Oakland, California.[28] **Table 3-1** shows the mixing height for the Oakland station used for this analysis.

[28] USEPA, Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution throughout the contiguous United States, AP-101, January 1972, Table B-1 *Mean Seasonal and Annual Morning and Afternoon Mixing Heights and Wind Speeds for NOP [no precipitation] and All Cases*.

Table 3-1
MIXING HEIGHTS FOR OAKLAND, CALIFORNIA

Season	Morning		Afternoon	
	Meters	Feet	Meters	Feet
Winter	453	1,486	709	2,326
Spring	763	2,503	1,121	3,678
Summer	527	1,729	644	2,113
Autumn	508	1,667	770	2,526
Annual	563	1,846	811	2,661
Average Annual Mixing Height	687 Meters or 2,254 feet			

Notes: Average Annual Height is the average of the annual morning and annual afternoon mixing heights.
One meter is equal to 3.281 feet.
Using the guidance provided by USEPA, Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution throughout the contiguous United States, AP-101, January 1972, Table B-1 *Mean Seasonal and Annual Morning and Afternoon Mixing Heights and Wind Speeds for NOP [no precipitation] and All Cases, it was* determined that the location of the nearest station to Gnoss Field with mixing height data is at Oakland, California. For the noise analysis in Appendix E, Napa Airport data was used because it was the closest site to Gnoss Field that had long-term temperature and humidity data.

Source: USEPA, Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution throughout the contiguous United States, AP-101, January 1972, Table B-1 *Mean Seasonal and Annual Morning and Afternoon Mixing Heights and Wind Speeds for NOP [no precipitation] and All Cases*.

3.2 AIRCRAFT

At all airports, including the General Aviation (GA) airport DVO, the number of aircraft operations directly affects emissions. **Table 3-2** shows the annual operations by aircraft category for each year in the study.

Table 3-2
ANNUAL OPERATIONS BY AIRCRAFT CATEGORY

	Annual Operations		
Aircraft Category	**2018**	**2024**	**2029**
Single Engine Piston	76,888	77,687	78,785
Multi Engine Piston	4,137	4,902	5,286
Turbine*	1,315	1,417	1,509
Rotorcraft	390	398	410
TOTAL	**82,730**	**84,404**	**85,990**

Note: The annual operations are based on the current and forecast operations provided in Appendix C-1, Table 6-2. The forecast was extrapolated to 2024 because 2024 is the projected implementation year of the proposed runway extension. The forecast was additionally extrapolated to 2029 because impacts are also evaluated for a condition five years beyond the opening year in 2029.
* Turbine operations include turboprop and turbofan operations

Source: Landrum & Brown Analysis, 2018.

For the existing baseline (2018) there are a total of 82,730 annual operations. Operations from the single engine piston type of aircraft made up 93 percent of the total. In 2024, there would be 84,404 annual operations, an approximate two percent increase from the baseline. In 2029, there would be 85,990 operations, an approximate two percent increase from 2024.

In order to properly estimate emissions, the landing take-off cycles (LTOs) of each particular aircraft is needed. An LTO consists of the approach, landing roll, taxi to and from the gate/terminal/or parking area, idle time, takeoff, and climbout. An LTO is defined as one arrival operation and one departure operation. Therefore, 82,730 annual operations in 2018 would equal 41,365 LTOs.

From the aircraft category, a representative aircraft that operated at DVO was selected and then entered into AEDT. **Table 3-3** shows the Annual LTOs per aircraft for each year in the study.

Table 3-3
LTOs BY AIRCRAFT

Aircraft Category	Representative Aircraft	2018	2024	2029
Single Engine Piston	Cessna 182, Piper Cherokee PA28	22,474	22,708	23,029
	TBM TB-700, Cirrus SR-22	10,994	11,108	11,265
	Cessna 172	4,345	4,390	4,452
	Cessna 206	632	638	647
Multi Engine Piston	Cessna 310, Cessna 340	2,068	2,451	2,643
Turbine	Citation 525, Citation I	115	115	115
	Beech King Air / Super King Air	362	401	436
	Cessna 560 Citation Excel, Citation 550	61	61	61
	Beech Super king Air 350	109	121	132
	Learjet 31	10	10	10
Rotorcraft	Sikorsky S-76 Spirit	195	199	205
	TOTAL	**41,365**	**42,202**	**42,995**

Source: Landrum & Brown Analysis, 2018

Alternative B Sponsor's Proposed Project and Alternatives D and E would not have the potential to increase the number of aircraft using DVO beyond what is forecasted; therefore, an increase of aircraft operations in the future would be the result of the natural forecasted growth of the Airport. The Future No Action alternatives and the various build alternatives would have the same number of aircraft operations.

3.3 TAXI TIMES

The average taxi in and taxi out time is dependent on the airfield configuration. Taxi distances for DVO were developed for aircraft traveling to each runway end. A central aircraft parking area was used in the calculation of taxi times. This area represents the main aircraft tie down area located near the Airport Management Office. The existing distance from the central aircraft parking area to Runway End 13 was determined to be 3,050 feet and the distance from the central aircraft parking area to Runway End 31 was determined to be 1,281 feet. For a taxi speed of ten miles per hour, an average taxi in and taxi out time of 2 minutes and 58 seconds was calculated for the 2018 Existing condition and the future No Action Alternatives. The total average taxi in and taxi out time for the Airport was applied to each aircraft in the fleet list for the calculation of the emissions inventory.

Although an increase in aircraft operations would not occur as a result of the Proposed Action, there would be a potential increase in annual emissions as a result of the proposed runway extensions in Alternative B, Sponsor's Proposed Project and Alternatives D and E. The proposed extensions would increase taxi distance and taxi time and therefore total emissions from aircraft operations. It is expected that Alternative B Sponsor's Proposed Project would have an increased taxi time over Alternatives D and E because the extension of Alternative B Sponsor's Proposed Project increases the distance from the central aircraft parking area to the runway ends as compared to Alternatives D and E. For Alternative B Sponsor's Proposed Project, an average taxi in and taxi out time of 3 minutes and 28 seconds was calculated and for Alternative D an average taxi in and taxi out time of 3 minutes and 25 seconds was calculated. Alternative E would have the smallest increase in taxi time compared to Alternatives B and D because the extension does not increase the distance from the central aircraft parking area to the runway ends as much as that for Alternatives B and D. For Alternative E, an average taxi in and taxi out time of 2 minutes and 54 seconds was calculated. The total average taxi in and taxi out time was applied to each aircraft in the future fleet list for the applicable alternative for the calculation of the emissions inventory.

3.4 AIRCRAFT PERFORMANCE

DVO is used by a variety of aircraft types, each with different runway length requirements. In the runway length analysis,[29] takeoff runway length requirements for the representative family grouping of critical aircraft at DVO were calculated using guidance from FAA AC 150/5325-4B. See Appendix D-1 for more information on how the runway length was determined.

[29] Runway Length Analysis, Landrum & Brown, February 2018.

Some aircraft operating into or out of DVO must take a weight penalty with the current 3,300 foot runway configuration. These weight penalties are typically achieved through reduced fuel loads or payloads, which may require an intermediate stop prior to reaching the intended destination. Currently, the turbine aircraft, Super KingAir 300, Cessna 525 CitationJet, and the Cessna 560 Citation Excel, take a payload penalty due the length of the runway under "hot day" conditions. According to the runway length analysis prepared for the 2014 Final EIS, the payload penalty results in these turbine aircraft under the 2018 Existing Conditions only being able to have a maximum of 90 percent of the maximum takeoff weight (MTOW). The reduced maximum takeoff weight was also used in the Future No Action alternatives.

For Alternatives B, D, and E, 100 percent of MTOW for all aircraft was used in AEDT because these alternatives provide additional runway length and allow the turbine aircraft to completely fill up with fuel in order to reach their destination. This was not the case for Alternative E because the alternative provides a shorter runway extension than that provided for Alternatives B and D. The runway length analysis prepared for the 2014 Final EIS determined that the Cessna 525 Citation Jet required a full 1,100 foot runway extension in order to operate at 100 percent of MTOW. Therefore, for Alternative E, 90 percent of MTOW for Cessna 525 Citation Jet aircraft was used in AEDT.

3.5 FUEL CONSUMPTION

Emissions from fuel storage and handling were based on annual fuel consumption. Annual fuel usage data for Jet A fuel and one hundred octane low lead (100LL) Aviation Gasoline (AvGas) were provided by Marin County for the 2018 Existing Conditions. The current demand was estimated based on 2017 data provided by the Airport.[30] Fuel throughputs for future no action analysis years were projected using the growth in aircraft operations. The annual fuel throughputs used for the No action alternatives are presented in **Table 3-4**.

[30] The 2017 data was provided by Dan Jensen, Gnoss Field Airport Manager, via email correspondence on August 7, 2018 and August 9, 2018. It should be noted that the data provided included periods of time during which the runway was closed (September 29, 2017 through December 29, 2017). Therefore, the current demand of utility and fuel energy was estimated by using data available for the months where the runway was in operation; the average consumption per month was applied for the months where the runway was closed before totaling the annual demand. Therefore, Table 5.15-1 represents the annual demand based on average current use. See Appendix E-1 for more information.

Table 3-4
FUEL CONSUMPTION NO ACTION

Existing 2018 (Gallons)		Projected 2024 No Action (Gallons)		Projected 2029 No Action (Gallons)	
Jet A	AvGas	Jet A	AvGas	Jet A	AvGas
74,919	84,905	80,715	86,545	85,955	88,103

Note: Fuel consumption projections are based on Aircraft operations. There is a 7.7% increase in turbine operations and a 1.9% increase in non-turbine operations from 2018 to 2024. There is a 6.5% increase in turbine operations and a 1.8% increase in non-turbine operations from 2024 to 2029.
Source: Marin County Airport and Landrum & Brown Analysis, 2018

For this analysis, it was assumed the proposed 1,100 foot runway extension in Alternatives B and D would allow aircraft to have additional fuel onboard. Alternative E, with the proposed 300-foot runway extension, assumes that the Cessna 525 would keep the load penalty. Alternatives B and D are projected to have an approximate nine percent increase of JetA fuel throughput over the No Action cases because the turbine aircraft will not have to take a payload penalty and will be able to takeoff with 100% MTOW. Alternative E is projected to have an approximate seven percent increase of Jet A fuel throughput over the No Action because the Cessna 525 would keep the load penalty.

In addition to additional fuel being used on takeoff, aircraft will be consuming more fuel during taxi in and taxi out on the proposed runway and taxiway extensions. Alternative B will have an increase in annual fuel consumption as compared to Alternative D because the extension of Alternative B Sponsor's Proposed Project increases the distance from the central aircraft parking area to the runway ends as compared to Alternative D. Alternative E would have the least increase in annual fuel consumption as compared to Alternatives B and D because it has the lowest taxi-time from the three alternatives. Fuel usage during the additional taxi in and taxi out was added to the increase due to 100% MTOW to determine annual fuel throughputs. The annual fuel throughputs for the build alternatives are presented in **Table 3-5**.

Table 3-5
FUEL CONSUMPTION BUILD ALTERNATIVES

	Projected 2024 (Gallons)		Projected 2029 (Gallons)	
	Jet A	AvGas	Jet A	AvGas
Alternative B	87,968	86,866	93,679	88,430
Alternative D	87,968	86,852	93,679	88,416
Alternative E	86,044	86,688	91,630	88,249

Source: Landrum & Brown Analysis, 2018

3.6 GROUND SUPPORT EQUIPMENT

Ground support equipment (GSE) is used to service aircraft between flights. Data relating to GSE was obtained from the Airport. The Airport has two fuel trucks, one gasoline powered, and one diesel powered. These fuel trucks are self-contained, and have their own pumps, filters, hoses, and other equipment. These GSE were entered into AEDT by population based on aircraft operating levels. The gasoline powered fuel truck was assigned to the turbine aircraft and the diesel fuel truck was assigned to the piston aircraft. In addition, the Airport has one diesel mowing tractor that uses less than 500 gallons of fuel per year. It is expected that with Alternative B, D, or E the mowing tractor would consume up to 750 gallons of fuel per year.

3.7 GROUND ACCESS VEHICLES

Data relating to motor vehicles traversing the airport's access roadways were obtained from Marin County Public Works. Emissions were determined from ground access vehicles (GAVs) traveling on Airport Road and vehicles traveling into and out of the Airport's main parking lot. The distance traveled by GAVs one way on Airport Road was determined to be 0.19 miles. Vehicle Miles Traveled (VMT's) were determined using the average daily traffic count on Airport Road, the speed limit of Airport Road (25 miles per hour), and the distance. Future vehicle traffic volumes on Airport Road were projected assuming the increase in the number of vehicles at the Airport would be directly related to projected increases in aircraft annual operations.

The distance traveled by GAVs in parking lots was determined to be 0.20 miles by measuring the distance from the entrance of the main parking lot to the last parking place in the lot to represent a conservative emissions estimate. The analysis did not consider employee parking because the number of employee vehicle trips was determined to be insignificant and is not expected to change with any of the alternatives. Average daily traffic provided in **Table 3-6** accounts for east bound and west bound traffic; therefore, the number of GAVs accessing the parking lot was assumed to be half of the average daily traffic or 168 vehicles for the existing conditions. VMT's were determined using the average daily traffic count in parking lots, the average speed of the vehicles in the parking lots (10 miles per hour), and the distance. Future vehicle traffic volumes in parking lots

were projected assuming the increase in the number of vehicles at the Airport would be directly related to projected increases in aircraft annual operations.

Table 3-6
AVERAGE DAILY TRAFFIC

	2018	2024	2029
Airport Road	324	330	336
Parking Lot	162	165	168

Note: Totals represent West Bound and East Bound traffic.
Source: Marin County Public Works and Landrum & Brown Analysis, 2018

The GAVs were entered into the USEPA's Motor Vehicle Emission Simulator (MOVES) version 2014a. Alternative B Sponsor's Proposed Project and Alternatives D and E would not have the potential to increase the number of ground access vehicles using DVO beyond the No Action conditions. The Future No Action alternatives and the various build alternatives would have the same number of GAVs on Airport Road and in the parking lots. There would be no increase in VMTs or vehicle trips due to the Proposed Action or the build alternatives.

3.8 STATIONARY SOURCES

The primary sources of electrical and natural gas energy consumption at DVO include the administration building, the hangars, and lighting for the airfield and public parking areas. The existing facilities are heated by natural gas boiler and cooled by electric chiller. Stationary sources modeled in AEDT for this analysis included the natural gas boiler and two 12,000 gallon capacity fuel storage tanks (one for Jet A fuel and one for Avgas). The fuel throughputs were converted to kiloliters and input into AEDT.

Energy consumption for future no action analysis years were projected using the growth in aircraft operations. It is assumed that the number of airport users increases with or without the proposed improvements.

While no new buildings or hangars are proposed, Alternatives B, D, and E would increase the demand for electricity above the No Action alternatives due to the need to provide power to edge lighting along the extended runway and taxiway.

3.9 LEAD EMISSIONS

The primary source of lead (Pb) emissions at DVO would be the combustion of AvGas in small piston-engine general aviation aircraft. Turbine aircraft were considered to use Jet A and therefore had no lead emissions. Single and multi-engine aircraft were considered to use 100LL Avgas. AEDT does not currently calculate lead emissions from piston-powered aircraft, and thus, it is not a readily available tool for determining airport lead inventories related to aircraft operations. The USEPA's *Lead Emissions from the use of leaded Aviation Gasoline in the US Technical Support Document* was used as the basis to determine lead emissions at DVO for the existing conditions and the various alternatives.[31]

The USEPA's methodology requires as input the number of operations of piston-engine aircraft, fuel consumption rates by aircraft during the LTO, the concentration of lead in the fuel, and the retention of lead in the engine and oil.

Using national averages, USEPA estimated for the National Emissions Inventory (NEI) that aircraft at DVO emitted 0.4 tons of lead per year during the LTO. However, for this air quality analysis specific data was available concerning the fleet mix percentages of aircraft and specific times in mode at DVO. There are continuing efforts to reduce or eliminate lead from Avgas for piston engine aircraft. Lead emissions for future years would be less than calculated in this EIS if the amount of lead in Avgas is reduced or eliminated.

3.10 ROG vs. TOG

Reactive organic gases (ROG) are a subset of total organic gases (TOG), where TOG is multiplied by the fraction of reactive organic gases (FROG) to obtain ROG. The AEDT computer program provides an accounting of TOG, the larger set of organic gases, versus ROG. Therefore, for the purposes of this analysis, TOG will be assumed to reflect ROG.

[31] USEPA. *Lead Emissions from the Use of Leaded Aviation Gasoline in the United States*. Technical Support Document . EPA420-R-08-020. October 2008.

4. EXISTING CONDITIONS

An emission inventory was prepared for the Existing Conditions (2008) using AEDT and MOVES. The model estimates the rate of emissions of the criteria and precursor pollutants in short tons per year.

The primary sources of air emissions at airports are aircraft, GSE, stationary sources, and GAVs traveling on roadways and in parking facilities. The results of the emission inventory are provided in **Table 4-1**. The greatest overall emission contribution comes from aircraft operations.

Table 4-1
EXISTING CONDITIONS (2018) EMISSIONS INVENTORY

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	262.92	3.47	4.05	0.91	0.32	0.22	0.22	1.10
GSE	0.32	0.14	0.14	0.35	0.01	0.01	0.01	NA
GAVs	0.92	0.13	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	0.13	1.22	0.00	0.05	0.05	NA
TOTAL	***264.68***	***3.83***	***4.45***	***2.65***	***0.33***	***0.28***	***0.28***	***1.1***

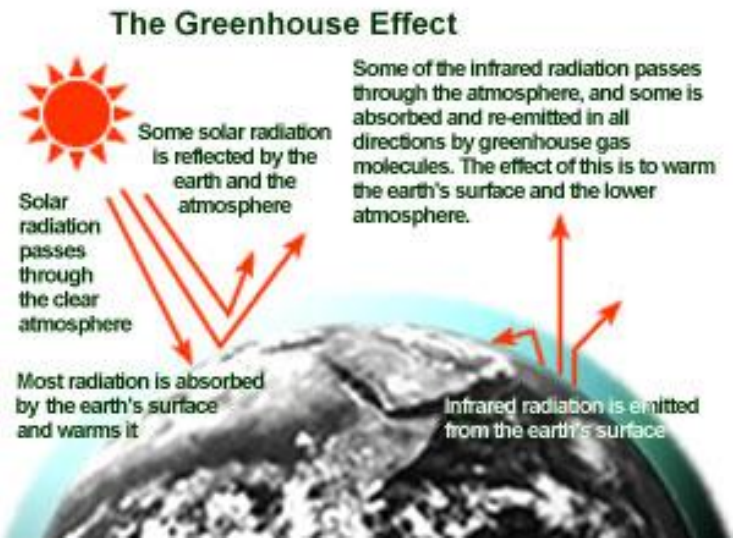
CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
GSE: Ground Service Equipment
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

4.1 GREENHOUSE GAS EMISSIONS

According to most international reviews, aviation emissions comprise a small but potentially important percentage of human made greenhouse gases and other emissions that contribute to global warming.

Greenhouse gases are gases that trap heat in the earth's atmosphere as shown in **Figure 4, *Greenhouse Effect***. Both naturally occurring and man-made greenhouse gases primarily include water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Sources that require fuel or power at an airport are the primary sources that would generate greenhouse gases. Aircraft are probably the most often cited air pollutant source, but they produce the same types of emissions as ground access vehicles (GAV).

Figure 3
GREENHOUSE EFFECT



Source: U.S. EPA.

Different chemical species that are emitted such as CO_2, CH_4, and N_2O have a different effect on climate. The equivalency method is a way to show relative impacts on climate change of different chemical species. Carbon Dioxide equivalent (CO2e) for this analysis was calculated using global warming potential (GWP) factors provided by the Intergovernmental Panel on Climate Control's Fourth Assessment Report. CO2e are reported in annual metric tons.

In order to determine CO_2 equivalent, all CO_2 emissions were converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results of the GHG emission inventory are provided in **Table 4-2**.

Table 4-2
EXISTING CONDITIONS (2018) GHG EMISSIONS INVENTORY

Metrics	Annual Emissions (short tons per year)		
	CO_2	CH_4	N_2O
Aircraft	856.98	0.00	0.00
GAV	43.81	0.00	0.00
Total	**900.79**	**0.00**	**0.00**

GAV: Ground Access Vehicles
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

In order to determine CO_2 equivalent all emissions sources were summed. Totals were converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results are provided in **Table 4-3**.

Table 4-3
EXISTING CONDITIONS (2018) CO2 EQUIVALENT

Metrics	Annual Metric Tons		
	CO_2	CH_4	N_2O
Aircraft	777.44	-	-
GAV	39.74	0.00	-
GWP_{100}	1	25	298
CO_{2e}	817.18	0.05	0.00
Total	817.24		

GAV: Ground Access Vehicles
GWP: Global Warming Potential
CO2e: Carbon Dioxide equivalent
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: IPCC Fourth Assessment Report; AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

4.2 HAZARDOUS AIR POLLUTANTS

Hazardous air pollutants (HAPs) are gaseous organic and inorganic chemicals, compounds, and particulate matter that may be carcinogenic (known or suspected to cause cancer) or non-carcinogenic (known or suspected to cause other adverse health effects). These substances are believed to cause unique exposure risks because of the innate toxicity of each substance. The 188 substances listed in CAA Section 112 have a variety of toxic effects causing major health concerns relating to, among others, the nervous and reproductive systems, and lung and liver diseases.

The health effects from exposure to HAPs in the ambient air are influenced by the regional meteorology. Higher winds have a tendency to dilute the vaporized pollutants downwind but may also increase the volatilization rate of some liquids.[32] Greater wind speeds may also increase the concentration of nonvolatile contaminants absorbed and adsorbed[33] to soil and dust. Atmospheric instability, which relates to vertical motions in the air, may increase the dispersion of contaminants throughout various vertical levels whereas downwind contaminant concentrations are usually higher when stable atmospheric conditions exist. Precipitation reduces overall airborne contaminants by removing the particles from the air and volatile contaminants emit at lower rates from wet soil than from dry soil. In addition, solar radiation and temperature can also affect the volatilization of liquids. When considering the parameters that affect the formation and dispersion of HAPs, it is clear that health effects from HAP emissions is appropriately assessed on a regional level and not confined to a project-level analysis of a single source.

The FAA has identified 24 HAPs related to aircraft operations. These 24 HAPS are presented in **Table 4-4**.

[32] Keith, Lawrence H., et al., Handbook of Air Toxics – Sampling, Analysis, and Properties, 1995.
[33] A substance that is attracted to a surface and remains concentrated on the surface is adsorbed, whereas absorption occurs when the substance is not only retained on the surface but also passes through the surface to become distributed throughout.

Table 4-4
EXISTING CONDITIONS (2018) HAPS EMISSIONS INVENTORY

TYPES OF HAZARDOUS AIR POLLUTANTS	ANNUAL HAP EMISSIONS BY SOURCE (tons per year)				
	Aircraft	**GSE**	**GAVs**	**Stationary Sources**	**Total**
1,3-butadiene	0.068	N/A	0.000	N/A	**0.069**
2,2,4-trimethylpentane	0.021	N/A	0.003	N/A	**0.024**
2-methylnaphthalene	0.008	0.004	N/A	N/A	**0.012**
Acetaldehyde	0.173	N/A	0.001	N/A	**0.174**
Acetone	0.015	N/A	N/A	N/A	**0.015**
Acrolein	0.099	0.001	0.000	N/A	**0.100**
Benzaldehyde	0.019	0.000	N/A	N/A	**0.019**
Benzene	0.068	N/A	0.003	0.005	**0.076**
Chlorobenzene	N/A	N/A	N/A	N/A	**0.000**
Cyclohexane	N/A	0.000	N/A	N/A	**0.000**
Ethylbenzene	0.007	0.012	N/A	0.002	**0.021**
Formaldehyde	0.497	N/A	0.001	0.006	**0.505**
Isopropylbenzene (cumene)	0.000	N/A	N/A	0.000	**0.000**
M & P-xylene	0.011	N/A	N/A	0.008	**0.019**
Methyl alcohol	0.073	N/A	N/A	N/A	**0.073**
M-xylene	N/A	N/A	N/A	N/A	**0.000**
Naphthalene	0.022	0.000	N/A	0.000	**0.022**
N-heptane	0.003	N/A	N/A	0.001	**0.004**
N-hexane	N/A	0.000	N/A	N/A	**0.000**
O-xylene	0.007	N/A	N/A	0.003	**0.010**
Phenol (carbolic acid)	0.029	0.002	N/A	N/A	**0.032**
Propionaldehyde	0.029	N/A	0.000	N/A	**0.029**
Styrene	0.012	0.000	0.000	0.000	**0.013**
Toluene	0.026	0.000	0.013	0.009	**0.049**

N/A = Not Applicable
GSE = Ground Support Equipment
Xylene is assumed to be the sum of O-xylene, M-xylene, and M & P-xylene.
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

4.3 NATURALLY OCCURRING ASBESTOS

Additional fill and aggregate rock material have been imported to DVO over the years to raise the elevation in preparation for construction of the runway and other facilities at DVO. In October 2017, during the rehabilitation of Runway 13/31, the construction contractor's routine testing identified Naturally Occurring Asbestos (NOA) in aggregate rock base material that was exposed during the construction work associated with the rehabilitation of the runway. It is not known when, or from where, the aggregate rock base material containing NOA was placed on the runway. The runway rehabilitation work may have exposed aggregate material imported during the original runway construction in 1968, or during subsequent repairs. The California Air Resources Board identified asbestos as a toxic air contaminant in 1986 and has taken several actions since 1990 to control the use of NOA in aggregate materials. Therefore, it is likely the NOA material was placed prior to 1990. Marin County developed a work plan to appropriately handle the NOA during construction to address public health and construction worker protection in accordance with California Occupational Safety and Health Administration and 8 CFR Section 1529 requirements. However, additional NOA may be present and be encountered during construction in the area where the existing runway is connected to the runway extension. NOA is not known to occur in the Reyes clay that naturally occurs on DVO.

5. CONSTRUCTION

In accordance with FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, the impacts to the environment due to construction activities must be assessed when preparing an EIS. Construction impacts are commonly short-term and temporary in nature. In addition, BAAQMD regulations require an assessment of construction emissions. An inventory of emissions from the use of construction equipment was prepared using the computer model California Emissions Estimator Model (CalEEMod) program (version 2016.3.2).

5.1 PHASING

Final engineering for a runway extension is not complete. Therefore, the analysis of construction emissions was based on estimates included in a preliminary design report[34] prepared for Marin County, on estimates calculated by Landrum & Brown, and on CalEEMod defaults.

Construction of a runway extension would only occur after the Supplement to the Final EIS is publicly released and when FAA and Marin County have issued a decision. The preliminary design report did not provide a schedule for construction. Therefore, for the purposes of this air quality analysis and to estimate emissions, a preliminary schedule was developed.[35] An actual construction schedule would be developed upon final engineering.

Gnoss Field is situated on reclaimed marshlands which lie on the eastern flank of low lying coastal foothills. The Airport site and properties to the north of it are nearly flat with elevations close to sea level. Several meandering sloughs and excavated drainage channels are adjacent to the site and connect with the Petaluma River to the east. A system of levees with pumps for flood protection surrounds the site.

The drainage system for the existing Airport consists of ditches around the airfield inside the perimeter levees, as well as ditches outside the levees. The airport has been designed so runoff will flow by gravity to ditches along the perimeter of the runway and operation areas. The interior ditches on the west side of the runway flow northwest, continue around the north end of the runway, and flow southeast to an area near the existing windsock. The interior ditches on the south end of the Airport flow north to the junction near the windsock. From this point, the flows join and move east towards the Petaluma River. The water leaves the Airport through a culvert in the perimeter levee. The water is eventually pumped into the Black John Slough and then to the Petaluma River. The 20 horsepower pump with a capacity of one acre foot per hour is owned, operated, and maintained by Rancho Del Pantoano. A drainage agreement is maintained between Marin County and the

[34] Preliminary Design Report Runway Extension Gnoss Field Marin County, California FAA AIP Project No. 3-06-0167-08. Cortright & Seibold, December 20, 2002.

[35] An 18-month construction schedule was developed by Landrum & Brown based on airport construction projects of similar size and scope that were successfully reviewed in previous airport environmental documents.

private property owners under which the County contributes toward the cost of operation and maintenance.

According to the preliminary design[36] it is estimated that adding the runway extension will not overload the existing airfield ditch system under reasonably expected average rainfall amounts. However, extension of the levees to the northwest will cut off one of the major natural drainage courses across the site. In order to avoid the levees diking this flow, an outside perimeter ditch would need to be constructed to redirect the surface flow around the extended north end of the levee. This ditch would reconnect with natural drainage courses down stream from the Airport levee system so surface water may continue from west to east toward the Petaluma River.

Completion of all phases would involve using typical construction vehicles. The number of vehicles would vary due to project timing, funding, budget constraints, weather, scope of work, and other unforeseen factors, but the types of equipment would remain relatively constant. Equipment common to all of the phases would be tractor loaders/backhoes, rubber tired bulldozers, dump trucks, excavators, trenchers, graders, pavers, rollers, and water trucks. Construction of Alternative B Sponsor's Proposed Project and Alternatives D and E would cause temporary emissions due to the use of construction equipment for the following phases.

Phase 1 – Site Preparation *(Duration 5 months)*

Site preparation involves clearing vegetation (grubbing and tree/stump removal and removing stones and other unwanted material or debris prior to grading. The project area to be disturbed is estimated to be 23.0 acres for Alternative B, 26.7 acres for Alternative D, and 17 acres for Alternative E.

Phase 2 – Grading *(Duration 6 months)*

Grading involves the cut and fill of land to ensure that the proper base and slope is created for the foundation of the landscaping and pavement. The total project area to be graded is estimated to be the same as for the site preparation (23.0 acres for Alternative B, 26.7 acres for Alternative D, and 17 acres for Alternative E). Grading is assumed to occur in two month phases. Because this phase involves cut and fill of land, it was assumed that the soil to be imported for future trenching activities would be imported in this phase. Assuming a maximum disturbance of two feet, the total estimated fill for the levee realignment/extension was estimated at 64,391 cy for Alternative B, 76,243 cy for Alternative D, and 47,491 cy for Alternative E.

[36] Preliminary Design Report Runway Extension Gnoss Field Marin County, California FAA AIP Project No. 3-06-0167-08. Cortright & Seibold, December 20, 2002.

Phase 3 – Trenching *(Duration 2 months)*

Trenching involves the realignment and extension of the drainage ditch and levee system. It is assumed that construction would include excavation of the new drainage ditch to a maximum depth of two feet. Material excavated from the drainage ditch extension would be used as fill for the new levee system. The total project area to be disturbed is estimated to be 23.0 acres for Alternative B, 26.7 acres for Alternative D, and 17 acres for Alternative E.

Phase 4 – Paving *(Duration 4 months)*

Paving involves the laying of concrete or asphalt. The area to be disturbed was calculated by using the proposed runway and taxiway length, the proposed runway width, the taxiway width, and the RSA areas. Alternative B and Alternative D would have similar pavement areas because the overall runway and taxiway extension lengths and widths are similar. Alternative E would have a reduced pavement area because the overall runway and taxiway extension length is less than that of Alternatives B and D. The total project area to be disturbed is estimated to be 10.3 acres for Alternative B, 10.7 acres for Alternative D, and 3.0 acres for Alternative E.

Phase 5 – Architectural Coating *(Duration 1 month)*

Architectural coating involves the painting of pavement surfaces. After the construction of the pavement, all pavement structures would be assumed to be painted. It was assumed that approximately six percent of the pavement surfaces would be painted.

5.2 CONSTRUCTION EMISSIONS

The daily construction emissions for each phase of Alternative B Sponsor's Proposed Project construction are provided in **Table 5-1.** The maximum daily construction emission for the entire project is listed in bold.

Table 5-1
ALTERNATIVE B MAXIMUM DAILY CONSTRUCTION EMISSIONS

EMISSION SOURCES	MAXIMUM DAILY CONSTRUCTION EMISSIONS (Pounds per day)			
	ROG	NOx	PM_{10}	$PM_{2.5}$
BAAQMD Threshold	**54**	**54**	**82**	**54**
Phase 1 Site Prep	4.2	42.8	2.2	2.0
Phase 2 Grading	3.0	44.8	1.3	1.2
Phase 3 Trenching	0.4	4.2	0.3	0.3
Phase 4 Paving	1.3	10.9	0.6	0.5
Phase 5 Architectural Coating	3.7	1.5	0.1	0.1

ROG: Reactive Organic Gases
NOx: Nitrogen Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
RSA: Runway Safety Area
Note: The daily maximum emissions for PM10 and PM2.5 are for construction exhaust emissions only.
Source: CalEEMod, version 2016.3.2; Landrum & Brown Analysis, 2018.

The construction emissions inventory for Alternative B Sponsor's Proposed Project is provided in **Table 5-2.**

Table 5-2
ALTERNATIVE B CONSTRUCTION EMISSIONS INVENTORY

EMISSION SOURCES	CONSTRUCTION EMISSIONS (tons per year)						
	CO	**VOC**	**ROG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Federal Threshold	**100**	**100**	**NA**	**100**	**100**	**NA**	**100**
BAAQMD Threshold	**NA**	**NA**	**10**	**10**	**NA**	**15**	**10**
Phase 1 Site Prep	1.2	NA	0.2	2.3	0.0	0.1	0.1
Phase 2 Grading	1.3	NA	0.2	2.9	0.0	0.1	0.1
Phase 3 Trenching	0.0	NA	0.0	0.0	0.0	0.0	0.0
Year 1 Sub Total	2.5	NA	0.4	5.3	0.0	0.2	0.2
Phase 3 Trenching	0.0	NA	0.0	0.0	0.0	0.0	0.0
Phase 4 Paving	0.6	NA	0.1	0.5	0.0	0.0	0.0
Phase 5 Architectural Coating	0.0	NA	0.0	0.0	0.0	0.0	0.0
Year 2 Sub Total	0.6	NA	0.1	0.5	0.0	0.0	0.0

CO: Carbon monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
RSA: Runway Safety Area
Total emissions may not sum exactly due to rounding.
NA=Not applicable
Note: PM10 and PM2.5 values are for construction exhaust emissions only.
Source: CalEEMod, version 2016.3.2; Landrum & Brown Analysis, 2018.

The daily construction emissions for each phase of Alternative D construction are provided in **Table 5-3**. The maximum daily construction emission for the entire project is listed in bold.

Table 5-3
ALTERNATIVE D MAXIMUM DAILY CONSTRUCTION EMISSIONS

EMISSION SOURCES	MAXIMUM DAILY CONSTRUCTION EMISSIONS (Pounds per day)			
	ROG	NOx	PM_{10}	$PM_{2.5}$
BAAQMD Threshold	**54**	**54**	**82**	**54**
Phase 1 Site Prep	4.2	42.8	2.2	2.0
Phase 2 Grading	3.1	48.1	1.3	1.2
Phase 3 Trenching	0.4	4.2	0.3	0.3
Phase 4 Paving	1.3	10.9	0.6	0.5
Phase 5 Architectural Coating	3.7	1.5	0.1	0.1

ROG: Reactive Organic Gases
NOx: Nitrogen Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
RSA: Runway Safety Area
Note: The daily maximum emissions for PM10 and PM2.5 are for construction exhaust emissions only.
Source: CalEEMod, version 2016.3.2; Landrum & Brown Analysis, 2018.

The construction emissions inventory for Alternative D is provided in **Table 5-4**.

Table 5-4
ALTERNATIVE D CONSTRUCTION EMISSIONS INVENTORY

EMISSION SOURCES	CONSTRUCTION EMISSIONS (tons per year)						
	CO	**VOC**	**ROG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Federal Threshold	**100**	**100**	**NA**	**100**	**100**	**NA**	**100**
BAAQMD Threshold	**NA**	**NA**	**10**	**10**	**NA**	**15**	**10**
Phase 1 Site Prep	1.2	NA	0.2	2.3	0.0	0.1	0.1
Phase 2 Grading	1.4	NA	0.2	3.1	0.0	0.1	0.1
Phase 3 Trenching	0.0	NA	0.0	0.0	0.0	0.0	0.0
Year 1 Sub Total	2.6	NA	0.4	5.5	0.0	0.2	0.2
Phase 3 Trenching	0.0	NA	0.0	0.0	0.0	0.0	0.0
Phase 4 Paving	0.6	NA	0.1	0.5	0.0	0.0	0.0
Phase 5 Architectural Coating	0.0	NA	0.0	0.0	0.0	0.0	0.0
Year 2 Sub Total	0.6	NA	0.1	0.5	0.0	0.0	0.0

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
RSA: Runway Safety Area
Total emissions may not sum exactly due to rounding.
NA=Not applicable
Note: PM10 and PM2.5 values are for construction exhaust emissions only.
Source: CalEEMod, version 2016.3.2; Landrum & Brown Analysis, 2018.

The daily construction emissions for each phase of Alternative E construction are provided in **Table 5-5**. The maximum daily construction emission for the entire project is listed in bold.

Table 5-5
ALTERNATIVE E MAXIMUM DAILY CONSTRUCTION EMISSIONS

EMISSION SOURCES	MAXIMUM DAILY CONSTRUCTION EMISSIONS (Pounds per day)			
	ROG	NOx	PM_{10}	$PM_{2.5}$
BAAQMD Threshold	**54**	**54**	**82**	**54**
Phase 1 Site Prep	4.2	42.8	2.2	2.0
Phase 2 Grading	2.9	40.1	1.3	1.2
Phase 3 Trenching	0.4	4.2	0.3	0.3
Phase 4 Paving	1.3	10.9	0.6	0.5
Phase 5 Architectural Coating	2.7	1.5	0.1	0.1

ROG: Reactive Organic Gases
NOx: Nitrogen Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
RSA: Runway Safety Area
Note: The daily maximum emissions for PM10 and PM2.5 are for construction exhaust emissions only.
Source: CalEEMod, version 2016.3.2; Landrum & Brown Analysis, 2018.

The construction emissions inventory for Alternative D is provided in **Table 5-6***.*

Table 5-6
ALTERNATIVE E CONSTRUCTION EMISSIONS INVENTORY

EMISSION SOURCES	CONSTRUCTION EMISSIONS (tons per year)						
	CO	**VOC**	**ROG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Federal Threshold	**100**	**100**	**NA**	**100**	**100**	**NA**	**100**
BAAQMD Threshold	**NA**	**NA**	**10**	**10**	**NA**	**15**	**10**
Phase 1 Site Prep	1.2	NA	0.2	2.3	0.0	0.1	0.1
Phase 2 Grading	1.3	NA	0.2	2.6	0.0	0.1	0.1
Phase 3 Trenching	0.0	NA	0.0	0.0	0.0	0.0	0.0
Year 1 Sub Total	2.5	NA	0.4	5.0	0.0	0.2	0.2
Phase 3 Trenching	0.0	NA	0.0	0.0	0.0	0.0	0.0
Phase 4 Paving	0.6	NA	0.1	0.5	0.0	0.0	0.0
Phase 5 Architectural Coating	0.0	NA	0.0	0.0	0.0	0.0	0.0
Year 2 Sub Total	0.6	NA	0.1	0.5	0.0	0.0	0.0

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
RSA: Runway Safety Area
Total emissions may not sum exactly due to rounding.
NA=Not applicable
Note: PM10 and PM2.5 values are for construction exhaust emissions only.
Source: CalEEMod, version 2016.3.2; Landrum & Brown Analysis, 2018.

5.3 MITIGATION

While the construction activity due to Alternatives B, D, or E would not exceed CAA or BAAQMD thresholds for significance, fugitive dust would be generated during project construction which has the potential to affect open space areas and adjacent and nearby properties. Construction Phase 1 – Site Preparation or Phase 2 – Grading could expose Naturally Occurring Asbestos (NOA) in the aggregate rock base material placed during prior construction or repair of Runway 13/31. As described in the mitigation measures below, any NOA detected during the project will be handled in accordance with local, state, and federal regulations.

5.3.1 BAAQMD Mitigation Measures

The BAAQMD recommends the use of the following basic construction mitigation measures whether or not construction related emissions exceed applicable thresholds of significance as well as mitigation measures regarding NOA, including:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
- All vehicle speeds on unpaved roads shall be limited to 15 mph.
- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible.
- Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
- Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.
- The existing aggregate material that will be disturbed to connect the existing runway to the runway extension will be tested for Naturally Occurring Asbestos prior to disturbing those areas for site preparation or grading.
- California Occupational Safety and Health Administration (Cal/OSHA) will be notified by the construction contractor a minimum of 24-hours prior to commencement of the grading, rock moving, or other disturbance of NOA activities.

- Caution signs meeting the specifications of OSHA Construction Safety Order, Section 1529(a)(7)(B)1, shall be posted at any location where airborne asbestos concentrations may be present.
- Exterior air intakes at the airport's offices will be turned off for the duration of the NOA processing, as approved by County's Mechanical Engineering staff.
- Wind socks will be mounted at each downwind locations where air monitoring will be performed to provide a visual indicator for the heavy equipment operators of the prevailing wind directions. Contractor will provide all necessary notifications to the Marin County airport management and FAA prior to installation of the wind socks.
- A weather station at the airport will be used to monitor prevailing wind direction and speed. The airport manager or project superintendent will notify the heavy equipment operators when wind speeds exceed 25 miles per hour consistently over a 5-minute period and work will cease. Work will not resume until wind speeds are consistently under 25 MPH continuously.
- Equipment operators will position themselves to take advantage of the prevailing winds, whenever possible, so as not to be positioned downwind of the dust generation work Supervisors will be in radio contact with the operators and will radio the various workers to adjust their positioning where activities are within the potential dust plume.
- The use of rock crushing, screening, and sorting equipment shall be prohibited for processing materials with more than 0.25% asbestos, as confirmed by California Air Resources Board Test Method 435 Determination of Asbestos Content in Serpentine Aggregate.
- Water truck operators will apply water in advance of all work that will disturb any ACM. Sufficient water shall be applied as part of the planned engineering controls, based on site observations and testing in compliance with the Asbestos Airborne Toxic Control Measure Plan (ATCM). The ATCM shall comply with Section 93105, Title 17, CCR. The ATCM shall be filed by the contractor with the Bay Area Air Quality Management District (BAAQMD) in a timely manner.
- If required, HEPA-filtered vacuums, stored near other safety equipment within the regulated area will be used for emergency cleanups and local decontamination.
- DOP testing of HEPA-filtered vacuums will be performed at the start of the NOA handling operations to assure proper operation and efficiency.
- No use of compressed air for cleaning will occur. Only wet cleaning and HEPA-filtered vacuuming will be done.
- A decontamination facility and wash station will be constructed in the area where ACM is being handled.
- Any construction vehicles leaving the work area shall be cleaned or decontaminated in compliance with BAAQMD and ATCM requirements. The exact method of compliance is at the discretion of the contractor, but shall be listed in their work plan.
- A Regulated Area shall be established at the perimeter of the Asbestos Containing Material work zone that will keep all other workers outside of the area of expected exposure. The Regulated Area will be marked with signage, barricades, warning tape to comply with 8 CCR Section 1529(b).

5.3.2 Federal Mitigation Measures

In addition to the BAAQMD mitigation measures, Marin County shall ensure that all possible measures would be taken to reduce fugitive emissions during construction by requiring the construction contractor to submit a proposed method of erosion and dust control, and disposal of waste materials pursuant to guidelines included in FAA, *Standards for Specifying Construction of Airports*[37] including:

- Exposing the minimum area of erodible earth.
- Applying temporary mulch with or without seeding.
- Using water sprinkler trucks.
- Using covered haul trucks.
- Using dust palliatives or penetration asphalt on haul roads.
- Using plastic sheet coverings.

[37] FAA, *Standard Specifications for Construction of Airports*, Item C-102, *Temporary Air and Water Pollution, Soil Erosion, and Siltation Control*, AC 150/5370-10H (December 21, 2018).

6. MODELING RESULTS

6.1 2024 ALTERNATIVE A: NO ACTION

Alternative A is the No Action alternative for 2024. Airport physical conditions such as the airfield configuration are assumed to be unchanged and therefore consistent with the 2018 Existing Conditions. However, with or without the development of a runway alternative, air traffic is projected to increase each year and by 2024 the number of annual aircraft operations will be higher as compared to 2018 Existing Conditions. As such, the higher number of annual aircraft operations in 2024 would increase emissions due to aircraft as compared to 2018 Existing Conditions.

The inventory for this alternative provided in **Table 6.1-1** shows the greatest overall emission contribution comes from aircraft operations.

Table 6.1-1
ALTERNATIVE A (2024) EMISSIONS INVENTORY

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	273.69	3.58	4.17	0.94	0.33	0.23	0.23	1.10
GSE	0.29	0.13	0.13	0.18	0.01	0.01	0.01	NA
GAVs	0.93	0.13	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	0.13	1.22	0.00	0.05	0.05	NA
TOTAL	***275.44***	***3.93***	***4.57***	***2.52***	***0.34***	***0.29***	***0.29***	***1.10***

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
GSE: Ground Service Equipment
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The results of the GHG emission inventory for this alternative are provided in **Table 6.1-2**.

Table 6.1-2
ALTERNATIVE A (2024) GHG EMISSIONS INVENTORY

Metrics	Annual EMISSIONS (short tons per year)		
	CO_2	CH_4	N_2O
Aircraft	892.53	0.00	0.00
GAV	44.61	0.00	-
Total	***937.14***	***0.00***	***0.00***

GAV: Ground Access Vehicles
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

In order to determine CO_2 equivalent, all GHG emissions sources were summed and converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results are provided in **Table 6.1-3**.

Table 6.1-3
ALTERNATIVE A (2024) CO_2 EQUIVALENT

Metrics	Annual Metric Tons		
	CO_2	CH_4	N_2O
Aircraft	809.69	0.00	0.00
GAV	40.47	0.00	-
GWP_{100}	*1*	*25*	*298*
CO_{2e}	850.16	0.06	0.00
Total	850.21		

GAV: Ground Access Vehicles
GWP: Global Warming Potential
CO2e: Carbon Dioxide equivalent
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: IPCC Fourth Assessment Report; AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The HAP inventory for this alternative is provided in **Table 6.1-4.** This inventory is provided for disclosure purposes only and should not be relied on as an interpretation of health risks, should not be compared to other sources of HAPs in the region, or compared to HAP emissions reported for other airports.

Table 6.1-4
ALTERNATIVE A (2024) HAPS EMISSIONS INVENTORY

TYPES OF HAZARDOUS AIR POLLUTANTS	ANNUAL HAP EMISSIONS BY SOURCE (tons per year)				
	Aircraft	**GSE**	**GAVs**	**Stationary Sources**	**Total**
1,3-butadiene	0.070	N/A	0.000	N/A	**0.070**
2,2,4-trimethylpentane	0.021	N/A	0.003	N/A	**0.024**
2-methylnaphthalene	0.009	0.004	N/A	N/A	**0.012**
Acetaldehyde	0.177	N/A	0.001	N/A	**0.178**
Acetone	0.015	N/A	N/A	N/A	**0.015**
Acrolein	0.102	0.001	0.000	N/A	**0.102**
Benzaldehyde	0.020	0.000	N/A	N/A	**0.020**
Benzene	0.070	N/A	0.003	0.005	**0.078**
Chlorobenzene	N/A	N/A	N/A	N/A	**0.000**
Cyclohexane	N/A	0.000	N/A	N/A	**0.000**
Ethylbenzene	0.007	0.011	N/A	0.002	**0.020**
Formaldehyde	0.511	N/A	0.001	0.006	**0.519**
Isopropylbenzene (cumene)	0.000	N/A	N/A	0.000	**0.000**
M & P-xylene	0.012	N/A	N/A	0.008	**0.020**
Methyl alcohol	0.075	N/A	N/A	N/A	**0.075**
M-xylene	N/A	N/A	N/A	N/A	**0.000**
Naphthalene	0.022	0.000	N/A	0.000	**0.023**
N-heptane	0.003	N/A	N/A	0.001	**0.004**
N-hexane	N/A	0.000	N/A	N/A	**0.000**
O-xylene	0.007	N/A	N/A	0.003	**0.010**
Phenol (carbolic acid)	0.030	0.002	N/A	N/A	**0.032**
Propionaldehyde	0.030	N/A	0.000	N/A	**0.030**
Styrene	0.013	0.000	0.000	0.000	**0.013**
Toluene	0.027	0.000	0.013	0.010	**0.050**

GSE = Ground Support Equipment
N/A = Not Applicable
Xylene is assumed to be the sum of O-xylene, M-xylene, and M & P-xylene.
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

6.2 2024 ALTERNATIVE B: EXTEND RUNWAY TO THE NORTHWEST BY 1,100 FEET (SPONSOR'S PROPOSED PROJECT)

Alternative B is the Sponsor's Proposed Project and includes the 1,100 foot extension of Runway 13/31 to the northwest. With or without the implementation of this alternative the number of annual aircraft operations for Alternative B would be the same as for the 2024 Alternative A (No Action). The annual number of ground access vehicles in parking lots and on roadways would also be the same as for the 2024 Alternative A (No Action). However, emissions due to aircraft will change as compared to the 2024 Alternative A (No Action) because the extension of the runway will cause a change in taxi time. This alternative will result in an increase in average aircraft taxi time as compared to the 2024 Alternative A (No Action). Longer taxi times increase annual aircraft emissions.

The inventory for this alternative provided in **Table 6.2-1** shows the greatest overall emission contribution comes from aircraft operations.

Table 6.2-1
ALTERNATIVE B (2024) EMISSIONS INVENTORY

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	316.51	5.96	6.91	1.00	0.39	0.24	0.24	1.10
GSE	0.30	0.13	0.13	0.18	0.01	0.01	0.01	NA
GAVs	0.93	0.13	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	0.14	1.22	0.00	0.05	0.05	NA
TOTAL	***318.26***	***6.31***	***7.31***	***2.57***	***0.40***	***0.31***	***0.31***	***1.10***

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
GSE: Ground Service Equipment
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The results of the GHG emission inventory for this alternative are provided in **Table 6.2-2**.

Table 6.2-2
ALTERNATIVE B (2024) GHG EMISSIONS INVENTORY

Metrics	Annual Emissions (short tons per year)		
	CO_2	CH_4	N_2O
Aircraft	1,038.91	0.00	0.00
GAV	44.61	0.00	-
Total	1,083.52	0.00	0.00

GAV: Ground Access Vehicles
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

In order to determine CO_2 equivalent all emissions sources were summed. Totals were converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results are provided in **Table 6.2-3**.

Table 6.2-3
ALTERNATIVE B (2024) CO_2 EQUIVALENT

Metrics	Annual Metric Tons		
	CO_2	CH_4	N_2O
Aircraft	942.48	0.00	0.00
GAV	40.5	0.0	-
GWP_{100}	1	25	298
CO_{2e}	982.95	0.06	0.00
Total	**983.01**		

GAV: Ground Access Vehicles
GWP: Global Warming Potential
CO2e: Carbon Dioxide equivalent
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: IPCC Fourth Assessment Report; AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The HAP inventory for this alternative is provided in **Table 6.2-4.** This inventory is provided for disclosure purposes only and should not be relied on as an interpretation of health risks, should not be compared to other sources of HAPs in the region, or compared to HAP emissions reported for other airports.

Table 6.2-4
ALTERNATIVE B (2024) HAPS EMISSIONS INVENTORY

TYPES OF HAZARDOUS AIR POLLUTANTS	ANNUAL HAP EMISSIONS BY SOURCE (tons per year)				
	Aircraft	**Motor Vehicles**	**GSE**	**Stationary Sources**	**Total**
1,3-butadiene	0.116	NA	0.000	NA	**0.117**
2,2,4-trimethylpentane	0.035	NA	0.003	NA	**0.038**
2-methylnaphthalene	0.014	0.004	NA	NA	**0.018**
Acetaldehyde	0.295	NA	0.001	NA	**0.296**
Acetone	0.025	NA	NA	NA	**0.025**
Acrolein	0.169	0.001	0.000	NA	**0.170**
Benzaldehyde	0.032	0.000	NA	NA	**0.033**
Benzene	0.116	NA	0.003	0.005	**0.124**
Chlorobenzene	NA	NA	NA	NA	**0.000**
Cyclohexane	NA	0.000	NA	NA	**0.000**
Ethylbenzene	0.012	0.011	NA	0.002	**0.025**
Formaldehyde	0.849	NA	0.001	0.006	**0.857**
Isopropylbenzene (cumene)	0.000	NA	NA	0.000	**0.000**
M & P-xylene	0.019	NA	NA	0.009	**0.028**
Methyl alcohol	0.125	NA	NA	NA	**0.125**
M-xylene	NA	NA	NA	NA	**0.000**
Naphthalene	0.037	0.000	NA	0.000	**0.038**
N-heptane	0.004	NA	NA	0.001	**0.005**
N-hexane	NA	0.000	NA	NA	**0.000**
O-xylene	0.011	NA	NA	0.004	**0.015**
Phenol (carbolic acid)	0.050	0.002	NA	NA	**0.052**
Propionaldehyde	0.050	NA	0.000	NA	**0.050**
Styrene	0.021	0.000	0.000	0.000	**0.022**
Toluene	0.044	0.000	0.013	0.010	**0.068**

GSE = Ground Support Equipment
N/A = Not Applicable
Xylene is assumed to be the sum of O-xylene, M-xylene, and M & P-xylene.
Total emissions may not sum exactly due to rounding.
Source:
AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

6.3 2024 ALTERNATIVE D: EXTEND RUNWAY TO THE SOUTHEAST BY 240 FEET AND TO THE NORTHWEST BY 860 FEET

Alternative D extends the runway to the southeast by 240 feet and to the northwest by 860 feet. Alternative D also requires extension of the corresponding taxiways, levee extension, realignment of the drainage, and reprogramming the navigational aids. The inventory for this alternative provided in **Table 6.3-1** shows the greatest overall emission contribution comes from aircraft operations.

Table 6.3-1
ALTERNATIVE D (2024) EMISSIONS INVENTORY

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	316.08	5.93	6.88	1.00	0.39	0.24	0.24	1.10
GSE	0.30	0.13	0.13	0.18	0.01	0.01	0.01	NA
GAVs	0.93	0.13	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	0.14	1.22	0.00	0.05	0.05	NA
TOTAL	**317.83**	**6.29**	**7.28**	**2.57**	**0.40**	**0.31**	**0.31**	***1.10***

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
GSE: Ground Service Equipment
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The results of the GHG emission inventory for this alternative are provided in **Table 6.3-2**.

Table 6.3-2
ALTERNATIVE D (2024) GHG EMISSIONS INVENTORY

Metrics	Annual Emissions (short tons per year)		
	CO_2	**CH_4**	**N_2O**
Aircraft	1,037.42	0.00	0.00
GAV	44.61	0.00	0.00
Total	1,082.03	0.00	0.00

GAV: Ground Access Vehicles
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

In order to determine CO_2 equivalent all emissions sources were summed. Totals were converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results are provided in **Table 6.3-3**.

Table 6.3-3
ALTERNATIVE D (2024) CO_2 EQUIVALENT

Metrics	Annual Metric Tons		
	CO_2	**CH_4**	**N_2O**
Aircraft	941.14	0.00	0.00
GAV	40.5	0.0	-
GWP_{100}	1	25	298
CO_{2e}	981.60	0.06	0.00
Total	981.66		

GAV: Ground Access Vehicles
GWP: Global Warming Potential
CO2e: Carbon Dioxide equivalent
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: IPCC Fourth Assessment Report; AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The HAP inventory for this alternative is provided in **Table 6.3-4.** This inventory is provided for disclosure purposes only and should not be relied on as an interpretation of health risks, should not be compared to other sources of HAPs in the region, or compared to HAP emissions reported for other airports.

Table 6.3-4
ALTERNATIVE D (2024) HAPS EMISSIONS INVENTORY

TYPES OF HAZARDOUS AIR POLLUTANTS	ANNUAL HAP EMISSIONS BY SOURCE (tons per year)				
	Aircraft	Motor Vehicles	GSE	Stationary Sources	Total
1,3-butadiene	0.116	NA	0.000	NA	**0.116**
2,2,4-trimethylpentane	0.035	NA	0.003	NA	**0.038**
2-methylnaphthalene	0.014	0.004	NA	NA	**0.018**
Acetaldehyde	0.294	NA	0.001	NA	**0.295**
Acetone	0.025	N/A	N/A	N/A	**0.025**
Acrolein	0.168	0.001	0.000	N/A	**0.169**
Benzaldehyde	0.032	0.000	N/A	N/A	**0.032**
Benzene	0.116	N/A	0.003	0.005	**0.124**
Chlorobenzene	N/A	N/A	N/A	N/A	**0.000**
Cyclohexane	N/A	0.000	N/A	N/A	**0.000**
Ethylbenzene	0.012	0.011	N/A	0.002	**0.025**
Formaldehyde	0.846	N/A	0.001	0.006	**0.853**
Isopropylbenzene (cumene)	0.000	N/A	N/A	0.000	**0.000**
M & P-xylene	0.019	N/A	N/A	0.009	**0.028**
Methyl alcohol	0.124	N/A	N/A	N/A	**0.124**
M-xylene	N/A	N/A	N/A	NA	**0.000**
Naphthalene	0.037	0.000	NA	0.000	**0.038**
N-heptane	0.004	N/A	N/A	0.001	**0.005**
N-hexane	N/A	0.000	N/A	N/A	**0.000**
O-xylene	0.011	N/A	N/A	0.004	**0.015**
Phenol (carbolic acid)	0.050	0.002	N/A	N/A	**0.052**
Propionaldehyde	0.050	N/A	0.000	N/A	**0.050**
Styrene	0.021	0.000	0.000	0.000	**0.022**
Toluene	0.044	0.000	0.013	0.010	**0.068**

N/A = Not Applicable
GSE = Ground Support Equipment
Xylene is assumed to be the sum of O-xylene, M-xylene, and M & P-xylene.
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

6.4 2024 ALTERNATIVE E: EXTEND RUNWAY TO THE NORTHWEST BY 300 FEET

Alternative E includes the 300-foot extension of Runway 13/31 to the northwest. With or without the implementation of this alternative the number of annual aircraft operations for Alternative E would be the same as for the 2024 Alternative A (No Action). The annual number of ground access vehicles in parking lots and on roadways would also be the same as for the 2024 Alternative A (No Action). However, emissions due to aircraft will change as compared to the 2024 Alternative A (No Action) because the extension of the runway will cause a change in taxi time. This alternative will result in an increase in average aircraft taxi time as compared to the 2024 Alternative A (No Action). Longer taxi times increase annual aircraft emissions.

The inventory for this alternative provided in **Table 6.4-1** shows the greatest overall emission contribution comes from aircraft operations.

Table 6.4-1
ALTERNATIVE E (2024) EMISSIONS INVENTORY

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	311.51	5.69	6.60	0.99	0.38	0.24	0.24	1.10
GSE	0.30	0.13	0.13	0.18	0.01	0.01	0.01	N/A
GAVs	0.93	0.13	0.13	0.17	0.00	0.00	0.00	N/A
Stationary Sources	0.52	0.09	0.14	1.22	0.00	0.05	0.05	N/A
TOTAL	**313.26**	**6.04**	**7.00**	**2.56**	**0.39**	**0.30**	**0.30**	***1.10***

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
GSE: Ground Service Equipment
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The results of the GHG emission inventory for this alternative are provided in **Table 6.4-2**.

Table 6.4-2
ALTERNATIVE E (2024) GHG EMISSIONS INVENTORY

Metrics	Annual Emissions (short tons per year)		
	CO_2	CH_4	N_2O
Aircraft	1,019.43	0.00	0.00
GAV	44.61	0.00	-
Total	1,064.03	0.00	0.00

GAV: Ground Access Vehicles
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

In order to determine CO_2 equivalent all emissions sources were summed. Totals were converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results are provided in **Table 6.4-3**.

Table 6.4-3
ALTERNATIVE E (2024) CO_2 EQUIVALENT

Metrics	Annual Metric Tons		
	CO_2	CH_4	N_2O
Aircraft	924.81	0.00	0.00
GAV	40.5	0.0	-
GWP_{100}	1	25	298
CO_{2e}	965.28	0.06	0.00
Total	965.33		

GAV: Ground Access Vehicles
GWP: Global Warming Potential
CO2e: Carbon Dioxide equivalent
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: IPCC Fourth Assessment Report; AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The HAP inventory for this alternative is provided in **Table 6.4-4.** This inventory is provided for disclosure purposes only and should not be relied on as an interpretation of health risks, should not be compared to other sources of HAPs in the region, or compared to HAP emissions reported for other airports.

Table 6.4-4
ALTERNATIVE E (2024) HAPS EMISSIONS INVENTORY

TYPES OF HAZARDOUS AIR POLLUTANTS	ANNUAL HAP EMISSIONS BY SOURCE (tons per year)				
	Aircraft	**Motor Vehicles**	**GSE**	**Stationary Sources**	**Total**
1,3-butadiene	0.111	NA	0.000	NA	**0.111**
2,2,4-trimethylpentane	0.034	NA	0.003	NA	**0.037**
2-methylnaphthalene	0.014	0.004	NA	NA	**0.017**
Acetaldehyde	0.281	NA	0.001	NA	**0.282**
Acetone	0.024	NA	NA	NA	**0.024**
Acrolein	0.161	0.001	0.000	NA	**0.162**
Benzaldehyde	0.031	0.000	NA	NA	**0.031**
Benzene	0.111	NA	0.003	0.005	**0.119**
Chlorobenzene	NA	NA	NA	NA	**0.000**
Cyclohexane	NA	0.000	NA	NA	**0.000**
Ethylbenzene	0.011	0.011	NA	0.002	**0.025**
Formaldehyde	0.810	NA	0.001	0.006	**0.817**
Isopropylbenzene (cumene)	0.000	NA	NA	0.000	**0.000**
M & P-xylene	0.019	NA	NA	0.009	**0.027**
Methyl alcohol	0.119	NA	NA	NA	**0.119**
M-xylene	NA	NA	NA	NA	**0.000**
Naphthalene	0.036	0.000	NA	0.000	**0.036**
N-heptane	0.004	NA	NA	0.001	**0.005**
N-hexane	NA	0.000	NA	NA	**0.000**
O-xylene	0.011	NA	NA	0.004	**0.015**
Phenol (carbolic acid)	0.048	0.002	NA	NA	**0.050**
Propionaldehyde	0.048	NA	0.000	NA	**0.048**
Styrene	0.020	0.000	0.000	0.000	**0.021**
Toluene	0.042	0.000	0.013	0.010	**0.066**

GSE = Ground Support Equipment
N/A = Not Applicable
Xylene is assumed to be the sum of O-xylene, M-xylene, and M & P-xylene.
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

6.5 2029 ALTERNATIVE A: NO ACTION

Alternative A is the No Action alternative for 2029. Airport physical conditions such as the airfield configuration are assumed to be unchanged and therefore consistent with the 2018 Existing Conditions. However, with or without the development of a runway alternative, air traffic is projected to increase each year and by 2029 the number of annual aircraft operations will be higher as compared to 2018 Existing Conditions. As such, the higher number of annual aircraft operations in 2029 would increase emissions due to aircraft as compared to 2018 Existing Conditions.

The inventory for this alternative provided in **Table 6.5-1** shows the greatest overall emission contribution comes from aircraft operations.

Table 6.5-1
ALTERNATIVE A (2029) EMISSIONS INVENTORY

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	281.00	3.66	4.26	0.97	0.34	0.23	0.23	1.10
GSE	0.31	0.13	0.13	0.17	0.01	0.01	0.01	NA
GAVs	0.95	0.13	0.14	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	0.13	1.22	0.00	0.05	0.05	NA
TOTAL	**282.78**	**4.01**	**4.66**	**2.54**	**0.35**	**0.29**	**0.29**	***1.10***

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
GSE: Ground Service Equipment
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The results of the GHG emission inventory for this alternative are provided in **Table 6.5-2**.

Table 6.5-2
ALTERNATIVE A (2029) GHG EMISSIONS INVENTORY

Metrics	Annual Emissions (short tons per year)		
	CO_2	CH_4	N_2O
Aircraft	919.58	0.00	0.00
GAV	45.43	0.00	0.00
Total	965.01	0.00	0.00

GAV: Ground Access Vehicles
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

In order to determine CO_2 equivalent all emissions sources were summed. Totals were converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results are provided in **Table 6.5-3**.

Table 6.5-3
ALTERNATIVE A (2029) CO_2 EQUIVALENT

Metrics	Annual Metric Tons		
	CO_2	CH_4	N_2O
Aircraft	834.23	0.00	0.00
GAV	41.2	0.0	-
GWP_{100}	1	25	298
CO_{2e}	875.44	0.06	0.00
Total	875.50		

GAV: Ground Access Vehicles
GWP: Global Warming Potential
CO2e: Carbon Dioxide equivalent
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: IPCC Fourth Assessment Report; AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The HAP inventory for this alternative is provided in **Table 6.5-4.** This inventory is provided for disclosure purposes only and should not be relied on as an interpretation of health risks, should not be compared to other sources of HAPs in the region, or compared to HAP emissions reported for other airports.

Table 6.5-4
ALTERNATIVE A (2029) HAPS EMISSIONS INVENTORY

TYPES OF HAZARDOUS AIR POLLUTANTS	ANNUAL HAP EMISSIONS BY SOURCE (tons per year)				
	Aircraft	**Motor Vehicles**	**GSE**	**Stationary Sources**	**Total**
1,3-butadiene	0.072	N/A	0.000	N/A	**0.072**
2,2,4-trimethylpentane	0.022	N/A	0.003	N/A	**0.025**
2-methylnaphthalene	0.009	0.004	N/A	N/A	**0.012**
Acetaldehyde	0.181	N/A	0.001	N/A	**0.182**
Acetone	0.016	N/A	N/A	N/A	**0.016**
Acrolein	0.104	0.001	0.000	N/A	**0.105**
Benzaldehyde	0.020	0.000	N/A	N/A	**0.020**
Benzene	0.071	N/A	0.003	0.005	**0.079**
Chlorobenzene	N/A	N/A	N/A	N/A	**0.000**
Cyclohexane	N/A	0.000	N/A	N/A	**0.000**
Ethylbenzene	0.007	0.011	N/A	0.002	**0.021**
Formaldehyde	0.522	N/A	0.001	0.006	**0.530**
Isopropylbenzene (cumene)	0.000	N/A	N/A	0.000	**0.000**
M & P-xylene	0.012	N/A	N/A	0.008	**0.020**
Methyl alcohol	0.077	N/A	N/A	N/A	**0.077**
M-xylene	N/A	N/A	N/A	N/A	**0.000**
Naphthalene	0.023	0.000	N/A	0.000	**0.023**
N-heptane	0.003	N/A	N/A	0.001	**0.004**
N-hexane	N/A	0.000	N/A	N/A	**0.000**
O-xylene	0.007	N/A	N/A	0.003	**0.011**
Phenol (carbolic acid)	0.031	0.002	N/A	N/A	**0.033**
Propionaldehyde	0.031	N/A	0.000	N/A	**0.031**
Styrene	0.013	0.000	0.000	0.000	**0.013**
Toluene	0.027	0.000	0.013	0.010	**0.050**

GSE = Ground Support Equipment
N/A = Not Applicable
Xylene is assumed to be the sum of O-xylene, M-xylene, and M & P-xylene.
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

6.6 2029 ALTERNATIVE B: EXTEND RUNWAY TO NORTHWEST BY 1,100 FEET (SPONSOR'S PROPOSED PROJECT)

Alternative B is the Sponsor's Proposed Project and includes the 1,100-foot extension of Runway 13/31 to the northwest. With or without the implementation of this alternative the number of annual aircraft operations for Alternative B would be the same as for the 2029 Alternative A (No Action). The annual number of ground access vehicles in parking lots and on roadways would also be the same as for the 2029 Alternative A (No Action). However, emissions due to aircraft will change as compared to the 2029 Alternative A (No Action) because the extension of the runway will cause a change in taxi time. This alternative will result in an increase in average aircraft taxi time as compared to the 2029 Alternative A (No Action). Longer taxi times increase annual aircraft emissions.

The inventory for this alternative provided in **Table 6.6-1** shows the greatest overall emission contribution comes from aircraft operations.

Table 6.6-1
ALTERNATIVE B (2029) EMISSIONS INVENTORY

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	324.99	6.09	7.06	1.03	0.40	0.25	0.25	1.10
GSE	0.31	0.13	0.13	0.17	0.01	0.01	0.01	NA
GAVs	0.95	0.13	0.14	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	0.14	1.22	0.00	0.05	0.05	0.52
TOTAL	**326.77**	**6.45**	**7.47**	**2.60**	**0.41**	**0.32**	**0.32**	**326.77**

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
GSE: Ground Service Equipment
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The results of the GHG emission inventory for this alternative are provided in **Table 6.6-2**.

Table 6.6-2
ALTERNATIVE B (2029) GHG EMISSIONS INVENTORY

Metrics	Annual Emissions (short tons per year)		
	CO_2	CH_4	N_2O
Aircraft	1,070.72	0.00	0.00
GAV	45.43	0.00	0.00
Total	1,116.15	0.00	0.00

GAV: Ground Access Vehicles
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

In order to determine CO_2 equivalent all emissions sources were summed. Totals were converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results are provided in **Table 6.6-3**.

Table 6.6-3
ALTERNATIVE B (2029) CO_2 EQUIVALENT

Metrics	Annual Metric Tons		
	CO_2	CH_4	N_2O
Aircraft	971.34	0.00	0.00
GAV	41.2	0.0	-
GWP_{100}	1	25	298
CO_{2e}	1,012.55	0.06	0.00
Total	1,012.61		

GAV: Ground Access Vehicles
GWP: Global Warming Potential
CO2e: Carbon Dioxide equivalent
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: IPCC Fourth Assessment Report; AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The HAP inventory for this alternative is provided in **Table 6.6-4**. This inventory is provided for disclosure purposes only and should not be relied on as an interpretation of health risks, should not be compared to other sources of HAPs in the region, or compared to HAP emissions reported for other airports.

Table 6.6-4
ALTERNATIVE B (2029) HAPS EMISSIONS INVENTORY

TYPES OF HAZARDOUS AIR POLLUTANTS	ANNUAL HAP EMISSIONS BY SOURCE (tons per year)				
	Aircraft	**GSE**	**GAVs**	**Stationary Sources**	**Total**
1,3-butadiene	0.119	NA	0.000	NA	**0.120**
2,2,4-trimethylpentane	0.036	NA	0.003	NA	**0.039**
2-methylnaphthalene	0.015	0.004	NA	NA	**0.018**
Acetaldehyde	0.302	NA	0.001	NA	**0.303**
Acetone	0.026	NA	NA	NA	**0.026**
Acrolein	0.173	0.001	0.000	NA	**0.174**
Benzaldehyde	0.033	0.000	NA	NA	**0.033**
Benzene	0.119	NA	0.003	0.005	**0.127**
Chlorobenzene	NA	NA	NA	NA	**0.000**
Cyclohexane	NA	0.000	NA	NA	**0.000**
Ethylbenzene	0.012	0.011	NA	0.002	**0.026**
Formaldehyde	0.870	NA	0.001	0.006	**0.877**
Isopropylbenzene (cumene)	0.000	NA	NA	0.000	**0.000**
M & P-xylene	0.020	NA	NA	0.009	**0.029**
Methyl alcohol	0.128	NA	NA	NA	**0.128**
M-xylene	NA	NA	NA	NA	**0.000**
Naphthalene	0.038	0.000	NA	0.000	**0.039**
N-heptane	0.005	NA	NA	0.001	**0.006**
N-hexane	NA	0.000	NA	NA	**0.000**
O-xylene	0.012	NA	NA	0.004	**0.015**
Phenol (carbolic acid)	0.051	0.002	NA	NA	**0.054**
Propionaldehyde	0.051	NA	0.000	NA	**0.051**
Styrene	0.022	0.000	0.000	0.000	**0.022**
Toluene	0.045	0.000	0.013	0.010	**0.069**

GSE = Ground Support Equipment
N/A = Not Applicable
Xylene is assumed to be the sum of O-xylene, M-xylene, and M & P-xylene.
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

6.7 2029 ALTERNATIVE D: EXTEND RUNWAY TO THE SOUTHEAST BY 240 FEET AND TO THE NORTHWEST BY 860 FEET

Alternative D extends the runway to the southeast by 240 feet and to the northwest by 860 feet. Alternative D also requires extension of the corresponding taxiways, levee extension, realignment of the drainage, and reprogramming the navigational aids. The inventory for this alternative provided in **Table 6.7-1** shows the greatest overall emission contribution comes from aircraft operations.

Table 6.7-1
ALTERNATIVE D (2029) EMISSIONS INVENTORY

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	324.54	6.07	7.03	1.03	0.40	0.25	0.25	1.10
GSE	0.31	0.13	0.13	0.17	0.01	0.01	0.01	NA
GAVs	0.95	0.13	0.14	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	0.14	1.22	0.00	0.05	0.05	NA
TOTAL	**326.32**	**6.43**	**7.44**	**2.60**	**0.41**	**0.32**	**0.32**	***1.10***

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
GSE: Ground Service Equipment
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The results of the GHG emission inventory for this alternative are provided in **Table 6.7-2**.

Table 6.7-2
ALTERNATIVE D (2029) GHG EMISSIONS INVENTORY

Metrics	Annual Emissions (short tons per year)		
	CO_2	**CH_4**	**N_2O**
Aircraft	1,069.18	0.00	0.00
GAV	45.43	0.00	-
Total	1,114.61	0.00	0.00

GAV: Ground Access Vehicles
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

In order to determine CO_2 equivalent all emissions sources were summed. Totals were converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results are provided in **Table 6.7-3**.

Table 6.7-3
ALTERNATIVE D (2029) CO_2 EQUIVALENT

Metrics	Annual Metric Tons		
	CO_2	**CH_4**	**N_2O**
Aircraft	969.95	0.00	0.00
GAV	41.21	0.00	0.00
GWP_{100}	1	25	298
CO_{2e}	1,011.16	0.06	0.00
Total	1,011.22		

GAV: Ground Access Vehicles
GWP: Global Warming Potential
CO2e: Carbon Dioxide equivalent
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: IPCC Fourth Assessment Report and L&B Analysis, 2009

The HAP inventory for this alternative is provided in **Table 6.7-4.** This inventory is provided for disclosure purposes only and should not be relied on as an interpretation of health risks, should not be compared to other sources of HAPs in the region, or compared to HAP emissions reported for other airports.

Table 6.7-4
ALTERNATIVE D (2029) HAPS EMISSIONS INVENTORY

TYPES OF HAZARDOUS AIR POLLUTANTS	ANNUAL HAP EMISSIONS BY SOURCE (tons per year)				
	Aircraft	**GSE**	**GAVs**	**Stationary Sources**	**Total**
1,3-butadiene	0.119	NA	0.000	NA	**0.119**
2,2,4-trimethylpentane	0.036	NA	0.003	NA	**0.039**
2-methylnaphthalene	0.014	0.004	NA	NA	**0.018**
Acetaldehyde	0.300	NA	0.001	NA	**0.301**
Acetone	0.026	NA	NA	NA	**0.026**
Acrolein	0.172	0.001	0.000	NA	**0.173**
Benzaldehyde	0.033	0.000	NA	NA	**0.033**
Benzene	0.118	NA	0.003	0.005	**0.126**
Chlorobenzene	NA	NA	NA	NA	**0.000**
Cyclohexane	NA	0.000	NA	NA	**0.000**
Ethylbenzene	0.012	0.011	NA	0.002	**0.026**
Formaldehyde	0.865	NA	0.001	0.006	**0.872**
Isopropylbenzene (cumene)	0.000	NA	NA	0.000	**0.000**
M & P-xylene	0.020	NA	NA	0.009	**0.029**
Methyl alcohol	0.127	NA	NA	NA	**0.127**
M-xylene	NA	NA	NA	NA	**0.000**
Naphthalene	0.038	0.000	NA	0.000	**0.039**
N-heptane	0.004	NA	NA	0.001	**0.006**
N-hexane	NA	0.000	NA	NA	**0.000**
O-xylene	0.012	NA	NA	0.004	**0.015**
Phenol (carbolic acid)	0.051	0.002	NA	NA	**0.053**
Propionaldehyde	0.051	NA	0.000	NA	**0.051**
Styrene	0.022	0.000	0.000	0.000	**0.022**
Toluene	0.045	0.000	0.013	0.010	**0.069**

N/A = Not Applicable
GSE = Ground Support Equipment
Xylene is assumed to be the sum of O-xylene, M-xylene, and M & P-xylene.
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

6.8 2029 ALTERNATIVE E: EXTEND RUNWAY TO THE NORTHWEST BY 300 FEET

Alternative E includes the 300-foot extension of Runway 13/31 to the northwest. With or without the implementation of this alternative the number of annual aircraft operations for Alternative E would be the same as for the 2029 Alternative A (No Action). The annual number of ground access vehicles in parking lots and on roadways would also be the same as for the 2029 Alternative A (No Action). However, emissions due to aircraft will change as compared to the 2029 Alternative A (No Action) because the extension of the runway will cause a change in taxi time. This alternative will result in an increase in average aircraft taxi time as compared to the 2029 Alternative A (No Action). Longer taxi times increase annual aircraft emissions.

The inventory for this alternative provided in **Table 6.8-1** shows the greatest overall emission contribution comes from aircraft operations.

Table 6.8-1
ALTERNATIVE E (2029) EMISSIONS INVENTORY

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	319.84	5.82	6.75	1.02	0.39	0.25	0.25	1.10
GSE	0.31	0.13	0.13	0.17	0.01	0.01	0.01	NA
GAVs	0.95	0.13	0.14	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	0.14	1.22	0.00	0.05	0.05	NA
TOTAL	**321.62**	**6.17**	**7.15**	**2.59**	**0.40**	**0.31**	**0.31**	***1.10***

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
GSE: Ground Service Equipment
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The results of the GHG emission inventory for this alternative are provided in **Table 6.8-2**.

Table 6.8-2
ALTERNATIVE E (2029) GHG EMISSIONS INVENTORY

Metrics	Annual Emissions (short tons per year)		
	CO_2	CH_4	N_2O
Aircraft	1,050.67	0.00	0.00
GAV	45.43	0.00	0.00
Total	1,096.10	0.00	0.00

GAV: Ground Access Vehicles
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

In order to determine CO_2 equivalent all emissions sources were summed. Totals were converted from short to metric tons (1 short ton = 0.907184 metric tons) and then multiplied by the Global Warming Potential provided in the IPCC Fourth Assessment Report. The results are provided in **Table 6.8-3**.

Table 6.8-3
ALTERNATIVE E (2029) CO_2 EQUIVALENT

Metrics	Annual Metric Tons		
	CO_2	CH_4	N_2O
Aircraft	953.16	0.00	0.00
GAV	41.21	0.00	0.00
GWP_{100}	1	25	298
CO_{2e}	994.37	0.06	0.00
Total	994.43		

GAV: Ground Access Vehicles
GWP: Global Warming Potential
CO2e: Carbon Dioxide equivalent
CO2: Carbon Dioxide
CH4: Methane
N20: Nitrogen Dioxide (nitrous oxide)
Total emissions may not sum exactly due to rounding.
Source: IPCC Fourth Assessment Report; AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The HAP inventory for this alternative is provided in **Table 6.8-4.** This inventory is provided for disclosure purposes only and should not be relied on as an interpretation of health risks, should not be compared to other sources of HAPs in the region, or compared to HAP emissions reported for other airports.

Table 6.8-4
ALTERNATIVE E (2029) HAPS EMISSIONS INVENTORY

TYPES OF HAZARDOUS AIR POLLUTANTS	ANNUAL HAP EMISSIONS BY SOURCE (tons per year)				
	Aircraft	**GSE**	**GAVs**	**Stationary Sources**	**Total**
1,3-butadiene	0.114	NA	0.000	NA	**0.114**
2,2,4-trimethylpentane	0.034	NA	0.003	NA	**0.037**
2-methylnaphthalene	0.014	0.004	NA	NA	**0.018**
Acetaldehyde	0.288	NA	0.001	NA	**0.289**
Acetone	0.025	NA	NA	NA	**0.025**
Acrolein	0.165	0.001	0.000	NA	**0.166**
Benzaldehyde	0.032	0.000	NA	NA	**0.032**
Benzene	0.113	NA	0.003	0.005	**0.121**
Chlorobenzene	NA	NA	NA	NA	**0.000**
Cyclohexane	NA	0.000	NA	NA	**0.000**
Ethylbenzene	0.012	0.011	NA	0.002	**0.025**
Formaldehyde	0.829	NA	0.001	0.006	**0.837**
Isopropylbenzene (cumene)	0.000	NA	NA	0.000	**0.000**
M & P-xylene	0.019	NA	NA	0.009	**0.028**
Methyl alcohol	0.122	NA	NA	NA	**0.122**
M-xylene	NA	NA	NA	NA	**0.000**
Naphthalene	0.036	0.000	NA	0.000	**0.037**
N-heptane	0.004	NA	NA	0.001	**0.005**
N-hexane	NA	0.000	NA	NA	**0.000**
O-xylene	0.011	NA	NA	0.004	**0.015**
Phenol (carbolic acid)	0.049	0.002	NA	NA	**0.051**
Propionaldehyde	0.049	NA	0.000	NA	**0.049**
Styrene	0.021	0.000	0.000	0.000	**0.021**
Toluene	0.043	0.000	0.013	0.010	**0.067**

GSE = Ground Support Equipment
N/A = Not Applicable
Xylene is assumed to be the sum of O-xylene, M-xylene, and M & P-xylene.
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

7. DISCUSSION OF DETERMINATIONS

7.1 TOTAL EMISSIONS

The results of the computer modeling to estimate air emissions resulting from the construction and operation of the Airport under the various alternatives are provided in **Table 7-1**.

Table 7-1
TOTAL ANNUAL EMISSIONS

ALTERNATIVES	TOTAL ANNUAL EMISSIONS FROM ALL AIRPORT-RELATED SOURCES (in tons per year)							
	CO	VOC	TOG	NO_x	SO_x	PM_{10}	$PM_{2.5}$	Pb
2018								
Existing Conditions	264.68	3.83	4.45	2.65	0.33	0.28	0.28	1.10
Year 1 Construction								
Alternative B	2.54	NA	0.43	5.27	0.01	0.21	0.19	NA
Alternative D	2.59	NA	0.43	5.49	0.01	0.21	0.19	NA
Alternative E	2.48	NA	0.42	4.96	0.01	0.21	0.19	NA
Year 2 Construction								
Alternative B	0.61	NA	0.10	0.53	0.00	0.03	0.03	NA
Alternative D	0.61	NA	0.10	0.53	0.00	0.03	0.03	NA
Alternative E	0.61	NA	0.09	0.53	0.00	0.03	0.03	NA
2024								
Alternative A	275.44	3.93	4.57	2.52	0.34	0.29	0.29	1.10
Alternative B	318.26	6.31	7.31	2.57	0.40	0.31	0.31	1.10
Alternative D	317.83	6.29	7.28	2.57	0.40	0.31	0.31	1.10
Alternative E	313.26	6.04	7.00	2.56	0.39	0.30	0.30	1.10
2029								
Alternative A	282.78	4.01	4.66	2.54	0.35	0.29	0.29	1.10
Alternative B	326.77	6.45	7.47	2.60	0.41	0.32	0.32	1.10
Alternative D	326.32	6.43	7.44	2.60	0.41	0.32	0.32	1.10
Alternative E	321.62	6.17	7.15	2.59	0.40	0.31	0.31	1.10

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
NA: Not Available/Not Applicable
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

The results of the emission inventory prepared for each alternative were compared to the results of the existing conditions and to the baseline alternative (Alternative A) of the same future year to disclose the potential increase in emissions caused by each project alternative. Annual net emissions are provided in **Table 7-2** and **Table 7-3**.

Table 7-2
ANNUAL NET IMPACT OF CRITERIA AND PRECURSOR POLLUTANT EMISSIONS (ALTERNATIVES COMPARED TO 2018 EXISTING CONDITIONS)

ALTERNATIVES	IMPACT OF CRITERIA AND PRECURSOR POLLUTANT EMISSIONS (in tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Federal Threshold	**100**	**100**	**NA**	**100**	**100**	**NA**	**100**	**NA**
BAAQMD Threshold	**NA**	**NA**	**10**	**10**	**NA**	**15**	**10**	**NA**
Year 1 Construction								
Alternative B	2.54	NA	0.43	5.27	0.01	0.21	0.19	NA
Alternative D	2.59	NA	0.43	5.49	0.01	0.21	0.19	NA
Alternative E	2.48	NA	0.42	4.96	0.01	0.21	0.19	NA
Year 2 Construction								
Alternative B	0.61	NA	0.10	0.53	0.00	0.03	0.03	NA
Alternative D	0.61	NA	0.10	0.53	0.00	0.03	0.03	NA
Alternative E	0.61	NA	0.09	0.53	0.00	0.03	0.03	NA
2024								
Alternative A	10.76	0.10	0.11	-0.13	0.01	0.01	0.01	0.0
Alternative B	53.58	2.48	2.86	-0.07	0.07	0.03	0.03	0.0
Alternative D	53.15	2.46	2.83	-0.07	0.07	0.03	0.03	0.0
Alternative E	48.58	2.22	2.55	-0.08	0.06	0.02	0.02	0.0
2029								
Alternative A	18.09	0.18	0.21	-0.10	0.02	0.01	0.01	0.0
Alternative B	62.08	2.62	3.01	-0.04	0.08	0.03	0.03	0.0
Alternative D	61.64	2.60	2.98	-0.04	0.08	0.03	0.03	0.0
Alternative E	56.94	2.34	2.70	-0.05	0.07	0.03	0.03	0.0

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
NA: Not Available/Not Applicable
Total emissions may not sum exactly due to rounding.
PM10 and PM2.5 values are for construction exhaust emissions only.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

NO_x emissions decrease in the future years as compared to the existing conditions because emissions factors applied in AEDT for ground access vehicles decrease in future years. CO emissions from the various alternatives increase as compared to the existing conditions due primarily to the increase in aircraft operations at DVO.

Table 7-3
ANNUAL NET IMPACT OF CRITERIA AND PRECURSOR POLLUTANT EMISSIONS (ALTERNATIVES COMPARED TO NO ACTION OF THE SAME YEAR)

ALTERNATIVES	IMPACT OF CRITERIA AND PRECURSOR POLLUTANT EMISSIONS (in tons per year)							
	CO	**VOC**	**TOG**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Federal Threshold	**100**	**100**	**NA**	**100**	**100**	**NA**	**100**	**NA**
BAAQMD Threshold	**NA**	**NA**	**10**	**10**	**NA**	**15**	**10**	**NA**
Year 1 Construction								
Alternative B	2.54	NA	0.43	5.27	0.01	0.21	0.19	NA
Alternative D	2.59	NA	0.43	5.49	0.01	0.21	0.19	NA
Alternative E	2.48	NA	0.42	4.96	0.01	0.21	0.19	NA
Year 2 Construction								
Alternative B	0.61	NA	0.10	0.53	0.00	0.03	0.03	NA
Alternative D	0.61	NA	0.10	0.53	0.00	0.03	0.03	NA
Alternative E	0.61	NA	0.09	0.53	0.00	0.03	0.03	NA
2024								
Alternative B	42.82	2.38	2.74	0.06	0.05	0.02	0.02	0.00
Alternative D	42.39	2.36	2.71	0.06	0.05	0.02	0.02	0.00
Alternative E	37.82	2.12	2.43	0.04	0.05	0.01	0.01	0.00
2029								
Alternative B	43.99	2.44	2.80	0.06	0.06	0.02	0.02	0.00
Alternative D	43.54	2.42	2.77	0.06	0.06	0.02	0.02	0.00
Alternative E	38.84	2.16	2.49	0.05	0.05	0.02	0.02	0.00

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
TOG: Total Organic Gases
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM10: Course particulate matter
PM2.5: Fine particulate matter
Pb: Lead
Total emissions may not sum exactly due to rounding.
NA: Not Available/Not Applicable
Note: PM10 and PM2.5 values are for construction exhaust emissions only.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

Annual net GHG emissions are provided in **Table 7-4**.

Table 7-4
ANNUAL NET IMPACT OF GHG EMISSIONS (ALTERNATIVES COMPARED TO 2018 EXISTING CONDITIONS)

ANNUAL NET EMISSIONS	
CO2e (metric tons per year)	
BAAQMD Threshold	1,100
Construction Year 1	
Alternative B	538.0
Alternative D	571.1
Alternative E	483.2
Construction Year 2	
Alternative B	86.0
Alternative D	85.4
Alternative E	86.0
2024	
Alternative A	33.0
Alternative B	165.8
Alternative D	164.4
Alternative E	148.1
2029	
Alternative A	58.3
Alternative B	195.4
Alternative D	194.0
Alternative E	177.2

CO2e is Carbon Dioxide equivalent.
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018.

7.2 FEDERAL THRESHOLDS OF SIGNIFICANCE

As shown in Table 7-3, neither construction nor operation of Alternative B Sponsor's Proposed Project or Alternatives D and E would cause annual net emissions that would equal or exceed the relevant Federal *de minimis* thresholds as identified in Table 2-4 for the pollutants of concern.

7.3 CALIFORNIA BAY AREA AIR QUALITY MANAGEMENT DISTRICT THRESHOLDS OF SIGNIFICANCE

As shown in Table 7-3, neither construction nor operation of Alternative B Sponsor's Proposed Project or Alternatives D and E would cause annual net emissions that would equal or exceed the relevant BAAQMD *de minimis* thresholds as identified in Table 2-5 for the pollutants of concern. Construction emissions for Alternative B Sponsor's Proposed Project and Alternatives D and E would not exceed BAAQMD daily emissions thresholds.

7.3.1 Greenhouse Gas Thresholds of Significance

The evaluation of GHG emissions showed that neither construction nor operation of Alternative B Sponsor's Proposed Project or Alternatives D and E would cause annual net GHG emissions that would equal or exceed the BAAQMD *de minimis* thresholds of 1,100 metric tons per year.

7.3.2 Local Carbon Monoxide Concentrations

Neither the Alternative B Sponsor's Proposed Project nor Alternatives D and E would cause vehicle emissions of CO on roadways or in parking lots to exceed 550 pounds per day (0.275 tons per day or 100 tons per year). In addition, none of the alternatives would be expected to produce significant traffic congestion; impact signalized intersections or roadway links operating at Level of Service (LOS) D, E, or F, or would cause a decline to the existing LOS.

7.3.3 Odors

While offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints. Alternative B Sponsor's Proposed Project and Alternatives D and E do not involve siting a new odor source near an existing sensitive receptor or siting a new sensitive receptor near an existing odor source. None of alternatives under consideration include construction or operation of wastewater treatment plants, landfills, confined animal facilities, compositing stations, food manufacturing plants, refineries or chemical plants. None of alternatives under consideration have the potential to cause odor emissions or expose members of the public to objectionable odors.

7.3.4 Toxic Air Contaminants

None of the alternatives under consideration have the potential to expose sensitive receptors or the general public to substantial levels of toxic air contaminants. Construction of the alternatives would cause temporary emissions due to the use of construction equipment and could result in the generation of diesel particulate matter. However, construction generated emissions of diesel PM are anticipated to occur away from any sensitive receptors.

7.3.5 Accidental Releases/Acutely Hazardous Air Emissions

None of the alternatives under consideration have the potential for accidental releases of acutely hazardous materials. Alternative B Sponsor's Proposed Project and Alternatives D and E do not use or store acutely hazardous materials located near sensitive receptors or result in sensitive receptors being located near any existing facilities using or storing acutely hazardous materials.

7.3.6 Adaption to Climate Change

The potential for flooding and erosion associated with climate change pose a threat to communities along the California coast and there is compelling evidence that these risks will increase in the future. Data presented in *The Impacts of Sea Level Rise on the California Coast*[38] project mean sea level along the California coast will rise from 1.0 to 1.4 meters by the year 2100. Rising seas put new areas at risk of flooding and increase the likelihood and intensity of floods in areas that are already at risk.

According to the preliminary design,[39] it is estimated that adding the 1,100-foot runway extension will not overload the existing airfield ditch system. After construction, the ditch system would reconnect with natural drainage courses down stream from the Airport levee system so surface water may continue from west to east toward the Petaluma River. The Airport levee system has a height of 5 feet and would provide protection from an increased risk of flooding and erosion due to climate change. Therefore, Alternative B Sponsor's Proposed Project, and Alternatives D and E would not have an adverse impact to climate change.

7.4 CUMULATIVE IMPACTS

Cumulative impacts are those impacts that can be reasonably expected to occur as a result of implementation of the Alternative B Sponsor's Proposed Project or Alternatives D and E, in combination with the impacts from other past, present, and reasonably foreseeable future activities, development, and/or projects that may be connected by geography or time.[40]

The results of this air quality analysis show that implementation of the Alternative B Sponsor's Proposed Project or Alternatives D and E would result in *de minimis* (negligible and insignificant)[41] increases in air emissions.

Net emissions caused by the construction and implementation of the Alternatives B, D, and E would not cause a violation of any NAAQS, delay the attainment of any NAAQS, or worsen any existing NAAQS violation. Therefore, the de minimis emissions defined for any of the alternatives, when combined with present and future projects, will not have the potential to change the current status of the air quality in Marin County and will not result in significant cumulative impacts. As necessary, mitigation procedures would be implemented to minimize potential impacts that would occur during construction.

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[38] California Climate Change Center. *The Impacts of Sea Level Rise on the California Coast*. Executive Summary. March 2009.

[39] Preliminary Design Report Runway Extension Gnoss Field Marin County, California FAA AIP Project No. 3-06-0167-08. Cortright & Seibold, December 20, 2002.

[40] *Considering Cumulative Impacts Under the National Environmental Policy Act*, Council on Environmental Quality, January 1997.

[41] A Federal action that is demonstrated to cause de minimis emissions is defined as having negligible or insignificant impacts; reference FAA, Air Quality Procedures for Civilian Airports & Air Force Bases, see Glossary entry for "de minimis," April 1997; and Addendum, September 2004.

Under CEQA, upon determining if a project does not individually have significant operational air quality impacts, the determination of significant cumulative impact should be based on an evaluation of the consistency of the proposed project with the local general plan and of the general plan with the regional air quality plan.

In addition, as shown in Table 7-4, Alternative B Sponsor's Proposed Project and Alternatives D and E would not exceed the BAAQMD GHG thresholds.

7.4.1 Consistency with Local Plans

The Marin Countywide Plan guides the conservation and development of Marin County. The Plan sets a target to maintain Gnoss Field as the County's civilian airport facility in accordance with the adopted Airport Master Plan. Alternative B Sponsor's Proposed Project and Alternatives D and E would be consistent with the Marin Countywide Plan.

In addition to the Countywide Plan, Marin County adopted a resolution in 2002 that recognizes both the gravity of global warming and the responsibility for local action. The resolution committed Marin County to analyze greenhouse gas emissions, set a reduction target, develop a local action plan, and implement the local action plan. Marin County did develop a local action plan[42] and as a result of analyzing emissions from internal government operations as well as Marin County as a whole, a target was made to voluntarily reduce greenhouse gas emissions 15% - 20% below 1990 levels by the year 2020 for internal government and 15% countywide. According to the plan, internal measures already implemented by the Marin County Department of Public Works will likely result in the County's achievement of the internal reduction target. Marin County remains proactive in implementing GHG emissions reduction projects in County buildings.

7.4.2 Consistency with Clean Air Plan

Alternative B Sponsor's Proposed Project and Alternatives D and E would not increase vehicle miles traveled (VMTs) or vehicle trips greater than the increase in population projected for Marin County. The Marin Countywide Plan's meets or exceeds the Clean Air Plan's transportation control measures as listed in below.

> **GOAL AIR-3 Reduction of Vehicle-Generated Pollutants**.
>
> Reduce vehicle trips and emissions, and improve vehicle efficiency, as means of limiting the volume of pollutants generated by traffic.
>
> **Policy AIR-3.1 Institute Transportation Control Measures**.
>
> Support a transportation program that reduces vehicle trips, increases ridesharing, and meets or exceeds the Transportation Control Measures recommended by BAAQMD in the most recent Clean Air Plan to reduce pollutants generated by vehicle use.

[42] Marin County Community Development Agency. *Marin County Greenhouse Gas Reduction Plan*. October 2006.

In addition Marin's Countywide plan provides buffer zones around sources of odors, toxics, and accidental releases and does not require a general plan amendment. Marin's Countywide plan and Greenhouse Gas Reduction plan are consistent with the Final Bay Area 2017 Clean Air Plan. Therefore, Alternative B Sponsor's Proposed Project and all of the alternatives would not individually have any significant impacts and no further analysis regarding cumulative impacts is necessary.

7.5 GENERAL CONFORMITY EVALUATION

The evaluation of General Conformity showed that annual net emissions caused by operation and construction of Alternative B Sponsor's Proposed Project and Alternatives D and E, would not equal or exceed the relevant *de minimis* thresholds for the pollutants of concern. Therefore, the General Conformity Rule does not apply to Alternative B Sponsor's Proposed Project or Alternatives D and E. Therefore, there is no requirement for a General Conformity Determination under regulations of the CAA. Further, Alternative B Sponsor's Proposed Project and Alternatives D and E would cause *de minimis*, or insignificant, emissions and would not have the potential to cause significant adverse air quality impacts in Marin County.

Further, because the emissions caused by Alternative B Sponsor's Proposed Project and the other alternatives are *de minimis*, the project is assumed not to cause an exceedance of the NAAQS or the CAAQS, and there is no requirement to conduct dispersion analysis to compare project-related emissions to the NAAQS or CAAQS. Consequently, Alternative B Sponsor's Proposed Project and the alternatives comply with the provisions of the Clean Air Act, *Clean Air Act Title 1, Section 176(c)(1*). No further analysis or reporting is required under the provisions of the CAA, NEPA or CEQA guidelines.

ATTACHMENT 1

GLOSSARY

Airport planning and the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) process require the use of many technical terms. Some of the most important terms are defined in this section. Terms in *italics* are defined separately in this glossary.

Air Quality Control Region (AQCR) An EPA designated interstate or intrastate geographic region that has significant air pollution or the potential for significant air pollution and, due to topography, meteorology, etc., needs a common air quality control strategy. The region includes all the counties that are affected by or have sources that contribute directly to the air quality of that region.

Attainment Area – Any area that meets the national primary or secondary ambient air quality standard for a particular criteria pollutant.

Carbon Monoxide (CO) - A *criteria pollutant* that is colorless, odorless gas produced through the incomplete combustion of fossil fuels.

CFRs – Code of Federal Regulations

Clean Air Act (CAA) – The Federal law regulating air quality. The first Clean Air Act (CAA) passed in 1967, required that air quality criteria necessary to protect the public health and welfare be developed. Since 1967, there have been several revisions to the CAA. The Clean Air Act Amendments of 1990 represent the fifth major effort to address clean air legislation.

Conformity – The act of meeting Section 176(c)(1) of the CAAA that requires Federal actions to conform to the SIP for air quality. The action may not increase the severity of an existing violation nor can it delay attainment of an standards.

Criteria Pollutants – The six air pollutants listed in the CAA for which the USEPA has established health-based limits. The six criteria pollutants are *carbon monoxide, nitrogen dioxide, lead, sulfur dioxide, particulate matter,* and *ozone*.

De Minimis Thresholds – The de minimis thresholds are considered the thresholds of significance relative to compliance of net emissions under Federal and state air quality regulations, and in determining the potential for significant air quality impacts caused by a Federal action. They are the minimum rates (tons per year) for *Alternative B Sponsor's Proposed Project* above which a General Conformity Determination would be required. De minimis is defined by the *USEPA* as emissions that are insignificant and negligible, with no potential to cause significant adverse air quality impacts. The applicable rates depend on the severity of the nonattainment designation and whether the project is located within the ozone transport region. Also applicable are rates for precursor pollutants, which are NO_x and VOC for ozone, and SO_x for emissions of $PM_{2.5}$.

Dispersion – The process by which atmospheric pollutants disseminate due to wind and vertical stability.

Emission Factor – The rate at which pollutants are emitted into the atmosphere by one source or a combination of sources.

Environmental Impact Statement (EIS) - A detailed report on proposals for major Federal actions significantly affecting the quality of the human environment, that includes: environmental impact of the Alternative B Sponsor's Proposed Project, any adverse environmental effects which cannot be avoided should the proposal be implemented, alternatives to the proposal, relationship between local short-term uses of the environment and maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources involved in the Alternative B Sponsor's Proposed Project, should it be implemented. Refer to CEQ regulation 40 CFR 1508.11 and National Environmental Policy Act Section 102 (42 USC §4332).

Federal Aviation Administration (FAA) - The Federal agency responsible for insuring the safe and efficient use of the nation's airspace, for fostering civil aeronautics and air commerce, and for supporting the requirements of national defense.

Fugitive Dust – Dust discharged to the atmosphere in an unconfined flow stream such as that from an unpaved road, storage piles, and heavy construction operations.

Hydrocarbons (HC) – Gases that represent unburned and wasted fuel. They come from incomplete combustion of gasoline and from evaporation of petroleum fuels.

Inversion – A thermal gradient created by warm air situated above cooler air. An inversion suppresses turbulent mixing and thus limits the upward dispersion of polluted air.

Lead (Pb) – A heavy metal that, when ingested or inhaled, affects the blood forming organs, kidneys, and the nervous system. The chief source of this pollutant at airports is the combustion of leaded aviation gasoline in piston-engine aircraft.

LTO – LTO refers to an aircraft's landing and takeoff cycle. One aircraft LTO is equivalent to two aircraft operations (one landing and one takeoff). The standard LTO cycle begins when the aircraft crosses into the mixing zone as it approaches the airport on its descent from cruising altitude, lands and taxis to the gate. The cycle continues as the aircraft taxis back out to the runway for takeoff and climbout as its heads out of the mixing zone and back up to cruising altitude. The five specific operating modes in a standard LTO are: approach, taxi/idle-in, taxi/idle-out, takeoff, and climbout. Most aircraft go through this sequence during a complete standard operating cycle.

Maintenance Area (MA) - Any geographic area of the United States previously designated nonattainment pursuant the CAA Amendments of 1990 and subsequently redesignated to attainment.

Mixing Height - The height of the completely mixed portion of atmosphere that begins at the earth's surface and extends to a few thousand feet overhead where the atmosphere becomes fairly stable.

Mobile Source - A moving vehicle that emits pollutants. Such sources include airplanes, automobiles, trucks and ground support equipment.

National Environmental Policy Act of 1969 (NEPA) - The original legislation establishing the environmental review process for proposed Federal actions.

Nitrogen Dioxide (NO_2) – A *criteria pollutant* gas that absorbs sunlight and gives air a reddish-brown color. NO_2 is a subset of the larger set of nitrogen oxides (*NO_X)*. The gas is reactive and forms when fuel is burned at high temperatures and high pressure. **Nitrogen Oxides (NO_X)** – See *NO_2*.

National Ambient Air Quality Standard (NAAQS) - Air Quality standards established by the EPA to protect human health (primary standards) and to protect property and aesthetics (secondary standards).

Nonattainment Area – Any geographical area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for any particular *criteria pollutant*.

Ozone (O_3) – A *criteria pollutant* which is not directly emitted, rather, ozone is formed in the atmosphere through photochemical reaction with *nitrogen oxides (NO_X)*, *volatile organic compounds (VOC)*, sunlight, and heat. It is the primary constituent of smog and problems occur many miles away from the pollutant sources. Due to the fact that ozone is not directly emitted and is a regional phenomenon, emissions of NO_x and VOC are evaluated to indicate the likely formation of ozone. Ozone is not evaluated for a project-level emission inventory.

Particulate Matter (PM_{10} & $PM_{2.5}$) – There are two sizes of particulate matter that account for one of the six criteria pollutants. PM_{10}, coarse particles with a diameter of 10 micrometers or less, and $PM_{2.5}$, fine particles with a diameter of 2.5 micrometers or less. Emissions of $PM_{2.5}$ is a subset of emissions of PM_{10}. Particulate matter can be any particle of these sizes, including dust, dirt, and soot. Particulate matter is directly emitted by engine combustion. $PM_{2.5}$ reacts with precursor pollutants VOC, NO*x*, and SO_x gases to form secondary particles.

PPM - Parts per million (106) by volume.

Precursor Pollutant – Pollutant which aid in the formation of *criteria pollutants*. *NO_x* and *VOC* are precursor pollutants to *ozone* development; *SO_x*, NO_x, and VOC are precursors to development of *$PM_{2.5}$*.

Alternative B Sponsor's Proposed Project – The solution proposal by the proponent to the "problem" that prompted the need for a review of possible environmental impacts. The Alternative B Sponsor's Proposed Project would have a specific purpose and need and a timeline for implementation. The *Environmental Impact Statement (EIS)* must also include reasonable and feasible alternatives to the Alternative B Sponsor's Proposed Project that may also meet the purpose and need of the project sponsor.

Scoping - Scoping is an early and open process for determining the scope or range of issues to be addressed in the *Environmental Impact Statement* and identifying the significant issues related to the Sponsor's Proposed Project. Issues important to the public and local, state, and Federal agencies are solicited through direct mailing, public notices, or meetings.

State Implementation Plan (SIP) – A plan stating the strategy the state will use to meet and maintain the Federal air quality standards as required under the Clean Air Act (CAA, including the 1990 Amendments). A SIP includes the projected emission budgets and controls for industrial, area, and mobile sources of pollution.

Sulfur Dioxide (SO_2) – A *criteria pollutant* formed when fuel containing sulfur, like coal, oil and jet fuel, is burned and is commonly expressed as SO_X since it is a large subset of sulfur dioxides (SO_2). SO_2 is a colorless gas that is typically identified as having a strong odor. SO_x is a *precursor pollutant* to the formation of $PM_{2.5}$ emissions.

Sulfur Oxides (SO_X) – See SO_2.

Total Organic Gases (TOG) - This term includes all hydrocarbon compounds in an emission sample. See also HC and VOC. These terms are not interchangeable.

Vehicle Miles Traveled (VMT) – The sum of distances traveled by all motor vehicles in a specified region. VMT is equal to the total number of vehicle trips multiplied by the trip distance (measured in miles). This sum is used in computing an emission inventory for motor vehicles.

Volatile Organic Compound (VOC) – Gases that are emitted from solids or liquids, such as fuel storage, paint, and cleaning fluids. VOC include a variety of chemicals, some which can have short and long-term adverse health effects. VOCs are *precursor pollutants* that react with heat, sunlight and *nitrogen oxides (NO_x* to form *ozone (O_3)*. VOC also mix with other gases to form $PM_{2.5}$. VOCs are a subset of TOGs.

ATTACHMENT 2
AGENCY COORDINATION

Air Quality Agency Coordination was described in Appendix F of the Final EIS. No additional Air Quality coordination was necessary prior to preparation of the Supplement to the Final EIS, and the Supplement to the Final EIS is being distributed for public comment including to the Bay Area Air Quality Management District.

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ATTACHMENT 4
COMPUTER MODELING FILES

The printout of the input and output files for the AEDT and MOVES computer modes used to calculate the emissions caused by the various alternatives would be hundreds of pages of data attached to this appendix. Therefore, these files are available electronically upon request.

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