



**Air Quality
Procedures for
Civilian Airports &
Air Force Bases**

**Federal Aviation Administration
Office of Environment & Energy**

ADDENDUM

September 2004



**Air Quality
Procedures for
Civilian Airports &
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INTRODUCTION

Background Information & Purpose of the Addendum

The assessment of the air quality impacts of proposed federal projects is usually required for compliance with the National Environmental Policy Act (NEPA), the Clean Air Act (CAA) and other similar regulations or directives promulgated by federal, state and local agencies. This requirement normally applies to new airports and new or extended runways but can also be required for a wide range of other airport and airway improvement projects or actions as a prerequisite to approval by the Federal Aviation Administration (FAA).

For assistance with meeting these requirements, in 1997 the FAA, in cooperation with the United States Air Force (USAF), published a compilation of recommended guidelines and procedures entitled *Air Quality Procedures For Civilian Airports & Air Force Bases*¹. Commonly referred to as the “*Air Quality Handbook*” this 210-page document is a comprehensive, yet practical, guide for preparing and conducting appropriate air quality analyses for airports and airbases.

Since the *Air Quality Handbook* was published in 1997, changes or advancements have been made to a number of the policies, guidelines and methods used to conduct air quality assessment of FAA actions and projects at airports. In other cases additional information is now available or alternative approaches and methods have been developed.

The purpose of this Addendum is to identify where these changes, advancements and improvements to the 1997 *Handbook* have occurred. Wherever appropriate, these revisions are discussed in this Addendum and, if considered helpful, supplemental information is also provided.

Obtainable through the FAA Office of Environment & Energy, the *Air Quality Handbook* includes thorough explanations of the airport air quality assessment process, guidance for determining when an assessment is required and detailed descriptions of the various assessment methods available². These methods include emission inventories of airport sources and the dispersion modeling of these emissions – also known as a “NAAQS” assessment. Other relevant topics covered in the *Handbook* include the General and Transportation Conformity requirements of the CAA; air quality mitigation and emission reduction measures; commonly used terms and references; and an assembly of technical approaches to estimating airport-related air emissions.

Use of the Addendum

As stated above, because much of the *Handbook* is still applicable and up to date, the vast majority of the 1997 material has not been revised, redrafted or republished in this Addendum. Rather, it is the aim of FAA that this Addendum be used in tandem with the 1997 *Handbook* to obtain a total and up-to-date compendium of the relevant air quality assessment guidelines.

For ease in identifying those sections of the Handbook that have been updated, revised or otherwise addressed by this Addendum, a Quick Lookup Guide is first provided. This Quick Lookup Guide is consistent with the Table of Contents of the *Handbook* and can be reviewed in a glance to determine if the Addendum contains any additional information - by section or topic.

The Addendum itself is also arranged following the same outline and format as the *Handbook*. Specifically, each Section is initially identified by Section No., Section Title and Page No. of the *Handbook* where the material is located (e.g. *Section 1.1.4 State and/or Local Requirements (p. 6)*). This is followed by a brief

¹ *Air Quality Procedures for Civilian Airports & Air Force Bases*, prepared for the Federal Aviation Administration, Office of Environment & Energy, AEE-120 and the United States Air Force, Armstrong Laboratory, Tyndall AFB, prepared by EEA Inc. and CSSI, Inc., April 1997.

² The *Air Quality Handbook* can be obtained on the FAA Office of Environment & Energy website at <http://www.aee.faa.gov/> or by contacting CSSI at 202 484-3354.

summary statement of the section's contents or purpose (e.g. *Discusses potential for state/local regulations.*)

For those sections where no updates or changes were made to the *Handbook*, the term “*No changes*” is inserted. For those sections whereby this Addendum serves to update, revise or enhance the material contained in the 1997 *Handbook*, an explanation is provided. In most cases, this information is complete and succinct. In other cases, the reader is referred to another document or publication that provides the appropriate information.

Approach & Methodology

To help restore the *Handbook* to current standards and conditions, staff of the FAA Office of Environment & Energy, with the assistance of its contractor – URS Corp., first conducted a thorough and detailed review of the 1997 document. The intent of this review was to compare the air quality assessment guidelines contained in the *Handbook* to the following rules, regulations and guidelines:

FAA Order 1050.1D CHG4, Policies & Procedures for Considering Environmental Impacts (June 14, 1999).

FAA Order 5050.4A, *Airport Environmental Handbook* (October 8, 1985).

42 U.S.C.A. *Federal Clean Air Act* (Air Pollution Prevention & Control) Sections 7401 to 7671.

40 CFR Parts 51 and 93, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, Final Rule, U.S. Environmental Protection Agency (EPA), November 30, 1993.

General Conformity Guidance for Airports – Questions & Answers, FAA Community & Environmental Needs Division and the U.S. EPA Office of Air Quality Planning & Standards (OAQPS), Air Quality Strategies & Standards Division (September 25, 2002).

40 CFR Part 93, Subpart A, *Conformity to State or Federal Implementation Plans of Transportation Plans, Programs and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Laws* (July 1, 1998).

Emissions & Dispersion Modeling System (EDMS) Reference Manual, prepared for the FAA, prepared by CSSI Inc. May 2001.

In addition, a comprehensive questionnaire was developed by URS Corp. and distributed to members of the FAA EDMS Design Review Group (DRG) – a group of 20 professionals representing government, consultants and academia with specialized expertise in airport air quality assessments, to obtain their input. The FAA Airport's Division also undertook a review of the *Handbook* and contributed comments in support of this Addendum.

QUICK LOOK-UP GUIDE

Title of Section of Air Quality Handbook	Update / Change to Handbook & Addendum Page No.
GLOSSARY	Yes, p. AD-5
1.0 INTRODUCTION	No
1.1 Regulatory Context	No
1.1.1 Federal Requirements and Documents – General	Yes, p. AD-5
1.1.2 Federal Requirements and Documents - DOT/FAA – Specific	Yes, p. AD-6
1.1.3 Federal Requirements and Documents - DOD/USAF – Specific	No
1.1.4 State and/or Local Requirements	No
2. AIR QUALITY ASSESSMENT PROCESS	N/A
2.1 Assessment Process Steps	Yes, p. AD-6
2.1.1 Project Definition	No
2.1.2 Emission Inventory	Yes, p. AD-7
2.1.3 Indirect Source Review	Yes, p. AD-7
2.1.4 Conformity	Yes, p. AD-8
2.1.5 NAAQS Assessment	Yes, p. AD-9
2.1.6 Governor’s Certificate	Yes, p. AD-9
2.1.7 Hazardous Air Pollutants (HAPs)	Yes, p. AD-9
2.2 Assessment Process Participants	No
2.3 Screening Thresholds	Yes, p. AD-10
2.3.1 Indirect Source Review	Yes, p. AD-10
2.3.2 Transportation Conformity	Yes, p. AD-10
2.3.3 General Conformity	Yes, p. AD-11
2.3.4 NAAQS Assessment – General	Yes, p. AD-11
2.3.5 NAAQS Assessment - Roadway Intersection Analysis	Yes, p. AD-12
3. EMISSIONS ASSESSMENT	N/A
3.1 Introduction	No
3.2 Emission Sources	No
3.2.1 Aircraft	Yes, p. AD-12
3.2.2 Auxiliary Power Units	No
3.2.3 Ground Support Equipment or Aerospace Ground Equipment	Yes, p. AD-12
3.2.4 Ground Access Vehicles	Yes, p. AD-13
3.2.5 Stationary Sources	No
3.2.6 Construction Emissions	Yes, p. AD-13
3.3 Available Models	Yes, p. AD-14
4. DISPERSION ASSESSMENT	N/A
4.1 Introduction	Yes, p. AD-15
4.2 Dispersion Inputs	No
4.2.1 Emission Sources	No
4.2.2 Meteorology	Yes, p. AD-15
4.2.3 Topography	Yes, p. AD-16
4.2.4 Receptors	Yes, p. AD-16
4.3 Available Models	Yes, p. AD-17
5. CONFORMITY	Yes, p. AD-18
5.1 Applicability	Yes, p. AD-18
5.2 Analysis	Yes, p. AD-18
5.3 Procedure	Yes, p. AD-18
5.3.1 Conformity Steps Summary	Yes, p. AD-18
5.3.2 Conformity and NEPA	Yes, p. AD-18

QUICK LOOK-UP GUIDE (CONTINUED)

5.4 References / Sources	Yes, p. AD-19
6. MITIGATION / CONTROL MEASURES	Yes, p. AD-19
6.1 Aircraft	No
6.1.1 Single / Reduced Engine Taxiing	No
6.1.2 Derate Takeoff Power	No
6.1.3 Reduce Use of Reverse Thrust	No
6.2 Auxiliary Power Units	No
6.3 Ground Support Equipment	No
7. REFERENCES	N/A
7.1 Reference List	Yes, p. AD-20
7.2 Annotated Reference List	Yes, p. AD-22
8. INDEX	No
APPENDICES	N/A
Appendix A: Air Quality Environmental Documents	Yes, p. AD-25
Appendix B: Project Reviewer's Check List	Yes, p. AD-26
Appendix C: Key Pollutants	Yes, p. AD-27
Appendix D: Aircraft Emission Methodology	Yes, p. AD-28
Appendix E: Auxiliary Power Unit Emission Methodology	Yes, p. AD-29
Appendix F: Ground Support Equipment and Aerospace Ground Equipment Emission Methodology	Yes, p. AD-30
Appendix G: Ground Access Vehicles Emission Methodology	Yes, p. AD-30
Appendix H: Stationary Emission Methodology	Yes, p. AD-30
Appendix I: Dispersion Methodology	Yes, p. AD-31
Appendix J: State Indirect Source Review Regulations	Yes, p. AD-32
ATTACHMENTS	N/A
Attachment 1: JP Airline-Fleets International 94/95 Example Page	Yes, p. AD-32
Attachment 2: ICAO engine Exhaust Emissions Databank Example Engine Data Sheet	Yes, p. AD-32
Attachment 3: "Aviation Week & Space Technology" U.S. Commercial Aircraft	Yes, p. AD-32
Attachment 4: Airport Activity Statistics of Certified Route Air Carriers	Yes, p. AD-33
Attachment 5: Airport Master Record Example of Ontario International Airport	Yes, p. AD-33
Attachment 6: FAA Air Traffic Activity	Yes, p. AD-33

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ADDENDUM**

GLOSSARY (p. xiii)

Contains and defines commonly used terms in the field of airport air quality.

The following terms and definitions have been amended or added to the handbook:

Criteria Pollutants – As one of the criteria pollutants, particulate matter is now segregated into two size ranges: equal to or less than 10 microns in diameter (PM-10) and equal to or less than 2.5 microns in diameter (PM-2.5). There are separate NAAQS for both categories.

Hazardous Air Pollutants – Under the federal Clean Air Act and its amendments, the U.S. EPA has initially identified 188 air pollutants that meet this definition and are regulated under Section 112 (*Toxic Air Pollutants*) of the act. These include a wide variety of organic and inorganic chemicals and compounds.

NAAQS Assessment – For the purposes of this Handbook, this refers to the use of an air quality model to predict ambient concentrations of air pollutants and the comparison of these results to the National Ambient Air Quality Standards.

PM-2.5 - is a criteria air pollutant for which there are National Ambient Air Quality Standards (NAAQS) and represents the category of particulates categorized as "fine" particulate matter (e.g. with an aerodynamic diameter of 2.5 microns or less). These particles are considered a health risk because of their ability to penetrate deep into the human respiratory system.

1. INTRODUCTION (p.1)

Provides information on the origins of the Handbook and its applicability to airports and air bases in the U.S. and those located abroad.

No changes.

1.1 Regulatory Context (p.1)

Provides background information on the relevance and applicability of the Handbook with respect to the list of Federal and state regulations that follow.

No changes.

1.1.1 Federal Requirements and Documents – General (p.1)

Provides overviews of NEPA, CAA & General Conformity Rule.

For additional and updated information and guidance on General Conformity and Transportation Conformity, see Addendum Section 2.1.4 (*General Conformity*) below.

Under the section Clean Air Act (p.3, 3rd para. 3rd sen,) the pollutant PM-2.5 should be added to the list of "criteria pollutants." In addition, sulfur oxide (SO_x) should be corrected to read sulfur dioxide (SO₂) and the abbreviation for nitrogen dioxide should be corrected to read (NO₂).

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1.1.2 Federal Requirements and Documents - DOT/FAA – Specific (p.4)

Provides summary information on NEPA-related regulations including FAA Orders 5050.4 (Airport Environmental Handbook) and 1050.1 (Policies and Procedures for Considering Environmental Impacts).

FAA Order 5050.4A is being revised with up-to-date information on conducting air quality assessments for airport improvement projects and actions. Check the FAA Airport Environmental Program website (www.faa.gov/arp/environmental) to ensure that you use the most recent version.

For an update of FAA Order 1050, see FAA Order 1050.1D CHG4, *Policies & Procedures for Considering Environmental Impacts* (June 14, 1999). (Reference 99)

1.1.3 Federal Requirements and Documents - DOD/USAF – Specific (p. 5)

Provides summary information on military NEPA-related regulations.

No changes.

1.1.4 State and/or Local Requirements (p. 6)

Discusses potential for state / local regulations.

No changes.

2. AIR QUALITY ASSESSMENT PROCESS (p. 7)

2.1 Assessment Process Steps (p. 7)

Provides overview of process and introduces the flowchart entitled Air Quality Assessment Process for Airports and Air Bases.

For clarification, the term "Assessment of NAAQS" means comparison to the applicable National Ambient Air Quality Standards based on the results of atmospheric dispersion modeling.

Figure 1 and Figure 2 on pages 9 and 10 of the Handbook have been updated and combined as Figure 1 (Parts A and B) and contained in the Appendix to this Addendum (see pages AD-34 and AD-35). The established level of commercial service airport activity below which a NAAQS assessment is not recommended has been corrected in both instances to be consistent with the text in 2.3.4. The threshold level has been corrected to read "activity more than 1.3 million ~~passengers~~ **annual enplanements.**" Additional changes to this figure include revision to footnotes and NAAQS Assessment area of the flowchart.

In addition to Figure 1, when preparing an analysis or scope of work, the project reviewers check list provided in Appendix B should be considered. The check list covers the various components of airport-related air quality impact analyses prepared under NEPA, General Conformity and/or Indirect Source Review requirements.

2.1.1 Project Definition (p. 11)

Describes "Build" vs. "No-Build" alternatives approach.

No changes.

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2.1.2 Emission Inventory (p. 11)

Defines the concept and provides basic information on the individual elements (i.e. pollutants, analysis years, conditions).

For a discussion of the six EPA criteria air pollutants and their precursors associated with emission inventorying, the reader should consult Appendix C: Key Pollutants of the Handbook.

For additional information on aircraft PM-10 and PM-2.5 emissions (1st para., 4th sentence), see the following FAA publication:

Status Report on Proposed Methodology to Characterize Jet/Gas Turbine Engine Particulate Matter Emissions - Progress Report, prepared for the FAA Office of Environment & Energy, prepared by R. Wayson, G. Fleming and B. Kim, Volpe National Transportation Systems Center, May 2003. (Reference 104)

The reference to a conformity assessment (2nd para., 2nd sentence) is amended to the following explanation:

For a conformity assessment, only the "build" and "no-build" emissions of the "preferred alternative" are analyzed (including construction emissions, which are the projected temporary emissions resulting from project construction).

In addition, the years for which an emission inventory should be computed under General Conformity needs clarification. For No-Build and proposed Build alternatives, the analyst should compute an inventory of the total project emissions for: (a) the year of maximum emissions caused by the action, (b) the attainment year or furthest year for the maintenance plan, and (c) the SIP emissions budget year(s).

The reference to a NAAQS assessment (2nd para., last sentence) is amended to the following explanation:

Conversely, for a ~~NAAQS~~ NEPA assessment, emissions must be estimated for each reasonable "build" and "no-build" alternative.

2.1.3 Indirect Source Review (p. 12)

Identifies and discusses the concept and applicability of this state-specific requirement.

The list of states that have Indirect Source Review (ISR) (also known as Transportation Facility Permits) changes over time. Therefore, these requirements should be verified on a case-by-case, or state-by-state, basis by contacting the appropriate agencies.

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2.1.4 Conformity (p. 12)

Introduces the rule, differentiates between general and transportation conformity, briefly discusses important concepts (i.e. non-attainment / maintenance designations, project-related emissions, presumed to conform, regionally significant).

For updated information and guidance on General and Transportation Conformity see the following publications:

- 40 CFR Parts 51 and 93, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, Final Rule, U.S. EPA, November 30, 1993.

This final document contains background material, exemptions to the rule, application criteria (including the de-minimis" application thresholds) and other definitive information pertaining the General Conformity requirements.

- *General Conformity Guidance for Airports – Questions & Answers*, FAA Community & Environmental Needs Division and the U.S. EPA OAQPS, Air Quality Strategies & Standards Division (September 25, 2002). (Reference 101)

This publication, prepared by the U.S. EPA and the FAA, provides interpretative information in a "question-and-answer" format to help facilitate a better understanding of the General Conformity Rule and its application to airport- and airway-related projects or actions.

- 40 CFR Part 93, Subpart A, *Conformity to State or Federal Implementation Plans of Transportation Plans, Programs and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Laws* (July 1, 1998). (Reference 95)

This document contains background information on the proper application of the Transportation Conformity Rule.

The FAA Office of Airport Planning and Programming is in the process of developing a Presumed to Conform list. This document will provide a list of airport-related projects and actions that FAA believes meet the criteria of "presumed to conform" to any applicable State Implementation Plan based on the types and amount(s) of emissions generated.

Further clarification to the following statement (p. 14, 1st para., 1st sentence) is provided below:

"To determine conformity, applicable pollutant concentrations are computed by dispersion modeling, combined with background concentrations, and compared with (the) NAAQS for exceedance."

The term "applicable" in the above statement denotes that dispersion modeling is not appropriate in all situations. For example, when the pollutant is not amenable to dispersion modeling (i.e. O₃) or when demonstration of General Conformity is achieved by showing that the project's emissions are compatible with (i.e. accounted for within) the SIP. (See the General Conformity guidance publication referenced above for additional information.)

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2.1.5 NAAQS Assessment (p. 14)

Identifies and discusses the conditions, or circumstances, for when this type of assessment should be considered and conducted.

For clarification, the term "NAAQS Assessment" means comparison to the applicable National Ambient Air Quality Standards based on the results of atmospheric dispersion modeling.

It should be noted that all areas of the U.S. must comply with the NAAQS and that demonstration of conformity with these standards is not just reserved for maintenance and non-attainment areas.

For a discussion of the six EPA criteria air pollutants, their precursors, and the NAAQS, the reader should consult Appendix C: Key Pollutants of the Handbook.

For additional guidance on the application of a NAAQS assessment in support of the General Conformity requirements, see the following publications:

- 40 CFR Parts 51 and 93, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, Final Rule, U.S. EPA, November 30, 1993.
- *General Conformity Guidance for Airports – Questions & Answers*, FAA Community & Environmental Needs Division and the U.S. EPA OAQPS, Air Quality Strategies & Standards Division (September 25, 2002).

The reference to "an air quality certificate obtained from the governor" (2nd sentence, 3rd para., p. 15 of the Handbook) should be omitted here. The applicability of this requirement is addressed in Section 2.1.6 Governor's Certificate (Addendum addition) as explained below.

2.1.6 Governor's Certificate (Addendum addition)

This is a new section for the Addendum, not covered previously in Handbook.

As discussed in Section 1.1.2 (*Federal Requirements and Documents – DOT/FAA-Specific*) of the Handbook, the *Airport and Airway Improvement Act of 1982* required that for airport projects that involve a new airport, runway or major runway extension, a letter from the Governor from the state in which the project is located must be obtained certifying that there is reasonable assurance that the project will be located, designed, constructed and operated in compliance with applicable air quality standards. This is no longer required following the passage of H.R. 2115, Vision 100 – Century of Aviation Reauthorization Act, December 2003.

2.1.7 Hazardous Air Pollutants (HAPs) (Addendum addition)

This is a new section for the Addendum, not covered previously in Handbook.

The FAA Office of Environment and Energy is undertaking a phased approach to assessing the relationships between the emissions of hazardous air pollutants (HAPs) and airport-related activities. (In this case, the terms "air toxics", "toxic air pollutants" or "TAPs" mean the same as "hazardous air pollutants" or "HAPs.")

The first step in this process is the publication of a resource document entitled "Selected Resource Materials and Annotated Bibliography on the Topic of Hazardous Air Pollutants (HAPs) Associated with Aircraft, Airports and Aviation" (July 2003). Based on publicly available information, this report provides a compendium and summary materials on the following topics:

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- Common HAPs Associated with Aircraft & Airport Operations,
- Agency Guidelines & Standards,
- Air Monitoring Data & Information,
- HAPs Emission Factors and
- Atmospheric Dispersion Models.

The report also contains an extensive List of References and Annotated Bibliography of relevant materials pertaining to HAPs associated with aircraft and airports. This material will be continually updated as new information becomes available.

The next phase of this process is the development of standardized HAPs assessment and modeling guidelines for airport-related projects and actions. This work is currently underway and is expected to be completed in 2004.

2.2 Assessment Process Participants (p. 15)

Provides overview of agency roles and responsibilities.

No changes.

2.3 Screening Thresholds (p. 15)

Introduces and discusses the screening thresholds, or conditions, used to determine the type(s) and level(s) of analyses required or recommended.

The information (i.e. project and analysis types and thresholds contained in Figure 3 (*Air Quality Analysis Guidelines and Thresholds*) on pg. 17 of the Handbook are provided for guidance purposes only. The actual types and extent of analyses needed is determined on a case-by-case (or project-by-project) basis in consultation with federal, state and local agencies.

For additional information on the need for a conformity analysis, the following publications should also be consulted:

- 40 CFR Parts 51 and 93, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, Final Rule, U.S. EPA, November 30, 1993.
- *General Conformity Guidance for Airports – Questions & Answers*, FAA Community & Environmental Needs Division and the U.S. EPA OAQPS, Air Quality Strategies & Standards Division (September 25, 2002).

2.3.1 Indirect Source Review (p. 16)

States the conditions for this potential local requirement.

The list of States that have Indirect Source Review (ISR) (also known as Transportation Facility Permits) changes over time. Therefore, these requirements should be verified on a case-by-case, or state-by-state, basis.

2.3.2 Transportation Conformity (p. 18)

Explains applicability of this CAA requirement.

For additional information on the applicability of the Transportation Conformity requirements see the following:

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- 40 CFR Part 93, Subpart A, *Conformity to State or Federal Implementation Plans of Transportation Plans, Programs and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Laws* (July 1, 1998).

2.3.3 General Conformity (p. 18)

Explains the General Conformity threshold rates given in Table 1.

For additional and updated information on the applicability of the General Conformity requirements see the following:

- 40 CFR Parts 51 and 93, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, Final Rule, U.S. EPA, November 30, 1993.
- *General Conformity Guidance for Airports – Questions & Answers*, FAA Community & Environmental Needs Division and the U.S. EPA OAQPS, Air Quality Strategies & Standards Division (September 25, 2002).

It is important to note that the conformity process is separate from the NEPA process, described in Section 2.3.4. However, the conformity analysis can be completed concurrently with the NEPA analysis, and linkage between the two is allowed. For additional information, see Section 5.3.2 of the Handbook.

2.3.4 NAAQS Assessment – General (p. 19)

Discusses preparation of NAAQS Assessments, which establish levels of annual commercial enplanements and/or general aviation activity below which an assessment is not recommended.

For clarification, the term “NAAQS Assessment” means comparison to the applicable National Ambient Air Quality Standards based on the results of atmospheric dispersion modeling.

The statement “For airports, a main pollutant of concern from an air quality standpoint is CO” (1st para., 3rd sentence) should be expanded to include the other criteria air pollutants of NO_x, ozone and particulate matter as well as the category of compounds called hydrocarbons.

In the Equation 1: *Dispersion Modeling Threshold* (pg. 20), the term “LTOs” should be changed to “Operations (000)”.

For clarification, a Landing & Takeoff Operation (LTO) is the combination of one arrival and one departure while an “operation” is an arrival or departure; therefore one LTO equals two operations.

Figure 4: *Airport Activity Threshold For NAAQS Assessment* should be used with discretion to determine if a NAAQS assessment is necessary. When determining if an analysis is necessary, the area attainment / non-attainment status, the project’s general conformity approach and/or state or local regulatory agency requirements are among the other factors that should be considered.

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2.3.5 NAAQS Assessment - Roadway Intersection Analysis (p. 21)

Provides and discusses roadway facility operational measures for determining whether or not microscale atmospheric dispersion analysis is required or recommended.

For additional clarification to the approach provided in the Handbook (see 1st para., 6th sentence) the following should also be considered:

Critical intersections are sometimes defined as those where the project increases total traffic by 10 percent or more and the level-of-service (LOS) is forecast to be D, E, or F. Of the intersections meeting these criteria, a subset of the highest ranked "worst-case" intersections could be selected for the initial analysis. This ranking should consider the total traffic volume (project and background), intersection LOS, and the proximity of air quality sensitive receptors. Should the initial modeling indicate that there is no likelihood of a violation of the NAAQS for CO, then no additional analysis is considered necessary.

3. EMISSIONS ASSESSMENT (p. 23)

No changes.

3.1 Introduction (p. 23)

Discusses the purpose and use of emissions inventory and defines "direct" and "indirect" emissions.

No changes.

3.2 Emission Sources (p. 24)

No changes.

3.2.1 Aircraft (p. 24)

Provides general discussion of ground-based and airborne aircraft operational characteristics

Reference to mixing zone (pg. 24, 5th para.) should be enhanced with the following:

For airport emission inventories, a mixing height of 3,000 feet above ground level (representing the annual average mixing height in the contiguous United States) is generally assumed although lower values can be used based on local meteorological conditions (Reference 97, Reference 82).

Reference to FAA's Aircraft Engine Emission Database (pg. 25, 1st para., last sentence) should be replaced with the ICAO Engine Emissions Database Bank.

3.2.2 Auxiliary Power Units (p. 25)

Provides general discussion of APU utilization.

No changes.

3.2.3 Ground Support Equipment or Aerospace Ground Equipment (p. 25)

Identifies the typical types and functions of GSE and identifies the appropriate model for calculating emissions.

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Note that the Emissions Dispersion Modeling System (EDMS) contains data derived from the EPA Draft NONROAD model (Reference 103). (See also the *EDMS Reference Manual* (Reference 98) for additional information).

3.2.4 Ground Access Vehicles (p. 26)

Gives classifications for motor vehicle types and discusses on- versus off-site trips.

The information contained in the last paragraph of this section should also acknowledge the following:

The *Emissions and Dispersion Modeling System (EDMS)*, *MOBILE*, *EMFAC* and *PART5* models are continually updated and the most recent or appropriate version should be used. Note that *PART5* is now part of *MOBILE6* and is no longer updated as a separate model. However, in some applications the most appropriate version is the one used in the support of the State Implementation Plan, which may not be the most recent version.

It is also noteworthy that EDMS is designed to provide an inventory of motor vehicle emissions and includes default emission factors based on *MOBILE* standard (or typical) input factors for the fleet mix, ambient temperature, emission control equipment and requirements, etc. For a more detailed, refined or site-specific emissions inventory, EDMS can be supplemented with emission factors calculated externally by the user with *MOBILE* and entered into EDMS. (See also the *EDMS Reference Manual* for additional information).

In some cases, motor vehicle trips that occur off the airport may already be accounted for in the regional Transportation Improvement Plan (TIP). Such occurrences should be verified with the regional or local transportation planning agency to avoid "double-counting" of these trips in the airport's emissions inventory or the State Implementation Plan.

3.2.5 Stationary Sources (p. 26)

Describes airport-related stationary source types.

No changes.

3.2.6 Construction Emissions (Addendum addition)

This is a new section for the Addendum, not covered previously in Handbook.

Construction-related activities are now considered an integral part of the overall assessment of air quality impacts associated with airport development projects. Typical sources of these emissions include a wide assortment of both light - and heavy-duty equipment and on- and off-road vehicles. The exhaust products from this fleet of equipment and vehicles contain a variety of pollutants including CO, NO_x, SO_x, particulate matter and hydrocarbons. The movement of earthen soils, stockpiling of raw materials and disposal of construction debris are also sources of fugitive dust and smoke.

Although comparatively short-term in duration, construction-related air emissions can have an impact on both local air quality conditions and on the regional airshed. For this reason, construction emissions are classifiable as "direct" sources of emissions under the Federal Clean Air Act *General Conformity Rule*.

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As a result, these emissions must be quantified and in some cases mitigated in order to meet the requirements of the General Conformity Rule. As with operational emissions discussed above, the quantification of construction emissions is conducted with an emission inventory and/or dispersion modeling analysis.

As discussed in Section 3.3 (*Available Models*) emission factors for light-duty vehicles (i.e. on-road cars and trucks) can be obtained from the EPA *MOBILE6* emissions model (Reference 108), or its most recent version. Emission factors for heavy-duty equipment (i.e. dump trucks, dozers, graders, etc.) can be obtained from the EPA *NONROAD* emissions model.

Emission factors for unpaved roads, stockpiles and other sources of emissions subject to wind erosion can be obtained from the EPA publication *Compilation of Air Pollution Emission Factors* (AP-42) as well as several other sources documented by the regulatory and scientific communities.

Levels of construction activity (including scheduling, types of equipment, project duration, etc.) are determined on a case-by-case basis and are derived from good engineering estimates.

3.3 Available Models (p. 28)

Identifies and describes sources of airport, motor vehicle, fuel and wind erosion emission factors including EDMS, EMFAC, FAEED, Mobile5a, PART5, TANKS and WIND.

Note that the EDMS, MOBILE, EMFAC, PART5, TANKS and WIND models are continually updated and the most recent version should be used (i.e. EDMS 4.1, MOBILE6.0/6.1/6.2, EMFAC2000). Particulate matter emission factors were based on the PART5 model; however, MOBILE6 now incorporates particulate emission factors. Because of these updates, the input and output values for these models may differ from what is described in the Handbook.

The reference to the Emissions Dispersion Modeling System (EDMS) should be updated to read as follows:

Emissions Dispersion Modeling System (EDMS) – EDMS is the FAA required and the EPA preferred model for the assessment of aviation-related sources of the EPA-criteria air pollutants and their precursors.

A more detailed explanation of FAA's policy on the application and use of EDMS for airport air quality assessments is provided in Federal Register, Vol. 63, No. 70 (April 13, 1998), Emissions and Dispersion Modeling System Policy for Airport Air Quality Analysis; Interim Guidance to FAA Orders 1050.1D and 5050.4A, Department of Transportation (DOT), FAA (Reference 100).

EDMS is the current emissions inventory tool supported by FAA, and required for FAA analyses of aviation sources. The reference to the FAA aircraft Engine Emission Database (FAEED) (6th para.) should be deleted.

Another available model that can be used to develop, compute and support the airport air quality analysis is NONROAD, as discussed below:

NONROAD – is computerized database developed by the EPA to provide state and local pollution control agencies with the ability and resources to create and forecast emission inventories for the nonroad category of emission sources. These included all-terrain recreational vehicles and marine equipment, agricultural and construction equipment, lawn and garden equipment, locomotives and a variety of other off-road vehicles and equipment. The required inputs vary by the type of vehicle/equipment for which emission estimates are sought.

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NONROAD is used in support of airport air quality assessments primarily for the estimation of emissions from construction-related equipment and aircraft ground support equipment (GSE). Still in the draft form, updates to this model are developed periodically and are available from the EPA Office of Transportation and Air Quality.

4. DISPERSION ASSESSMENT (p. 31)

4.1 Introduction (p. 31)

Describes the purpose and applicability of dispersion modeling and introduces the concept of screening models.

For additional information and guidance on dispersion models, refer to the following publications:

- 40 CFR Chapter 1, Appendix W to Part 51 – *Guideline on Air Quality Models* (April 15, 2003 or the most recent edition.) (Reference 94)

Contains recommendations and supporting information on the selection and applications of air quality models.
- Federal Register, Vol. 63, No. 70 (April 13, 1998), *Emissions and Dispersion Modeling System Policy for Airport Air Quality Analysis*; Interim Guidance to FAA Orders 1050.1D and 5050.4A, DOT, FAA.

Provides an explanation of FAA's policy on the application and use of EDMS for airport air quality assessments. EDMS is now the FAA *required* model for air quality analysis of aviation sources: aircraft, auxiliary power units, and ground support equipment.

4.2 Dispersion Inputs (p. 32)

Introduces the section sub-headings that follow.

No changes.

4.2.1 Emission Sources (p. 32)

Refers to the emissions inventory for information.

No changes.

4.2.2 Meteorology (p. 32)

Describes the importance of wind speed, wind direction, atmospheric stability and mixing height.

In accordance with EPA's *Appendix W – Guideline to Air Quality Models*, "The meteorological data used as input to a dispersion model should be selected on the basis of spatial and climatological (e.g. temporal) representativeness as well as the ability of the individual parameters selected to characterize the transport and dispersion conditions in the area of concern". Temporal representativeness is defined as a function of the year-to-year variations in weather conditions. The EPA guidelines further advise, "The model user should acquire enough meteorological data to ensure that worst-case meteorological conditions are adequately represented in the model results".

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In order to meet these objectives, Appendix W calls for the use of up to five years of representative meteorological data. Five years of National Weather Service (NWS) meteorological data or at least one year of site-specific (e.g. data collected at, or in the immediate vicinity of, the facility) may be used. When site-specific data is available, these data are preferred. Appendix W provides further guidance when using less than 5 years of meteorological data: "when sufficient and representative data exist for less than a 5 year period from a nearby NWS site...then the highest concentration estimate should be considered the design value."

EPA is currently developing a screening process for its AERMOD atmospheric dispersion model that will enable the analysis of simulated worst-case meteorological conditions. As an interim measure, the modeler may coordinate with the reviewing agencies during the early stages of an air quality analysis to supplement and streamline this process.

In many cases, the reviewing agencies have already identified the yearly data set(s) that represent worst-case or other appropriate meteorological conditions for the study area. In other cases, the modeler may attempt to demonstrate which year(s) of meteorological data is characteristic of worst-case or other appropriate conditions.

The selection of appropriate meteorological data should be coordinated and verified early and on a case-by-case basis with the U.S. EPA, state and/or local agency that will review the modeling results. Any proposals for alternative approaches (e.g. number of scenarios analyzed or meteorological conditions requiring modeling) that expedite the work while meeting the reviewing agency(s) requirements should also be discussed and documented at this time.

4.2.3 Topography (p. 33)

Describes the potential effects of buoyant plumes and complex terrain.

For additional information on aircraft plume behavior, see the following publication:

- Preliminary Report: *The Use of LIDAR to Characterize Aircraft Initial Plume Characteristics*, prepared by R. Wayson, G. Flemming & B. Kim, Volpe National Transportation Systems Center, U.S. DOT, FAA, Office of Environment & Energy, October, 2002. (Reference 105)

4.2.4 Receptors (p. 33)

Defines the term and generally discusses the locations and amounts considered appropriate.

The number and placement of receptors is determined on a case-by-case basis taking into consideration such factors as the size and complexity of the project, the presence of sensitive receptors and the computer run time, among others. Based on EPA guidance developed for the modeling of other air emission sources, the following considerations are also appropriate for receptor locations when modeling airport emissions:

- Perimeter fence line
- Onsite areas of public access (i.e. main terminal area)
- Adjoining neighborhoods or other offsite sensitive receptors
- Offsite intersections (if CO hot-spot modeling is conducted)
- Nearby Class 1 areas

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- Nearby air monitoring sites

See also Section 4.1.2 (*Dispersion Calculations – Receptor Locations*) of the *EDMS Reference Manual* and EPA's *Appendix W, Guideline on Air Quality Models* (Section 8.2.2).

4.3 Available Models (p. 33)

Identifies and discusses EPA-preferred dispersion models including EDMS, CAL3QHC and ISC3. Also identifies several other models such as CALINE3 and Urban Airshed Model in Table 2).

The reference (2nd para., 1st sentence) to the Emissions Dispersion Modeling System (EDMS) should be updated to read as follows:

Emissions Dispersion Modeling System (EDMS) – The EDMS is the EPA preferred and the FAA required model for the assessment of aviation-related sources of the EPA-criteria air pollutants and their precursors.

The following model description should also be added to this section:

AERMOD (Reference 107) – This EPA model is designed to simulate the dispersion of non-reactive air pollutants over a wide variety of conditions. It is intended that this model will replace the Point-Area-Line (PAL) model and in some cases the Industrial Source Complex (ISC) model as EPA's preferred guideline model. Versions 4.0 and higher of EDMS contain AERMOD as the dispersion model. A meteorological data preprocessor is also used with this model called AERMET (Reference 106). Note: AERMET does not allow the user to create their own weather files.

Note that the EDMS, CAL3QHC, ISC and the other dispersion models described in this section and listed in Table 2 are continually updated and the most recent version should be used.

As of April 15, 2003, the following models were identified as EPA preferred models in Appendix W (Reference 94) and should be added to Table 2:

Buoyant Line and Point Source Model (BLP) - Gaussian model - industrial stationary line sources

CALPUFF - non-steady-state puff dispersion model – long range transport

Also, the following models should be removed from Table 2: CDM, RAM, UAM

For additional information and guidance on dispersion models, refer to the following publications:

- 40 CFR Chapter 1, Appendix W to Part 51 – *Guideline on Air Quality Models* (April 15, 2003 or the most recent edition.).

Contains recommendations and supporting information on the selection and applications of air quality models.

- Federal Register, Vol. 63, No. 70 (April 13, 1998), *Emissions and Dispersion Modeling System Policy for Airport Air Quality Analysis*; Interim Guidance to FAA Orders 1050.1D and 5050.4A, DOT, FAA.

Provides an explanation of FAA's policy on the application and use of EDMS for airport air quality assessments.

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5. CONFORMITY (p. 37)

Provides further explanation of the General and Transportation Conformity Rules and gives the regulatory citations.

For additional and updated information on the applicability of the General Conformity requirements see the following:

- 40 CFR Parts 51 and 93, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, Final Rule, U.S. EPA, November 30, 1993.
- *General Conformity Guidance for Airports – Questions & Answers*, FAA Community & Environmental Needs Division and the U.S. EPA OAQPS, Air Quality Strategies & Standards Division (September 25, 2002).

5.1 Applicability (p. 38)

Discusses the basis, conditions and criteria for determining the applicability of the General Conformity Rule including nonattainment designation, exemptions, threshold emission levels and regional significance; describes "direct" emissions and the concepts of "practicably control" and "continuing program responsibility". Tables 3 & 4 provide a listing of threshold levels, by pollutant and nonattainment/maintenance areas, below which a General Conformity analysis is not required.

See information under Section 5 (*Conformity*), above.

5.2 Analysis (p. 41)

Discusses the conditions, or methods, for meeting the General Conformity requirement

See information under Section 5 (*Conformity*), above.

5.3 Procedure (p. 42)

Provides clarification on the procedures for projects that do not require a General Conformity determination and the public notification requirements for projects that do.

See information under Section 5 (*Conformity*), above.

5.3.1 Conformity Steps Summary (p. 42)

Reviews the steps for considering the applicability of the General Conformity Rule.

See information under Section 5 (*Conformity*), above.

5.3.2 Conformity and NEPA (p. 42)

Discusses the relationship between NEPA and General Conformity requirements including the alternatives analysis.

See information under Section 5 (*Conformity*), above.

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5.4 References / Sources (p. 43)

Refers to EPA documents and other resources on General Conformity.

See information under Section 5 (*Conformity*), above.

6. MITIGATION / CONTROL MEASURES (p. 45)

Introduces the emission reduction measures that are discussed in this section.

It is important to note that although the title of this section is "Mitigation / Control Measures", a more appropriate title may be "Emission Reduction Measures" since "mitigation" is a specialized term in the context of General Conformity. Under General Conformity, an emission reduction measure that is a component of a proposed action and contributes to the action being below *de minimis* levels (and the General Conformity Rule not applying), is an emission reduction measure rather than a mitigation measure. Conversely, if a proposed action exceeds *de minimis* levels and the conformity determination process is activated, then "mitigation measures" may be identified as part of the General Conformity process. However, in this context, the mitigation measures "should be used to reduce the emissions from the action down to zero and not just to below *de minimis* as is the case when the Federal agency decides up front, before the action occurs, to reduce its emissions to below *de minimis* levels." (U.S. Environmental Protection Agency, July 13, 1994. *General Conformity Guidance: Questions and Answers*, Office of Air Quality Planning and Standards, Question 29.) Therefore, if a proposed project's emissions exceed *de minimis* levels, then the project sponsors should consider redesigning the project to avoid this to avoid this exceedance and requirement to offset emissions to zero.

6.1 Aircraft (p. 45)

Introduces the emission reduction measures that are discussed in this section.

No changes.

6.1.1 Single / Reduced Engine Taxiing (p. 45)

Explains the applicability and limitations of this practice as a mitigation measure.

No changes.

6.1.2 Derate Takeoff Power (p. 46)

Explains the applicability and limitations of this mitigation measure.

No changes.

6.1.3 Reduce Use of Reverse Thrust (p. 46)

Explains the applicability and limitations of this practice as a mitigation measure.

No changes.

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6.2 Auxiliary Power Units (p. 46)

Discusses the trade-offs of turning off the aircraft APU and using electricity as an energy source.

No changes.

6.3 Ground Support Equipment (p. 47)

Describes the benefits of alternative-fueled GSE.

No changes.

7. REFERENCES (p. 49)

7.1 Reference List (p. 49)

Lists references, by title, source, date, report number and/or telephone number for documents, regulations, agencies and other sources of relevant information.

The ICAO Engine Exhaust Emissions Databank (Reference 27) is now available in electronic spreadsheet form at <http://www.qinetiq.com/aircraft.html>.

The following publications should be added to the References List:

94. 40 CFR Chapter 1, Appendix W to Part 51 – *Guideline on Air Quality Models* (April 15, 2003, or the most recent edition).
95. 40 CFR Part 93, Subpart A, *Conformity to State or Federal Implementation Plans of Transportation Plans, Programs and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Laws* (July 1, 1998).
96. *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations. IERA-RS-BR-SR-2001-0010, Prepared by Robert O'Brien and Mark Wade of the Air Force Institute for Environment, Safety and Occupational Health Risk Analysis, Environmental Analysis Division, Brooks AFB, Texas, January 2002.*
97. *Consideration of Air Quality Impacts By Airplane Operations at or Above 3,000 feet AGL – Final Report*, prepared for the FAA Office of Environment & Energy, prepared by R. Wayson and G. Fleming Volpe National Transportation Systems Center, September 2000.
98. *Emissions & Dispersion Modeling System (EDMS) Reference Manual*, prepared for the FAA, prepared by CSSI Inc. May 2001.
99. FAA Order 1050.1D CHG4, *Policies & Procedures for Considering Environmental Impacts* (June 14, 1999).
100. Federal Register, Vol. 63, No. 70 (April 13, 1998), *Emissions and Dispersion Modeling System Policy for Airport Air Quality Analysis*; Interim Guidance to FAA Orders 1050.1D and 5050.4A, DOT, FAA.
101. *General Conformity Guidance for Airports – Questions & Answers*, FAA Community & Environmental Needs Division and the U.S. EPA OAQPS, Air Quality Strategies & Standards Division (September 25, 2002).

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102. *NONROAD – User’s Guide For The EPA Nonroad Emissions Model Draft NONROAD 2002*, (EPA 420-P-02-013) prepared by ENVIRON International Corp., prepared for the U.S. EPA Office of Transportation and Air Quality (OTAQ), December 2002.
103. *Selected Resource Materials and Annotated Bibliography on the Topic of Hazardous Air Pollutants (HAPs) Associated with Aircraft, Airports, and Aviation*. Prepared by URS Corp., prepared for the FAA Office of Environment & Energy, July 2003.
104. *Status Report on Proposed Methodology to Characterize Jet/Gas Turbine Engine Particulate Matter Emissions - Progress Report*, prepared for the FAA Office of Environment & Energy, prepared by R. Wayson, G. Fleming and B. Kim, Volpe National Transportation Systems Center, May 2003.
105. *The Use of LIDAR to Characterize Aircraft Initial Plume Characteristics*, Preliminary Report, prepared by R. Wayson, G. Flemming & B. Kim, Volpe National Transportation Systems Center, U.S. DOT, FAA, Office of Environment & Energy, October 2002.
106. *User’s Guide for the AERMOD Meteorological Preprocessor (AERMET), Revised Draft*, U.S. EPA, Office of Air Quality Planning and Standards, November 1998.
107. *User’s Guide for the AMS/EPA Regulatory Model – AERMOD, Revised Draft*, U.S. EPA, Office of Air Quality Planning Standards, November 1998.
108. *User’s Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model*, U.S. EPA, Office of Transportation and Air Quality, August 2003.
109. Personal correspondence to Bryan Manning, U.S. EPA, National Vehicle and Fuel Emissions Laboratory from Randall C. Williams, Honeywell Engines & Systems, regarding APU Emissions, September, 29, 2000.

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7.2 Annotated Reference List (p. 55)

Provides a synopsis of contents, applicability and/or interpretation of the references listed above in Section 7.1 of the Handbook.

Reference 53, *Airport Activity Statistics of Certificated Route Air Carriers*, is no longer published in hard copy by the U.S. DOT. Summary tables from recent publications can be found on the U.S. DOT, Office of Airline Information (OAI) website at <http://www.bts.gov/oai>. For detailed *Airport Activity Statistics* tables listing annual airline and aircraft activity by airport (as shown in the Attachment 4 example page), contact the Bureau of Transportation Statistics (BTS) directly at 1-800-853-1351 or answers@bts.gov.

The following publications should be added to the Annotated References List:

94. 40 CFR Chapter 1, Appendix W to Part 51 – *Guideline on Air Quality Models* (April 15, 2003 or the most recent edition.)

Federal publication containing summary information on the use of computerized atmospheric dispersion models, their intended applications and a list of EPA's "preferred" models.

95. 40 CFR Part 93, Subpart A, *Conformity to State or Federal Implementation Plans of Transportation Plans, Programs and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Laws* (July 1, 1998).

This publication provides background information and guidance on the development of, and compliance with, the Transportation Conformity Rule promulgated under the federal Clean Air Act.

96. *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations, Air Force Institute for Environment, Safety and Occupational Health Risk Analysis*. January 2002.

This report serves as a guidance document for the preparation of mobile source air emissions inventories at U.S. Air Force installations.

97. *Consideration of Air Quality Impacts By Airplane Operations at or Above 3,000 feet AGL – Final Report*, prepared for the FAA Office of Environment & Energy, prepared by R. Wayson and G. Fleming Volpe National Transportation Systems Center, September 2000.

Summary information and backup material of an analysis demonstrating that while commercial aircraft emissions do occur above 3,000 feet in altitude, they have little or no ground-level impacts.

98. *Emissions & Dispersion Modeling System (EDMS) Reference Manual*, prepared for the FAA, prepared by CSSI Inc. May 2001.

This reference manual provides updated and detailed information on the EDMS model including the AERMOD dispersion algorithm and the expanded databases of emission factors.

99. FAA Order 1050.1D CHG4, *Policies & Procedures for Considering Environmental Impacts* (June 14, 1999).

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This order change provides an updated version to the 1986 guidelines for conducting environmental impact assessments for FAA projects and actions, including impacts to air quality.

100. Federal Register, Vol. 63, No. 70 (April 13, 1998), *Emissions and Dispersion Modeling System Policy for Airport Air Quality Analysis*; Interim Guidance to FAA Orders 1050.1D and 5050.4A, DOT, FAA.

Provides an explanation of FAA's policy on the application and use of EDMS for airport air quality assessments.

101. *General Conformity Guidance for Airports – Questions & Answers*, FAA Community & Environmental Needs Division and the U.S. EPA OAQPS, Air Quality Strategies & Standards Division (September 25, 2002).

Prepared jointly by the FAA and the U.S. EPA with a particular emphasis on airport- and aviation-related projects or actions, this publication uses a question-and-answer format to address a wide assortment of issues associated with the requirements of the General Conformity Rule of the federal Clean Air Act.

102. *NONROAD – User's Guide For The EPA Nonroad Emissions Model*, Draft NONROAD 2002, prepared by ENVIRON International Corp., prepared for the U.S. EPA OTAQ, December 2002.

A computerized database developed by the EPA to provide state and local pollution control agencies with the ability and resources to create and forecast emission inventories for the nonroad category of emission sources. Still in the draft form, updates to this model are developed periodically and are available from the EPA Office of Transportation and Air Quality.

103. *Selected Resource Materials and Annotated Bibliography on the topic of Hazardous Air Pollutants (HAPs) associated with Aircraft, Airports, and Aviation*. Prepared by URS Corp. Prepared for the FAA Office of Environment & Energy, July 2003.

Based on publicly available information, this report provides a compendium and summary materials on the following topics:

- Common HAPs Associated with Aircraft & Airport Operations,
- Agency Guidelines & Standards,
- Air Monitoring Data & Information,
- HAPs Emission Factors and
- Atmospheric Dispersion Models.

The report also contains an extensive List of References and Annotated Bibliography of relevant materials pertaining to HAPs associated with aircraft and airports.).

104. *Status Report on Proposed Methodology to Characterize Jet/Gas Turbine Engine Particulate Matter Emissions - Progress Report*, prepared for the FAA Office of Environment & Energy, prepared by R. Wayson, G. Fleming and B. Kim, Volpe National Transportation Systems Center, May 2003.

This status report provides information on the results of a literature review and development of first order approximations for estimating particulate matter from transport-category aircraft.

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105. *The Use of LIDAR to Characterize Aircraft Initial Plume Characteristics*, Preliminary Report, prepared by R. Wayson, G. Flemming & B. Kim, Volpe National Transportation Systems Center, U.S. DOT, FAA, Office of Environment & Energy, October, 2002.

Preliminary results of a study using Light Detection and Ranging (LIDAR) to measure the initial plume characteristics of jet exhaust plumes.

106. *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*, Revised Draft, U.S. EPA, Office of Air Quality Planning and Standards, November 1998.

User's manual for the meteorological preprocessor used in conjunction with the EPA AERMOD atmospheric dispersion model.

107. *User's Guide for the AMS/EPA Regulatory Model – AERMOD*, Revised Draft, U.S. EPA, Office of Air Quality Planning and Standards, November 1998.

User's manual for the EPA guideline model designed to simulate the dispersion of non-reactive air pollutants.

108. *User's Guide to the MOBILE6.1 and MOBILE6.2 Mobile Source Emission Factor Model*, U.S. EPA, Office of Transportation and Air Quality, August 2003.

User's manual for the EPA guideline model designed to estimate highway vehicle emission factors of HC, CO, NO_x, PM and toxics.

109. Personal correspondence to Bryan Manning, U.S. EPA, National Vehicle and Fuel Emissions Laboratory from Randall C. Williams, Honeywell Engines & Systems, regarding APU Emissions, September, 29, 2000.

Honeywell's review of available APU emissions data. This information is used in EDMS.

8. INDEX (p. 69)

Provides the page number of topics contained in the report.

No changes.

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Appendix A: Air Quality Environmental Documents (p. A-3)

Identifies and describes various relevant NEPA documents prepared by FAA or the USAF in support of airport and airfield improvement actions including an EA, EIS, FONSI, ROD and General Conformity Determination.

- See FAA Order 1050.1D CHG4, *Policies & Procedures for Considering Environmental Impacts* (June 14, 1999) for an update on this guidance.

For additional and updated information on the applicability of the General Conformity requirements see the following:

- 40 CFR Parts 51 and 93, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, Final Rule, U.S. EPA, November 30, 1993.
- *General Conformity Guidance for Airports – Questions & Answers*, FAA Community & Environmental Needs Division and the U.S. EPA OAQPS, Air Quality Strategies & Standards Division (September 25, 2002).

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Appendix B: Project Reviewer's Check List (p. B-5)

Contains a recommended check list (in question format) for reviewing the various components of airport-related air quality impact analyses prepared under NEPA, General Conformity and/or Indirect Source Review requirements.

B1.4 General Conformity – The following changes should be made to the numbered steps:

The following is in addition:

10. Add PM-2.5 to the list of criteria pollutants.

The following are a reorganization of the steps and should be substituted for items 17 through 22:

17. Is the proposed project specified in the applicable state implementation plan (SIP) or is there sufficient emissions budget in the SIP to accommodate the action's emissions? If yes, the project conforms, coordinate with the state/local agencies; proceed to item 23 (conformity determination). If no, continue to item 18.
18. Were emissions mitigated or offset or the project redesigned to reduce direct, indirect, or construction/temporary emissions such that the project does conform with the provisions of the SIP? If yes, proceed to item 23 (conformity determination). If no, the project must be redefined and reevaluated such that it does conform to the SIP; or proceed to item 19 or 22.
19. For the proposed action, were the applicable pollutant concentrations computed by dispersion modeling?
20. Were appropriate background pollutant concentrations included in the dispersion analysis?
21. Do airport pollutant concentrations, when combined with the background pollutant concentrations exceed NAAQS? If yes, return to item 18. If no, action conforms; continue to item 23 (conformity determination).
22. Were local and state air quality agencies and EPA consulted for an alternative conformity determination? If yes and an alternate approach is successfully developed, proceed to item 23 (conformity determination). If no, go to item 18

B1.5 NAAQS Analysis – The following changes should be made to the numbered steps:

25. Do the airport operational levels exceed the passenger/activity thresholds established to indicate a potential need for National Ambient Air Quality Standard (NAAQS) review? If yes, coordinate with the FAA, EPA and other state/local agencies to verify need and develop approach for NAAQS assessment; proceed to item 26. If no, no further action is required.
26. Change the reference to item 26 to item 27.
27. Coordinate with FAA, EPA and other state/local agencies to verify need for the dispersion modeling of construction emissions.
29. Change reference to item 29 to item 30.

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Appendix C: Key Pollutants (p. C-3)

Discusses the six EPA criteria air pollutants individually and lists the NAAQS.

Particulate matter, one of the six criteria pollutants, is segregated into two size ranges; less than or equal to 10 microns in diameter (PM-10) and less than or equal to 2.5 microns in diameter (PM-2.5). Table C-1 (National Ambient Air Quality Standards (NAAQS) has been updated to include the PM-2.5 and 8-hr Ozone standards adopted by the U.S. EPA in 1997. However, EPA has delayed designating attainment and nonattainment areas for the PM-2.5 and 8-hr Ozone until 2004, while sufficient monitoring data is collected to determine which areas are in nonattainment. The standards are not effective until EPA finalizes the designations. Once an area has been designated as nonattainment for a pollutant, it will be required to do an environmental assessment on that pollutant and any other pollutant for which it has been designated as nonattainment (or maintenance).

Pollutant	Averaging Period	Standard¹
Ozone (O ₃)	8-hour average	0.08 ppm
	1-hour average	0.120 ppm (235 ug/m ³)
Carbon Monoxide (CO)	8-hour average	9 ppm (10 mg/ ³)
	1-hour average	35 ppm (40 mg/ ³)
Particulate Matter (PM-10)	24-hour average	150 ug/m ³
	Annual arithmetic mean	50 ug/m ³
Particulate Matter (PM-2.5)	24-hour average	50 ug/m ³
	Annual arithmetic mean	150 ug/m ³
Sulfur Dioxide (SO ₂)	24-hour average	365 ug/m ³
	Annual arithmetic mean	0.03 ppm (80 ug/m ³)
Nitrogen Dioxide (NO ₂)	Annual arithmetic mean	0.053 ppm (100 ug/m ³)
Lead (Pb)	Annual arithmetic mean	1.5 ug/m ³

Section C1.1 Ozone (O₃) is amended to include the 8-hour NAAQS for ozone, which was adopted by the U.S. EPA in 1997. This standard is evaluated on the 4th (daily maximum) 8-hour average per year, averaged over 3 years. As stated above, designations for attainment and nonattainment areas (based on 2001 to 2003 monitoring data) occurred on April 15, 2004.

Section C1.3 Particulates (PM-10) is amended to include the NAAQS for PM-2.5 that was also adopted by the U.S. EPA in 1997. The annual standard will be met when the 3-year average of the annual arithmetic mean PM-2.5 concentration is less than or equal to 15 ug/m³. The 24-hour standard will be met when the 3-year average of the 98th percentile of 24-hour PM-2.5 concentration is less than or equal to 65 ug/m³. EPA plans to make final attainment designations, based on 2001 to 2003 monitoring data, by December 15, 2004.

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Appendix D: Aircraft Emission Methodology (D-1)

Provides detailed instructions, sources of information, formulas, and common assumptions for the preparation of aircraft-related emission inventories.

D2.1 Commercial Aircraft – Methodology (p. D-5)

For additional information and guidance on conducting aircraft emissions inventory, see the following publication:

- *Emissions & Dispersion Modeling System (EDMS) Reference Manual*, prepared for the FAA, prepared by CSSI Inc. May 2001 (or the latest version).

D2.2 Data Sources (p. D-6)

D2.2.1 Aircraft type and Number of LTOs (p. D-6)

Aircraft type and number of LTOs can be obtained from a variety of sources including (but not limited to) airport master plans, airport tower records and noise impact assessments. Another source of data is the Bureau of Transportation Statistics (BTS)'s Office of Airline Information (OAI), which is part of the U.S. DOT. The OAI *publication Airport Activity Statistics of Certificated Route Air Carriers* provides detailed tables listing annual airline and aircraft activity by airport (as shown in the Attachment 4 example page). For additional information, contact the BTS directly at 1-800-853-1351 or answers@bts.gov.

For air quality analyses, the actual (or forecasted actual) aircraft fleet mix should be used (e.g., rather than an adjusted fleet that includes aircraft substitutions based on available noise data). Wherever aircraft substitutions are necessary for emissions analysis purposes, these can be made using similar aircraft operational and/or performance characteristics (including size and manufacturer) as a basis.

D.2.2.2 Engine type and Number (p. D-6)

See notes in connection with D2.2.1 *Aircraft type and Number of LTOs*, above.

D.2.2.3 Engine Emission Indices and Engine Fuel Flow (p. D-6)

For updated information pertaining to PM-10 emission factors, see the following publication:

- *A Review of Literature on Particulate Matter Emissions From Aircraft – Draft Letter Report*, prepared for the FAA Office of Environment & Energy, prepared by R. Wayson, G. Fleming and B. Kim, Volpe National Transportation Systems Center, April 2002.

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The *ICAO Engine Exhaust Emissions Databank* referenced in the text is now available in electronic spreadsheet form, as noted in Section 7: References. The SO_x emission factor should be corrected to read 1 lb/1000 lb (rather than 0.54 lb/1000 lb). (Wilcox, Richard S., US EPA. Letter to J. Draper, FAA dated November 22, 2000.) Additional information on this is provided in the *EDMS Reference Manual* report "Model Changes Between EDMS 3.2 and EDMS 4.0".

D.2.2.4 Time In Mode (p. D-6)

A variety of aircraft time in mode data (including taxi-in, taxi-out and ground-based delay) can be obtained from a variety of sources including (but not limited to) airport master plans, in-the-field measurements, ICAO, and airport operational models (i.e. SIMMOD).

Takeoff, climb out, approach and the landing roll portion of the idle mode TIMs are aircraft-specific in EDMS. They are generated using flight profile data that are based on the airframe, engine, takeoff weight, and approach angle to be flown. Additional information can be found in the EDMS User's Manual on TIMs.

The BTS OAI website has an airline on-time statistics searchable database. From this database, one can obtain summary statistics including airport average taxi-in and taxi-out times, or detailed statistics including taxi-in and taxi-out times by airport and airline.

D3. General Aviation and Air Taxi Aircraft (p. D.7)

The first paragraph on page D-8 is intended to refer to equations D-1 and D-2, which immediately follow the paragraph. Regarding Section D3.2 Data Sources, see information and comments provided in support of Sec. D2.1 *Commercial Aircraft – Methodology - D2.2 Data Sources*, above. In addition, another source of airport activity totals is the FAA's Air Traffic Data System (ATADS) located at the following FAA website: <http://www.apo.data.faa.gov/faaatadsall.htm>. ATADS is the official source of historical air traffic operations for center, airport, instrument, and approach counts.

D4. Military Aircraft (p. D.9)

See the USAF's most recent guidance, *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations* (see Section 7: Reference 96).

Appendix E: Auxiliary Power Unit Emission Methodology (p. E-1)

Provides detailed instructions, sources of information, formulas and common assumptions for the preparation of APU-related emission inventories.

More recent civilian APU data can be obtained from a variety of sources including (but not limited to) the airlines, APU manufacturers and in-the-field measurements. Updated information from Honeywell Engines & Systems on APU emissions data has been incorporated into EDMS (see Section 7: Reference 109). For military APUs, see the USAF's most recent guidance, *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations*.

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Appendix F: Ground Support Equipment and Aerospace Ground Equipment Emission Methodology (p. F-1)

Provides a listing of GSE types and detailed instructions, sources of information, formulas and common assumptions for the preparation of GSE-related emission inventories that are conventionally fueled or electric.

More recent and/or site specific GSE data (i.e. type, fuel, operational times) can be obtained from a variety of sources including (but not limited to) the airport, the airlines, the equipment/vehicle owner/operator, in-the-field surveys, EPA's draft NONROAD model, and EDMS. For military AGE, see the USAF's most recent guidance, *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations* (see Section 7: References).

GSE emissions can be calculated using a total GSE population-based approach (i.e. an accounting of all the equipment and vehicles on the airport) or using an aircraft LTO approach (i.e. based on the type and number of GSE serving each aircraft type for an LTO).

Appendix G: Ground Access Vehicles Emission Methodology (p. G-1)

Provides detailed instructions, sources of information, formulas and common assumptions for the preparation of motor vehicle-related emissions (including exhaust, evaporation, idling) associated with airport roadways and parking facilities. Also discusses the computation of motor vehicle emission factors and vehicle miles traveled.

The airport-related ground access motor vehicle (or surface traffic) data (i.e. volumes, fleet mix, speeds, idling times, fuel types) and associated information (i.e. roadway links, parking facilities, etc.) can be obtained from a variety of sources, including (but not limited to) airport planning studies, traffic studies and in-the-field surveys.

Other appropriate input data (i.e. temperature, local emission control measures, etc.) for computing motor vehicle emissions factors from the EPA MOBILE (or other equivalent emissions model) can be obtained from local transportation or air quality agencies.

There are several versions of EPA MOBILE model (e.g. MOBILE5, MOBILE6/6.2). An airport analysis generally should use the version of MOBILE that was used for the State SIP analysis. Effective January 2004, MOBILE6 will be the required emissions model for on-road motor vehicles.

Appendix H: Stationary Emission Methodology (p. H-1)

Provides detailed instructions, sources of information, formulas and assumptions for a wide array of combustion (i.e. boilers, generators, incinerators, fire training, engine testing) and non-combustion (fuel storage, deicing chemicals, sand piles) sources of emissions.

Site-specific data and information for stationary sources can be obtained from the airport authority, the individual airport tenants or the state/local air quality regulatory agency.

In Section H2.4.2.2 Emission Index, the text is intended to refer to Table H-3 for training fire emission indices.

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Appendix I: Dispersion Methodology (p. I-1)

Provides background information on dispersion modeling theory with specific instructions, sources of information and common input parameters and assumptions for airport applications.

EDMS 4.0 and its subsequent updates contains EPA's latest, and most preferred, atmospheric dispersion model – AERMOD. Unlike previous dispersion models, AERMOD significantly increases the fidelity of modeling concentrations by using both surface and upper-air observations to more accurately characterize the atmosphere. This allows for the mixing height and stability to be calculated continuously, as well as to provide a vertical profile for many atmospheric parameters. In addition, AERMOD allows irregularly shaped area sources as well as point and volume sources to be modeled. EDMS uses a combination of all these source types for modeling airport sources. This represents a significant advancement to EDMS and the analyst should refer to the following publication for additional information and guidance on the application of this model:

- *Emissions & Dispersion Modeling System (EDMS) Reference Manual*, prepared for the FAA, prepared by CSSI Inc. May 2001 (or the latest version).
- *User's Guide for the AMS/EPA Regulatory Model – AERMOD, Revised Draft*, U.S. EPA, Office of Air Quality Planning and Standards, November 1998.

When evaluating the modeling results to determine if a violation of the NAAQS is/are expected to occur, consideration must be given to the appropriate averaging time(s) and number of exceedances for the pollutant for which standards exist. EPA has identified a limited number of exceedances before a violation occurs for each pollutant. In most cases, each receptor in the modeling network is treated individually and any exceedance above the number allowed of a NAAQS at any receptor is considered a violation.

Equation I-1, in the handbook, on page I-6, defines Q as the mass flow of contaminants "from receptor", should read "from source".

EDMS does not use point "puffs" as described in paragraph 2 on Page I-8 to represent the takeoff roll and initial climb (and approach and landing). Instead, EDMS uses a series of area sources that represent "wide lines" for those modes.

In EDMS 4.0 and later, dispersion emissions are calculated for airplanes on takeoff, during their climb at takeoff power up to 1000 feet above the surface, during approach from 1000 ft. above the surface and during the landing roll. Dispersion emissions for helicopters are only modeled for a hover taxi mode.

For additional information and guidance on meteorology data, see Sec. 4.2.2 *Meteorology*, above.

For additional information and guidance on receptors, see Sec. 4.2.4 *Receptors*, above.

For additional information and guidance on aircraft emission sources, see *Appendix D: Aircraft Emission Methodology*, above.

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Appendix J: State Indirect Source Review Regulations (p. J-1)

Provides a list of states the ISR requirements and their thresholds.

The list of states that have the ISR (or Transportation Facility Permit) changes regularly and so the requirement for this assessment should be checked with each state on a case-by-case basis.

Attachment 1: JP Airline-Fleets International 94/95 Example Page

Provides an example summary page of airline fleet mix information.

Complete sets of JP airline fleets data for more recent years can be purchased in electronic and/or hard format on the following web site:

- <http://www.buchair.com/JPAF.htm>

Attachment 2: ICAO Engine Exhaust Emissions Databank Example Engine Data Sheet

Provides an example one-page summary of aircraft engine emission factors.

An updated electronic version of this material can be found on the following web site:

- <http://www.qinetiq.com/aircraft.html>

Attachment 3: "Aviation Week & Space Technology" U.S. Commercial Aircraft

Provides an example one page summary of aircraft / aircraft engine combinations.

An up-to-date listing of aircraft / aircraft engine combinations can be found in the following publications or on the following web site:

- *North American Airlines Handbook*, Second Edition, Airways International Inc., 1999.
- *International Directory of Civil Aircraft 2001/2002*, Aerospace Publications Ltd. 2001
- <http://www.speednews.com/lists/lists.shtml> (SpeedNews is a source for news and information for the commercial and military aviation industries.
- <http://www.backaviation.com/> [by subscription]

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Attachment 4: Airport Activity Statistics of Certified Route Air Carriers

Provides an example one page listing of aircraft operations at an air carrier airport.

Summary tables of recent *Airport Activity Statistics of Certificated Route Air Carriers* publications can be found on the US DOT, Office of Airline Information (OAI) website at <http://www.bts.gov/oai>, which contains a comprehensive listing of up-to-date data and information on airport and airline operational characteristics. For detailed *Airport Activity Statistics* tables listing annual airline and aircraft activity by airport (as shown in the Attachment 4 example page), contact the Bureau of Transportation Statistics (BTS) directly at 1-800-853-1351 or answers@bts.gov. Data and information pertaining to total airport activity levels can be found on the following FAA web sites:

- <http://www.apo.data.faa.gov/faaatadsall.htm> (The Air Traffic Activity Data System (ATADS) is the official source of historical air traffic operations for center, airport, instrument and approach counts. ATADS provides airport activity totals for air carriers, air taxis, general aviation aircraft, and military aircraft.)
- <http://www2.faa.gov/arp/planning/stats/index.cfm> (The Air Carrier Activity Information System (ACAIS) is a database that contains revenue passenger enplanements and all-cargo data in support of FAA's Airport Improvement Program (e.g., annual boardings by airport)).

Attachment 5: Airport Master Record Example of Ontario International Airport

Provides a two-page summary of actual aircraft activity records at an air carrier airport.

See information provided under Attachment 6 (*FAA Air Traffic Activity*) below.

Attachment 6: FAA Air Traffic Activity

Provides an example one page listing of aircraft operations at an air carrier airport.

An electronic source of airport activity totals is the FAA's Air Traffic Activity Data System (ATADS) located at the following FAA website: <http://www.apo.data.faa.gov/faaatadsall.htm>. ATADS is the official source of historical air traffic operations for center, airport, instrument and approach counts. ATADS provides airport activity totals for air carriers, air taxis, general aviation aircraft, and military aircraft.

In addition, a comprehensive listing of up-to-date data and information on airport and airline operational characteristics can be obtained from the U.S. DOT, Office of Airline Information (OAI). OAI's mission is to provide the U.S. government, DOT, and other users with uniform and comprehensive financial and market/traffic statistical economic data on individual air carrier (airline) operations and the air transportation industry. The web site is shown below:

- <http://www.bts.gov/oai/>

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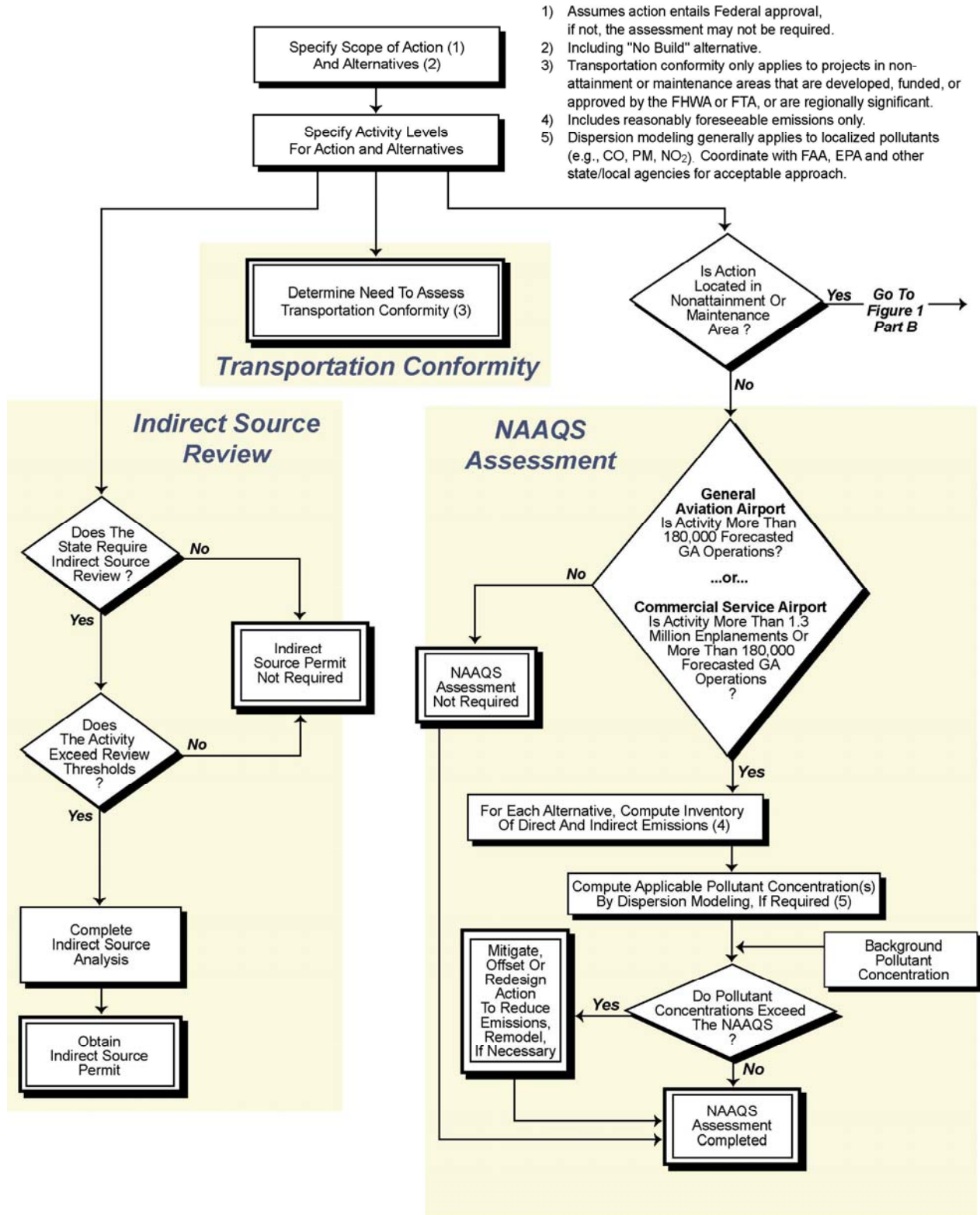


Figure 1. Air Quality Assessment Process for Airports and Air Bases - Part A

(Amended 9/04)

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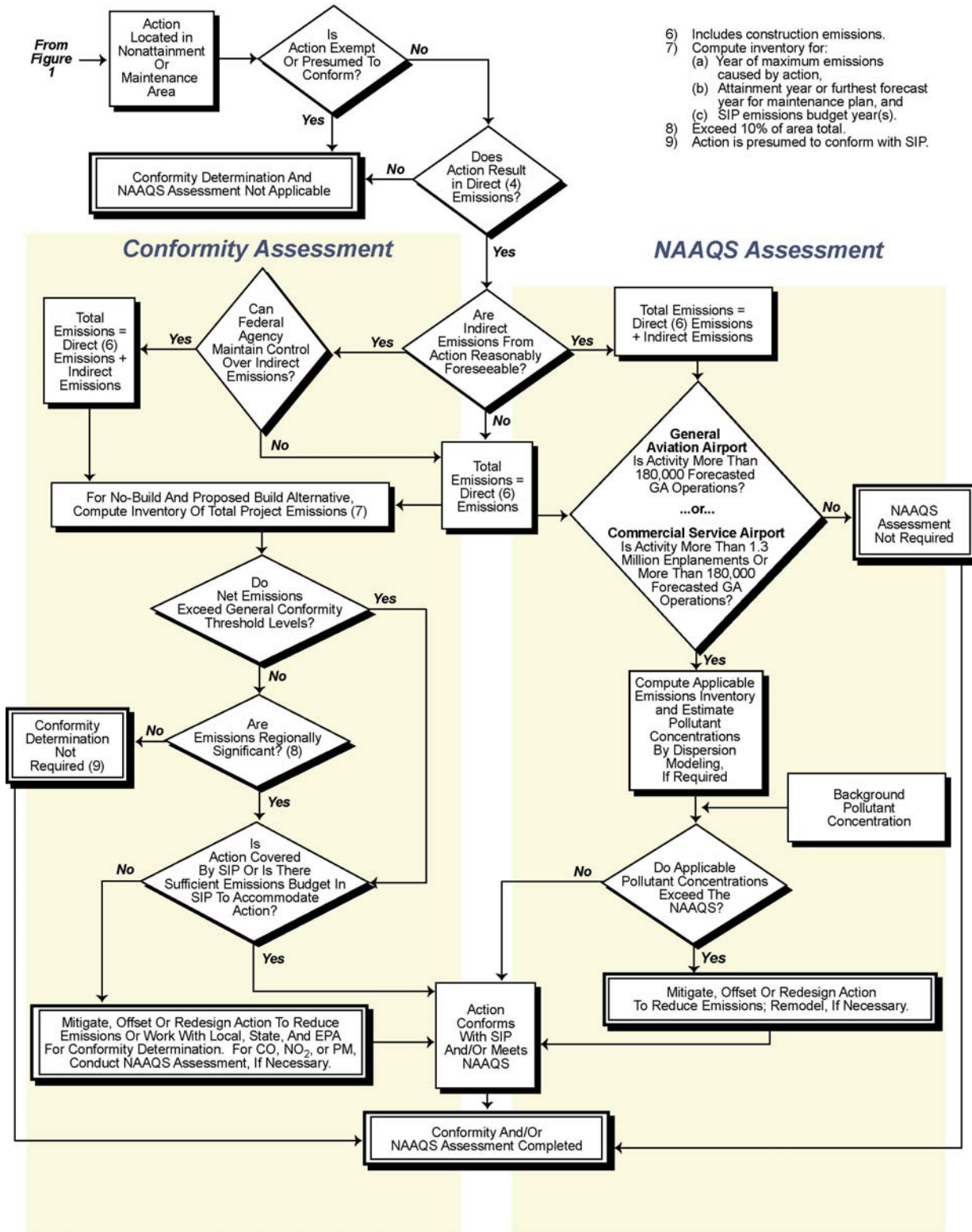


Figure 1. Air Quality Assessment Process for Airports and Air Bases - Part B