5.6 AIR QUALITY

It should be noted that the discussion of the air quality analysis for the Build Alternatives in this Final EIS has been modified from that which was provided in the Draft EIS. While the discussion has been summarized to facilitate review of the results of the analysis, the content allows for the same comparisons that were provided in the Draft EIS.

5.6.1 Background and Methodology

This section of the EIS presents the results of O'Hare-related changes in criteria air pollutant and pollutant precursor emissions, which are carbon monoxide, volatile organic compounds, nitrogen oxides, sulfur oxides, and particulate matter, with the proposed project alternatives under consideration for the No Action Alternative (Alternative A) as well as the Build Alternatives. Refer to **Appendix J**, **Air Quality**, for a detailed discussion of the assumptions, methodologies, and results of the analysis.

5.6.1.1 Interagency Coordination

The U.S. Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA) are Cooperating Agencies for this EIS. Prior to Scoping, FAA met with USEPA and IEPA representatives to identify their concerns and to initiate the development of the air quality assessment methodologies structured to best address those concerns. Thereafter, FAA maintained coordination with the USEPA and IEPA at each step of the air quality analyses. FAA's coordination included development of the air quality protocols[1] that established rigorous analytic methodologies that were discussed and subsequently modified based on input from these Agencies. For further information, including copies of these protocols, refer to **Appendix T, Public Outreach and Agency Coordination; Appendix J, Air Quality;** and **Appendix I, Hazardous Air Pollutant Discussion.**

5.6.1.2 Regulatory Context

FAA Order 1050.1E states the following regarding Air Quality:

> **2.1a**. Two primary laws apply to air quality: NEPA, and the Clean Air Act (CAA). As a Federal agency, the FAA is required under NEPA to prepare an environmental document…for major Federal actions that have the potential to affect the quality including air quality of the human environment. An air quality assessment prepared for inclusion in a NEPA environmental document should include an analysis and conclusions of a proposed action's impacts on air quality.

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[1] Protocols for Air Quality Criteria Pollutants and Hazardous Air Pollutants (HAPS) were completed.

2.1c. 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. The inventory should include both direct and indirect emissions that are reasonably foreseeable. Normally, further analysis would not be required for pollutants where emissions do not exceed general conformity thresholds. However, based on the nature of the project and consultation with State and local air quality agencies additional analysis may be deemed appropriate, such as that required for cumulative impacts.

Clean Air Act and Clean Air Act Amendments

Congress began addressing poor air quality during the 1960s. The Clean Air Act was enacted in 1967, which in general focused on technical information associated with air pollution, research, grants, and the abatement of interstate air pollution issues. The 1970 Clean Act was the first comprehensive act addressing air pollution levels in the United States. The 1970 Clean Air Act established the National Ambient Air Quality Standards (NAAQS) to protect public health and welfare and required states to prepare and implement plans (SIPs) to show how they could achieve the NAAQS.

In accordance with the Clean Air Act, all areas within the United States are designated with respect to the NAAQS as attainment, non-attainment, maintenance, or unclassifiable. An area with air quality better than the NAAQS is designated attainment; an area with historical air quality conditions worse than the NAAQS is designated non-attainment. Maintenance areas are non-attainment areas that have been re-designated to attainment status. Finally, an area may be designated as being unclassifiable when there is a lack of data to form a basis of attainment status. O'Hare is located in an area designated as non-attainment for the 8-hour ozone standard (moderate non-attainment) and for the annual standard for particulate matter 2.5 microns or less in size. Notably, the area was previously designated as being a non-attainment area with respect to the 1-hour standard for ozone (severe). The USEPA revoked the 1-hour standard for ozone on June 15, 2005.

The 1990 Clean Air Act Amendments address strategies meant to achieve and maintain the criteria air pollutant NAAQS, to reduce emissions from mobile sources, to regulate air toxics (hazardous air pollutants), to control acid rain, to phase-out production of chemicals that affect ozone levels in the upper atmosphere (e.g., chlorofluorocarbons), and to provide enforcement sanctions for not achieving and maintaining the NAAQS.

Clean Air Act Conformity

Under Section 176(c) of the Clean Air Act, 42 U.S.C. § 7506(c) (also known as Conformity), Federal agencies, such as the FAA, are prohibited from engaging in, supporting in any way, providing financial assistance for, licensing or permitting, or approving any activity in a non-attainment or maintenance area that does not conform to an approved SIP.

To implement the provisions of Section 176(c) of the Clean Air Act, the USEPA has adopted guidance for demonstrating conformity. Within non-attainment areas, Federal actions related to transportation (highway) plans, programs, and projects that are developed, funded, or approved under U.S.C. Title 23[2] or the Federal Transit Act,[3] must meet the procedures and criteria of 40 CFR Part 51, Subpart T.[4] Non-highway related actions must also demonstrate conformity. These conformity demonstrations must meet the procedures and criteria of 40 CFR Part 51, Subpart W.[5] IEPA has adopted these "general conformity rules" (Title 35, IL Administration Code, Part 255).

Under the general conformity rules (40 CFR Part 93 Subpart B), a project does not require a conformity determination if the project is exempt, presumed to conform, or if the increase in emissions due to a proposed Federal action is less than the *de minimis* thresholds outlined in Title 35 Illinois (IL) Administrative Code Part 255 and 40 CFR Part 93 Subpart B, and if the action-related emissions are not regionally significant (if the action-related emissions are less than 10 percent of the emissions in the SIP).

USEPA's general conformity rule defines a "conforming" project as one that: 1) conforms to the SIP's overall objective of eliminating or reducing the severity and number of air quality violations in a state and achieving expeditious attainment of the NAAQS; 2) does not cause or contribute to new NAAQS violations in the area; 3) does not increase the frequency or severity of existing NAAQS violations in the area; and 4) does not delay the state's timely attainment of the NAAQS or impede required progress toward attainment.[6]

As discussed below in **Section 5.6.4**, **Clean Air Act Conformity Determination**, the FAA published a Draft General Conformity Determination on May 18, 2005. The FAA's Final General Conformity Determination with respect to the proposed improvements at O'Hare is provided as **Attachment J-3**, in **Appendix J, Air Quality**.

Illinois State Implementation Plans (SIPs)

Because measured levels of ambient air in the Greater Chicago Metropolitan Area have exceeded the NAAQS for ozone and particulate matter 2.5 microns or less in size, the State of Illinois is required to develop SIPs that outline the actions that will be taken to achieve the standards. The area which encompasses the O'Hare International Airport is designated as attainment for all other pollutants. The mandated attainment date for the 1-hour ozone NAAQS was November 15, 2007. In compliance with the mandates of the Clean Air Act, the

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[2] 49 USC 1601.
[3] 49 USC Chapter 53.
[4] 40 CFR Part 51, Subpart T 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.
[5] 40 CFR Part 51, Subpart W Determining Conformity of General Federal Actions to State or Federal Implementation Plans. 40 CFR Part 93, Subpart B applies after States include general conformity requirements in their SIPs.
[6] 40 CFR § 93.158.

IEPA developed a SIP to define the process by which the 1-hour ozone NAAQS would be attained. On November 13, 2001 the USEPA approved the 1-hour ozone SIP, which included a demonstration of attainment by the end of the year 2007.[7] The approved SIP also contained a post-1999 ozone Rate-of-Progress plan with associated Rate-of-Progress mobile source conformity emission budgets; a contingency measure plan for both the ozone non-attainment demonstration and the post-1999 Rate-of-Progress plan; a commitment by the State of Illinois to conduct a Mid-Course Review of the ozone non-attainment demonstration; motor vehicle emission inventories and budgets for volatile organic compounds and oxides of nitrogen for the years 2005 and 2007 (the inventories and budgets were updated in September of 2003);[8] and, a demonstration that the State of Illinois had fully implemented Reasonably Available Control Measures.

Rate-of-Progress plans are a requirement of the Clean Air Act. The plans contain strategies to achieve periodic reductions in emissions that produce ozone in areas not attaining the ozone NAAQS. The SIP for the Illinois portion of the 1-hour non-attainment area (referred to in this document as the Chicago non-attainment area) contains control strategies that the State is using to reduce emissions to reach attainment of the standard. The emission control strategies within the SIP include an enhanced motor vehicle inspection/maintenance program, new source review (NSR) requirements, a clean fuel fleet program, measures to offset growth in motor vehicle miles traveled, and measures to recover gasoline vapors at retail service stations.

Because both the NAAQS for 8-hour ozone and for particulate matter 2.5 microns are relatively new, there are no approved SIPs for these pollutants and/or averaging times. Rather, the IEPA is in the process of preparing the SIPs that will define the steps that will be taken to attain the standards for these pollutants. The 8-hour ozone SIP is to be submitted to the USEPA by April of 2007 and the SIP for particulate matter 2.5 microns or less in size is to be submitted to the USEPA by April of 2008.

Ambient Air Quality Standards

Under the authority of the Clean Air Act, the USEPA established NAAQS for six common air pollutants. These pollutants are referred to as the "criteria" air pollutants. The USEPA established the NAAQS to protect both the health and welfare of the public. Primary air quality standards are the levels established by the USEPA to protect public health. Secondary standards are levels that protect the welfare of the public (buildings, clothing, and vegetation).

The pollutants for which NAAQS have been established are ozone, nitrogen dioxide, carbon monoxide, particulate matter 10 microns in size or less, particulate matter 2.5 microns in size or less, sulfur dioxide, and lead. The NAAQS are provided in **Table 5.6-1**. With the exception of the 8-hour ozone standard and the standard for particulate 2.5 microns in size or less, the State of Illinois has adopted the NAAQS. It is expected that the 8-hour ozone standard and the

[7] Federal Register, Vol 66, No. 219, November 13, 2001.
[8] Federal Register, Vol 68, No. 178, September 13, 2003.

standards for particulate 2.5 microns or less in size will be adopted by the State of Illinois in the near future.

The NAAQS are expressed in either parts per million (ppm) or micrograms per cubic meter (µg/m³). These units are used to describe very small amounts of contaminants within the ambient air. Concentrations expressed in ppm indicate the number of samples (parts) of the applicable pollutant in one million samples (parts) of air and concentrations expressed in µg/m³ indicate the weight of a pollutant in a cubic meter (or volume) of air.

TABLE 5.6-1
NATIONAL AMBIENT AIR QUALITY STANDARDS

		Primary Standards(Health Based)		Secondary Standards(Welfare Based)	
Pollutant	**Averaging Time**	**Micrograms per cubic meter (µg/m³)**	**Parts per million (ppm)**	**Micrograms per cubic meter (µg/m³)**	**Parts per million (ppm)**
Ozone	1-Hour(a)	-	0.12	-	0.12
	8-Hour(b)	-	0.08	-	0.08
Nitrogen dioxide	Annual(c)	100	0.053	100	0.053
Carbon monoxide	1-Hour(d)	40,000	35	NS	NS
	8-Hour(d)	10,000	9	NS	NS
Particulate matter 10 microns or less in size	24-hour(e)	150	-	150	-
	Annual(f)	50	-	50	-
Particulate matter 2.5 microns or less in size	24-hour(g)	65	-	65	-
	Annual(h)	15.0	-	15.0	-
Sulfur dioxide(j)	3-hour(d)	NS	NS	1,300	0.5
	24-hour(d)	-	0.14	NS	NS
	Annual(h)	-	0.030	NS	NS
Lead	Quarterly Mean(i)	1.5	-	1.5	-

Notes: "-" = not applicable
NS = No established standard
ppm - parts per million
µg/m3 - micrograms per cubic meter
(a) The 1-hour ozone standard was revoked by the USEPA on June 15, 2005. Previously, the 1-hour standard was attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 parts per million (235 µg/m3) was equal to or less than one.
(b) Attained when the average of the annual fourth highest daily maximum 8-hour average is less than or equal to 0.08 ppm.
(c) Attained when the annual arithmetic mean concentration in a calendar year is less than or equal to 0.053 ppm, rounded to three decimal places.
(d) Not to be exceeded more than once per year.
(e) Attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is equal to or less than one.
(f) Attained when the expected annual arithmetic mean concentration is less than or equal to 50 µg/m³.
(g) Attained when the 98th percentile 24-hour concentration is less than or equal to 65 µg/m³.
(h) Attained when the annual arithmetic mean concentration is less than or equal to 15.0 µg/m³.
(i) Maximum arithmetic mean averaged over a calendar quarter.
(j) The NAAQS for sulfur oxides is measured in the ambient air as sulfur dioxide.

Source: 40 CFR Part 50, National Primary and Secondary Ambient Air Quality Standards.

The following provides a brief summary of the potential health and welfare effects of each of the criteria air pollutants.

Ozone – When volatile organic compounds and nitrogen oxides accumulate in the atmosphere and are exposed to the ultraviolet component of sunlight, the pollutant ozone is formed. Ozone is a pulmonary irritant that affects the respiratory mucous membranes, other lung tissues, and respiratory functions. Exposure to ozone at certain concentrations can result in symptoms such as tightness in the chest, coughing, and wheezing, and can trigger an attack or exacerbate the symptoms of asthma, bronchitis, and emphysema. Elevated concentrations of ozone also interfere with the ability of a plant to produce and store food, damage the leaves of trees, and reduce crop and forest yields. Within Illinois, the duration of the ozone season is typically from May 1st through September 30th.

Nitrogen Dioxide - When combustion temperatures are extremely high, as in aircraft engines, boilers, furnaces, or automobile engines, nitrogen gas from the atmosphere and from fuel combines with oxygen gas to form various oxides of nitrogen. Of these oxides of nitrogen, nitrogen dioxide is the most significant air pollutant. Nitrogen dioxide is a lung irritant capable of producing pulmonary edema at high concentrations, and exposure to elevated concentrations can lead to respiratory illnesses such as bronchitis and pneumonia. Nitrate particles and nitrogen dioxide can also block the transmission of light, reducing visibility in urban areas.

Carbon Monoxide – Carbon monoxide is a colorless and odorless gas that is a product of incomplete combustion. At elevated concentrations, this pollutant can have cardiovascular and central nervous system effects. Carbon monoxide is absorbed by the lungs and reacts with hemoglobin to reduce the oxygen-carrying capacity of the blood. At moderate concentrations, carbon monoxide has been shown to aggravate the symptoms of cardiovascular disease. It can also cause headaches and nausea, and in extremely high concentrations, can lead to coma and death.

Particulate Matter - Typical sources of particulate matter are combustion of fossil fuels, industrial processes involving metals and fibers, fugitive dust from wind and mechanical erosion of soil, and photochemically produced particles (complex chain reactions between sunlight and gaseous pollutants). Particulate matter is made up of small solid particles and liquid droplets. Suspended particulates refer to particles of approximately 100 micrometers or less in diameter. Particulates larger than 10 micrometers remain in the nose and throat and are readily expelled. Particles 10 micrometers or smaller can reach the air ducts (bronchi) and the air sacs (alveoli) of the lung. Particles 2.5 micrometers or smaller have the best chance of reaching the lower respiratory tract. These particulates have been associated with increased respiratory diseases such as asthma, bronchitis, and emphysema; cardiopulmonary disease (heart attack); and cancer. Particulate matter is also a major cause of reduced visibility in parts of the United States.

Sulfur Dioxide – Sulfur dioxide is a colorless gas that is formed when fuels containing sulfur compounds are combusted. Sulfur dioxide can cause irritation and inflammation of tissues with which it comes in contact. Inhalation of elevated concentrations can cause irritation of the mucous membranes, bronchial damage, and can exacerbate pre-existing respiratory diseases such as asthma, bronchitis, and emphysema. Sulfate particles are the major cause of reduced visibility in many areas of the United States. When combined with other substances in the air, this pollutant can fall to the earth as rain, fog, snow, or dry particles (commonly referred to as "acid rain"). Sulfur dioxide can also accelerate the decay of building materials and certain types of paint.

Lead – People and animals can be exposed to lead by breathing or ingesting it in food, water, soil, or dust. Historically, the majority of lead came from the combustion of leaded fuels. However, the use of unleaded fuels since 1975 has reduced mobile source lead emissions by over 90 percent. Unlike unleaded automobile gasoline, aviation gasoline (commonly known as "AvGas" or 100 octane low-lead "100LL") still contains lead as an antiknock agent. AvGas is generally only used by general aviation aircraft with piston engines. Currently, stationary sources such as lead smelters, battery manufacturers, and iron and steel producers emit the majority of ground-based lead emissions. Lead is a stable compound that accumulates in the environment and in living organisms where it can interfere with the maturation and development of red blood cells, affects liver and kidney functions, and disturbs enzyme activity. Lead exposure can also cause liver disease, affect the normal functions of the reproductive and cardiovascular systems, and cause mental retardation and brain damage in children. Near industrial facilities, concentrations of lead have been shown to slow down the rate of vegetative growth.

5.6.1.3 Regional Air Quality Conditions

The O'Hare International Airport is located within Cook and DuPage counties. These counties are within Illinois Air Quality Control Region Number 67 (the Metropolitan Chicago Interstate (Illinois-Indiana) Region). Cook and DuPage counties are designated attainment for carbon monoxide, nitrogen dioxide, and sulfur dioxide.[9] With the exception of areas within the Lyons Township (in Cook County but south of O'Hare) and in southeast Chicago[10] that are designated moderate non-attainment, both counties are also designated attainment for particulate matter 10 microns in size or less. Finally, the two counties (Cook and DuPage) are included within an area that is currently designated non-attainment for the annual NAAQS for particulate matter 2.5 microns in size or less and for the 8-hour NAAQS for ozone. Notably, the area was also previously designated non-attainment for the 1-hour ozone NAAQS. For the 8-hour ozone NAAQS, the USEPA designated the area as moderate non-attainment. The eight-hour ozone and annual particulate matter 2.5 microns and less in size non-attainment area encompasses the following:

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9 USEPA Green Book (http://www.epa.gov/oar/oaqps/greenbk/oindex.html).

10 The area bounded on the north by 79th Street, on the west by Interstate 57 between Sibley Boulevard and Interstate 94 and by Interstate 94 between Interstate 57 and 79th Street, on the south by Sibley Boulevard, and on the east by the Illinois/Indiana State line.

- Illinois: the counties of Cook, DuPage, Grundy (Aux Sable and Gooselake Townships), Kane, Kendall (Oswego Township), Lake, McHenry, and Will.
- Indiana: The counties of Lake and Porter.

The mandated attainment date for the 8-hour ozone NAAQS is June 15, 2010. The area is mandated to attain the annual standard for particulate matter 2.5 microns or less in size on or before April of 2010.

Because O'Hare is located within Illinois, the discussion and assessment of precursors to the air pollutant ozone and particulate matter 2.5 microns or less in size has, for the most part, been limited to the Illinois portion of the non-attainment area (referred to as the Chicago non-attainment area). Notably, representatives of the IEPA and representatives of the Indiana Department of Environmental Management (IDEM) serve together in the Lake Michigan Air Directors Consortium to assess air quality conditions within the entire non-attainment area.

SIP Emission Inventories

The only USEPA approved SIP addresses the 1-hour ozone NAAQS. As previously stated, SIPs that address the 8-hour ozone NAAQS and the annual NAAQS for particulate matter 2.5 microns or less in size are being prepared by the IEPA and will be submitted to the USEPA for review and approval on or before April of 2007 and April of 2008, respectively. As required by the USEPA, SIPs mandate that the State of Illinois generate Rate-of-Progress emission inventories every three years. Within these inventories, four general types of emission sources are identified: mobile (on-road and off-road); point (facilities holding operating permits); area (small stationary and other sources); and biogenic (or natural) sources. Aircraft and ground support equipment (GSE) are mobile off-road sources. Construction activities are also included in the mobile off-road category. **Table 5.6-2** presents the IEPA's estimated emission inventories of volatile organic compounds for the year 1990. Year 1990 emission totals were used as the base by which emission control measures were evaluated for attainment of the 1-hour ozone NAAQS and for meeting Rate-of-Progress requirements.

As also shown in **Table 5.6-2**, by 1999, the IEPA estimates of volatile organic compounds indicate that regional emission levels decreased approximately 592 tons/day, a 47 percent reduction when compared to 1990 levels. The majority of this reduction was due to compliance with emission controls established by the State and USEPA. Of the total volatile organic compound emissions occurring in 1999 (661 tons/day), the portion from area sources increased to represent approximately 26 percent (174 tons/day) of the total, while on-road mobile source emissions decreased to represent approximately 37 percent (242 tons/day) of the total emissions. Off-road mobile source increased to represent approximately 20 percent (133 tons/day) while point source emissions also decreased to represent approximately 17 percent (112 tons/day). Notably, in 1990 and 1999, the aircraft and ground support equipment operating within the

Chicago non-attainment area contributed less than one percent (approximately 11 and nine tons/day, respectively) to the regional total of volatile organic compound emissions.[11]

TABLE 5.6-2
SUMMER WEEKDAY EMISSION INVENTORY WITHIN THE CHICAGO OZONE NON-ATTAINMENT AREA – VOLATILE ORGANIC COMPOUNDS

	1990 (Tons/Day)					1999 (Tons/Day)				
Source	**Point**	**Area**	**On Road**	**Off Road**	**Total**	**Point**	**Area**	**On Road**	**Off Road**	**Total**
Storage, Transportation and Marketing(a)	21.46	56.10	-	-	77.56	10.58	14.96	-	-	25.54
Industrial Process	143.31	-	-	-	143.31	37.08	-	-	-	37.08
Industrial Surface Coating	104.33	-	-	-	104.33	27.87	-	-	-	27.87
Non-Industrial Surface Coating	-	79.37	-	-	79.37	-	53.26	-	-	53.26
Other Solvent Use	46.28	116.22	-	-	162.50	15.35	88.32	-	-	103.67
Waste Disposal	23.33	3.39	-	-	26.72	11.95	3.75	-	-	15.70
Miscellaneous Sources(b)	11.37	12.93	-	-	24.30	9.26	13.59	-	-	22.85
Mobile - On Road	-	-	491.22	-	491.22	-	-	241.77	-	241.77
Mobile - Off Road	-	-		133.26	133.26	-	-		124.04	124.04
Mobile - Off Road - Aircraft and Ground Support Equipment	-	-	-	11.02	11.02	-	-	-	9.40	9.40
Total	**350.08**	**268.01**	**491.22**	**144.28**	**1253.59**	**112.09**	**173.88**	**241.77**	**133.44**	**661.18**
Percent of Regional Total	**28**	**21**	**39**	**12**	**100**	**17**	**26**	**37**	**20**	**100**

Notes: "-" = not applicable
(a) Includes aircraft refueling
(b) Excludes biogenic sources

Source: Environmental Science Associates, Inc. [TPC] analysis of information provided by the Illinois Environmental Protection Agency.

As shown in **Table 5.6-3**, by 1999, regional emission levels of nitrogen oxides decreased approximately 51 tons/day – a 5 percent reduction when compared to 1990 levels. Of the total nitrogen oxide emissions occurring in 1999 (992 tons/day), on-road mobile sources contributed approximately 50 percent (496 tons/day); point sources contributed approximately 28 percent (276 tons/day); off-road mobile sources contributed approximately 19 percent (187 tons/day); and area sources contributed approximately three percent (33 tons/day). As also shown, the aircraft and ground support equipment operating within the Chicago non-attainment area contributed approximately three percent to the regional total emissions (28 and 33 tons/day, respectively).

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11 Aircraft and ground support equipment emissions from O'Hare International Airport and other airports within the non-attainment area including the Chicago Midway, Lansing Municipal, and Palwaukee Municipal airports in Cook County, the Schaumburg Regional and DuPage airports in DuPage County, and the Clow International, Joliet Regional, and Sanger airports in Will County.

TABLE 5.6-3
SUMMER WEEKDAY EMISSION INVENTORY WITHIN THE CHICAGO OZONE NON-ATTAINMENT AREA – NITROGEN OXIDES

	1990 (Tons/Day)					1999 (Tons/Day)				
Source	Point	Area	On Road	Off Road	Total	Point	Area	On Road	Off Road	Total
External Fuel Combustion	202.78	21.64	-	-	224.42	214.29	28.88	-	-	243.17
Stationary Internal Combustion	48.46		-	-	48.46	31.80	-	-	-	31.80
Other Combustion	3.56	2.19	-	-	5.75	2.77	3.95	-	-	6.72
Industrial Processes	55.90	-	-	-	55.90	27.20	-	-	-	27.20
Mobile - On Road	-	-	540.26	-	540.26	-	-	495.94	-	495.94
Mobile - Off Road	-	-	-	139.26	139.26	-	-	-	153.51	153.51
Mobile - Off Road - Aircraft and Ground Support Equipment	-	-	-	28.25	28.25	-	-	-	33.38	33.38
Total	**310.7**	**23.83**	**540.26**	**167.51**	**1042.30**	**276.06**	**32.83**	**495.94**	**186.89**	**991.72**
Percent of Regional Total	**30**	**2**	**52**	**16**	**100**	**28**	**3**	**50**	**19**	**100**

Note: "-" = not applicable
The 1990 inventory does not include a line item for biogenic sources
Source: Environmental Science Associates, Inc. [TPC] analysis of information provided by the Illinois Environmental Protection Agency.

In compliance with Clean Air Act requirements, the IEPA prepared projected emission inventories for the Chicago non-attainment area for the year 2007. **Tables 5.6-4** and **5.6-5** present the IEPA projected 2007 volatile organic compound and nitrogen oxide emissions by source category. The year 2007 is the farthest year out for which the IEPA has prepared projections of regional emissions. As shown in **Table 5.6-4**, by 2007, the IEPA predicts that emissions of volatile organic compounds will decrease to approximately 407 tons/day, a 68 percent reduction when compared to 1990 levels and a 38 percent reduction when compared to 1999 levels. By 2007, area sources are predicted to be the largest source of regional emissions contributing approximately 185 tons/day (45 percent) to the total. Most notably, the aircraft and ground support equipment operating within the Chicago non-attainment area are predicted to contribute approximately 12 tons/day to the regional total (three percent). As such, the proportion of aircraft and ground support equipment emissions is not expected to increase significantly through the year 2007.

Exhibit 5.6-1 illustrates the source distribution of regional emissions of volatile organic compounds in the base year of 1990 and the year 2007. As previously stated, aircraft and ground support equipment emissions contributed approximately one percent to the regional total of these emissions in 1990, and the proportional share of emissions from these sources is not expected to increase significantly through the year 2007 (3 percent).

TABLE 5.6-4
IEPA PROJECTED (2007) SUMMER WEEKDAY EMISSIONS WITHIN THE CHICAGO OZONE NON-ATTAINMENT AREA – VOLATILE ORGANIC COMPOUNDS

	2007 (Tons/Day)				
Source	**Point**	**Area**	**On Road**	**Off Road**	**Total**
Storage, Transportation and Marketing(a)	9.52	14.98	-	-	24.50
Industrial Process	34.48	-	-	-	34.48
Industrial Surface Coating	40.19	-	-	-	40.19
Non-Industrial Surface Coating	-	56.44	-	-	56.44
Other Solvent Use	20.51	97.16	-	-	117.67
Waste Disposal	13.67	2.14	-	-	15.81
Miscellaneous Sources(b)	13.23	14.19	-	-	27.42
Mobile - On Road (c)	-	-	127.42	-	127.42
Mobile - Off Road	-	-	-	78.27	78.27
Mobile - Off Road - Aircraft and Ground Support Equipment	-	-	-	12.15	12.15
Total	**131.6**	**184.91**	**127.42**	**90.42**	**406.93**
Percent of Regional Total	**32**	**45**	**31**	**22**	**100**
1990	**350.08**	**268.01**	**491.22**	**144.28**	**1,253.59**
(Percent Increase/Decrease by 2007)	**(-62)**	**(-31)**	**(-74)**	**(-37)**	**(-68)**
1999	**112.09**	**173.88**	**241.77**	**133.44**	**661.18**
(Percent Increase/Decrease by 2007)	**(-17)**	**(+6)**	**(-47)**	**(-32)**	**(-38)**

Notes: "-" = not applicable
(a) Includes aircraft refueling
(b) Excludes biogenic sources
(c) IEPA mobile on road source emission estimates using the MOBILE6 emission model.

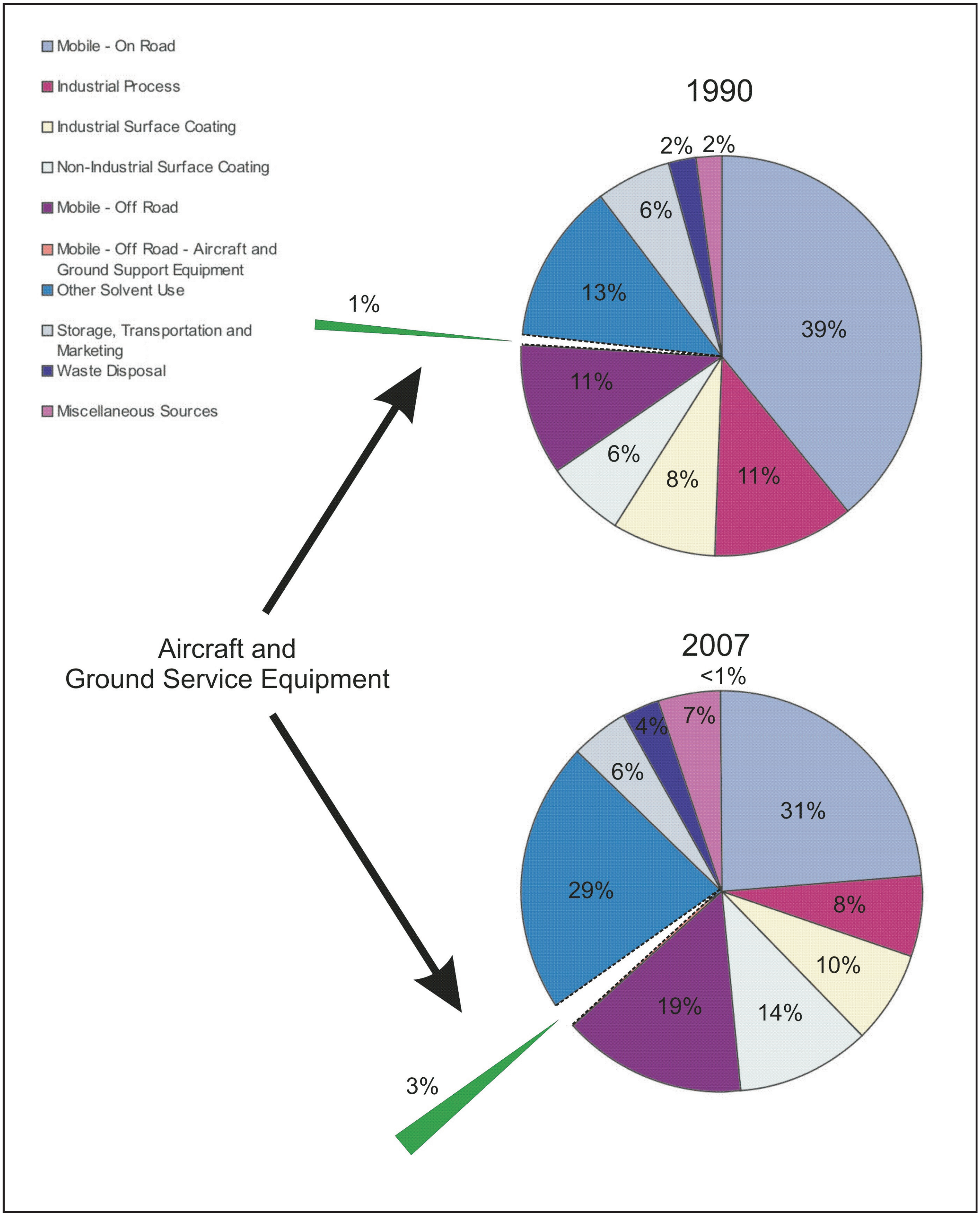
Source: Environmental Science Associates, Inc. [TPC] analysis of information provided by the Illinois Environmental Protection Agency.

TABLE 5.6-5
IEPA PROJECTED (2007) SUMMER WEEKDAY EMISSIONS WITHIN THE CHICAGO OZONE NON-ATTAINMENT AREA – NITROGEN OXIDES

	2007 (Tons/Day)				
Source	**Point**	**Area**	**On Road**	**Off Road**	**Total**
External Fuel Combustion	123.77	30.84	-	-	154.61
Stationary Internal Combustion	53.93	-	-	-	53.93
Other Combustion	3.26	4.22	-	-	7.48
Industrial Processes	33.65	-	-	-	33.65
Mobile - On Road (a)	-	-	280.40	-	280.40
Mobile - Off Road	-	-	-	127.85	127.85
Mobile - Off Road - Aircraft and Ground Support Equipment	-	-	-	39.19	39.19
Total	**214.61**	**35.06**	**280.40**	**167.04**	**697.118**
Percent of Regional Total	**31**	**5**	**41**	**24**	**100**
1990	**310.70**	**23.83**	**540.26**	**167.51**	**1,042.30**
(Percent Increase/Decrease by 2007)	**(-31)**	**(+47)**	**(-48)**	**(0)**	**(-33)**
1999	**276.06**	**32.83**	**495.94**	**186.89**	**991.72**
(Percent Increase/Decrease by 2007)	**(-22)**	**(+7)**	**(-41)**	**(-11)**	**(-30)**

Note: "-" = not applicable
(a) IEPA mobile on road source emission estimates using the MOBILE6 emission model.

Source: Environmental Science Associates, Inc. [TPC] analysis of information provided by the Illinois Environmental Protection Agency.



Source: Environmental Science Associates [TPC], 2004.

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Source Distribution of Regional Emissions Volatile Organic Compounds

Exhibit 5.6-1

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As shown in **Table 5.6-5**, all sources are predicted to emit approximately 697 tons of nitrogen oxides each summer day during the year 2007 (a decrease of 345 tons/day or 33 percent less than in the year 1990 and a decrease of 295 tons/day or 30 percent less than in the year 1999). By 2007, on-road mobile sources are predicted to be the largest contributor (approximately 280 tons/day or 41 percent of the total) while aircraft and ground support equipment are predicted to contribute approximately 39 tons (approximately six percent).

Exhibit 5.6-2 illustrates the source distribution of regional emissions of nitrogen oxides in the base year of 1990 and in the year 2007. As previously stated, aircraft and ground support equipment contributed approximately three percent to the regional total of these emissions in 1990 and 1999 and the proportional share of emissions from these sources is not expected to increase significantly through the year 2007 (six percent).

Ambient Air Pollutant Measurements

The IEPA and the IDEM maintain networks of air quality monitors to assess compliance with the NAAQS and to evaluate the affect of air pollution control strategies. **Exhibit 5.6-3** illustrates the air pollutant monitoring stations located within the 1- and 8-hour ozone non-attainment areas relative to the location of O'Hare.

The maximum IEPA measured pollutant concentrations of ozone within the Chicago 1- and 8-hour non-attainment areas and the maximum IEPA measured concentrations of nitrogen dioxide, carbon monoxide, particulate matter 2.5 and 10 microns in size or less, sulfur dioxide, and lead at monitors within 25 miles of O'Hare are presented in **Table 5.6-6**. Values are provided for the year 2000 through the year 2004. The number of monitors with recorded exceedances of the 1-hour ozone standard and standards for particulate matter both 2.5 and 10 microns in size or less is also provided. The number of days with levels greater than the standard is provided for the 8-hour ozone NAAQS.

As shown, exceedances of the 1-hour ozone standard were recorded in 2002 with at least one exceedance of the 8-hour ozone standard recorded each year through 2003. Also, while there were no recorded exceedances of the standards for particulate matter 10 microns in size or less within 25 miles of O'Hare, more than one monitor recorded exceedances of the annual standard for particulate matter 2.5 microns or less in size.

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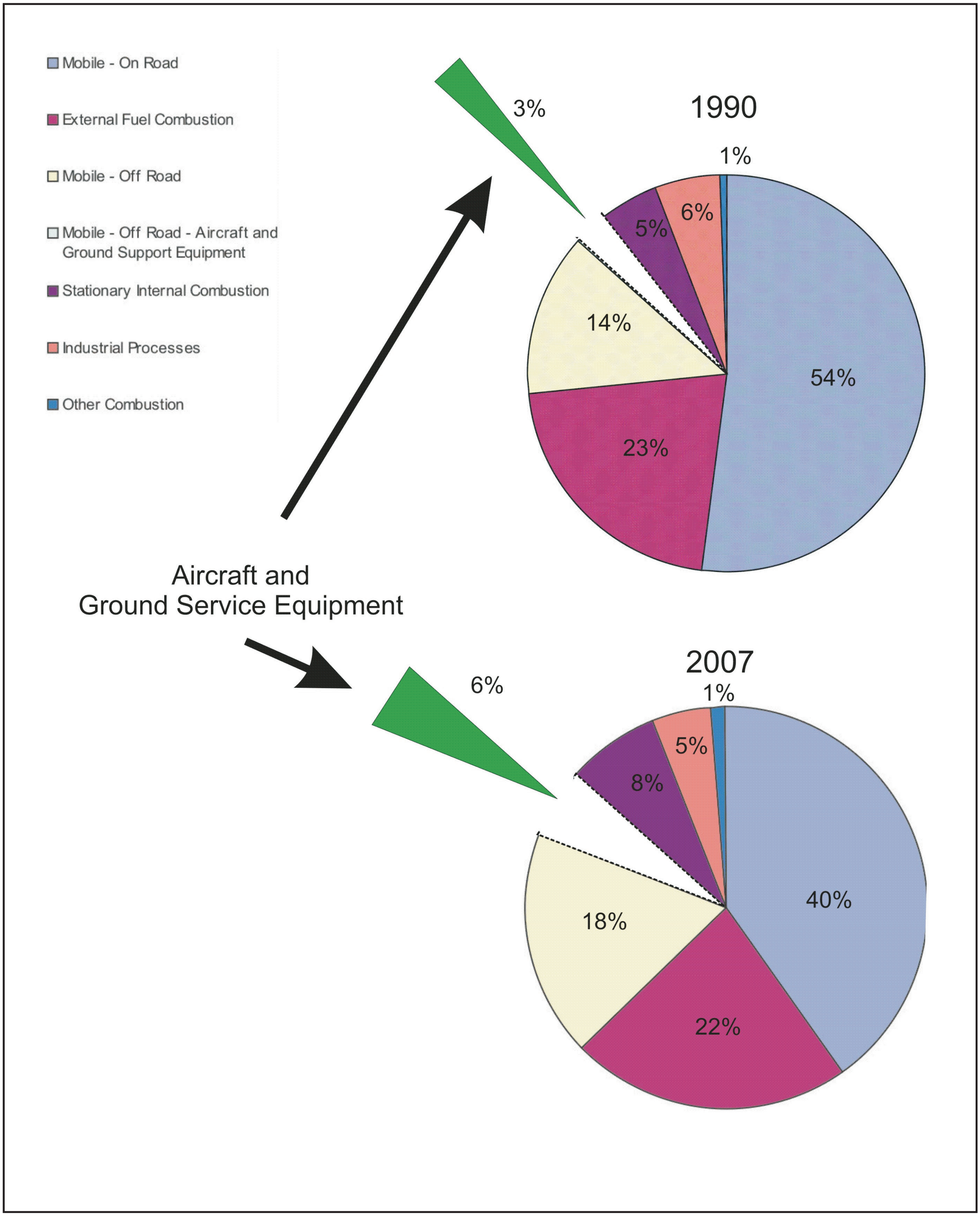

Source: Environmental Science Associates [TPC], 2004.

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Source Distribution of Regional Emissions Nitrogen Oxide

Exhibit 5.6-2

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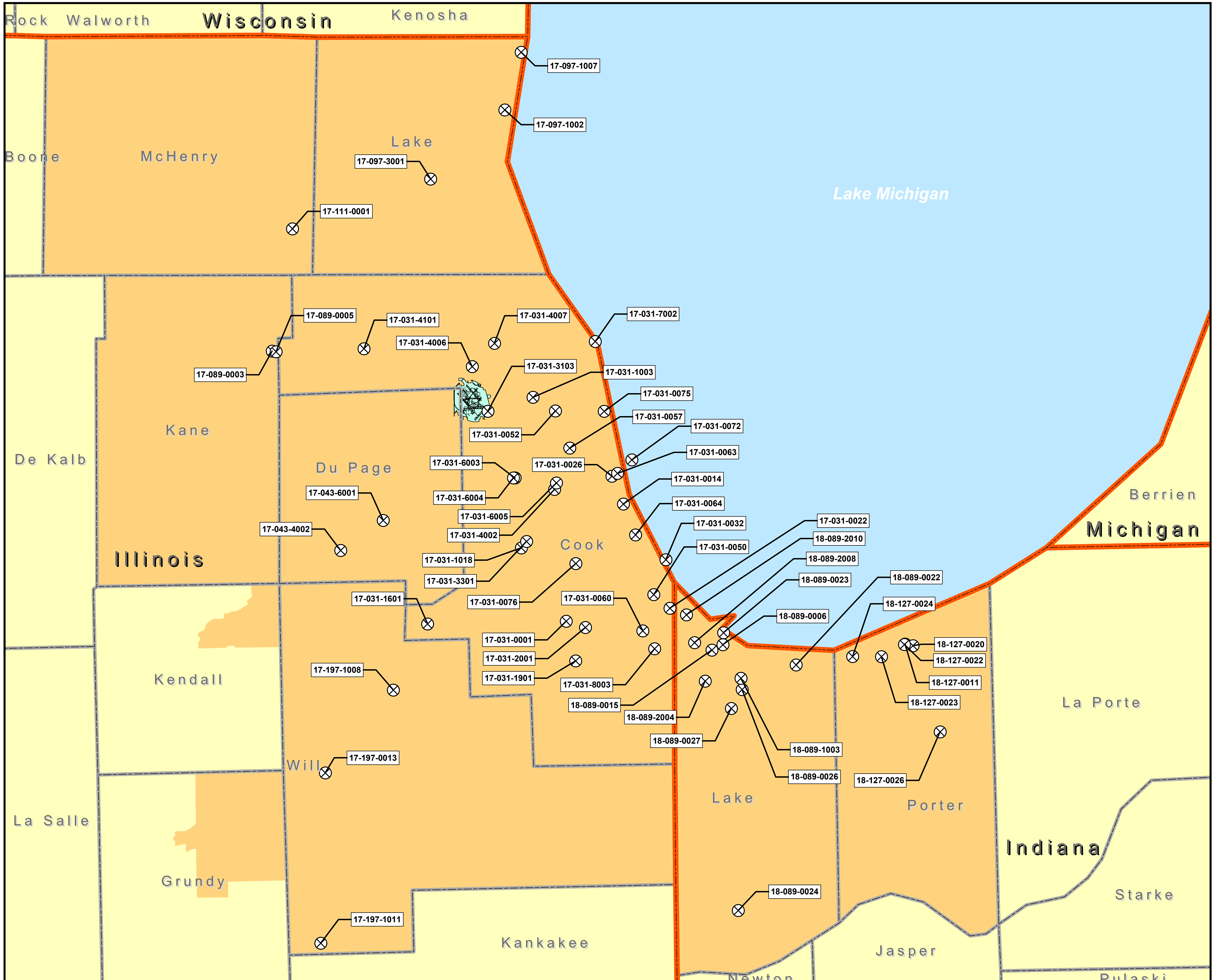

Source: Environmental Protection Agency, 2003.

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Air Quality Monitoring Sites
O'Hare International Airport
Counties
States
Ozone Non-Attainment Area

0 7.5 15
Miles

N
S

IEPA and IDEM Air Quality Monitoring Network

▶ Exhibit 5.6-3

TABLE 5.6-6
HIGHEST MEASURED POLLUTANT CONCENTRATIONS

Pollutant	Averaging Time	Item	NAAQS Value	NAAQS Units	Highest Measured Level(a, b, c) 2000	2001	2002	2003	2004
Ozone	1-Hour	Measurement	0.12	ppm	0.100	0.122	0.136	0.117	0.101
		Number of Monitors With Exceedances	-	-	0	0	3	0	0
	8-Hour	Measurement	0.08	ppm	0.086	0.103	0.116	0.099	0.084
		Number of Days Greater than Standard	-	-	1	7	13	2	0
Nitrogen dioxide	Annual	Measurement	0.053	ppm	0.032	0.032	0.032	0.031	0.029
Carbon monoxide	1-Hour	Measurement	35	ppm	6.4	5.5	5.1	4.7	4.9
	8-Hour	Measurement	9	ppm	4.6	4.7	4.3	3.5	3.7
Particulate matter 10 microns or less in size	24-hour	Measurement	150	μg/m³	129	137	107	120	93
		Number of Monitors With Exceedances	-	-	0	0	0	0	0
	Annual	Measurement	50	μg/m³	35	38	36	33	33
		Number of Monitors With Exceedances	-	-	0	0	0	0	0
Particulate matter 2.5 microns or less in size	24-Hour	Measurement	65	μg/m³	64	62	49	57	54
		Number of Monitors With Exceedances	-	-	0	0	0	0	0
	Annual	Measurement	15.0	μg/m³	18.3	19.4	16.5	16.8	15.3
		Number of Monitors With Exceedances	-	-	12	11	9	7	2
Sulfur dioxide	3-hour	Measurement	0.5	ppm	0.104	0.084	0.078	0.076	0.163
	24-hour	Measurement	0.14	ppm	0.078	0.037	0.029	0.033	0.069
	Annual	Measurement	0.03	ppm	0.012	0.006	0.006	0.006	0.007
Lead	Quarterly Mean	Measurement	1.5	μg/m³	0.15	0.06	0.04	0.08	No Data

Notes: ppm= parts per million.
μg/m3 = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
"-" = not applicable
(a) Data from all monitors for ozone within the Illinois and Indiana 1- and 8-hour ozone non-attainment area and within 25 miles of O'Hare for all other pollutants.
(b) The concentrations in this table are the highest measured levels within the defined area. As such, the levels may/may not be directly comparable to the NAAQS with respect to number of exceedances because of the methodologies used to determine if an exceedance has occurred (see **Table 5.6-1** of the EIS).
(c) The IEPA determined that certain monitoring locations and monitors were not suitable for consideration in summarizing this data as the measurements at these sites/from the monitors did not appropriately represent regional conditions..

Source: *AIRData – Monitor Values Reports.* USEPA, Office of Air Quality Planning and Standards. (http://www.epa.gov/air/data/index.html), May, 2005.

Annually, the IEPA prepares reports that address the level of air pollutant concentrations during the year. The report for 2003[12] states that the there were no recorded exceedances of the 1-hour NAAQS for ozone with the State of Illinois and that there were no days when air quality in any part of Illinois was considered "unhealthy". The IEPA also reports that over time, the trend has been that emissions of each of the criteria air pollutants are decreasing. For the period from 1994 through 2003, emission reductions have resulted in a two percent decrease in ozone, a ten percent decrease in nitrogen dioxide, a 52 percent decrease in carbon monoxide levels, a seven percent decrease in particulate 10 microns or less in size, a 37 percent decrease in sulfur dioxide, and a decrease of 36 percent in lead.[13]

Climate and Meteorological Conditions

The air pollutant levels assessed in this EIS occur in the lower part of the atmosphere (referred to as the planetary boundary layer). The planetary boundary layer is defined as "the region in which the atmosphere experiences surface effects through vertical exchanges of momentum, heat, and moisture."[14] Within the layer, the concentration of an air pollutant is based on the amount of pollutant emitted (or developed) and the degree to which the pollutant is diluted and dispersed.

In general, climatological conditions within the State of Illinois are described as being "continental" or typical of the interior of a large landmass. The area experiences cold winters, warm summers, and frequent short fluctuations in temperature, humidity, cloudiness, and wind direction. Lake Michigan influences the climate of northeastern Illinois, especially Chicago. The large mass of the lake tends to moderate temperatures, resulting in slightly cooler summers and warmer winters than areas located further inland.

The average annual temperature in Chicago is 49 degrees Fahrenheit. On a monthly basis, the average temperature ranges from 22 degrees (in January) to 74 degrees (in July). In the summertime, the average possibility for sunshine ranges from 63 percent (in August) to 67 percent (in July). During the summer, meteorological conditions are favorable for the formation of the air pollutant ozone. Peak ozone levels typically occur when hot, dry, and stagnant summertime conditions exist.

Prevailing meteorological conditions can significantly affect local air quality in a particular region. If an area is prone to experiencing stagnant atmospheric conditions (i.e., light winds and abundant sunshine), days of high pollutant (especially ozone) concentrations are usually more numerous. However, in the Chicago ozone non-attainment areas, the large quantity of emission sources is responsible for the production of ground-based ozone more than local meteorology.

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[12] Illinois Annual Air Quality Report, 2003, Illinois Environmental Protection Agency, Bureau of Air, August, 2004.
[13] Illinois Annual Air Quality Report, 2003, Illinois Environmental Protection Agency, Bureau of Air, August, 2004.
[14] Panofsky H.A., Dutton J.A., 1984: Atmospheric turbulence, models and methods for engineering applications, John Wiley and Sons, New York.

5.6.1.4 Thresholds of Significance

As stated in FAA Order 1050.1E (Appendix A, 2.3):

> Potentially significant air quality impacts associated with an FAA project or action would be demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.

The NAAQS (discussed and provided in **Section 5.6.1.2**, **Regulatory Context**) were established by the USEPA to protect both the health and welfare of the public. Should the air quality analysis indicate that the project has the potential to cause or contribute to a violation of any of the NAAQS, it would be necessary to evaluate potential airport-related emission reduction alternatives.

While not specifically a threshold of significance under the NEPA, the General Conformity regulations provide *de minimis* thresholds to determine if a full conformity determination is required. The de minimis threshold is a level that provides an indication of the significance that a project may have on local and/or regional air pollutant concentrations. Should the level of net project-related volatile organic compound emissions (comparing a Build Alternative to the No Action Alternative), exceed the de minimis levels, the FAA must provide a demonstration that the project would not cause or contribute to any new violation of the ozone standard, increase the frequency or severity of ozone levels, or delay either timely attainment or required emission reduction milestones for the area. On May 18, 2005, the FAA published a Draft General Conformity Determination for public review and comment. See **Section 5.6.4, Clean Air Act Conformity Determination,** for details, and **Attachment J-3** in **Appendix J, Air Quality** for the Final General Conformity Determination.

Based on USEPA guidance that indicates demonstration of ozone conformity for projects in locations where an 8-hour SIP has not been approved, the conformity demonstration was based on the current 1-hour SIP. However, as requested by the USEPA, project-related emissions of volatile organic compounds and nitrogen oxide emissions were compared to the 8-hour ozone de minimis threshold and the evaluation assumed no nitrogen oxide waiver, as existed for 1-hour ozone evaluations.[15] The 8-hour ozone de minimis threshold is 100 tons of either volatile organic compounds or nitrogen oxides. The de minimis threshold for the previous 1-hour ozone de minimis threshold was also considered (25 tons of either volatile organic compounds or nitrogen oxides).

5.6.1.5 Airport-Related Sources of Air Pollutant/Precursor Emissions

The sources of air pollution at most airports are categorized as follows: aircraft and auxiliary power units, motor vehicles, ground support equipment and vehicles, fuel storage and transfer facilities, space heating and incineration facilities, and construction activities. **Table 5.6-7**

[15] Conference call, USEPA, IEPA, FAA; November 3, 2004.

provides a summary of potential airport-related sources and the types of air emissions each emits.

Exhaust gases from aircraft engines are predominantly comprised of nitrogen, oxygen, and water vapor, which are compounds not normally considered air pollutants. To a lesser extent, aircraft also emit carbon monoxide, nitrogen oxides, volatile organic compounds, sulfur oxides, and particulate matter. The amount of pollutant emitted depends on many factors, such as engine type, aircraft type, and operational mode (taxi/idle, approach, climbout, and takeoff).

Onsite motor vehicle activity arises from passenger, employee, and cargo vehicles using airport roadways and parking lots. Offsite airport-related motor vehicle traffic is fundamentally indistinct from non-airport motor vehicle traffic, as this traffic enters the regional roadway network.

Ground support equipment and support vehicles are much like motor vehicles, as their emissions depend on fuel consumption and distance traveled. This type of equipment includes baggage tugs, tow tugs, and belt loaders.

There are various stationary and point sources found at airports. Fuel storage and transfer facilities are potential sources of volatile organic compound emissions. Usually, these emissions are low because of emission control devices on these types of facilities. Emissions from these sources vary with tank type, fuel type, fuel throughput volume, ambient temperature, and the presence or absence of a vapor recovery system. Indoor heating units and water reduction facilities are considered to be point sources. Such facilities typically operate according to regulatory permits, which limit the level of emissions.

Dust and particulate emissions may occur temporarily at airports during construction and land clearing activities. Erosion control measures are typically taken to minimize these fugitive dust and particulate emissions. Construction equipment and vehicles also emit carbon monoxide, nitrogen oxides, particulate matter, volatile organic compounds, and sulfur oxides.

5.6.1.6 Methodologies

To evaluate the potential effect of proposed airport improvements on local and regional air quality conditions, two types of air quality analyses were performed - emission inventories and dispersion modeling.

The emission inventories and dispersion modeling were performed for the three construction schedules discussed in **Section 5.0**, **Introduction (**the Original, Compressed, and Delayed Schedules). The following describes the assumptions regarding the years of analysis for each of the schedules:

- Original - The Original Schedule assumes that the construction would begin in the year 2004, and continue through the year 2014. The years 2007, 2009, and 2013 represent the last year of Construction Phase I, Construction Phase II, and Build Out, and the year 2018 represents Build Out +5 conditions.

- Compressed – The Compressed Schedule assumes that construction would begin in the year 2005, and continue through the year 2014. The years 2007, 2009 and 2013 represent the last year of Construction Phase I, Construction Phase II, and Build Out, and the year 2018 represents Build Out +5 conditions.

- Delayed – The Delayed Schedule assumes that construction would begin in the year 2005, and continue through the year 2015. The years 2008, 2010, and 2014 represent the last year of Construction Phase I, Construction Phase II, and Build Out, and the year 2019 represents Build Out +5 conditions.

TABLE 5.6-7
AIRPORT-RELATED SOURCES OF AIR POLLUTANT/PRECURSOR EMISSIONS

Source(s)	Emissions	Characteristics
Aircraft and auxiliary power units	Carbon monoxide, nitrogen oxides particulate matter sulfur oxides, volatile organic compounds	Exhaust products of fuel combustion vary greatly depending on aircraft engine type, power setting, and period of operation. Aircraft altitude precludes measurable offsite ground-level effects from aircraft at altitudes above the atmospheric mixing zone (the height of the zone varies daily). Aircraft emissions are reflective of the aircraft landing and takeoff cycle that consists of approach, taxi/idle, takeoff, and climbout. Carbon monoxide and volatile organic compounds are typically greatest in the taxi/idle mode, while emissions of nitrogen oxides are greatest in the takeoff and climbout modes.
Motor vehicles	Carbon monoxide, nitrogen oxides, particulate matter, sulfur oxides, volatile organic compounds	Exhaust products of fuel combustion from patron traffic approaching, departing, and moving about the Airport site. Emissions fluctuate with vehicle type, distance traveled, operating speed, and ambient conditions. Onsite emissions are confined to access/egress roadways and parking facilities. Offsite emissions are often indistinguishable from those of background traffic.
Ground support equipment and vehicles	Carbon monoxide, nitrogen oxides, particulate matter, sulfur oxides, volatile organic compounds	Exhaust products of fuel combustion from service trucks, tow tugs, belt loaders, and other portable equipment.
Fuel storage and transfer facilities	Volatile organic compounds	Emissions formed from the evaporation and vapor displacement of fuel from storage tanks and fuel transfer facilities. Emissions vary with fuel use, storage tank type, refueling method, fuel type, vapor recovery, and meteorology.
Space heating and incineration facilities	Carbon monoxide, nitrogen oxides, particulate matter, sulfur oxides, volatile organic compounds	Exhaust products of fossil fuel combustion from boilers dedicated to indoor heating requirements and emissions from incinerators used for waste reduction. These sources are often permitted through a regulatory agency.
Construction activities	Carbon monoxide, nitrogen oxides, particulate matter, sulfur oxides, volatile organic compounds	Exhaust products of fuel combustion from construction equipment and vehicles; dust (e.g., soil and concrete) generated during construction and land-clearing activities released into the air by wind and machinery.

Source: Environmental Science Associates, Inc. [TPC], 2004/2005.

The following provides a summary of the methodologies used to prepare the emission inventories and perform the dispersion modeling. **Appendix J**, **Air Quality**, **Section J.2, Technical Memorandum**, provides a detailed discussion of the modeling methodologies and the input data used to prepare the air quality analysis for the proposed project alternatives. The appendix also contains a criteria pollutant modeling protocol that was developed in cooperation with USEPA and IEPA (**Section J.1, Air Quality Analysis Protocol – Criteria Air Pollutants**).

Emission Inventories

Prior to Scoping, FAA met with USEPA and IEPA representatives to identify their concerns and to initiate the development of the air quality assessment methodologies structured to best address those concerns. FAA's ongoing coordination included development of the air quality protocols[16] that established rigorous analytic methodologies which were discussed and subsequently modified based on input from these agencies.

Airport Operations - Emission inventories provide an indication of increases and decreases in air pollutant or pollutant precursor emissions by providing an estimate of total emissions from sources with and without project implementation.

Except for emissions associated with aircraft refueling, the emission inventories in this EIS air quality assessment were prepared using the FAA's Emissions and Dispersion Modeling System (EDMS-Version 4.12).[17] Use of this model is required by the FAA when evaluating airport-related emissions at civilian airports and military air bases.[18] The model was developed by the FAA in cooperation with the United States Air Force. EDMS generates an emission inventory of carbon monoxide, volatile organic compounds, nitrogen oxides, sulfur oxides, and particulate matter with a diameter of 10 microns or less.

The EDMS does not calculate the level of volatile organic compounds associated with aircraft refueling. As such, levels of this pollutant from this airport-related activity were estimated using IEPA's SIP-based methodologies and USEPA's AP-42 (Sections 5.2 and 7.1). Notably, the EDMS also does not include/calculate aircraft-related particulate matter emission factors (for particulate matter 10 microns or less in size or for particulate matter 2.5 microns or less in size). In order to provide estimates of this pollutant from aircraft, mode-specific emission factors were developed for the turbine (jet) engines evaluated in this air quality assessment. The factors were developed using methodologies prepared by/for the FAA. [19] It should be noted further that the FAA considers the estimated levels of aircraft-related particulate matter emissions using these methodologies to be conservative approximations of the actual level of aircraft-related emissions. Additional details regarding the emission factors that were used to approximate the aircraft-related particulate matter emissions presented in this FEIS are provided in **Section J.2.2.1**, **Aircraft**, in **Appendix J, Air Quality**.

The following categories of sources were evaluated within the Chicago ozone non-attainment area: aircraft, ground support equipment, auxiliary power units, motor vehicles on roadways (both on Airport and within a defined study area off Airport property) and at curbsides and parking facilities located on Airport property, fuel storage facilities, Airport-related fire training activities, and on Airport stationary sources (boilers, generators, etc.). The limits of the motor vehicle study area were assumed to be the same as the limits used to evaluate surface transportation (**Exhibit 5.6-4**).

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16 Protocols for Air Quality Criteria Pollutants and Hazardous Air Pollutants (HAPS) were completed.

17 Emissions and Dispersion Modeling System (EDMS) Reference Manual, U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Washington, DC. Version 4.12, December 2003.

18 63 Federal Register 18068 (Monday, April 13, 1998).

19 Fleming, Gregg et al. 2003. "Derivation of a First Order Approximation of Particulate Matter from Aircraft" 96th Annual Conference and Exhibition of the Air and Waste Management Association, San Diego, CA, June 22-26, 2003, Paper #69970 and FAA Memorandum, Use of the First Order Approximation to Estimate Aircraft Engine Particulate Matter Emissions in NEPA Documents and Clean Air Act General Conformity Analyses, May 24, 2005.

Construction - Pollutant emissions resulting from activities associated with the construction of the proposed runways, extended runways, proposed and extended taxiways, proposed terminals, parking facilities, and roadways were also estimated. Data regarding the number of pieces and types of construction equipment to be used on the project, the deployment schedule of equipment (monthly and annually), and the approximate daily operating time (including power level or usage factor) were estimated for each individual construction project based on a schedule of construction activity. These estimates were prepared by the City's consulting team (CCT) and used in the analysis after review and acceptance by the TPC. The estimates were provided by project phase, by subcomponent, and by month.

The emission inventories for off-road (non-highway) equipment were calculated using emission factors obtained from the USEPA's Non-road Engine and Vehicle Emission Study,[20] the NONROAD model (Version 2.2.0)[21] databases and support information, and/or the Compilation of Air Pollutant Emission Factors (AP-42). Emission factors for on-road (highway) pickup, flat bed, bucket, and dual tandem trucks were obtained from the MOBILE6.2 motor vehicle emission rate model. Estimates of emissions attributable to construction-related employee vehicle trips were also evaluated, as well as onsite busing.

As requested by the IEPA during Scoping for this EIS, an estimate of potential air pollutant emissions resulting from demolition of residences and businesses was also prepared. Emission estimates of particulate matter 10 microns in size or less due to demolition were calculated based on the size of each building and a factor of 0.00042 pounds of particulate matter per cubic foot of building.[22] Particulate matter 2.5 microns in size or less were assumed to be 40 percent of the particulate matter 10 microns in size or less due to demolition.

Fugitive particulate matter emissions (emissions in the ambient air that result from anthropogenic (manmade) sources other than point sources) would also occur from the handling and storage of raw materials for construction purposes. The methodology used to estimate the level of particulate emissions from this activity is provided in AP-42 (Section 13.2.4). Notably, the quantity of dust emissions from aggregate handling and storage operations would vary based on the volume of aggregate passing through the storage cycle(s). In addition to estimating emissions from the handling of material in storage piles, particulate emissions due to wind erosion of the stored materials was also considered (AP-42 Section 13.2.5).

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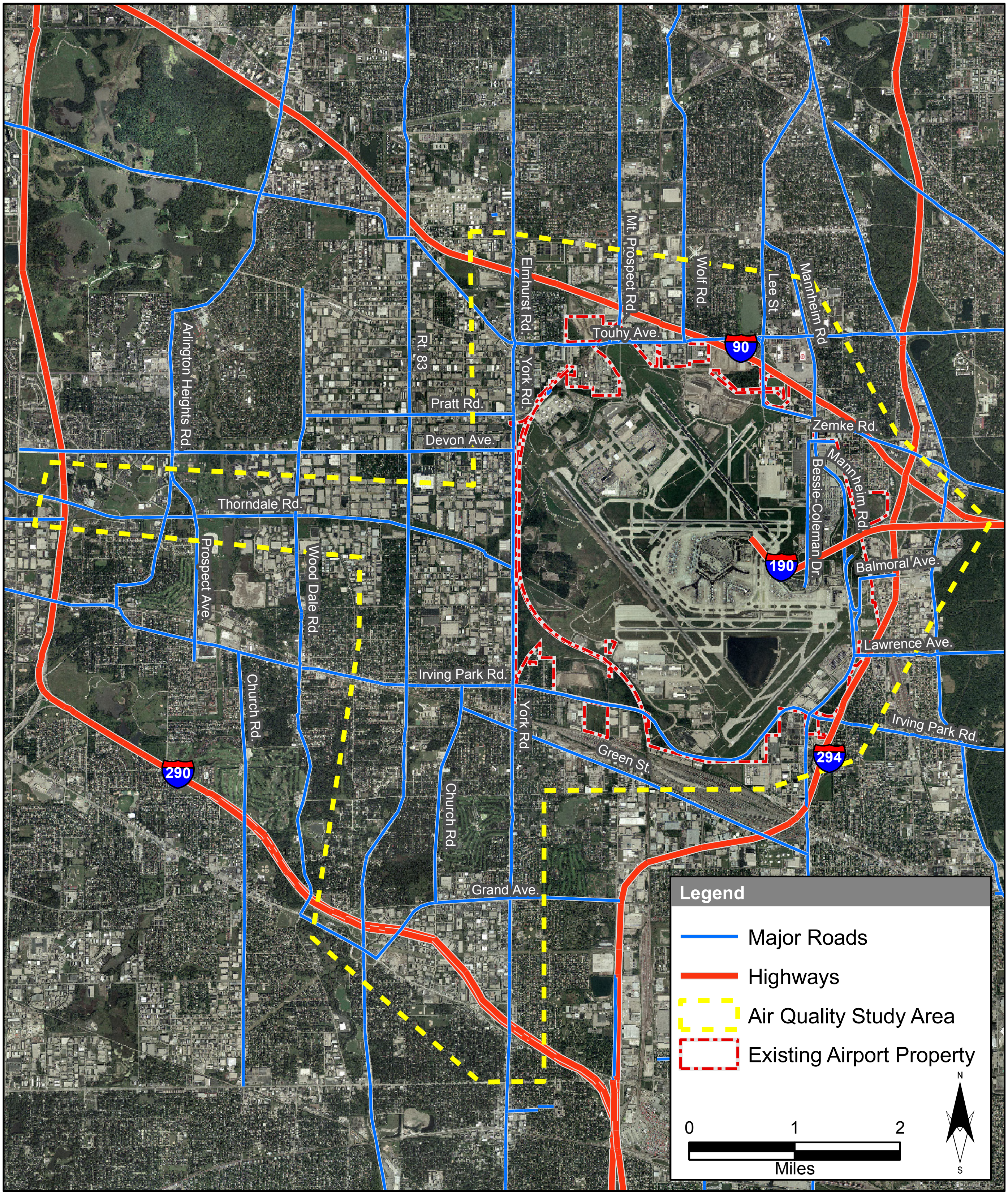
[20] Nonroad Engine and Vehicle Emission Study – Report, U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Research Triangle Park, NC., Report number EPA-460/3-91-02, November 1991.

[21] NONROAD, Version 2.2.0, December, 2002. U.S. Environmental Protection Agency.

[22] South Coast Air Quality Management District, CEQA Air Quality Handbook, May 1993. Table A9-9, Estimating PM10 Emissions from Fugitive Dust.



Source: Aerials Express, September 2002. StreetmapUSA, ESRI 2003. Environmental Science Associates [TPC], 2004.

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Air Quality Study Area of Potential Surface Transportation Impacts

▶ Exhibit 5.6-4

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Dispersion Modeling

Dispersion modeling provides predicted concentrations of ambient pollutant levels for all criteria pollutants and precursors that can be compared directly to the NAAQS. For the purpose of the assessment, two "scales" of dispersion analysis were performed—macroscale (large) and microscale (very small). The macroscale analysis evaluates pollutant concentrations on and in the vicinity of the Airport (nitrogen dioxide, carbon monoxide, particulate matter and sulfur dioxide) and the microscale analysis evaluates carbon monoxide pollutant concentrations immediately adjacent to intersections/interchanges within the study area. The macroscale and microscale dispersion modeling was performed for ground level emissions only (those occurring within the Chicago ozone non-attainment area).

Prior to Scoping, FAA met with USEPA and IEPA representatives to identify their concerns and to initiate the development of the air quality assessment methodologies structured to best address those concerns. FAA's ongoing coordination included development of the air quality protocols[23] that established rigorous analytic methodologies which were discussed and subsequently modified based on input from these Agencies.

Macroscale Analysis - The macroscale analysis was used to evaluate the change in ambient pollutant concentrations at various locations on Airport property and in areas adjacent to the Airport. On Airport, the locations included terminal curbsides, the bus center, and parking areas. Off Airport, specific locations were selected either because they are considered sensitive to changes in ambient pollutant concentrations (i.e., residences) or because they were locations where the highest predicted concentrations of any of the air pollutants are expected to occur (intersections, near the end of runways). The on- and off-Airport "receptor" locations are shown on **Exhibit 5.6-5**.

[23] Protocols for Air Quality Criteria Pollutants and Hazardous Air Pollutants (HAPS) were completed.

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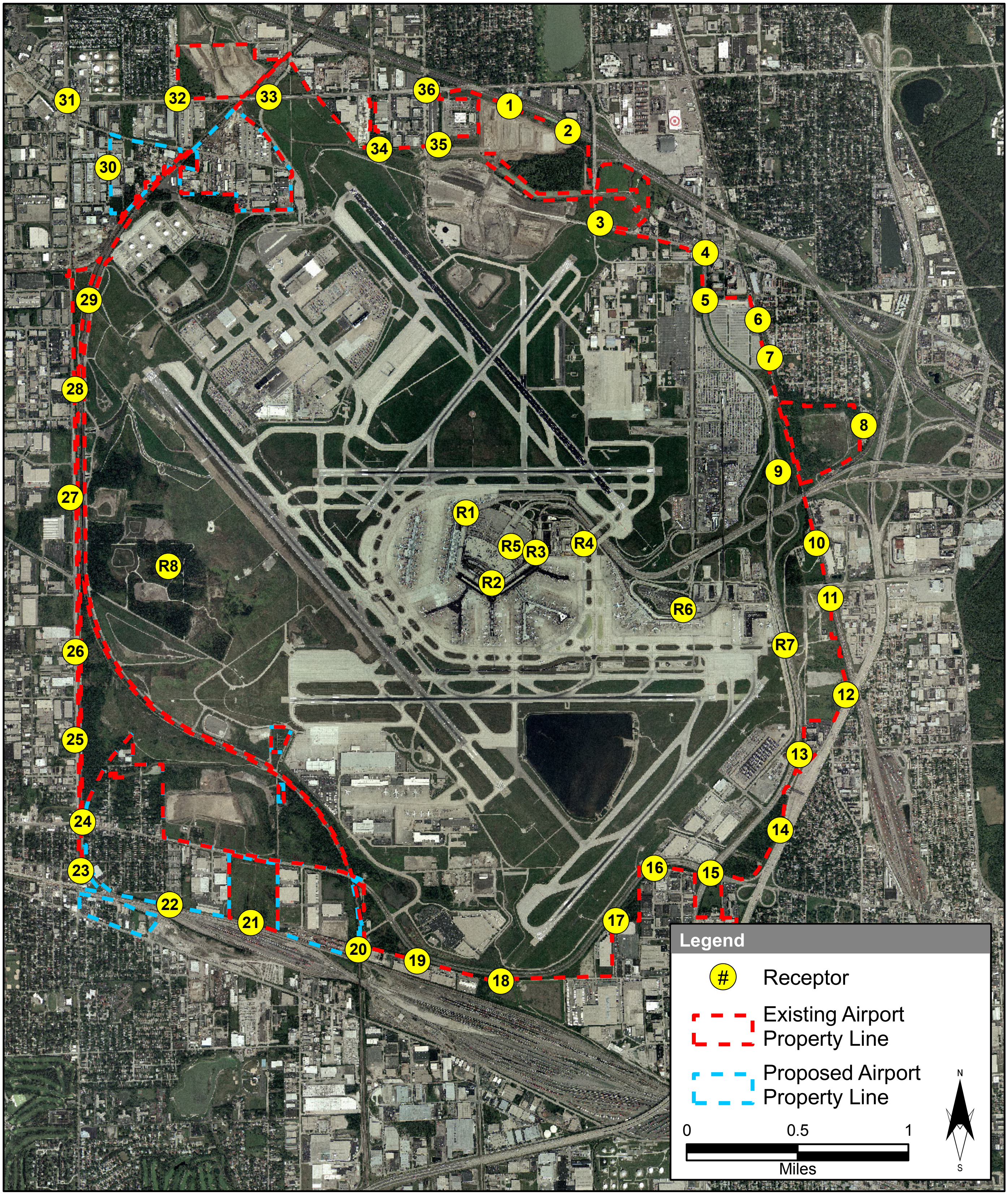

Source: Aerials Express, September 2002. Environmental Science Associates [TPC], 2004.

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Receptor Locations

Exhibit 5.6-5

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The dispersion analysis was performed using the FAA's EDMS (Version 4.12). The EDMS uses as its base, emission inventory data and site-specific meteorological data. EDMS provides dispersion analysis for the air pollutants nitrogen dioxide, carbon monoxide, particulate matter, and sulfur dioxide. In addition to the sources within the defined study area, background concentrations were "added" to computer predicted levels of each pollutant. These background levels were selected by the IEPA for the purpose of this EIS.

The dispersion analysis performed by the EDMS does not directly calculate ambient concentrations of nitrogen dioxide or sulfur dioxide-the pollutants regulated by NAAQS. As such, the estimates of nitrogen dioxide were derived using levels of nitrogen oxides and the USEPA's default factor for converting nitrogen oxides to nitrogen dioxide. To be conservative, sulfur oxide results were compared directly to the NAAQS for sulfur dioxide.

Notably, modeling to determine the effects of an individual project on regional levels of ozone are not considered reasonable because the computer models used to assess ozone do not support comparisons between modeling results at specific locations and the NAAQS. Rather, these models predict the relative impacts of regional emission changes (increases and decreases).

Finally, it should be noted that the dispersion modeling component of the EDMS used to perform the air quality assessment of the alternatives does not include algorithms that simulate the gravitational settling of particulates nor the removal of particulates from the ambient air by dry deposition[24]. The model also does not include algorithms to simulate the scavenging and removal by wet deposition (i.e., precipitation scavenging) of gases or particulates. As such, the dispersion modeling results for particulate matter 10 microns or less in size and 2.5 microns or less in size should be considered conservative as consideration of these factors would reduce the predicted results.

Microscale Analysis - EDMS does not include algorithms that consider both the free flow and congested motor vehicle operating conditions on levels of carbon monoxide. Therefore, a second type of dispersion analysis, a microscale analysis, was performed to evaluate the change in carbon monoxide emissions in the vicinity of the intersections and/or interchanges affected by the proposed improvements. The microscale analysis was performed using the USEPA's MOBILE6.2[25] motor vehicle emission rate model and CAL3QHC[26] roadway/intersection

[24] Atmospheric deposition occurs when pollutants fall from the air on the land or water. Pollution deposited along with snow, fog, or rain is called wet deposition, while the deposition of pollutants as dry particles or gases is called dry deposition.

[25] User's Guide to MOBILE62 (Mobile Source Emission Factor Model), U.S. Environmental Protection Agency, October 2002.

[26] User's Guide to CAL3QHC Version 2: A Modeling Methodology for Predicting Pollutant Concentration Near Roadway Intersections, EPA-454/R-92-006, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1992.

dispersion model. The CAL3QHC (Version 2.0)[27] model is currently the most accurate tool for identifying potential carbon monoxide concentrations due to mobile source emissions at congested locations.

As for the macroscale dispersion analysis, background concentrations (discussed previously) were added to the computer modeled predicted levels. Again, the background levels were selected by the IEPA for the purpose of this EIS.

The roadway intersection analysis evaluated impacts of the alternatives at ten intersections in the vicinity of the Airport. The intersections included both existing intersections and proposed/improved intersections that would be constructed if the project is approved. The selection of intersections was based on the analysis methodology described in the USEPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections*. Notably, the selection of intersections was made independently for each scenario evaluated (with and without the proposed Airport-related improvements). Use of this methodology ensures that the highest concentrations are predicted for each scenario. **Exhibit 5.6-6** illustrates the locations of the intersections considered for the microscale dispersion analysis.

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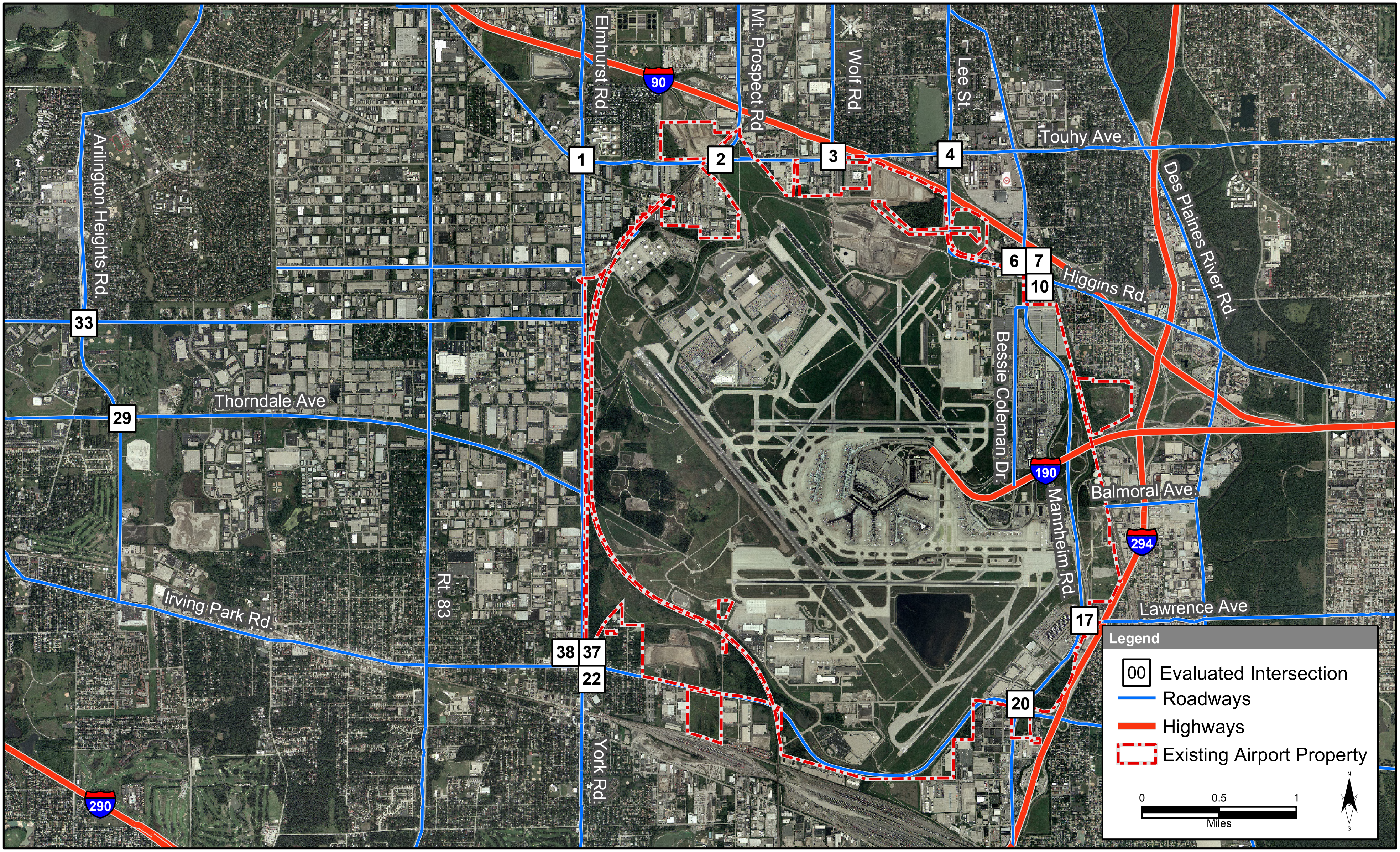
[27] Guideline for Modeling Carbon Monoxide from Roadway Intersections, U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards. Research Triangle Park, NC. Report number EPA-454/R-92-005, November 1992.



Source: Aerials Express, Sept. 2002. Roads; ESRI Streetmap 2003. Environmental Science Associates [TPC], 2004.

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Microscale Dispersion Analysis Intersection Locations

▶ **Exhibit 5.6-6**

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5.6.2 Existing (2002) Air Quality Conditions within the Study Area

To provide information regarding the contribution of existing Airport-related activities to regional totals of pollutants and the effect of Airport-related activities on air pollutant levels of the criteria air pollutants in the vicinity of the Airport, an emission inventory and dispersion analysis were performed for the year 2002.

5.6.2.1 Emission Inventory - 2002

Table 5.6-8 presents results of the emission inventory for the year 2002. As shown, the greatest source of carbon monoxide, particulate matter, and volatile organic compounds were motor vehicles operating on roadways while emissions of nitrogen oxides and sulfur oxides were greatest from aircraft.

TABLE 5.6-8
EMISSIONS INVENTORY (2002)

	Tons Emitted in 2002					
Source Category	**Carbon Monoxide**	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Sulfur Oxides**	**Particulate Matter 10 microns or less**	**Particulate Matter 2.5 microns or less**
Aircraft (a)	4,052	424	3,956	340	53	53
GSE/APU (b)	9,083	414	479	36	10	10
Roadways	15,698	1,149	2,134	66	72	43
Parking Lots	68	11	10	<1	<1	<1
Stationary Sources	42	23	50	<1	4	4
Training Fires	4	2	1	<1	15	15
Total	**28,947**	**2,023**	**6,629**	**443**	**154**	**124**

Note: (a) Estimates of volatile organic compounds include emissions from aircraft refueling activities.
(b) GSE/APU = Ground support equipment/auxiliary power units.

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

It should be noted that the results of the Airport-related emission inventories are not directly comparable to the 1990, 1999, or 2007 regional inventories prepared by the IEPA and presented in **Section 5.6.1.3**, **Regional Air Quality Conditions,** because 1) of differences in the years, 2) the IEPA inventories are representative of average emissions occurring on a typical summer weekday (weekdays between May 1 and September 30), and 3) the O'Hare inventories are representative of average daily emissions over a period of one year (2002).

5.6.2.2 Dispersion Analysis - 2002

Macroscale Analysis

Table 5.6-9 presents the maximum (highest) predicted level of each air pollutant evaluated. For comparative/informational purposes, the NAAQS and the assumed background concentrations are also provided. As shown, the results of the analysis indicate that there would have been no exceedances of the NAAQS for the evaluated pollutants in the vicinity of the Airport in the year 2002.

TABLE 5-6.9
MAXIMUM MACROSCALE DISPERSION MODELING RESULTS (2002)

	Maximum Predicted Pollutant Concentrations (µg/m³)									
	Nitrogen Dioxide	Carbon Monoxide		Particulate Matter 10 microns or less		Particulate Matter 2.5 microns or less		Sulfur Dioxide		
Source(s)	**Annual**	**1-Hour**	**8-Hour**	**24-Hour**	**Annual**	**24-Hour**	**Annual**	**3-Hour**	**24-Hour**	**Annual**
NAAQS (a)	100	40,000	10,000	150	50	65	15	1,300	365	80
Receptor ID(b)	R01B	R02B	R01B	1	1	1	1	13	R01B	R01B
Predicted Concentration	27	23,967	4,941	6	2	4	1	69	17	4
Background	58	5,143	3,314	60	30	35	13	192	76	8
Total	**85**	**29,110**	**8,255**	**66**	**32**	**39**	**14**	**261**	**93**	**12**

Note: (a) NAAQS = National Ambient Air Quality Standards
(b) See **Exhibit 5.6-5.**

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004

Microscale Analysis

Table 5.6-10 presents the maximum (highest) carbon monoxide levels at the intersections evaluated. As shown, the results of the analysis indicate that the maximum 1- and 8-hour concentrations of carbon monoxide would have been 12.7 and 8.1 parts per million (ppm), respectively. These concentrations are predicted to have occurred at the intersection of Mannheim Road and Irving Park Road. Notably, the levels are below the NAAQS (35 and 9.0 ppm, respectively) for this pollutant.

TABLE 5.6-10
MAXIMUM MICROSCALE DISPERSION MODELING RESULTS (2002)

Intersection No.	Intersection	One Hour (ppm)(a)	Eight Hour (ppm)(b)
NAAQS		35	9
20	Mannheim Road and Irving Park Road	12.7	8.1

Notes: ppm= parts per million.
(a) Includes background concentration of 4.5 ppm.
(b) Includes background concentration of 2.9 ppm.
Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

5.6.3 Alternatives Analysis

Because emission rates of the individual pollutants and pollutant precursors evaluated in this EIS increase/decrease annually due to changes in motor vehicle fleet mixes (as older vehicles are retired and newer vehicles are introduced in to the fleet and as vehicles within the fleet age), the alternatives air quality analysis assumes specific years to evaluate the potential increases/decreases in these emissions with and without the proposed improvements.

For the purpose of the air quality analysis, the Original Schedule assumes that the construction would begin in the year 2004, and continue through the year 2014. The years 2007, 2009, and 2013 represent the last year of Construction Phase I, Construction Phase II, and Build Out, and the year 2018 represents Build Out +5 conditions. The Compressed Schedule assumes that construction would begin in the year 2005 and continue through the year 2014. The years 2007, 2009, and 2013 represent the last year of Construction Phase I, Construction Phase II, and Build Out, and the year 2018 represents Build Out +5 conditions. Finally, the Delayed Schedule assumes that construction would begin in the year 2005 and continue through the year 2015. The years 2008, 2010, and 2014 represent the last year of Construction Phase I, Construction Phase II, and Build Out, and the year 2019 represents Build Out +5 conditions.

Notably, the construction emission estimates are assumed to be the same for Alternatives C, D, and G, although it is likely that emissions would be slightly less with Alternative D than with Alternatives C and G because one less runway is being proposed. However, because there would be a need to perform additional earthwork in the area in which the additional runway is located with Alternatives C and G, the differences between the emission estimates are considered minimal. To facilitate the analysis, the construction emission estimates were assumed to be the same for all Build Alternatives.

The construction-related emission inventory presented and discussed in this section of the EIS assumes that 9.4 million cubic yards (MCY) of soil would be removed from Airport property and hauled to off Airport locations. Data regarding the number of pieces and types of construction equipment to be used on the project, the deployment schedule of equipment (monthly and annually), and the approximate daily operating time (including power level or usage factor) were estimated for each individual construction project based on a schedule of construction activity. These estimates were prepared by the City of Chicago's consulting team (CCT)[28] by project phase, by subcomponent, and by month.

5.6.3.1 Construction Phase I

Emission Inventories

Table 5.6-11 presents the air pollutant and pollutant precursor emission inventories for Alternative A (No Action Alternative) and the construction and airport operation-related inventories for Alternatives C, D, and G for the last year of Construction Phase I (year 2007 for the Original and Compressed Construction Schedules and year 2008 for the Delayed Construction Schedule).

TABLE 5.6-11
EMISSION INVENTORIES – CONSTRUCTION PHASE I

	Tons Emitted Last Year of Phase (c,d)					
Alternative (a)	Carbon Monoxide	Volatile Organic Compounds (e)	Nitrogen Oxides	Sulfur Oxides	Particulate Matter 10 microns or less	Particulate Matter 2.5 microns or less
ORIGINAL CONSTRUCTION SCHEDULE						
A	25,473	1,540	6,405	406	127	104
C, D, G	26,375	1,646	6,941	449	223	160
Increase/Decrease (b)	**+1,406**	**+106**	**+536**	**+43**	**+96**	**+56**
COMPRESSED CONSTRUCTION SCHEDULE						
A	25,473	1,540	6,405	406	127	104
C, D, G	27,044	1,678	7,175	455	231	168
Increase/Decrease (b)	**+1,572**	**+138**	**+770**	**+49**	**+104**	**+64**
DELAYED CONSTRUCTION SCHEDULE						
A	24,942	1,469	6,276	405	123	101
C, D, G	26,639	1,597	6,808	452	211	177
Increase/Decrease (b)	**+1,697**	**+128**	**+531**	**+47**	**+88**	**+76**

Notes: (a) Alternative A = No Action, Alternative C, D, and G are "Build Alternatives."
(b) When compared to Alternative A (No Action Alternative).
(c) Numbers reflect numerical rounding.
(d) Level of emissions with the 9.4 MCY construction scenario.
(e) Estimates of volatile organic compounds include emissions from aircraft refueling activities.

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action Alternative) - Within the study area, approximately 43 percent of the total emissions of all pollutants and pollutant precursors would result from the operation of motor vehicles on roadways and within parking facilities, 30 percent would result from the

[28] Construction Logistics Equipment Plan based on the Airport Layout Plan, AOR/TOK, March 24, 2004.

operation of ground support equipment, and 26 percent would result from the operation of aircraft. The remaining emissions would result from the operation of stationary sources and from fire training activities. Notably, motor vehicle emissions include Airport-related and non-Airport-related background traffic within the evaluated area.

Alternatives C, D, and G - With Alternatives C, D, or G, emissions of the pollutants/precursors are predicted to increase when compared to Alternative A (No Action Alternative). The increase in emissions from an individual source varies depending on the type of source (aircraft, ground support equipment, etc.) and how the source would be affected by the Build Alternatives.

The results of this emissions inventory serve as the base for the macroscale dispersion analysis as well as the general conformity analysis.

Dispersion Analysis – Macroscale Analysis

Table 5.6-12 presents the maximum (highest) predicted ambient (outdoor) concentrations of nitrogen dioxide, carbon monoxide, particulate matter, and sulfur oxides.

TABLE 5.6-12
MAXIMUM MACROSCALE DISPERSION MODELING RESULTS – CONSTRUCTION PHASE I

	Maximum Predicted Pollutant Concentrations (μg/m^3)									
	Nitrogen Dioxide	Carbon Monoxide		Particulate Matter 10 microns or less		Particulate Matter 2.5 microns or less		Sulfur Dioxide		
Source(s)	Annual	1-Hour	8-Hour	24-Hour	Annual	24-Hour	Annual	3-Hour	24-Hour	Annual
NAAQS(b)	100	40,000	10,000	150	50	65	15	1,300	365	80
Background	58	5,143	3,314	60	30	35	13	192	76	8
ORIGINAL CONSTRUCTION SCHEDULE										
Alternative A										
Receptor ID(c)	1	R02B	R01B	1	1	17	1	17	17	R01B
Predicted Concentration	**89**	**31,409**	**8,106**	**64**	**31**	**39**	**14**	**323**	**99**	**13**
Alternatives C, D, and G										
Receptor ID(c)	1	R02B	R01B	1	1	R01B	1	16	R05	R01A
Predicted Concentration	**91**	**33,751**	**8,566**	**64**	**31**	**39**	**14**	**291**	**98**	**13**
Percent Increase/Decrease	2	7	6	0	0	0	0	-10	-1	0
COMPRESSED CONSTRUCTION SCHEDULE										
Alternative A										
Receptor ID(c)	1	R02B	R01B	1	1	1	1	17	17	R01B
Predicted Concentration	**89**	**31,409**	**8,106**	**64**	**31**	**39**	**14**	**323**	**99**	**13**
Alternatives C, D, and G										
Receptor ID(c)	1	R02B	R01B	1	1	1	1	16	R05	R01
Predicted Concentration	**91**	**33,751**	**8,568**	**64**	**31**	**39**	**14**	**291**	**98**	**13**
Percent Increase/Decrease	2	7	6	0	0	0	0	-10	-1	0
DELAYED CONSTRUCTION SCHEDULE										
Alternative A										
Receptor ID(c)	1	R02B	R01B	1	1	17	1	17	17	R01B
Predicted Concentration	**87**	**32,068**	**7,874**	**64**	**31**	**39**	**14**	**324**	**99**	**13**
Alternatives C, D, and G										
Receptor ID(c)	1	R06B	R01B	1	1	R01B	1	16	R05	R01A
Predicted Concentration	**88**	**36,222**	**8,388**	**64**	**31**	**39**	**14**	**292**	**98**	**13**
Percent Increase/Decrease	1	13	7	0	0	0	0	-10	-1	0

Notes: (a) Alternative A = No Action, Alternative C, D, and G are "Build Alternatives."
(b) NAAQS = National Ambient Air Quality Standard
(c) See **Exhibit 5.6-5.**

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action) - With Alternative A, predicted concentrations of the evaluated pollutants are below the NAAQS. The pollutant predicted to be closest to its standard(s) is nitrogen dioxide. Concentrations of this pollutant are predicted to be the highest adjacent to the terminal curbsides with levels of the pollutant decreasing significantly at and beyond the Airport property line. The source that contributes the majority of emissions on the terminal curbsides is motor vehicle traffic.

Alternatives C, D and G - With Alternatives C, D, or G, predicted concentrations of the evaluated pollutants are also below the NAAQS. With these alternatives, the pollutant predicted to be closest to its standard(s) is nitrogen dioxide. However, the maximum concentration is predicted to occur on the northern Airport property line, adjacent to the proposed Runway 9L/27R, changes in roadway activity in the area, and the O'Hare Express Center parking lot.

Dispersion Analysis - Microscale

Table 5.6-13 presents the maximum (highest) carbon monoxide levels at the ten intersections within the study area expected to have the maximum concentrations of this pollutant.

TABLE 5.6-13
MAXIMUM MICROSCALE DISPERSION ANALYSIS RESULTS – CONSTRUCTION PHASE I

Alternative	Intersection No.	Intersection	One Hour (ppm)(a)	Eight Hour (ppm)(b)
NAAQS			35	9
ORIGINAL/COMPRESSED CONSTRUCTION SCHEDULE				
Alternative A (No Action)	17	Mannheim Road and Lawrence Avenue	14.3	9.1
Alternatives C, D, G	17	Mannheim Road and Lawrence Avenue	11.2	7.2
DELAYED CONSTRUCTION SCHEDULE				
Alternative A (No Action)	17	Mannheim Road and Lawrence Avenue	13.9	8.9
Alternatives C, D, G	17	Mannheim Road and Lawrence Avenue	11.3	7.2

Notes: ppm= parts per million.
(a) Includes background concentration of 4.5 ppm.
(b) Includes background concentration of 2.9 ppm.
Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action) - As shown, the results of the analysis indicate that the maximum 1- and 8-hour concentrations of carbon monoxide with Alternative A (No Action Alternative) would be 14.3 and 9.1 ppm, respectively. These concentrations are predicted to occur at the intersection of Mannheim Road and Lawrence Avenue. Based on the results of the analysis, the 8-hour concentration is predicted to exceed the NAAQS of 9.0 ppm.

Alternatives C, D, and G - With Alternative C, the maximum 1- and 8-hour concentrations are predicted to be 11.3 and 7.2 ppm, respectively. These concentrations would occur at the intersection of Mannheim Road and Lawrence Avenue. Based on the results of the analysis, predicted levels of carbon monoxide are below the NAAQS (35 and 9.0 ppm, respectively). When compared to Alternative A, the maximum concentrations of carbon monoxide are predicted to decrease with Alternatives C, D, and G. The reduction in carbon monoxide concentrations is a direct result of the addition of an exclusive southbound left turn lane at the Mannheim Road and Lawrence Avenue intersection and the resultant decrease in average vehicle delay.

5.6.3.2 Construction Phase II

Emission Inventories

Table 5.6-14 presents the air pollutant and pollutant precursor emission inventories for the last year of Construction Phase II (2009 with the Original or Compressed Construction Schedules, 2010 with the Delayed Construction Schedule).

TABLE 5.6-14
EMISSION INVENTORIES – CONSTRUCTION PHASE II

		Tons emitted Last Year of Phase (c)					
Construction Schedule	**Alternative (a)**	**Carbon Monoxide**	**Volatile Organic Compounds (d)**	**Nitrogen Oxides**	**Sulfur Oxides**	**Particulate Matter 10 microns or less**	**Particulate Matter 2.5 microns or less**
Original/ Compressed	A	24,411	1,393	6,149	405	120	99
	C, D, G	26,375	1,537	6,693	468	189	154
	Increase/Decrease(b)	**+1,964**	**+144**	**+544**	**+63**	**+69**	**+55**
Delayed	A	23,902	1,318	6,106	406	119	98
	C, D, G	26,394	1,499	6,793	487	191	164
	Increase/Decrease(b)	**+2,494**	**+181**	**+657**	**+81**	**+72**	**+66**

Notes: (a) Alternative A = No Action, Alternative C, D, and G are "Build Alternatives."
(b) When compared to Alternative A (No Action).
(c) Numbers reflect numerical rounding.
(d) Level of emissions with the 9.4 MCY scenario.

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action) - Within the study area, approximately 40 percent of the total emissions of all pollutants and pollutant precursors would result from the operation of motor vehicles on roadways and within parking facilities, approximately 32 percent would result from the operation of ground support equipment, and approximately 27 percent would result from the operation of aircraft. The remaining emissions would result from the operation of stationary sources and from fire training activities.

Alternatives C, D, and G - With the Build Alternatives (Alternatives C, D, or G), emissions of the pollutants/precursors are predicted to increase when compared to Alternative A (No Action Alternative). The increase in emissions from an individual source varies depending on the type of source (aircraft, ground support equipment, etc.) and how the source would be affected by the Build Alternatives.

The most notable increase in emissions would occur in emissions of carbon monoxide, nitrogen oxides, and volatile organic compounds. This increase in emissions, when compared to Alternative A (No Action Alternative), is a direct result of the forecast increase in annual aircraft and ground support equipment operations and the increase in taxi distance/ground based delay with the improvements. Construction activities would also contribute to the increase.

The results of this emissions inventory serve as the base for the macroscale dispersion analysis as well as the general conformity analysis.

Dispersion Analysis – Macroscale Analysis

Table 5.6-15 presents the maximum (highest) predicted ambient (outdoor) concentrations of nitrogen dioxide, carbon monoxide, particulate matter, and sulfur oxides.

TABLE 5.6-15
MAXIMUM MACROSCALE DISPERSION MODELING RESULTS – CONSTRUCTION PHASE II

	Maximum Predicted Pollutant Concentrations (μg/m³)									
	Nitrogen Dioxide	Carbon Monoxide		Particulate Matter 10 microns or less		Particulate Matter 2.5 microns or less		Sulfur Dioxide		
Source(s)	Annual	1-Hour	8-Hour	24-Hour	Annual	24-Hour	Annual	3-Hour	24-Hour	Annual
NAAQS(b)	100	40,000	10,000	150	50	65	15	1,300	365	80
Background	58	5,143	3,314	60	30	35	13	192	76	8
ORIGINAL/ COMPRESSED CONSTRUCTION SCHEDULES										
Alternative A										
Receptor ID(c)	1	R06B	R01B	1	1	R01B	1	13	R01B	R01B
Predicted Concentration	**84**	**30,131**	**8,037**	**64**	**31**	**38**	**14**	**280**	**94**	**13**
Alternatives C, D, and G										
Receptor ID(c)	1	R06B	R01B	1	1	R01B	1	16	R01A	R01B
Predicted Concentration	**84**	**19,959**	**8,267**	**64**	**31**	**38**	**14**	**279**	**93**	**12**
Percent Increase/Decrease	0	-34	3	0	0	0	0	0	-1	-3
DELAYED CONSTRUCTION SCHEDULE										
Alternative A										
Receptor ID(c)	R01B	R06B	R01B	1	1	R01B	1	13	R01B	R01B
Predicted Concentration	**83**	**30,557**	**8,052**	**64**	**31**	**39**	**14**	**279**	**94**	**13**
Alternatives C, D, and G										
Receptor ID(c)	R01B	R06B	R01B	1	1	R01B	1	16	R01A	R01B
Predicted Concentration	**81**	**20,333**	**8,362**	**64**	**31**	**38**	**14**	**281**	**93**	**12**
Percent Increase/Decrease	-2	-33	4	0	0	2	0	2	-1	-1

Notes: (a) Alternative A = No Action, Alternative C, D, and G are "Build Alternatives."
(b) NAAQS = National Ambient Air Quality Standard
(c) See **Exhibit 5.6-5.**

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action) - With Alternative A, predicted concentrations of the evaluated pollutants are all below the NAAQS. The pollutant predicted to be closest to its standard(s) is nitrogen dioxide. Concentrations of this pollutant are predicted to be the highest adjacent to the terminal curbsides with levels of the pollutant decreasing significantly (approximately 62 percent) at and beyond the Airport property line. The source that contributes the majority of emissions on the terminal curbsides is motor vehicle traffic.

Alternatives C, D, and G - With the Build Alternatives (Alternatives C, D, or G), predicted concentrations of the evaluated pollutants are also below the NAAQS. With these alternatives, the pollutant predicted to be closest to its standard(s) is nitrogen dioxide. With the Build Alternatives, the maximum concentration is predicted to occur on the northern Airport property line, adjacent to the proposed Runway 9L/27R and the O'Hare Express Center parking lot. When compared to Alternative A (No Action Alternative), maximum 1-hour average carbon monoxide concentrations are predicted to decrease as a result of the "spreading" of aircraft operations from Terminals 2 and 5 to the proposed Terminal 7.

Dispersion Analysis - Microscale

Table 5.6-16 presents the estimated carbon monoxide levels at the ten intersections within the study area expected to have the maximum concentrations of this pollutant.

TABLE 5.6-16
MAXIMUM MICROSCALE DISPERSION MODELING RESULTS – CONSTRUCTION PHASE II

Alternative	Intersection No.	Intersection	One Hour (ppm)(a)	Eight Hour (ppm)(b)
NAAQS			35	9
ORIGINAL/COMPRESSED CONSTRUCTION SCHEDULES				
Alternative A (No Action)	17	Mannheim Road and Lawrence Avenue	13.6	8.7
Alternative C, D, G	17	Mannheim Road and Lawrence Avenue	10.9	7.0
DELAYED CONSTRUCTION SCHEDULE				
Alternative A (No Action)	17	Mannheim Road and Lawrence Avenue	13.4	8.6
Alternative C, D, G	17	Mannheim Road and Lawrence Avenue	11.2	7.2

Notes: ppm= parts per million.
(a) Includes background concentration of 4.5 ppm.
(b) Includes background concentration of 2.9 ppm.
Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action) - The results of the analysis indicate that the maximum 1- and 8-hour concentrations of carbon monoxide with Alternative A (No Action Alternative) would be 13.6 and 8.7 ppm, respectively. These concentrations are predicted to occur at the intersection of Mannheim Road and Lawrence Avenue. Based on the results of the analysis, predicted average 1- and 8-hour concentrations of carbon monoxide are not predicted to exceed the NAAQS (35 and 9.0 ppm, respectively).

Alternatives C, D, and G - With the Build Alternatives (Alternatives C, D, or G), the maximum 1-and 8-hour concentrations are predicted to be 11.2 and 7.2 ppm, respectively. These concentrations would also occur at the intersection of Mannheim Road and Lawrence Avenue. Based on the results of the analysis, predicted levels of carbon monoxide are below the NAAQS (35 and 9.0 ppm, respectively). When compared to Alternative A (No Action Alternative), the maximum concentrations of carbon monoxide are predicted to decrease. At the Mannheim Road and Lawrence Avenue intersection, the reduction in carbon monoxide concentrations is a direct result of the addition of an exclusive southbound left turn lane which decreases average delay.

5.6.3.3 Build Out

Emission Inventories

Table 5.6-17 presents the air pollutant and pollutant precursor emission inventories for Alternative A (No Action Alternative) and the construction and operation-related inventories for Alternatives C, D, and G for the last year of Build Out (the year 2013 with the Original or Compressed Construction Schedules, the year 2014 with the Delayed Construction Schedule).

TABLE 5.6-17
EMISSION INVENTORIES (BUILD OUT)

		Tons Emitted Last Year of Phase (d,e)					
Construction Scenario	**Alternative (a)**	**Carbon Monoxide**	**Volatile Organic Compounds (f)**	**Nitrogen Oxides**	**Sulfur Oxides**	**Particulate Matter 10 microns or less**	**Particulate Matter 2.5 microns or less**
Original/ Compressed	A	22,849	1,159	6,163	421	113	93
	C	**26,095**	1,358	6,905	503	131	105
	Increase/Decrease(b)	**+3,246**	**+199**	**+742**	**+82**	**+18**	**+12**
	D(c)	26,370	1,392	6,970	517	132	107
	Increase/Decrease(b)	**+3,522**	**+225**	**+805**	**+95**	**+19**	**+14**
	G(c)	26,010	1,353	6,885	499	131	105
	Increase/Decrease(b)	**+3,161**	**+194**	**+722**	**+77**	**+18**	**+12**
Delayed	A	22,612	1,129	6,170	426	112	93
	C	26,004	1,337	6,946	514	133	112
	Increase/Decrease(b)	**+3,391**	**+208**	**+776**	**+87**	**+21**	**+19**
	D(c)	26,263	1,359	7,006	527	134	113
	Increase/Decrease(b)	**+3,651**	**+230**	**+836**	**+101**	**+22**	**+20**
	G(c)	25,874	1,328	6,916	507	133	112
	Increase/Decrease(b)	**+3,262**	**+199**	**+746**	**+81**	**+20**	**+19**

Notes: (a) Alternative A = No Action, Alternative C, D, and G are "Build Alternatives."
(b) When compared to Alternative A (No Action)
(c) From an air quality/air pollutant perspective, the only difference in estimated emissions between Alternatives C and D or G would be those resulting from the operation of aircraft.
(d) Numbers reflect numerical rounding.
(e) Level of emissions with the 9.4 MCY scenario.
(f) Estimates of volatile organic compounds include emissions from aircraft refueling activities.

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action) - Within the study area, approximately 35 percent of the total emissions of all pollutants and pollutant precursors would result from the operation of ground support equipment, 34 percent of the emissions would result from the operation of motor vehicles on roadways and within parking facilities, and 30 percent would result from the operation of aircraft. The remaining emissions would result from the operation of stationary sources and from fire training activities.

Alternatives C, D, and G - With the Build Alternatives (Alternatives C, D, or G), emissions of the pollutants/precursors are predicted to increase when compared to Alternative A (No Action Alternative). The increase in emissions from an individual source varies depending on the type of source (aircraft, ground support equipment, etc.) and how the source would be affected by the development alternatives.

A portion of the increase in aircraft emissions with Alternatives C, D, or G is directly attributable to the increase in annual operations with the Build Alternatives (an increase of 146,600 operations when compared to Alternative A (No Action Alternative). Other factors that affect the increase in individual pollutant or precursor emissions when comparing the Build Alternatives to Alternative A (No Action) include differences in the aircraft fleet mixes, distribution of aircraft types within the fleet, and differences in cumulative delay and taxi time.

The estimated increase in ground support equipment emissions is directly attributable to the increase in annual operations with the Build Alternatives. Variations in the percent increase of the emissions are attributable to variations in operations of each type of equipment (baggage tugs, loaders, etc.). The increase in ground support equipment emissions is to some extent offset by a reduction in auxiliary power unit usage because, with the Build Alternatives, there would be more aircraft gates with pre-conditioned air and ground power, a reduction in the number of remotely parked aircraft (handstands), and no need to bus passengers to and from the terminals from the remote aircraft parking locations.

The estimated increase in motor vehicle emissions both on and off airport is directly attributable to the forecast increase in vehicle-miles-traveled with the Build Alternatives. The increase in vehicle-miles-traveled results from a combination of the increase in the number of vehicles and the distance each vehicle would travel. A factor that should offset the magnitude of the increase with the Build Alternatives is the forecast operating speeds on individual roadway segments (in most cases, emissions of individual pollutants or precursors decrease with an increase in speed). The increase in motor vehicle emissions in airport parking facilities is directly attributable to the increase in forecast vehicle-miles-traveled (again, either an increase in the number of vehicles or the distance each vehicle would travel).

The majority of the estimated increase in stationary source emissions is directly attributable to the increase in emissions from the heating and refrigeration plant(s). The increased use of these facilities would result from the additional building square footage with the Build Alternatives. A heating and refrigeration plant would be necessary for the proposed West Terminal. Notably, the new heating/refrigeration plant for the West Terminal would require separate permitting as a new source of emissions. The primary stationary source of volatile organic compound emissions is fuel storage. The increase in stationary source emissions is directly related to the increase in fuel usage (which is related to the number of aircraft operations). It should be noted that the estimated percent increase in emissions from stationary sources is larger than for any other source. However, because the level of future emissions was interpolated per standard practice using existing (2002) actual emissions in lieu of permitted levels of emissions, the increase in emissions should be within allowable/permitted limits.

There is no forecast increase in training fire activities with the Build Alternatives (and therefore, no change in the emission levels from this activity with or without the proposed improvements to O'Hare).

The results of this emissions inventory serve as the base for the macroscale dispersion analysis as well as the general conformity analysis.

Dispersion Analysis - Macroscale

Table 5.6-18 presents the maximum (highest) predicted ambient (outdoor) concentrations of nitrogen dioxide, carbon monoxide, particulate matter, and sulfur oxides.

TABLE 5.6-18
MAXIMUM MACROSCALE DISPERSION MODELING RESULTS – BUILD OUT

	Maximum Predicted Pollutant Concentrations (µg/m³)									
	Nitrogen Dioxide	Carbon Monoxide		Particulate Matter 10 microns or less		Particulate Matter 2.5 microns or less		Sulfur Dioxide		
Source(s)	Annual	1-Hour	8-Hour	24-Hour	Annual	24-Hour	Annual	3-Hour	24-Hour	Annual
NAAQS(b)	100	40,000	10,000	150	50	65	15	1,300	365	80
Background	58	5,143	3,314	60	30	35	13	192	76	8
ORIGINAL/COMPRESSED CONSTRUCTION SCHEDULES										
Alternative A (No Action)										
Receptor ID(c)	R01B	R06B	R01B	R01B	1	R01B	1	13	13	R01B
Predicted Concentration	**84**	**32,326**	**8,135**	**64**	**31**	**39**	**14**	**322**	**101**	**13**
Alternative C										
Receptor ID(c)	R01B	R04B	R01B	1	1	R01B	1	R04B	R05	R01
Predicted Concentration	**83**	**28,046**	**7,960**	**64**	**31**	**38**	**14**	**285**	**96**	**13**
Percent Increase/Decrease	-2	-13	-2	0	0	2	0	-11	-5	0
Alternative D										
Receptor ID(c)	R01B	R04B	R01B	1	1	R01B	1	R05	R05	R01
Predicted Concentration	**82**	**26,818**	**7,930**	**64**	**31**	38	14	**273**	**96**	**13**
Percent Increase/Decrease	-2	-17	-3	0	0	2	0	-15	-5	0
Alternative G										
Receptor ID(c)	R01B	R04B	R01B	1	1	R01B	1	R05	R05	R01
Predicted Concentration	**82**	**26,693**	**7,944**	**64**	**31**	38	14	**273**	**96**	**13**
Percent Increase/Decrease	-2	-17	-2	0	0	2	0	-15	-5	0
DELAYED CONSTRUCTION SCHEDULE										
Alternative A (No Action)										
Receptor ID(c)	R01B	R06B	R01B	R01B	1	R01B	R06B	13	13	R01B
Predicted Concentration	**84**	**33,412**	**8,274**	**63**	**31**	**39**	**14**	**323**	**101**	**13**

TABLE 5.6-18
MAXIMUM MACROSCALE DISPERSION MODELING RESULTS – BUILD OUT

Source(s)	Maximum Predicted Pollutant Concentrations (µg/m³)									
	Nitrogen Dioxide	Carbon Monoxide		Particulate Matter 10 microns or less		Particulate Matter 2.5 microns or less		Sulfur Dioxide		
	Annual	1-Hour	8-Hour	24-Hour	Annual	24-Hour	Annual	3-Hour	24-Hour	Annual
DELAYED CONSTRUCTION SCHEDULE (Continued)										
Alternative C										
Receptor ID(c)	R01B	R04B	R01B	1	1	R01B	1	R04B	R05	R01B
Predicted Concentration	**83**	**28,095**	**8,050**	**64**	**31**	**39**	**14**	**285**	**102**	**13**
Percent Increase/Decrease	-1	-16	-3	2	0	0	0	-12	-1	0
Alternative D										
Receptor ID(c)	R01B	R04B	R01B	1	1	R01B	1	R05	R05	R01
Predicted Concentration	83	26,848	8,020	**64**	**31**	38	14	274	96	13
Percent Increase/Decrease	-1	-24	-3	2	0	-3	0	-18	-5	0
Alternative G										
Receptor ID(c)	R01B	R04B	R01B	1	1	R01B	1	R05	R05	R01
Predicted Concentration	82	26,720	8,038	**64**	**31**	**39**	**14**	274	96	13
Percent Increase/Decrease	-2	-25	-3	2	0	0	0	-18	-5	0

Notes: (a) Alternative A = No Action, Alternative C, D, and G are "Build Alternatives."
(b) NAAQS = National Ambient Air Quality Standard
(c) See **Exhibit 5.6-5.**

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action) - With Alternative A, predicted concentrations of the evaluated pollutants are all below the NAAQS. The pollutant predicted to be closest to its standard(s) is nitrogen dioxide. Concentrations of this pollutant are predicted to be the highest adjacent to the terminal curbsides with levels of the pollutant decreasing significantly at and beyond the Airport property line. The source that contributes the majority of emissions on the terminal curbsides is motor vehicle traffic.

Alternatives C, D and G - With the Build Alternatives (Alternatives C, D, or G), predicted concentrations of the evaluated pollutants are also below the NAAQS. With these alternatives, the pollutant predicted to be closest to its standard(s) is nitrogen dioxide. The maximum concentration is predicted to occur at the curbside terminal. When compared to Alternative A (No Action Alternative), maximum concentrations of nitrogen oxides, carbon monoxide, and sulfur dioxide are predicted to decrease. The maximum 1-hour average carbon monoxide are predicted to decrease due to the "spreading" of aircraft operations (and emissions) from Terminals 1 and 5 to the proposed Terminals 4, 6, and 7. The maximum three-hour sulfur dioxide concentrations are predicted to decrease as a result of a decrease in queue time at the Runway 4R/22L.

Dispersion Analysis - Microscale

Table 5.6-19 presents the maximum carbon monoxide levels at the evaluated intersections.

TABLE 5.6-19
MAXIMUM MICROSCALE DISPERSION MODELING RESULTS – BUILD OUT

Alternative	Intersection No.	Intersection	One Hour (ppm)(a)	Eight Hour (ppm)(b)
NAAQS			35	9
ORIGINAL/COMPRESSED CONSTRUCTION SCHEDULES				
Alternative A (No Action)	17	Mannheim Road and Lawrence Avenue	12.7	8.1
Alternatives C, D, and G	20	Mannheim Road and Irving Park Road	12.0	7.7
DELAYED CONSTRUCTION SCHEDULE				
Alternative A (No Action)	17	Mannheim Road and Lawrence Avenue	12.4	7.9
Alternatives C, D, and G	20	Mannheim Road and Irving Park Road	11.8	7.5

Notes: (a) Includes background concentration of 4.5 ppm.
(b) Includes background concentration of 2.9 ppm.
ppm = parts per million
Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action) - The results of the analysis indicate that the maximum 1- and 8-hour concentrations of carbon monoxide with Alternative A (No Action Alternative) would be 12.7 and 8.1 ppm, respectively. These concentrations are predicted to occur at the intersection of Mannheim Road and Lawrence Avenue. Based on the results of the analysis, predicted average 1- and 8-hour concentrations of carbon monoxide are not predicted to exceed the NAAQS (35 and 9.0 ppm, respectively).

Alternatives C, D, and G **-** The results of the analysis indicate that the maximum 1- and 8-hour concentrations of carbon monoxide with Alternatives C, D, or G would be 12.0 and 7.7 ppm, respectively. These concentrations are predicted to occur at the intersection of Mannheim Road and Irving Park Road. As such, predicted levels of carbon monoxide, with or without the proposed improvements, are below the NAAQS (35 and 9.0 ppm, respectively). The reduction in carbon monoxide concentrations (at the intersection of Mannheim Road and Lawrence Avenue; with Alternative A (No Action Alternative) is a direct result of the addition of a number of exclusive turn lanes. The addition of these movements would increase the roadway capacity while reducing queue times.

5.6.3.4 Build Out + 5

Emission Inventories

Table 5.6-20 presents the air pollutant and pollutant precursor emission inventories for the Build Out + 5 phase (the year 2018 with the Original or Compressed Construction Schedules, the year 2019 with the Delayed Construction Schedule).

Alternative A (No Action) - Within the study area, approximately 37 percent of the total emissions of all pollutants and pollutant precursors would result from the operation of ground support equipment, 32 percent of the emissions would result from the operation of aircraft, and 30 percent would result from the operation of motor vehicles on roadways and within parking facilities. The remaining emissions would result from the operation of stationary sources and from fire training activities.

Alternatives C, D, and G –With the Build Alternatives (Alternatives C, D, or G), emissions of the pollutants/precursors are predicted to increase when compared to Alternative A (No Action Alternative). The increase in emissions from an individual source varies depending on the type of source (aircraft, ground support equipment, etc.) and how the source would be affected.

TABLE 5.6-20
EMISSION INVENTORIES - BUILD OUT + 5

Construction Scenario	Alternative (a)	Tons Emitted Last Year of Phase (d,e) Carbon Monoxide	Volatile Organic Compounds (e)	Nitrogen Oxides	Sulfur Oxides	Particulate Matter 10 microns or less	Particulate Matter 2.5 microns or less
Original/ Compressed	A	21,952	1,064	6,246	438	111	93
	C	25,977	1,318	7,239	554	125	106
	Increase/Decrease(b)	**+4,025**	**+254**	**+993**	**+116**	**+14**	**+12**
	D(c)	26,455	1,360	7,355	579	127	107
	Increase/Decrease(b)	**+4,502**	**+297**	**+1,109**	**+141**	**+15**	**+14**
	G(c)	25,954	1,316	7,234	553	125	106
	Increase/Decrease(b)	**+4,002**	**+252**	**+987**	**+115**	**+14**	**+12**
Delayed	A	21,844	1,055	6,210	438	112	94
	C	26,119	1,324	7,290	564	127	107
	Increase/Decrease(b)	**+4,274**	**+268**	**+1,081**	**+125**	**+15**	**+13**
	D(c)	26,605	1,367	7,408	589	128	109
	Increase/Decrease(b)	**+4,761**	**+311**	**+1,199**	**+151**	**+17**	**+15**
	G(c)	26,085	1,321	7,382	562	127	107
	Increase/Decrease(b)	**+4,241**	**+265**	**+1,073**	**+124**	**+15**	**+13**

Notes:
(a) Alternative A = No Action, Alternative C, D, and G are "Build Alternatives."
(b) When compared to Alternative A (No Action)
(c) From an air quality/air pollutant perspective, the only difference in estimated emissions between Alternatives C and D or G would be those resulting from the operation of aircraft.
(d) Numbers reflect numerical rounding.
(e) Estimates of volatile organic compounds include emissions from aircraft refueling activities.

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

A portion of the estimated increase in aircraft emissions with Alternatives C, D, or G is directly attributable to the increase in annual operations with the Build Alternatives (an increase of 220,000 operations when compared to Alternative A (No Action Alternative). Other factors that affect the increase in individual pollutant or precursor emissions when comparing the Build Alternatives to Alternative A (No Action) include differences in the aircraft fleet mixes, distribution of aircraft types within the fleets, and differences in cumulative delay and taxi time.

The estimated increase in ground support equipment emissions is directly attributable to the increase in annual operations with the Build Alternatives. Variations in the percent increase of the emissions when comparing the individual Build Alternatives to Alternative A (No Action) are attributable to variations in the operations of each type of equipment (baggage tugs, loaders, etc.). Notably, the increase in ground support equipment emissions is to some extent offset by a reduction in auxiliary power unit usage because, with the Build Alternatives, there would be more aircraft gates with pre-conditioned air and ground power, a reduction in the number of remotely parked aircraft (handstands), and no need to bus passengers to and from the terminals from the remote aircraft parking locations.

The estimated increase in motor vehicle emissions both on and off airport is directly attributable to the forecast increase in vehicle-miles-traveled with the Build Alternatives. The increase in vehicle-miles-traveled results from a combination of the increase in the number of vehicles and the distance each vehicle would travel. A factor that should offset the magnitude of the increase with the Build Alternatives is the forecast operating speeds on individual roadway segments (in most cases, emissions of individual pollutants or precursors decrease with an increase in speed). The increase in motor vehicle emissions in airport parking facilities is directly attributable to the increase in forecast vehicle-miles-traveled (again, either an increase in the number of vehicles or the distance each vehicle would travel).

The majority of the estimated increase in stationary source emissions is directly attributable to the increase in emissions from the heating and refrigeration plant(s). The increased use of these facilities would result from the additional building square footage with the Build Alternatives. A heating and refrigeration plant would also be necessary for the proposed West Terminal. Notably, the additional heating/refrigeration plant for the West Terminal would require separate permitting as a new source of emissions. The primary stationary source of volatile organic compound emissions is fuel storage. The increase in emissions from this source is directly related to the increase in fuel usage (which is related to the number of aircraft operations). It should be noted that the percent increase in emissions from stationary sources is larger than for any other source. However, because the level of future emissions was interpolated using existing (2002) actual emissions in lieu of permitted levels of emissions, the increase in emissions should be within allowable/permitted limits.

There is no forecast increase in training fire activities with the Build Alternatives (and therefore, no change in the emission levels from this activity with or without the proposed improvements to O'Hare).

The results of this emissions inventory serve as the base for the macroscale dispersion analysis as well as the general conformity analysis.

Dispersion Analysis - Macroscale

Table 5.6-21 presents the maximum (highest) predicted ambient (outdoor) concentrations of nitrogen dioxide, carbon monoxide, particulate matter, and sulfur oxides.

TABLE 5.6-21
MAXIMUM MACROSCALE DISPERSION MODELING RESULTS - BUILD OUT +5

	Maximum Predicted Pollutant Concentrations (µg/m³)									
	Nitrogen Dioxide	Carbon Monoxide		Particulate Matter 10 microns or less		Particulate Matter 2.5 microns or less		Sulfur Dioxide		
Alternative	Annual	1-Hour	8-Hour	24-Hour	Annual	24-Hour	Annual	3-Hour	24-Hour	Annual
NAAQS(b)	100	40,000	10,000	150	50	65	15	1,300	365	80
Background	58	5,143	3,314	60	30	35	13	192	76	8
ORIGINAL/ COMPRESSED CONSTRUCTION SCHEDULES										
Alternative A										
Receptor ID(c)	R01B	R06B	R01B	R01B	1	R01B	R06B	17	17	R01B
Predicted Concentration	**84**	**34,687**	**8,237**	**64**	**31**	**39**	**14**	**303**	**96**	**13**
Alternative C										
Receptor ID(c)	R01B	R04B	R01B	R01B	1	R01B	1	16	R02A	R01
Predicted Concentration	**83**	**28,497**	**8,281**	**64**	**31**	**39**	**14**	**288**	**98**	**13**
Percent Increase/Decrease	-1	-18	1	0	0	0	0	-5	2	0
Alternative D										
Receptor ID(c)	R01B	R04B	R01B	R01B	1	R01B	1	R04B	R05	R01
Predicted Concentration	**84**	**29,239**	**8,208**	**64**	**31**	**39**	**14**	**289**	**98**	**13**
Percent Increase/Decrease	0	-18	-3	0	0	0	0	-5	2	0
Alternative G										
Receptor ID(c)	R01B	R04B	R01B	R01B	1	R01B	1	R04B	R05	R01
Predicted Concentration	**83**	**29,076**	**8,245**	**64**	**31**	**39**	**14**	**289**	**98**	**13**
Percent Increase/Decrease	-1	-16	0	0	0	0	0	-5	2	0
DELAYED CONSTRUCTION SCHEDULE										
Alternative A										
Receptor ID(c)	R01B	R06B	R01B	R01B	1	R01B	R06B	17	17	R01B
Predicted Concentration	84	34,687	8,237	64	31	39	14	303	96	13
Alternative C										
Receptor ID(c)	R01B	R04B	R01B	R01B	1	R01B	1	16	R05	R01A
Predicted Concentration	**84**	**28,767**	**8,338**	**64**	**31**	39	14	**290**	**99**	**13**
Percent Increase/Decrease	-1	-16	-3	0	0	0	0	-12	-1	0

TABLE 5.6-21
MAXIMUM MACROSCALE DISPERSION MODELING RESULTS - BUILD OUT +5

	Maximum Predicted Pollutant Concentrations (μg/m³)									
	Nitrogen Dioxide	Carbon Monoxide		Particulate Matter 10 microns or less		Particulate Matter 2.5 microns or less		Sulfur Dioxide		
Alternative	Annual	1-Hour	8-Hour	24-Hour	Annual	24-Hour	Annual	3-Hour	24-Hour	Annual
DELAYED CONSTRUCTION SCHEDULE (Continued)										
Alternative D										
Receptor ID(c)	R01B	R04B	R01B	R01B	1	R01B	1	R04B	R05	R01
Predicted Concentration	84	29,517	8,265	64	31	39	14	291	99	13
Percent Increase/Decrease	0	-18	0	0	0	0	0	-4	3	0
Alternative G										
Receptor ID(c)	R01B	R04B	R01B	R01B	1	R01B	1	R04B	R05	R01
Predicted Concentration	83	29,352	8,302	64	31	39	14	290	99	13
Percent Increase/Decrease	-1	-18	1	0	0	0	0	-4	3	0

Notes: (a) Alternative A = No Action, Alternative C, D, and G are "Build Alternatives."
(b) NAAQS = National Ambient Air Quality Standard
(c) See **Exhibit 5.6-5.**

Source: Environmental Science Associates, Inc. [TPC] analysis, 2005.

Alternative A (No Action) - With Alternative A, predicted concentrations of the evaluated pollutants are all below the NAAQS. The pollutant predicted to be closest to its standard(s) is nitrogen dioxide. Concentrations of this pollutant are predicted to be the highest adjacent to the terminal curbsides with levels of the pollutant decreasing significantly at and beyond the Airport property line. The source that contributes the majority of emissions on the terminal curbsides is motor vehicle traffic.

Alternatives C, D, and G - With the Build Alternatives (Alternatives C, D, or G), predicted concentrations of the evaluated pollutants are also below the NAAQS. With these alternatives, the pollutant predicted to be closest to its standard(s) is nitrogen dioxide. The maximum concentration is again predicted to occur at the curbside terminal. When compared to Alternative A (No Action Alternative), maximum concentrations of nitrogen oxides, carbon monoxide, and sulfur dioxide are predicted to decrease. The maximum 1-hour average carbon monoxide concentrations are predicted to decrease due to the "spreading" of operations (and emissions) from Terminals 2 and 5 to the proposed Terminals 4, 6, and 7. The maximum three-hour average sulfur dioxide concentrations are predicted to decrease as a result of a decrease in queue time for Runway 4R/22L.

Dispersion Analysis - Microscale

Table 5.6-22 presents the maximum carbon monoxide levels at the evaluated intersections.

TABLE 5.6-22
MAXIMUM MICROSCALE DISPERSION MODELING RESULTS – BUILD OUT + 5

Alternative	Intersection No.	Intersection	One Hour (ppm)(a)	Eight Hour (ppm)(b)
NAAQS			35	9
ORIGINAL/COMPRESSED CONSTRUCTION SCHEDULES				
Alternative A (No Action)	10	Mannheim Road and Zemke Road	11.9	7.6
Alternatives C, D, and G	20	Mannheim Road and Irving Park Road	10.9	7.0
DELAYED CONSTRUCTION SCHEDULE				
Alternative A (No Action)	10	Mannheim Road and Zemke Road	11.7	7.5
Alternatives C, D, and G	20	Mannheim Road and Irving Park Road	10.9	7.0

Notes: (a) Includes background concentration of 4.5 ppm.
(b) Includes background concentration of 2.9 ppm.
ppm= parts per million.
Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

Alternative A (No Action) - The results of the analysis indicate that the maximum 1- and 8-hour concentrations of carbon monoxide with Alternative A (No Action Alternative) would be 11.9 and 7.6 ppm, respectively. These concentrations are predicted to occur at the intersection of Mannheim Road and Zemke Road.

Alternatives C, D, and G -The results of the analysis indicate that the maximum 1- and 8-hour concentrations of carbon monoxide with Alternatives C, D, or G would be 10.9 and 7.0 ppm, respectively. These concentrations are predicted to occur at the intersection of Mannheim Road and Irving Park Road. Based on the results of the analysis, average 1- and 8-hour concentrations of carbon monoxide are not predicted to exceed the NAAQS (35 and 9.0 ppm, respectively). The reduction in carbon monoxide concentrations at the intersection of Mannheim Road and Zemke Road with any of the Build Alternatives is a direct result of the addition of exclusive turn lanes. The addition of these movements increases the roadway capacity and reduces vehicle queue (idle) times.

5.6.4 Clean Air Act Conformity Determination

The Clean Air Act Amendments of 1990 require Federal agencies to ensure that their actions conform to the appropriate State Implementation Plan (SIP). The SIP is a plan which provides for implementation, maintenance, and enforcement of the NAAQS, and includes emission limitations and control measures to attain and maintain the NAAQS. Conformity is defined as demonstrating that a project conforms to the SIP's purpose of eliminating or reducing the severity and number of violations of the ambient air quality standards and achieving expeditious attainment of such standards.

As noted earlier, O'Hare is located in an area designated as non-attainment for the 8-hour ozone NAAQS and the annual NAAQS for particulate matter 2.5 microns or less in size. Since the 8-hour ozone and standard, and the standards for particulate matter 2.5 microns or less in size are recent, general conformity requirements for these pollutants and/or averaging times have not yet been established by the USEPA. As such, the General Conformity Rules are not yet applicable to ozone with respect to the 8-hour NAAQS nor to the NAAQS for particulate matter 2.5 microns or less in size. Further, IEPA has not yet completed, nor has the USEPA approved, SIPs that address either 8-hour ozone or particulate matter 2.5 microns in size.

Because the proposed Build Alternatives include proposed changes to the airfield, landside, terminal, and off-airport roadways, two forms of conformity were addressed with respect to the improvements: Transportation and General Conformity. Transportation Conformity applies to roadway and transit projects to be funded or approved by the Federal Highway Administration (FHWA) or Federal Transit Administration (FTA), as well as projects that affect regionally significant roadways.[29] The FAA has determined that the Transportation Conformity Rules apply because the project would alter regionally significant roadways. Evidential records, provided by the Chicago Area Transportation Study (CATS) with respect to the proposed roadway improvements and their conformance with the Transportation Conformity Rules, were provided in the FAA's Draft General Conformity Determination (published by the FAA on

[29] 40CFR Part 93 Subpart A, defines regionally significant roadway projects as "a transportation project ... that is on a facility which serves regional transportation needs … and would normally be included in the modeling of a metropolitan area's transportation network."

May 18, 2005) and in the Final General Conformity Determination – Transportation Conformity Documentation (see **Attachment J-4** in **Appendix J, Air Quality**).

Federally funded projects not governed by transportation conformity, are subject to the "general conformity" regulations (40 CFR Part 93, Subpart B). General Conformity applies to Federal actions occurring in non-attainment and maintenance areas for any of the criteria pollutants. As documented in **Chapter 3, Alternatives,** actions by the FAA are expected on the proposed Build Alternatives that, before rendered, would require General Conformity.

Although the conformity analysis and determination is a Federal responsibility, the regulations require that Federal, State, and local air agencies are provided notification and their expertise consulted. The USEPA rules mandate that the sponsoring Federal agency must provide a 30-day notice of the Federal action, and the agency's Draft and Final General Conformity Determinations for the Federal action, to the appropriate USEPA Region, State, local air agencies, and other parties. The sponsoring Federal agency must also make the Draft and Final General Conformity Determinations available to the public to allow opportunity for review and comments. Following the requirements of the General Conformity Rules,[30] the FAA provided, and will provide, copies of the Draft and Final General Conformity Determinations to the following agencies:

- Illinois Department of Natural Resources
- Illinois Department of Transportation
- Illinois Environmental Protection Agency
- National Park Service
- U.S. Army Corps of Engineers
- U.S. Department of Interior
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

The Final General Conformity Determination is being provided to these agencies by distribution of this Final EIS (**Attachment J-2**, in **Appendix J, Air Quality**). Additionally, the FAA informed the public of the availability of the Draft and Final General Conformity Determinations by publishing notices in the following newspapers:

[30] 40 CFR § 93.155.

- Chicago Tribune
- Chicago Sun-Times
- Daily Herald
- Daily Southtown

For areas designated moderate for the 8-hour ozone standard, the *de minimis* threshold is 100 tons per year of volatile organic compounds or nitrogen oxides. Because analysis with respect to the 1-hour ozone standard that was performed by the IEPA indicated that reductions in nitrogen oxide emissions did not affect regional concentrations of ozone when compared to the 1-hour standard, USEPA waived the need for the IEPA to provide regional reductions in nitrogen oxide emissions.[31] For the evaluation of the O'Hare Build Alternatives, the USEPA requested use of the regional emission totals in the currently approved 1-hour ozone SIP (the applicable SIP) and the use of the *de minimis* threshold for the 8-hour ozone standard (100 tons per year).[32] Notably, the de minimis threshold for the previous 1-hour ozone NAAQS (25 tons) was also considered. As further requested by the USEPA, the conformance evaluation also includes an evaluation of nitrogen oxide emissions because the IEPA has yet to determine whether or not reductions in these emissions would affect regional concentrations of ozone with respect to the 8-hour standard.[33]

5.6.5 Potential Emission Reduction Measures

The City of Chicago and the City of Chicago's Department of Aviation have numerous best management practices[34] and other measures aimed at the reduction of pollutant emissions and pollutant precursors related to aircraft operations and construction activities at O'Hare. These measures include:

- Seventy-five percent of the gates at O'Hare have the necessary electrical power and connections so that pilots reduce the time that they use auxiliary power units. It is also the DOA's policy that all new gates at O'Hare have this type of power/connections.

- Sixty-one percent of the gates at O'Hare have pre-conditioned air units. These units supply hot and cold air to aircraft for climate control and also reduce the time that aircraft auxiliary power units are used.

- Nearly 76 percent of the Airport's tenants use hydrant fueling system. This type of system reduces/eliminates the need for aircraft fueling trucks.

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[31] 40 CFR Part 52, Approval of a Section 182(f) Exemption: Illinois, Indiana, Michigan, and Wisconsin; 40 CFR 52.726, Control Strategy: Ozone.
[32] Meeting/conference call, USEPA, IEPA, FAA; November 3, 2004.
[33] Meeting/conference call, USEPA, IEPA, FAA; November 3, 2004.
[34] Best Management Practices Manual for Chicago O'Hare International Airport. Department of Aviation. Revised March 2003. (http://216.146.77.178/objGW/OMImages/9/000000GH/DOA_BM~1.PDF) Best Management Practices relate to the prevention and control of pollutants.

- There is a compressed natural gas fueling station located on Airport property that is available for use by City-owned vehicles.

- The Airport's Airport Rescue and Fire Fighting (ARFF) facility is considered state-of-the-art and uses propane, an environment-friendly accelerant, to simulate aircraft fires for training purposes.

- The Airport has a Stage II vapor recovery system on its fuel storage and dispensing facilities. This type of system reduces the release of fuel vapors to the atmosphere during fueling operations.

- Approximately 44 percent of the airline-owned ground support equipment currently in use at O'Hare is alternatively fueled (electric, jet fuel, and propane).

- When feasible, material (soil) that is removed from areas that are under construction is stockpiled in lieu of hauling the material off-site via haul trucks.

- Dust control plans are required for each construction project. Measures implemented as a result of these plans include use of dust suppression agents on all loose materials and/or exposed earth, covers for stockpiled material, wash downs of construction-related vehicles exiting the Airport and use of rumble strips to remove soil from vehicle tires, dust suppression measures for public roadways used for construction routes, regularly scheduled street sweeping, covered haul trucks, use of dust palliatives or asphalt on temporary haul roads, and hydro-seeding of exposed earth as soon as practical.

- The Chicago Transit Authority operates a commuter light rail system by which passengers and employees can travel to/from O'Hare instead of using private automobiles. The Airport also facilitates access by suburban and regional bus services, and Metra regional commuter rail.

- The Airport provides "Kiss-n-Fly" service. By facilitating the drop-off of passengers prior to the terminal area, motor vehicle congestion (and idling) is reduced in the terminal areas. Passengers using this service access the Airport terminals via the Airport Transit System (ATS), an electric rail system that operates between the terminals.

- The Airport has a holding area (centralized staging area) for commercial vehicles (taxis, shuttles, etc.). This staging area also reduces motor vehicle congestion (and idling) in the terminal areas.

- The rates in the parking lots are structured such that "meeters and greeters" are encouraged to park instead of continual circling on Airport roadways.

- The Airport's ATS can be accessed from remote parking areas eliminating the need for shuttles to and from this area to the terminals.

- Airport staff continually monitors the traffic flow on Airport roadways in to/out of the terminal core areas.
- Additional pay booths have been added to the elevated parking structure. These additional booths reduce the traffic congestion (and idling) of vehicles when exiting this facility. Pay and go kiosks are also available in every parking facility for those wishing to pre-pay before getting to their parked car and avoid waiting in traffic queues to exit the parking facility.
- The Airport implemented an Automated Vehicle Identification (AVI) system for all commercial vehicles accessing the terminal staging areas and/or terminals. Use of this system eliminates excessive dwell times by these types of vehicles.
- The Department of Aviation participates in the USEPA's Energy Star program.[35] Participation in this program recently reduced the energy consumption for lighting requirements outside of Terminals 2 and 3 by approximately 40 percent.
- Solar powered road signs are used where practicable.

Certain fuel conserving practices by the airlines operating at O'Hare also reduce air pollutant and pollutant precursor emissions. These include:

- Use of pushback tugs (ground support equipment) to move aircraft from parked positions at gates to positions conducive to taxiing toward runways.
- Shutting down (turning off) all ground support equipment when not in use.
- Taxiing aircraft with fewer than all available engines, when practical and feasible.

The O'Hare Modernization Program Sustainable Design Manual has been developed by the City of Chicago as an integral part of the overall design and construction standards for the O'Hare Modernization Program (OMP). The Sustainable Design Manual supports the City's ongoing efforts toward implementing more environmentally sustainable buildings and infrastructure. Many of these initiatives build on the City's existing environmental best management practices, and are meant to supplement the existing federal, state, or local regulatory requirements with additional best practice environmental strategies and considerations. When practicable, the contents of the OMP Sustainable Design Manual[36] will be considered in every step of the design, planning, and implementation of the OMP.

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[35] A USEPA program that supports businesses in reducing energy usage through practices which are energy efficient (http://www.energystar.gov/index.cfm?c=about.ab_index).

[36] Sustainable Design Manual, City of Chicago, December 2003. See **Attachment Q-2** in **Appendix Q, Construction**.

The emission inventories presented/discussed in **Section 5.6.3**, **Alternatives Analysis**, conservatively assumes that 9.4 MCY of material would be removed from O'Hare property to construct the proposed improvements. Two potential scenarios, a 0.0 MCY scenario and a 5.4 MCY scenario are also being considered by the City. Each of these scenarios would reduce the level of construction-related emissions associated with the proposed improvements; primarily due to a lesser need for haul trucks to remove the material from the Airport. The estimated range of construction-related emissions (from the 9.4 MCY to the 0.0 MCY scenarios) is presented in **Table 5.6-23.** Notably, the values presented in **Table 5.6-23** are representative of those estimated to occur over the entire construction period for the proposed improvements. As shown, the level of carbon monoxide, volatile organic compounds, nitrogen oxides, sulfur oxides, and particulate matter emissions could potentially be reduced from 12 to 38 percent of those presented in this EIS through the implementation of the 5.4 or 0.0 MCY scenarios, respectively.

TABLE 5.6-23
TOTAL CONSTRUCTION-RELATED EMISSIONS

	Tons of Pollutants/Precursors					
Scenario	Carbon Monoxide	Volatile Organic Compounds	Nitrogen Oxides	Sulfur Oxides	Particulate Matter 10 microns or less	Particulate Matter 2.5 microns or less
9.4 MCY	1,611	197	2,338	78	113	104
5.4 MCY	1,551	185	2,026	69	111	93
Percent Decrease (a)	4%	6%	13%	12%	2%	11%
0.0 MCY	1,413	155	1,459	55	77	71
Percent Decrease (a)	12%	21%	38%	29%	32%	32%

Note: (a) When compared to the 9.4 MCY construction scenario.
Source: Environmental Science Associates, Inc. [TPC] analysis, 2005.

Based on existing programs, Best Management Practices[37] and implementation of the Sustainable Design Manual, several additional potential emission reduction measures were identified in the Draft EIS that would reduce pollutant emissions associated with both the operation and construction of the Airport. Certain measures, listed in **Table 5.6-24**, would be implemented, or would be considered for potential implementation, by the City of Chicago for incorporation into the proposed improvements at O'Hare depending on potential benefit, cost, practicability and feasibility of use, impact to participation by Disadvantaged Business Enterprises (including Minority Business Enterprises and Women-Owned Business Enterprises), and potential impact to the construction schedule.

[37] Best Management Practices Manual for Chicago O'Hare International Airport, Department of Aviation. Revised March 2003. See **Attachment Q-1** in **Appendix Q, Construction**.

Notably, there are two measures that could substantially reduce construction-related air pollutant and pollutant precursor emissions:

- With certain limitations, requiring construction-related contractors to use ultra low sulfur diesel fuel in on- and off-road engines/vehicles, and
- With certain limitations, requiring construction-related contractors, in conjunction with the use of ultra low sulfur diesel fuel, to install and/or retrofit older off-road engines/vehicles with emission control devices prior to the equipment being used on the project site.

The limitations associated with the two measures above are related to the length of time certain contractors would use their equipment on the project (for contractors only using equipment on the project for a short period of time, the measures could be an undue burden). Taking these limitations into consideration, the potential for the two measures to reduce construction-related emissions was evaluated.

As shown in **Table 5.6-25**, requirements to only use ultra low sulfur diesel fuel would not reduce emissions of carbon monoxide or volatile organic compounds. However, emissions of sulfur dioxide and particulate matter less than 10 microns in size (including particles 2.5 microns or less in size and diesel particulate matter) would be reduced approximately 94 and 5 percent, respectively. As also shown, requirements to use ultra low sulfur diesel fuel and emission control devices are estimated to result in a minimum reduction in carbon monoxide, volatile organic compounds, sulfur oxides, and particulate matter emissions of 4, 17, 94, and 15 percent, respectively while the reduction could be as much as 10, 24, 94, and 33 percent, respectively (these measures would not appreciably reduce emissions of nitrogen oxides). Notably, the emission reductions have been quantified using estimated ranges because it is not known what types of devices an individual contractor would select and because the level of emission reductions from the various types of available emission control devices varies.

TABLE 5.6-24
EMISSION REDUCTION MEASURES

	Implemented with the OMP			
Emission Reduction Measure	**Yes**	**Where practicable and reasonable**	**No**	**Comment**
Provide preferred parking for the public and employees traveling to/from the Airport in alternatively fueled vehicles, in vanpools/carpools, and for rental car fleets using alternatively fueled vehicles.		X		
Encourage the use of alternate fuel and retrofits for internal bus/shuttle transport.	X			Construction-related contractors will be encouraged to identify and incorporate measures to use alternatively fueled vehicles for construction-related employee shuttles.
Provide 400 Hz power at all future gates.	X			
Provide pre-conditioned air (PCU) at all future gates.	X			
Provide Fuel Hydrant System access at all future gates to eliminate tanker fuel trucks.	X			
Use of ultra low sulfur fuel for all on-road diesel trucks prior to the year 2007 (use of this fuel is Federally mandated in the year 2007 for on-road equipment).	X			Applicable to equipment with an engine horsepower rating of 50 or more that would transport materials regularly (exceeding 5 calendar days per month) to and form the project site. Implementing this measure will require contractors to use ultra low sulfur diesel fuel in advance of Federal mandates to do so.
Use of ultra low sulfur fuel for all off-road diesel equipment prior to the year 2010 (use of this fuel is Federally mandated in the year 2010 for off-road equipment).	X			Applicable to equipment with engine horsepower rating of 50 or more utilized on the project site for a minimum of fourteen consecutive calendar days. Implementing this measure will require contractors to use ultra low sulfur diesel fuel in advance of Federal mandates to do so.
Use of newer, cleaner, and more fuel efficient engines in lieu of older diesel engines during construction.	X			Construction-related contractors would be required to install and/or retrofit older diesel engines to meet minimum emission reduction goals (in conjunction with the use of ultra low sulfur diesel fuel.
Use of diesel emission traps and oxidation catalysts for off-road diesel equipment during construction.	X			Construction-related contractors would be required to install and/or retrofit older diesel engines to meet minimum emission reduction goals (in conjunction with the use of ultra low sulfur diesel fuel.
Require that contractors limit the time that construction-related vehicles idle.	X			Diesel powered engines will not be permitted to idle during periods of non-active vehicle use. When in use, diesel powered engines would not idle more than 5 minutes in a 60-minute period except when necessary (i.e., when forced to remain motionless because of traffic conditions).

TABLE 5.6-24
EMISSION REDUCTION MEASURES

	Implemented with the OMP			
Emission Reduction Measure	**Yes**	**Where practicable and reasonable**	**No**	**Comment**
Continue the use of Stage II vapor recovery for refueling (ground support equipment and aircraft).	X			
Use low-volatile organic compound (VOC) emission paints and solvents to construct OMP-related buildings and terminals.		X		
Extend the existing Airport Transit System to proposed facilities.	X			
Continue the use of Best Management Practices.	X			
Provide a centralized rental car facility with connection to the Airport Transit System.	X			
Use highly efficient heating, ventilating, air conditioning (HVAC) systems in proposed terminal facilities.		X		
Implement diesel idling restrictions for delivery vehicles.	X			There is currently a City ordinance pending on this issue.
Continue the use of aircraft idling time reduction measures at gates.		X		There is an existing Airline Transport Association (ATA) policy to reduce idling time to the best of airlines' capabilities.
Use active/passive solar energy where practicable and feasible.		X		
Landscape and provide exterior design to reduce "heat islands" associated with Airport surfaces.		X		

Note: (a) Buildings and pavement made of dark materials absorb the sun's rays instead of reflecting them away, causing the temperature of the surfaces and the air around them to rise. Smog is created by photochemical reactions of pollutants in the air. These reactions are more likely to occur and intensify at higher temperatures.

TABLE 5.6-25
ESTIMATED REDUCTION IN CONSTRUCTION EMISSIONS

Emission Reduction Measure	Estimated Reduction Range	Percent Reduction in Total Construction-Related Emissions					
		Carbon Monoxide	Volatile Organic Compounds	Nitrogen Oxides	Sulfur Oxides	Particulate Matter 10 microns or less	Particulate Matter 2.5 microns or less
Ultra low sulfur diesel fuel	NA	0%	0%	0%	94%	5%	5%
Ultra low sulfur diesel fuel and emission control devices	Minimum	4%	17%	0%	94%	15%	15%
	Average	7%	18%	1%	94%	23%	23%
	Maximum	10%	24%	4%	94%	33%	33%

Source: Environmental Science Associates, Inc. [TPC] analysis, 2005.

5.6.6 Summary

Implementation of the Alternative A (No Action Alternative) and any of the Build Alternatives would result in both short-term and long-term air quality effects. Over the short-term, air quality conditions would be temporarily affected due to construction activities. Over the long-term, the Build Alternatives have the potential to affect air quality conditions due to increases in the number of aircraft operations and airport support operations, and changes to aircraft and motor vehicle circulation patterns. To evaluate the effect of these changes on local and regional air quality conditions, two types of air quality analyses were performed - emission inventories and dispersion modeling.

Based on the results of the air quality analysis, key conclusions with respect to the proposed improvements and air quality conditions are:

- Emission loads, related to the Build Alternatives, of carbon monoxide, volatile organic compounds, nitrogen oxides, sulfur oxides, and particulate matter are higher (see **Table 5.6-26**) than with Alternative A (No Action Alternative). This conclusion is based on the assumption that operations are constrained significantly with Alternative A.

- While emission loads related to the Build Alternatives are higher, predicted ambient concentrations of carbon monoxide, nitrogen dioxide, sulfur oxide, and particulate matter are below the NAAQS (see **Tables 5.6-27** and **5.6-28**).

- In Construction Phase I and Construction Phase II, there would be no difference in emission totals related to the Build Alternatives. In Build Out and Build Out +5, differences in emission totals with the Build Alternatives would only be one to two percent when comparing the alternative expected to result in the highest emissions (Alternative D) with the alternative predicted to result in the lowest emissions (Alternative C).

- The project sponsor would implement emission reduction control measures which would reduce the level of air pollutant and pollutant precursor emissions estimated to occur as a result of construction of the proposed projects (see **Tables 5.6-24** and **5.6-25**).

TABLE 5.6-26
CHANGES IN TOTAL EMISSIONS

		Tons (b)					
Phase	**Alternative (a)**	**Carbon Monoxide**	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Sulfur Oxides**	**Particulate Matter 10 microns or less**	**Particulate Matter 2.5 microns or less**
ORIGINAL CONSTRUCTION SCHEDULE							
Construction Phase I (2007)	C, D, G	+1,406	+106	+536	+43	+96	+56
Construction Phase II (2009)	C, D, G	+1,964	+144	+544	+63	+69	+55
Build-Out (2013)	C	+3,246	+199	+742	+82	+18	+12
	D	+3,522	+225	+805	+95	+19	+12
	G	+3,161	+194	+722	+77	+18	+12
Build-Out+5 (2018)	C	+4,025	+254	+993	+116	+14	+12
	D	+4,502	+297	+1,109	+141	+15	+14
	G	+4,002	+252	+987	+115	+14	+12
COMPRESSED CONSTRUCTION SCHEDULE							
Construction Phase I (2007)	C, D, G	+1,572	+138	+770	+49	+104	+64
Construction Phase II (2009)	C, D, G	+1,964	+144	+544	+63	+69	+55
Build-Out (2013)	C	+3,246	+199	+742	+82	+18	+12
	D	+3,522	+225	+805	+95	+19	+12
	G	+3,161	+194	+722	+77	+18	+12
Build-Out+5 (2018)	C	+4,025	+254	+993	+116	+14	+12
	D	+4,502	+297	+1,109	+141	+15	+14
	G	+4,002	+252	+987	+115	+14	+12
DELAYED CONSTRUCTION SCHEDULE							
Construction Phase I (2008)	C, D, G	+1,697	+128	+531	+47	+88	+76
Construction Phase II (2010)	C, D, G	+2,494	+181	+657	+81	+72	+66

TABLE 5.6-26
CHANGES IN TOTAL EMISSIONS

		Tons (b)					
Phase	**Alternative (a)**	**Carbon Monoxide**	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Sulfur Oxides**	**Particulate Matter 10 microns or less**	**Particulate Matter 2.5 microns or less**
DELAYED CONSTRUCTION SCHEDULE (Continued)							
Build-Out (2014)	C	+3,391	+208	+776	+87	+21	+19
	D	+3,651	+230	+836	+101	+22	+20
	G	+3,262	+199	+846	+81	+20	+19
Build-Out+5 (2019)	C	+4,274	+268	+1,081	+125	+15	+13
	D	+4,761	+304	+1,199	+151	+17	+15
	G	+4,241	+265	+1,073	+124	+15	+13

Notes: (a) Alternative A = No Action,. Alternatives C, D, and G = Build Alternatives
(b) The changes in total emissions do not reflect the potential reduction in emissions that would occur with the emission reduction measures discussed in **Section 5.6.5, Potential Emission Reduction Measures**.

Source: Environmental Science Associates, Inc. [TPC], 2004/2005.

TABLE 5.6-27
MAXIMUM MACROSCALE DISPERSION MODELING RESULTS

		Maximum Predicted Pollutant Concentrations (μg/m^3) (d)									
		Nitrogen Dioxide	Carbon Monoxide		Particulate Matter 10 microns or less		Particulate Matter 2.5 microns or less		Sulfur Dioxide		
Phase	**Alternative(b)**	**Annual**	**1-Hour**	**8-Hour**	**24-Hour**	**Annual**	**24-Hour**	**Annual**	**3-Hour**	**24-Hour**	**Annual**
NAAQS(c)	-	100	40,000	10,000	150	50	65	15	1,300	365	80
ORIGINAL CONSTRUCTION SCHEDULE											
Construction Phase I (2007)	A	89	31,409	8,106	64	31	39	14	323	99	13
	C, D, G	91	33,751	8,566	64	31	39	14	291	98	13
Construction Phase II (2009)	A	84	30,131	8,037	64	31	38	14	280	94	13
	C, D, G	84	19,959	8,267	64	31	38	14	279	93	12
Build Out (2013)	A	84	32,326	8,135	64	31	39	14	322	101	13
	C	83	28,046	7,960	64	31	38	14	273	96	13
	D	82	26,818	7,930	64	31	38	14	273	96	13
	G	82	26,690	7,947	64	31	38	14	273	96	13
Build Out+5 (2018)	A	84	34,687	8,237	64	31	39	14	303	96	13
	C	83	28,502	8,281	64	31	39	14	288	98	13
	D	84	29,239	8,207	64	31	39	14	289	98	13
	G	83	29,076	8,245	64	31	39	14	289	98	13
DELAYED CONSTRUCTION SCHEDULE											
Construction Phase I (2008)	A	87	32,068	7,874	64	31	39	14	324	99	13
	C, D, G	88	36,215	8,386	64	31	39	14	292	98	13
Construction Phase II (2010)	A	83	30,557	8,052	64	31	39	14	279	94	13
	C, D, G	81	20,333	8,362	64	31	38	14	281	94	12
Build Out (2014)	A	84	33,412	8,274	64	31	39	14	323	101	13
	C	83	28,095	8,050	64	31	38	14	285	102	13
	D	83	26,848	8,020	64	31	38	14	274	96	13
	G	82	26,720	8,038	64	31	39	14	274	96	13

TABLE 5.6-27
MAXIMUM MACROSCALE DISPERSION MODELING RESULTS

		Maximum Predicted Pollutant Concentrations (μg/m^3) (d)									
		Nitrogen Dioxide	Carbon Monoxide		Particulate Matter 10 microns or less		Particulate Matter 2.5 microns or less		Sulfur Dioxide		
Phase	Alternative(b)	Annual	1-Hour	8-Hour	24-Hour	Annual	24-Hour	Annual	3-Hour	24-Hour	Annual
DELAYED CONSTRUCTION SCHEDULE (Continued)											
Build Out+5 (2019)	A	84	34,687	8,237	64	31	39	14	303	96	13
	C	84	28,767	8,338	64	31	39	14	290	99	13
	D	84	29,517	8,265	64	31	39	14	291	99	13
	G	83	29,352	8,302	64	31	39	14	290	99	13

Notes:
(a) Includes Background concentrations.
(b) Alternative A = No Action, Alternative C, D, and G are "Build Alternatives."
(c) NAAQS = National Ambient Air Quality Standards
(d) The macroscale dispersion results do not reflect the potential reduction in emissions that would occur with the emission reduction measures discussed in **Section 5.6.5, Potential Emission Reduction Measures**.

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

TABLE 5.6-28
MAXIMUM MICROSCALE DISPERSION MODELING RESULTS

Phase	Alternative	Intersection No.	Intersection	Carbon Monoxide Concentrations (ppm)(a) One Hour(b)	Carbon Monoxide Concentrations (ppm)(a) Eight Hour(c)
ORIGINAL AND COMPRESSED CONSTRUCTION SCHEDULES					
Construction	A (No Action)	17	Mannheim Road and Lawrence Avenue	14.3	9.1
Phase I (2007)	C, D, G	17	Mannheim Road and Lawrence Avenue	11.2	7.2
Construction	A (No Action)	17	Mannheim Road and Lawrence Avenue	13.6	8.7
Phase II (2009)	C, D, G	17	Mannheim Road and Lawrence Avenue	10.9	7.0
Build Out	A (No Action)	17	Mannheim Road and Lawrence Avenue	12.7	8.1
(2013)	C, D, G	20	Mannheim Road and Irving Park Road	12.0	7.7
Build Out+5	A (No Action)	10	Mannheim Road and Zemke Road	11.9	7.6
(2018)	C, D, G	20	Mannheim Road and Irving Park Road	10.9	7.0
DELAYED CONSTRUCTION SCHEDULE					
Construction	A (No Action)	17	Mannheim Road and Lawrence Avenue	13.9	8.9
Phase I (2008)	C, D, G	17	Mannheim Road and Lawrence Avenue	11.3	7.2
Construction	A (No Action)	17	Mannheim Road and Lawrence Avenue	13.4	8.6
Phase II (2010)	C, D, G	17	Mannheim Road and Lawrence Avenue	11.2	7.2
Build Out	A (No Action)	17	Mannheim Road and Lawrence Avenue	12.4	7.9
(2014)	C, D, G	20	Mannheim Road and Irving Park Road	11.8	7.5
Build Out+5	A (No Action)	10	Mannheim Road and Zemke Road	11.7	7.5
(2019)	C, D, G	20	Mannheim Road and Irving Park Road	10.9	7.0

Notes: (a) ppm= parts per million.
(b) Includes background concentration of 4.5 ppm.
(c) Includes background concentration of 2.9 ppm.

Source: Environmental Science Associates, Inc. [TPC] analysis, 2004/2005.

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