Final Report

Chicago O'Hare Airport

Air Toxic Monitoring Program

June – December, 2000

Illinois Environmental Protection Agency

Bureau of Air

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Executive Summary

O'Hare International Airport (O'Hare) is one of the world's busiest airports and the subject of much interest regarding the environmental impact airport operations have on the surrounding community and the Chicago area in general. As part of its fiscal year 2001 air monitoring program, the Illinois EPA measured the airborne levels of various air contaminants in the vicinity of O'Hare as well as at other locations in the Chicago area. The purpose of this measurement program was to collect information that would help assess the relative impact of airport related emissions and levels of airborne contaminants characteristic of large urban areas. This monitoring program will supplement a national program designed to assess and minimize the impact of toxic air contaminants in urban areas. The national program is referred to as the National Integrated Urban Air Toxics Strategy (National Strategy).

The National Strategy was developed by the United States Environmental Protection Agency (USEPA) in response to requirements specified in the federal Clean Air Act. Under these requirements, USEPA is charged with assessing the impact of airborne levels of various air toxic compounds on human health in urban areas of the United States and taking action to reduce risks caused by unacceptable levels of such contaminants. In July 1999, the USEPA released its National Strategy describing a framework for addressing air toxic emissions from stationary and mobile sources such as O'Hare Airport. As part of the National Strategy, air monitoring programs are to be used to identify and measure compounds believed to present the greatest concern to public health in urban areas.

Federal and State funding was provided to allow the initiation of an urban air toxic monitoring program in calendar year 2000. The funding was adequate to support a limited air quality investigation of targeted compounds through a six month monitoring program with two sites located near O'Hare Airport and three other sites in the Chicago metropolitan area. The monitoring program began in June 2000 and focused on the urban air toxic compounds identified in USEPA's National Strategy and on mobile source emissions associated with airport operations. The compounds sampled included volatile organics, semi-volatile organics, carbonyls and trace metals. The monitoring program ended in December 2000.

The Chicago area toxics monitoring program, as deployed in 2000, was designed to provide data to meet four objectives:

1) Measure the concentrations of specific compounds of concern;
2) Assess the geographic variability of various compounds in the Chicago area and perform a comparison of levels measured at the two O'Hare sites to those recorded at the remaining three Chicago area locations;
3) Compare Chicago area results to data collected for other large U.S. cities; and
4) Determine if the emissions associated with O'Hare Airport have a measurable impact on air quality in areas adjacent to the airport.

In order to measure the concentrations of the target compounds, comprehensive sampling was conducted on sixteen days through the six month period of June through December 2000, using a once every twelve days sampling schedule. The sampling results were summarized for each of the five monitoring sites and tabulated into two categories, Urban Air Toxic compounds and Hazardous Air Pollutants (HAPs). The Urban Air Toxics compounds are those identified by USEPA in the National Strategy that present the greatest threat to public health in urban areas, including known or suspected cancer risks from compounds such as benzene, formaldehyde, chromium and dioxins. The HAPs are compounds required to be regulated by USEPA under the Clean Air Amendments of 1990 that are known or suspected to cause cancer or have other serious health effects but are not included in the list of Urban Air Toxic compounds covered under the National Strategy. The HAPs measured included such compounds as ethyl benzene, styrene, toluene, xylenes and various polycyclic aromatics such as naphthalene and phenanthrene. The tabulated data included the individual daily sampling results along with the overall average concentration found for each target compound.

The program's sampling sites were located to provide air toxic measurements at different points across the Chicago metropolitan area, thereby allowing for a comparison of the levels found at O'Hare Airport to those found in different parts of the metropolitan area. In addition to the two sites located near O'Hare in Bensenville and Schiller Park, sites were also located in Northbrook, just north of the urban core, at Washington School in highly industrialized Southeast Chicago, and in Lemont, just downwind of major refineries and chemical complexes and on the southwestern edge of the metropolitan area.

A review and analysis of the accumulated monitoring results obtained from the five site monitoring network provided the following findings:

1. The average concentrations measured at O'Hare Airport for many of the target compounds were found to be comparable with the concentrations found at the other Chicago area sites;
2. The highest concentrations of several target urban air toxic compounds were found to be spread between several sites but generally the highest levels for many of the air toxics were found to occur in Southeast Chicago;
3. The lowest concentrations of most target compounds were measured at Lemont.

A comparison of measured levels of urban air toxics in Chicago to those found in other large cities served as a point of reference to what would be considered "typical urban" concentrations. USEPA's Aerometric Storage and Retrieval System (AIRS) was accessed to obtain the air quality data collected from monitoring sites nationwide. A review of information submitted to AIRS found that data for certain air toxic compounds had been reported for a number of large urbanized areas. Based upon a comparison of the results from the Chicago area monitoring program to that collected for other large U.S. cities data, it was found that:

1. Concentrations of several of the principal urban air toxics, such as acetaldehyde, benzene, and formaldehyde, compared to the metropolitan areas of Atlanta, Detroit, Houston and Milwaukee, were found to be comparable or lower in the Chicago metropolitan area.

2. The acetaldehyde and formaldehyde levels measured near O'Hare Airport were comparable or lower than levels measured in Atlanta, Detroit and Houston.

In order to assess the possible impact of emissions from O'Hare Airport on adjacent areas, two monitoring sites were deployed on different sides of the airport. This configuration allowed for the collection of sampling data on wind persistent days that would align one site to be upwind, unaffected by the airport, and the other to be downwind and subject to airport emissions. The difference in concentrations found between the two sites on those wind-persistent days allowed for an approximation of the airport's impact. Of the sixteen sampling days, five days had such wind-persistent conditions. An analysis of the results from those five days found the downwind site to record levels of some target compounds from 20-85% higher than the upwind site. The compounds with measurable differences included acetaldehyde, benzene, formaldehyde, polycyclic organics, toluene and lead. All of those compounds have been associated with emissions from airport operations. An impact from the airport was not unexpected since airport operations are sources of various air contaminants. The concentrations measured downwind of O'Hare were at levels considered to be "typical" of an urban area and in some cases lower than values measured in other cities.

Based upon the review of the air toxics monitoring data collected near O'Hare Airport, from other Chicago area sites, and from USEPA's AIRS database, the following conclusions were reached:

1. The levels of air toxic compounds found near O'Hare and other sites in the Chicago metropolitan area were comparable or lower than those found in other large U.S. cities.

2. The highest levels of most air toxic compounds measured in the Chicago area were found in Southeast Chicago.

3. An analysis of data collected from the sites at O'Hare found that emissions from the Airport have an impact on the air quality in adjacent communities, but that impact did not result in levels higher than those found in a typical urban environment.

The data collected through this study's air monitoring program indicated that the toxics air quality in the vicinity of O'Hare Airport is comparable to the air quality in other parts of Chicago and comparable to the air quality in other major urban areas. There are continuing and ongoing efforts, such as through USEPA's National Strategy, to identify, assess and reduce risk from air toxics in and around urban areas.

Section 1.0 Air Monitoring Program Description

1.1 Background

Ambient air monitoring for a limited number of air toxic compounds has been conducted in Illinois for many years. Measurement of airborne particulate metals, some of which are considered hazardous air pollutants (HAPs), has been done statewide since the early 1970s. In the early 1990s, the Photochemical (Ozone) Assessment Monitoring (PAMS) program began collecting data for volatile organic compounds, which included a number of compounds considered to be urban air toxics; e.g., benzene and formaldehyde. The PAMS program has been limited to the Chicago metropolitan area. Beyond these two programs, air toxic monitoring efforts have been minimal due to a lack of any specific regulatory requirements.

In July 1999, as part of its national program to reduce ambient levels of air toxics, the United States Environmental Protection Agency (USEPA) released its National Integrated Urban Air Toxics Strategy (National Strategy). Reference 1. The National Strategy presented a framework for addressing air toxic emissions from stationary sources and mobile sources such as Chicago's O'Hare Airport. An integral part of National Strategy called for the establishment of air monitoring programs to begin collecting data needed to characterize the ambient concentrations of certain compounds known to present the greatest concern for public health in urban areas.

A preliminary assessment of the air toxic emissions from O'Hare Airport and the resulting health effects created by the toxic emissions in surrounding communities was sponsored the City of Park Ridge, Illinois, in early 2000. Reference 2. The Park Ridge Study concluded that toxic emissions from O'Hare had a widespread impact and presented an associated health risk to residents in the communities surrounding O'Hare. The Park Ridge Study also identified the need for better assessment of the data used in the study and recommended that comprehensive air monitoring be conducted around O'Hare and in impacted communities. These data could then be used to conduct a more complete and comprehensive air quality analysis.

In the fall of 1999, federal and state funding became available to allow the initiation of an urban air toxic monitoring program in Illinois. The funding was adequate to support a preliminary air quality investigation of targeted compounds through a six month monitoring program with two sites near O'Hare Airport and at three other sites in the Chicago metropolitan area. The monitoring program began in June 2000 and focused on the urban air toxic compounds identified in USEPA's National Strategy and on mobile source emissions associated with airport operations. The compounds of interest included volatile organics, semi-volatile organics, carbonyls and trace metals. The monitoring program ended in December 2000.

1.2 Monitoring Objectives

The Chicago area air toxics monitoring network deployed in 2000 was designed to provide data to meet the following objectives:

1. Determine ambient concentrations of specific compounds of concern;
2. Describe pollutant levels at various locations across the area, assess their geographic variability and perform a comparison of the levels of air toxics found at O'Hare Airport to other sites in the Chicago area;
3. Provide monitoring results consistent with nationally available air toxics information that would allow for a comparison of Chicago area results to data collected for other large U.S. cities; and
4. Determine if the target compound emissions from O'Hare Airport have a measurable impact on air quality in the surrounding communities.

To meet the above objectives, the focus was on the compounds identified by USEPA as Urban Air Toxics and on other compounds known to be emitted by mobile sources (e.g., cars, trucks and aircraft). Particular attention was placed on those compounds associated with aircraft operations; e.g., takeoff, landing, refueling and idling.

1.3 Monitoring Network

The monitoring program consisted of five sampling sites located as shown in Figure 1 that were operated to collect calendar day samples (24-hour integrated samples) on a once every 12 day schedule throughout the period of June through December 2000. Air monitoring sites were located with two near O'Hare Airport, in Bensenville and Schiller Park, one site in Northbrook just downwind (North) of the urban core, at Chicago-Washington in highly industrialized Southeast Chicago, and in Lemont, an area impacted by refineries and on the southwestern edge of the metropolitan area.

The site selections were made based upon a review of historical meteorological data from the National Weather Service and from air quality data collected as part of the Illinois air monitoring network. The sites selected at O'Hare were located to fall into two areas where predominant winds would provide the greatest frequency of impact from airport operations. The location of other significant emission sources, such as expressways, major arterial streets and industrial sources of organic compounds, was also a consideration in the final site selections. The sites were also located in areas with population exposure; e.g., non-remote areas along the fenceline, to allow the estimation of target compound concentrations in public areas adjacent to the airport.

A complete description of each of the five sampling sites is provided in Appendix I. The descriptions provided include location details (address, building), immediate site locale, distance from influencing sources (roadways, airports, industry), landmarks and a photograph showing the site exposure. All of the sites were established in USEPA's Aerometric Information Retrieval System (AIRS) complete with the required site description information.

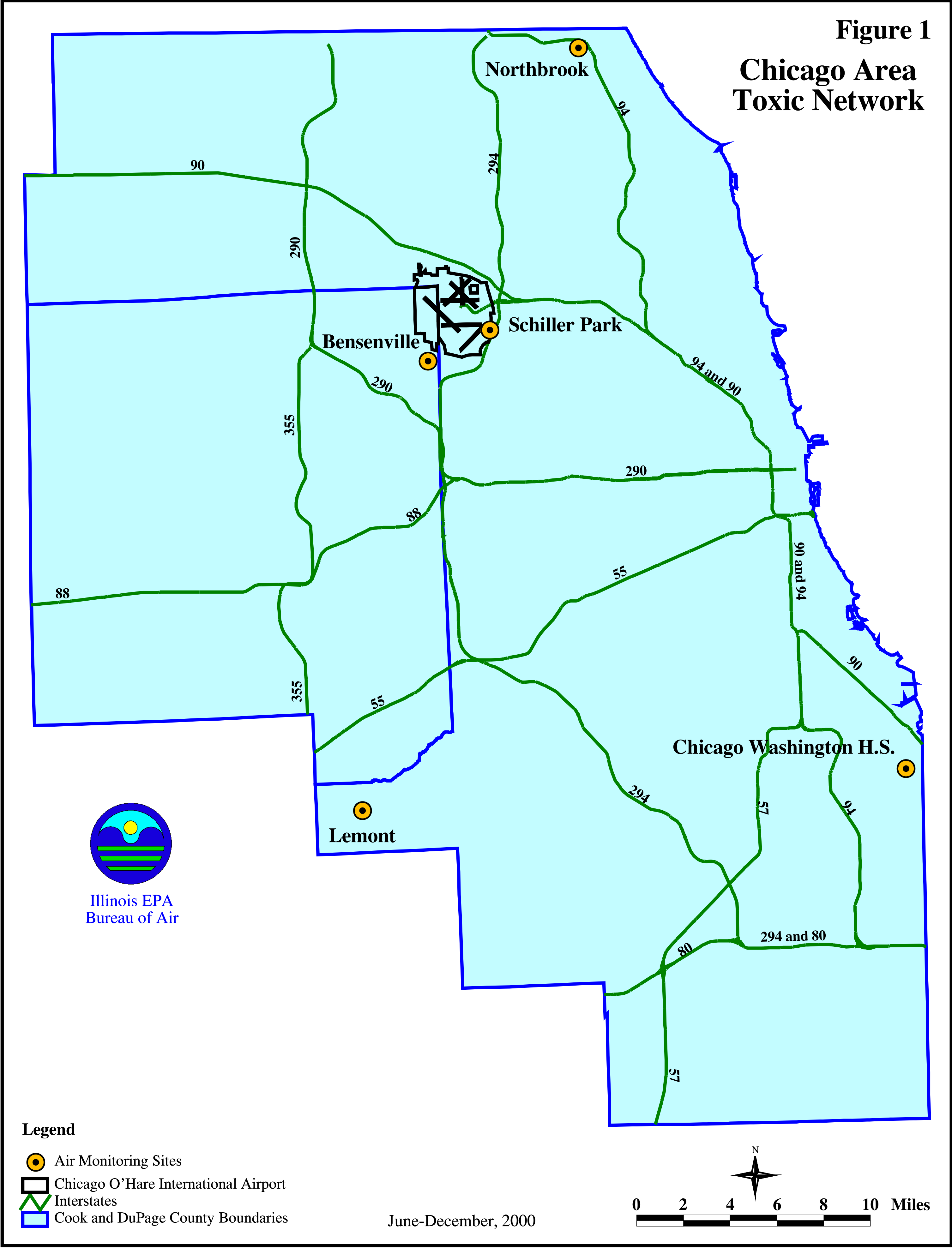


Figure 1

Chicago Area Toxic Network

Each monitoring site deployed four separate sampling systems to collect a wide-range of compounds on each sampling day. The samplers and analytical methods selected were consistent with those designated and approved by USEPA. The systems deployed included a VOC canister system with sample analysis by method TO-15, DNPH cartridge sampler with analysis by method TO-11A for carbonyls, high volume air sampler with filter analysis by atomic absorption for metals and PUF sampler with analysis by TO-13A method for semi-volatile organics. Appendix II provides a listing of specific compounds, considered either as an Urban Toxic or HAP, obtained for each of these sampling and analysis methods.

The sampling schedule utilized provided that 24-hour samples were collected on a calendar day basis once every 12 days. The schedule overlapped the national one-in-six day schedule used for the particulate and PAMS networks. The collected samples coincided with samples collected on the same days in other states. Sampling commenced on June 17, 2000, and ended on December 26, 2000, providing a total of 16 sampling days.

1.4 Laboratory Methods and Quality Assurance

All of the analytical methods used have been recognized and approved by USEPA. The four methods used were as follows:

1. volatile organics (53 compounds) - TO-15, gas chromatography with mass spectroscopy (confirmation)
2. carbonyls (14 compounds) - TO-11a, high pressure liquid chromatography
3. semi-volatile organics (18 cmpds) - TO-13a gas chromotagraphy and mass spectroscopy analysis
4. particulate metals (8 compounds) - atomic absorption

The above analytical methods provide analyses for additional compounds not shown in Appendix II. For example, there are 18 compounds listed under Appendix II, Volatile Organics (Category I), but Method TO-15 tests for 53 compounds. This report provides the results for all compounds reported by the analytical method.

For the purposes of this report, values are reported according to the Method Detection Limit (MDL). The MDL, as defined by USEPA, is the minimum concentration of a substance that can be measured and reported with 99% confidence that the target compound concentration is greater than zero, and is determined from analysis of a sample in a matrix containing the target compound. Analytical results were reported as zero for those values below the MDL.

Quality assurance activities were conducted in a manner consistent with the PAMS and particulate sampling programs. This included flow audits, some duplicate sampling for precision (metals, VOCs), replicate analyses (VOCs) and independent performance audits (blind samples) for metals, VOCs and carbonyls. The maintenance and calibration procedures used were those provided in the Illinois Quality Assurance Plan for use in the Illinois air monitoring network and those that have been approved by USEPA.

2.0 Sampling Results

2.1 Reporting Units

This report provides both summaries of the accumulated sampling results and data tables that present the individual sample values. Because of the nature of the toxic compounds; i.e., gases and solid particles, the results are expressed in different units. The volatile organic compound and carbonyl data in this report has been reported in parts per billion by volume (ppbv). It is important to note that PAMS data are typically reported in parts per billion by carbon (ppbc) and that the PAMS data used in this report have been converted from ppbc to ppbv.

Data for the semi-volatile organic compounds and particulate metals have been reported in the units of nanograms per cubic meter, with the exception that the dioxins and furans data have been reported in picograms per cubic meter due to their extreme low concentration. Nanograms are 10^{-9} grams and picograms are 10^{-12} grams.

The data available from USEPA's AIRS database is reported in many different units and care should be taken when using AIRS data to note the units reported with each value. For example, particulate metals can be reported in micrograms per cubic meter, nanograms per cubic meter or picograms per cubic meter.

2.2 Program Data

The Chicago O'Hare air toxics monitoring program began in June 2000, and concluded in December 2000. During the seven month period, 24-hour integrated samples were collected on 16 calendar days. The results obtained for each individual compound on the 16 sampling days for each of the five monitoring sites have been summarized and are provided in Appendix IIIA through Appendix IIIF. The sampling results for each site have been presented in two categories, "Urban Air Toxic Compounds" which include compounds designated in USEPA's National Strategy and "Hazardous Air Pollutants (HAPS)" listed by USEPA as air toxic compounds which potentially can have adverse public health impacts. For example, Appendix IIIA lists the individual daily sampling results for Urban Air Toxic compounds measured at Bensenville and Appendix IIIB lists the daily HAPS values measured at Bensenville.

The focus of the data analysis included in this report was placed on the compounds designated as Urban Air Toxics and on other HAPS known to be emitted by mobile sources with emphasis on those associated with airport operations. These "target" compounds include those identified in the Park Ridge Study as the chemicals that contribute most significantly to risks associated with O'Hare aircraft emissions.

Section 3.0 Findings

3.1 Chicago Area Measurements

A primary objective of the Chicago urban area air toxics monitoring program was to determine ambient concentrations of specific “target” compounds of concern at various locations in the metropolitan area. The accumulated sampling data at each site then allowed for a determination of the typical concentrations that might be expected in each area. The data collected at each site have been summarized in Table 1 that provides the average concentration for each target compound at each of the five sampling sites. The values reported represent the arithmetic average of the results obtained on each of the 16 sampling days.

Of the target compounds, only vinyl chloride and 1,1,2,2-tetrachloroethylene were not found at a concentration above the sampling methods MDL and have values reported as zero. Acrolein was detected only on one day at two sites, Northbrook and Chicago-Washington, in a concentration that would allow a minimal average to be reported. Essentially, the average concentration of acrolein was zero at all five sites. While these three compounds are considered to be important urban air toxic compounds and may be found in significant concentration in some urbanized areas; e.g. Southern California, they do not appear to be in measurable levels in the Chicago Metropolitan Area.

All of the other target compounds were found in concentrations above the MDL at all five sites. The compounds of most interest, including acetaldehyde, benzene, chromium formaldehyde, polycyclic organics and dioxins, were found at concentrations well above the MDL. USEPA identified benzene, formaldehyde, chromium and dioxins in their National Strategy as those compounds that present the greatest risk to public health in urban areas. The Park Ridge Study identified acetaldehyde, formaldehyde, benzene and napthalene (a major component of polycyclic organics) as those chemicals that contribute most significantly to risks associated with aircraft emissions. The concentrations of these compounds found, as shown in Table 1, serve to demonstrate the levels at which they might be expected to occur in the Chicago metropolitan area. The following sections describe the results of additional data analyses needed to assess the significance of the presence of these compounds.

3.2 Geographic Area Analysis

In order to better understand the significance of the measured concentrations, a comparison of the results found from site to site provided insight into the urban nature of the some toxic compounds and identified compounds or areas that showed notable differences. The monitoring network design placed the sampling sites in areas with differing emission source impacts, thereby allowing an analysis of the results found in different areas across the urbanized area. The Bensenville and Schiller Park sites were located near O’Hare Airport in areas impacted by airport operations and the traffic in the surrounding expressways and major arterial streets. The Northbrook site was located just north and downwind of the urban core (Chicago Loop) in a high population density area impacted by emissions generated throughout the urbanized area. The Chicago-Washington site was located in highly industrialized Southeast Chicago in an area impacted by numerous large point source (industrial) emissions. The Lemont site was located on the southwestern edge of the metropolitan area in an area impacted by refineries and chemical manufacturing facilities.

The review of the monitoring results for each of the target compounds, as recorded at each monitoring site, provided the following findings:

1. The average concentrations of target compounds measured at the O'Hare Airport sites were found to be comparable to those measured at the other metropolitan area sites.

   This fact is readily seen from the data presented in Table 1 and from Figures 2a and 2b which graphically display the five site results for various target compounds. As the figures show, the highest concentration of the individual target compounds was found to vary between different sampling sites. For example, highest levels of benzene were found at Chicago-Washington, while highest acetaldehyde levels were at Bensenville and highest formaldehyde levels at Schiller Park. Generally, the levels of the target compounds were found to be comparable between the five sites. For example, benzene averages ranged from 0.33 to 0.69 ppbv, acetaldehyde from 0.60 to 1.07 ppbv, formaldehyde from 1.67 to 3.54 ppbv and polycyclic organics (PAHs) levels ranged from 140 to 298 nanograms per cubic meter.

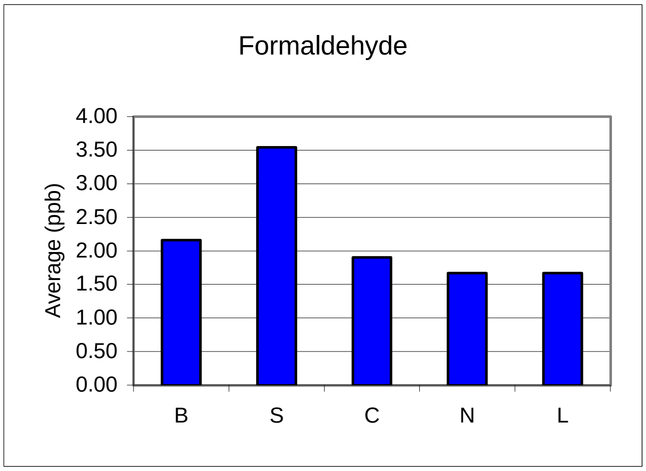
2. Of the five monitoring sites, the highest levels of more target compounds was found at the Chicago-Washington site found than any other site.

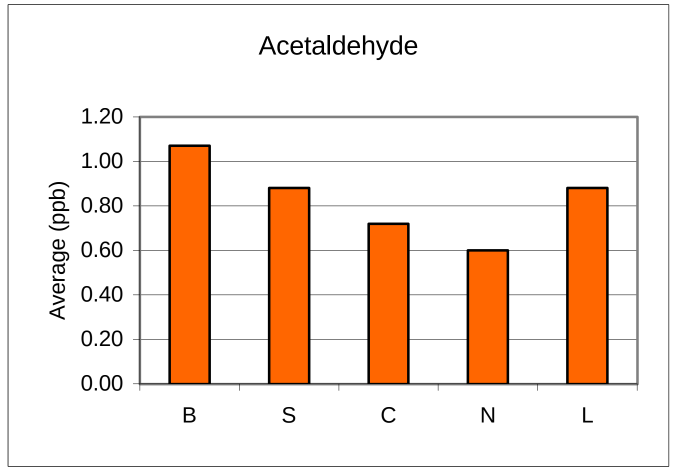
   Using a difference of 20% to indicate a significantly higher value (that is, the highest average found was at least 20% higher than the average found at any other site), the Chicago-Washington site was found to have the highest levels of seven target compounds including benzene, chromium, polycyclic organics and dioxins. Table 2 presents a listing by site of target compounds that were found to be 20% higher at one site. Four of the five sites recorded the highest concentration of at least one compound, with Schiller Park recording the highest level of three targets, Bensenville with three targets and Northbrook recording the highest levels of one target.

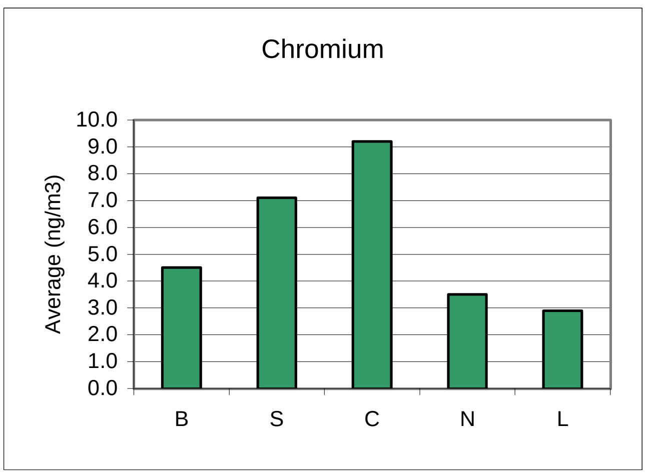
   Taken as a group of target compounds, these data indicate that the highest concentration of air toxic compounds in the Chicago area was found in industrialized Southeast Chicago, not around O'Hare Airport.

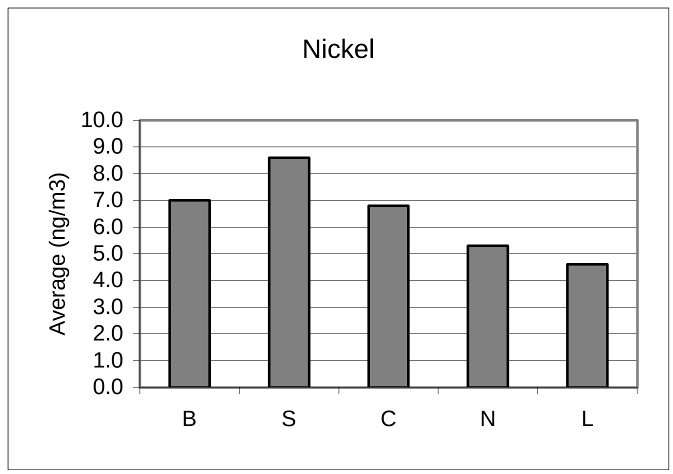
3. Two target compounds, acetaldehyde and formaldehyde, were found to be higher at the O'Hare Airport sites than at any of the other Chicago area sites.

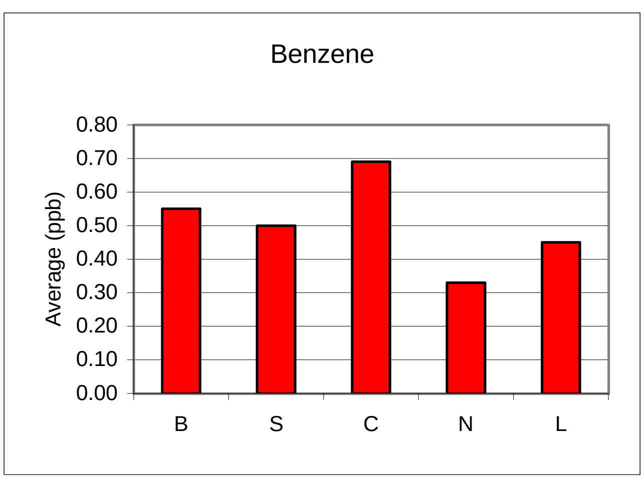
Figure 2a
Comparison of Results by Site







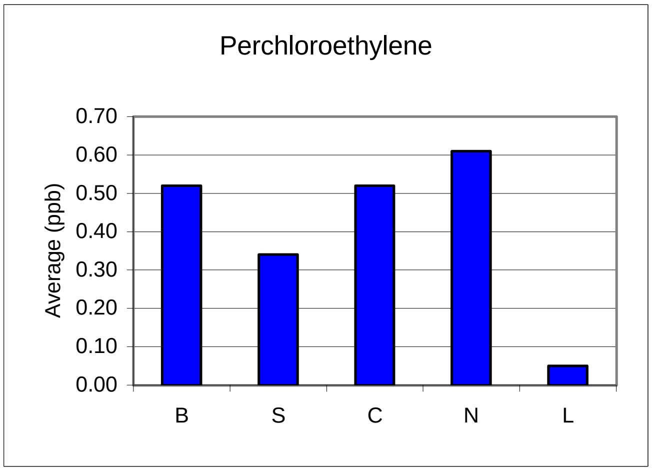


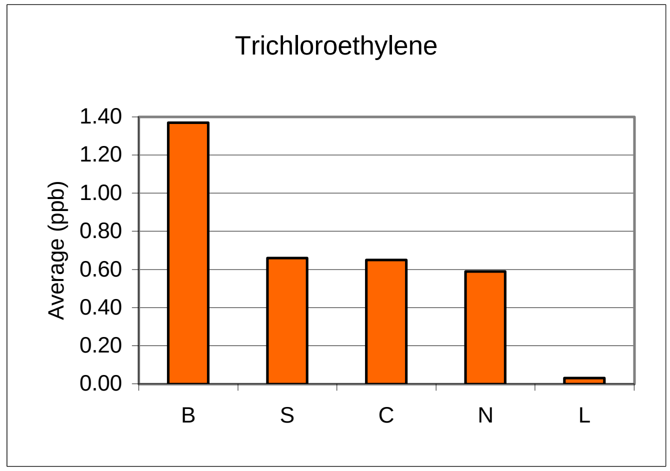


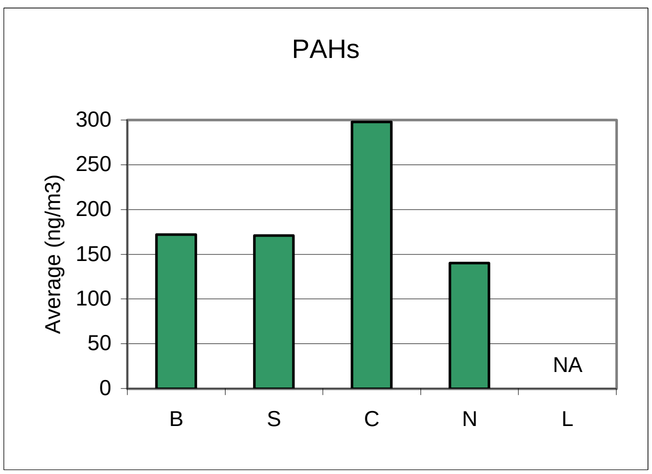
Site Listing

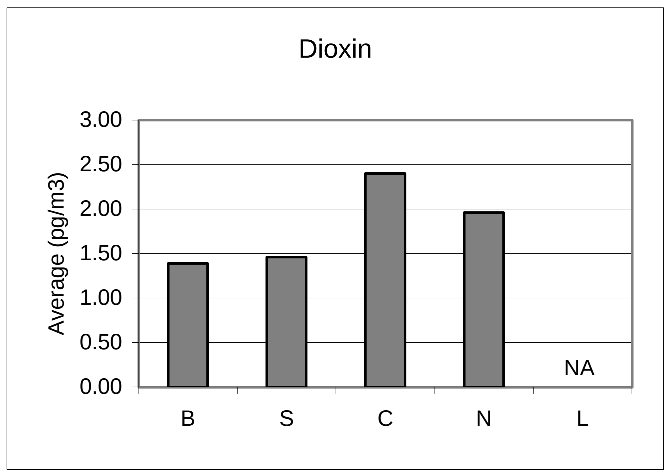
B - Bensenville
S - Schiller Park
C - Chicago Washington
N - Northbrook
L - Lemont

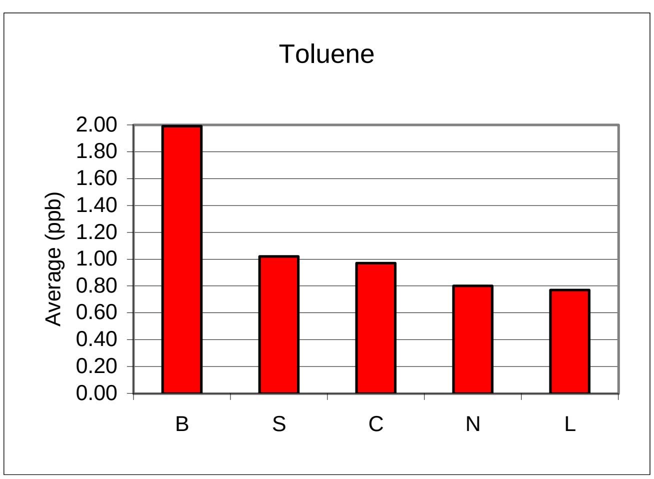
Figure 2b
Comparison of Results by Site











Site Listing

B - Bensenville
S - Schiller Park
C - Chicago Washington
N - Northbrook
L - Lemont

NA - Samples not taken for these compounds

The highest acetaldehyde levels were measured at Bensenville with an average of 1.07 ppbv compared to the next highest average of 0.88 ppbv recorded at Schiller Park and Lemont. The highest formaldehyde level recorded was at Schiller Park at 3.54 ppbv compared to the next highest value of 2.16 ppbv measured at Bensenville. These data indicated that the highest levels of aldehydes found during this monitoring study occurred around O'Hare Airport.

The major source of aldehyde emissions in any large metropolitan area has been shown to be from mobile sources: cars, trucks and aircraft. The area in and around O'Hare Airport has a concentration of cars and trucks on the expressways (I-90 and I-294), major arterials (Mannhiem, Irving Park and Higgins Roads) and in traffic entering and leaving the airport. Airport operations including aircraft takeoffs, landings, taxiing, refueling and support equipment emissions are also sources of aldehydes. With the accumulation of these emissions in the area, elevated concentrations of aldehydes in the surrounding area would not be unexpected and was likely the influencing factor in the levels measured at Bensenville and Schiller Park.

4. The lowest concentrations of most target compounds were measured at the Lemont site.

   While it is near major emission sources such as refineries and chemical plants, Lemont is located southwest of the Chicago urban area and lies predominantly upwind of it, measuring levels entering the area from downstate and outside the area impacted by the Chicago area emissions. As a result, it would be expected, as the monitoring data showed, that air toxic levels in Lemont are lower than the other monitoring sites located in the urbanized area.

3.3 Comparison of Results to Other U.S. Cities

A comparison of the measured levels of certain target air toxic compounds found in Chicago to those found in other large U.S. cities provided a point of reference to what concentrations might be considered as "typical" for an urban area. The comparative analyses also identified any unusual or atypical compound measurements for the Chicago area.

The other U.S. cities data was extracted from USEPA's AIRS database that contains air quality data collected and reported nationwide. The most recent data reported to AIRS was almost exclusively 1999, as no 2000 data had yet been reported, and was used for reference in this report. The averages reported from AIRS were based upon sampling periods of six to twelve months, consistent with and comparable to the six month average data compiled from the June-December 2000 sampling in Chicago.

A review of the information submitted to AIRS found that data for a limited number of the target air toxic compounds, obtained primarily from PAMS monitoring networks, had been reported for several large urbanized areas, including Atlanta, Detroit, Houston, Milwaukee and New York City. The target compound data reported for these cities included acetaldehyde, benzene, formaldehyde, toluene and xylenes. The AIRS data used in the comparative analysis has been summarized in Table 3. A review and analysis of the available information concluded the following:

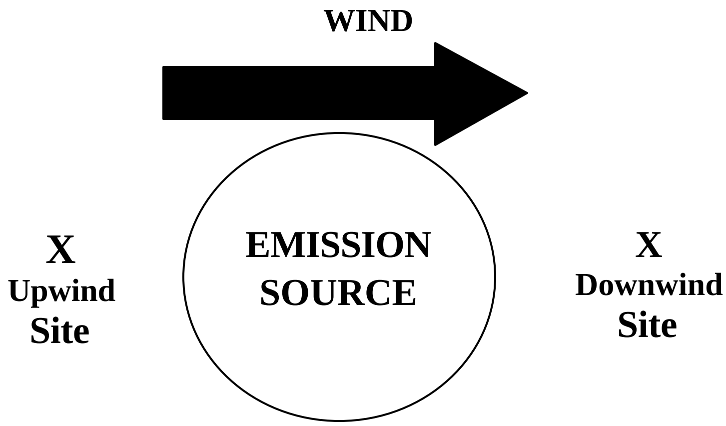
1. Compared to other major metropolitan areas; e.g., Atlanta, Detroit, Houston and Milwaukee, concentrations of key "target" air toxic compounds were found to be comparable or lower in the Chicago metropolitan area. The comparative analysis indicated that the levels found at the Chicago area sites were typical of those found in the other large urban areas.

   The data from Table 3 and the corresponding compound data from Table 1 has been graphically displayed in Figure 3. The highest formaldehyde levels were found in Atlanta and Detroit, 5.72 and 5.13 ppbv respectively, compared to 3.54 ppbv at Schiller Park, the highest Chicago area site. The highest acetaldehyde levels were found in Atlanta and Houston, 2.40 and 1.69 ppbv, compared to 1.07 ppbv at Bensenville. The highest benzene levels were found in Houston and Detroit, 0.97 and 0.70 ppbv, compared to 0.69 ppbv at Chicago-Washington. The highest levels of toluene were found in New York City at 1.34 ppbv, compared to 1.99 ppbv at Bensenville. The highest levels of xylenes were found in Atlanta at 1.22 ppbv compared to 0.90 ppbv at Bensenville.

2. The comparative analysis shows that target air toxic compounds measured in the Chicago area to be typical of other large urban areas. The concentrations of some key target compounds were found to be significantly higher in cities like Atlanta and Houston. The acetaldehyde and formaldehyde levels measured at O'Hare, while the highest of Chicago area sites, were well below those found in Atlanta, Detroit, and Houston.

3.4 O'Hare Airport Impact

In order to assess the possible impact of O'Hare Airport emissions in areas adjacent to the airport, two monitoring sites were deployed on different sides of the airport. This allowed for collection of sampling data on days with persistent winds that impacted one site but not the other. Essentially, one site was upwind, unaffected by the airport, and the other site was downwind of the airport and subjected to its emissions. See the following diagram. The difference in the results obtained from the downwind site (impacted by emissions) and the upwind site (unaffected) provides an indication of the increased levels of target compounds associated with the airport's emissions. For example, the downwind site measured a compound concentration at 1.50 ppb and the upwind site reported only 1.00 ppb, providing a difference of 0.50 ppb (1.50 minus 1.00) or that levels were found to be 50% higher at the downwind site (0.50 divided by 1.00).



Of the sixteen sampling days, five days did have wind-persistent conditions that allowed for a upwind /downwind analysis. The sampling data obtained for each of the five days for key target compounds has been presented in Figure 4 along with wind roses (wind frequency distribution) that depict the associated wind direction data. Figure 4 also provides for each target compound the average value obtained from the five samples for the wind positive site and the wind negative site and the calculated percent difference (wind positive to wind negative). The Figure 4 wind roses illustrate the site impacts, Bensenville located southwest of the airport impacted by winds from the north to east, and Schiller Park located east of the airport impacted by winds from the southwest to northwest.

The data analysis demonstrated that O'Hare Airport emissions had an impact in the areas adjacent to the airport for several key target compounds, including acetaldehyde, benzene, formaldehyde, polycyclic organics and lead. All these compounds are Urban Air Toxics and have been identified as associated with airport operations. The downwind concentration of acetaldehyde was found to be 45.6% higher than upwind, formaldehyde was 32.8% higher, benzene was 34.1% higher, polycyclics (PAHs) were 65.9% higher and lead was 87.5% higher. An impact from airport operations was not unexpected as airport operations, including aircraft takeoffs, landings, taxiing, refueling and use of support equipment, result in significant emissions of volatile organics and target air toxic compounds. The resulting airport emissions should have had, as the monitoring data shows, some impact in the areas adjacent to the airport. While the downwind concentrations were found to be higher, the results showed that the levels found at O'Hare Airport are still in the "typical urban" range and lower than levels found in other large urban areas.

Appendix IV provides a detailed summary of the meteorological conditions which were present on each of the sampling days. The appendix also includes a summary table that provides for each sampling day the frequency distribution of hourly wind data, which has also been plotted in a wind rose shown in Figure 5. As can be seen from that summary table, the most prevalent wind directions on sampling days were winds from the west southwest, west and the northeast. These three wind directions provided the opportunity for frequent impact of airport emissions on the two O'Hare area monitoring sites.

Figure 3
Comparison of Results to Other U.S. Cities

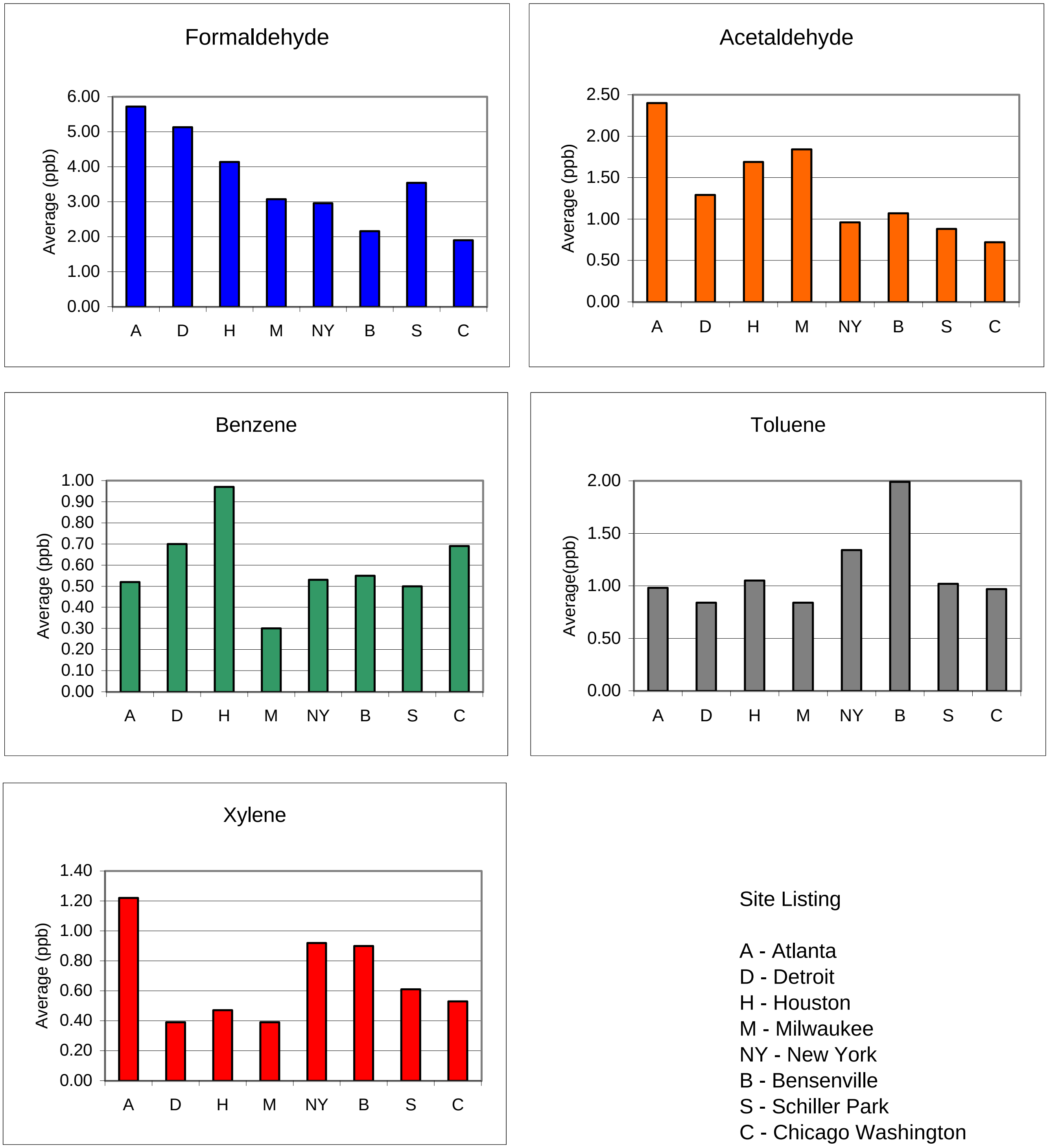
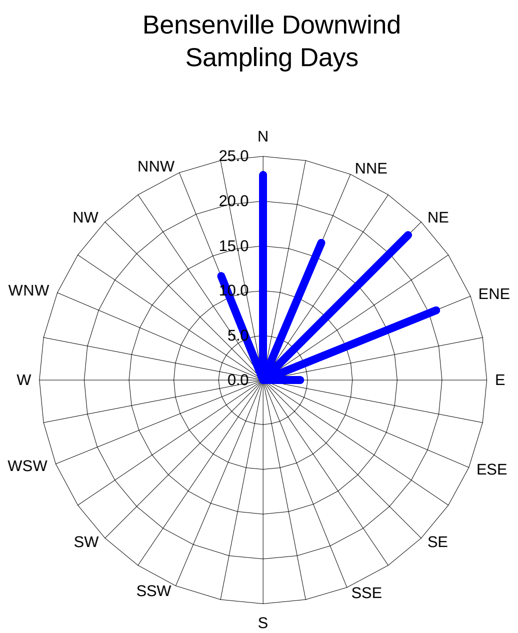
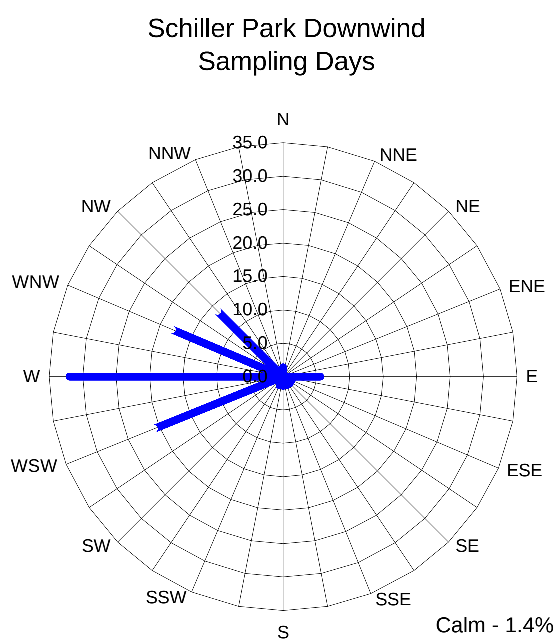


Figure 4
Wind Persistence Days
Upwind/Downwind Analysis

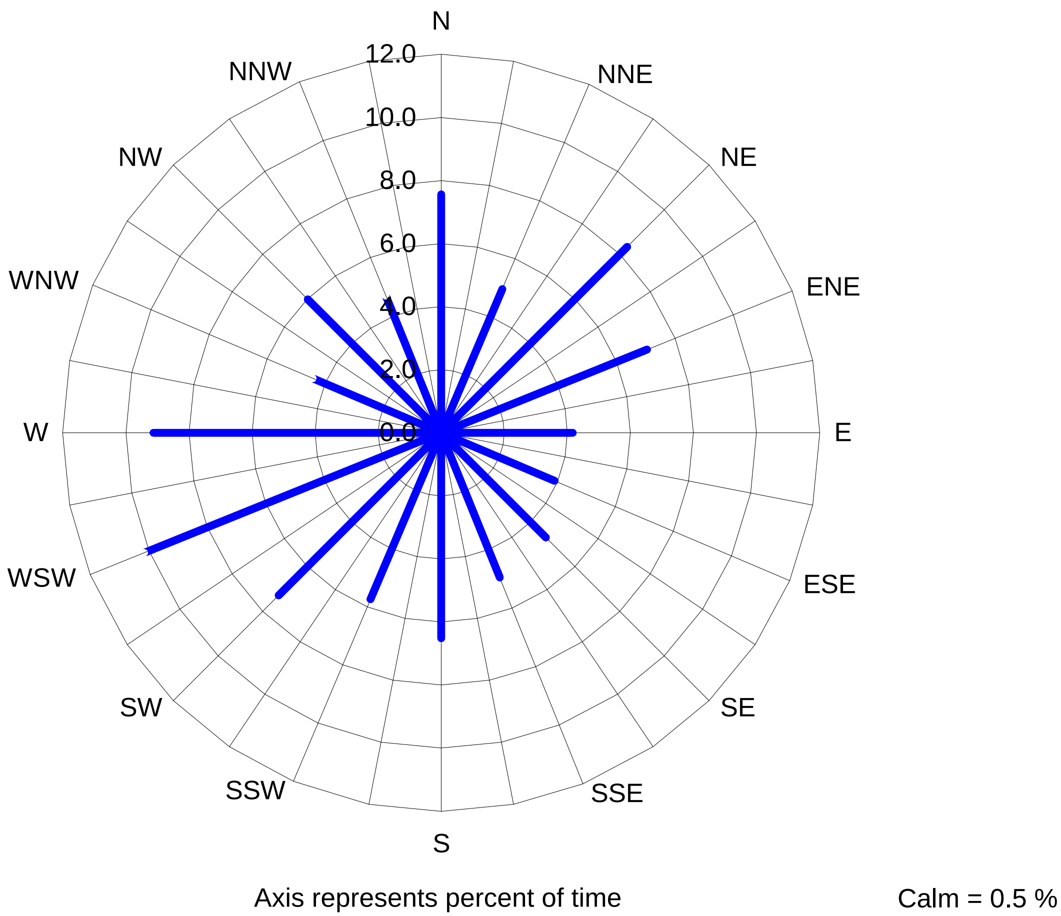
Compound	Downwind 7/23	8/16	9/21	11/20	12/14	Avg	Upwind 7/23	8/16	9/21	11/20	12/14	Avg	Percent Difference
Formaldehyde	2.56	3.32	1.64	0.94	3.09	2.31	1.72	3.04	1.89	0.32	1.73	1.74	32.8%
Acetaldehyde	1.29	1.33	0.56	0.36	1.73	1.05	0.53	0.76	1.00	0.23	1.10	0.72	45.6%
Benzene	0.90		0.24	0.19	1.07	0.60	0.50		0.09	0.13	1.07	0.45	34.1%
PAH(s)	311	175	48	126	440	220	220	10	37	46	350	133	65.9%
Lead	30	60	10	20	30	30	10	10	20	20	20	16	87.5%
Toluene	2.50		0.31	0.16	1.63	1.15	1.00		0.21	0.10	2.52	0.96	20.1%
Chromium	5	6	5	5	5	5	5	7	2	3	3	4	30.0%
Xylenes	1.20		0.25	0.15	1.33	0.73	0.60		0.07	0.02	1.61	0.58	27.4%





axis represents percent of time

Figure 5
Wind Rose O'Hare Toxic Project
June - December, 2000
Sampling Days Only



Section 4.0 Conclusions

Based upon the review of the air toxics monitoring data collected near Chicago O'Hare Airport and from other Chicago area monitoring sites and data from USEPA's AIRS database, the following conclusions were reached:

1. The levels of air toxic compounds found near O'Hare Airport and at other sites in the Chicago metropolitan area are "typical" or lower that those levels found in other large U.S. cities.

2. Of the Chicago area sites, the highest levels of acetaldehyde and formaldehyde were found at the O'Hare Airport sites. However, the concentrations found were at levels comparable or lower than those found in other large U.S. cities.

3. Of the Chicago area sites, the highest levels of most air toxic compounds was not found near O'Hare Airport, but in industrialized Southeast Chicago.

4. An analysis of data from the sites near O'Hare Airport found that emissions from the airport have an impact on air quality in the areas adjacent to the airport. However, the airport's impact did not result in levels higher than those found in a typical urban environment.

The data collected through this study's air monitoring program indicated that the toxics air quality in the vicinity of O'Hare Airport is comparable to the air quality in other parts of Chicago and comparable to air quality in other major urban areas.

There are continuing efforts to identify, assess and reduce risk from air toxics, especially in urban areas. For example, USEPA has completed a nationwide study of potential inhalation exposures and health risks associated with 32 HAPs and from diesel particulate matter based on 1996 air emissions inventories, known as the National-Scale Air Toxics Assessment (NATA). This study has not yet been released to the public, but it will serve as a basis for characterizing risk associated with these compounds on a county by county level throughout the U.S. As a continuing part of the federal Clean Air Act requirements to identify, assess and reduce risk from toxic pollutants, USEPA has also developed the National Strategy. Part of the National Strategy is to develop a plan that will attain a 75% reduction in the incidence of cancer attributable to exposure to HAPs emitted by stationary sources, to attain a substantial reduction in public health risks posed by exposure to HAP emissions from area sources, and to address disproportionate impacts of air toxics across urban areas. USEPA has announced that part of the regulatory actions to implement this strategy will include, among others, the development and implementation of maximum achievable control technology or MACT standards to reduce emissions of HAPs from major source categories beyond those already required under section 112 (d) of the Clean Air Act, developing area source standards, and regulating motor vehicle emissions and fuels. Moreover, the Chicago Area Cumulative Risk Initiative (CRI) is an ongoing community-based effort to assess cumulative air pollution hazards and to then develop strategies to reduce risks posed by exposure in the Cook County, Illinois and Lake County, Indiana. USEPA and the Illinois EPA are cooperating in this effort, and an assessment of the risks identified is expected to be released in the Summer of 2002.

In addition to these efforts, the development and implementation of MACT standards required under Section 112 (d) of the Clean Air Act are ongoing. For example, USEPA has published over 70 air toxic MACT standards affecting over 113 categories of industrial sources, with varying implementation schedules. By May 15, 2002, USEPA will have published 106 MACT standards affecting a total of 174 categories of industrial sources. After publishing a MACT for a source category, the Clean Air Act also requires USEPA to assess and address the remaining risk from these source categories after the implementation of the MACT standard and within eight to nine years after the development of the initial standard. This effort is now ongoing for the earliest MACT standards. In addition to the efforts to address stationary sources, USEPA continues to address toxic emissions from motor vehicles and fuels, a major component of toxic emissions from O'Hare. USEPA has also promulgated the final rule for "Control of Emissions of Hazardous Air Pollutants from Mobile Sources" under Section 202(l) of the Clean Air Act.

Section 5.0 References

1. USEPA, "National Air Toxics Program: The Integrated Urban Strategy", Federal Register/Vol. 64, No. 137/ Monday, July 19, 1999.
2. City of Park Ridge, "Preliminary Study and Analysis of Toxic Air Pollutant Emissions from O'Hare International Airport and the Resulting Health Risks Created by these Toxic Emissions in Surrounding Residential Communities, Volumes I-IV, August, 2000.
3. USEPA, "Unified Air Toxics Website", Technology Transfer Network (TTNWeb).

Table 1
Air Toxic Target Compound Results*
June - December, 2000

Compound	Bensenville	Schiller Park	Chicago-Washington	Northbrook	Lemont
acetaldehyde	1.07	0.88	0.72	0.60	0.88
acrolein	0.00	0.00	0.01	0.01	0.00
arsenic[1]	1.10	1.00	1.00	0.70	0.70
benzene	0.55	0.50	0.69	0.33	0.45
beryllium[1]	0.30	0.50	0.46	0.30	0.10
1,3-butadiene	0.08	0.11	0.12	0.02	0.02
cadmium[1]	2.20	2.70	2.60	2.10	2.00
carbon tetrachloride	0.07	0.07	0.08	0.07	0.06
chloroform	0.18	0.44	0.55	0.14	0.01
chromium[1]	4.50	7.10	9.20	3.50	2.90
ethylene dichloride	0.25	0.26	0.15	0.25	0.00
formaldehyde	2.16	3.54	1.90	1.67	1.67
lead[1]	22.7	16.7	31.5	12.0	14.4
manganese	25.7	31.5	139.9	17.5	25.1
methylene chloride	0.46	0.07	0.47	0.27	0.23
nickel[1]	7.00	8.60	6.80	5.30	4.60
1,1,2,2-tetrachloroethane	0.00	0.00	0.00	0.00	0.00
perchloroethylene	0.52	0.34	0.52	0.61	0.05
trichloroethylene	1.37	0.66	0.65	0.59	0.03
toluene	1.99	1.02	0.97	0.80	0.77
vinyl chloride	0.00	0.00	0.00	0.00	0.00
xylenes (O,M,P)	0.90	0.61	0.53	0.42	0.56
polycyclic organics (PAH)[1]	172.0	171.0	298.0	140.0	NA
dioxins (2,3,7,8 total)[2]	1.399	1.464	2.389	1.956	NA

[1]values expressed in nanograms per cubic meter (ng/m^3)
[2]values expressed in in picograms per cubic meter (pg/m^3)
*values are averages expressed in parts per billion by volume (ppbv) unless otherwise indicated

Table 2

Urban Air Toxic Compounds
Sites with Highest Concentration*

Chicago-Washington	Bensenville	Schiller Park	Northbrook	Lemont
benzene	formaldehyde	acetaldehyde	perchloroethylene	none
chloroform	nickel	trichloroethylene		
chromium	toluene	xylenes		
lead				
manganese				
polycyclic organics				
dioxins				

***Concentration of the target compound was found to be at least 20% higher than all other sites.**

Table 3

Air Toxic Data for U.S. Cities
1999 AIRS Data[1]

Pollutant	Atlanta (GA)	Detroit (MI)	Houston (TX)	New York City	Milwaukee (WI)	Chicago[3] Study
acetaldehyde	2.40	1.29	1.69	0.96	1.02	1.07
benzene	0.52	0.70	0.97	0.53	0.38	0.69
1-3 butadiene	NR	0.10*	0.52	NR	0.13 [2]	0.12
formaldehyde	5.72	5.13	4.14	2.96	2.50	3.54
xylenes (m/p)	1.22	0.34	0.47	0.92	0.53 [2]	0.90
toluene	0.98	0.84	1.06	1.34	0.84 [2]	1.99

[1]all values reported in parts per billion volume (ppbv)
*value reported from Midland, MI
NR - Not Reported
[2]values reported in 1998 Wisconsin DNR Report
[3] highest value reported at any of the five Chicago Study sites

Appendix I
Description of Monitoring sites

Bensenville

This monitoring site is located on the Village of Bensenville sewage treatment plant at 711 E. Jefferson. Industrial/commercial areas are located east of the site (0.5 – 1.0 km). Immediately southwest are residential areas. A large railyard is located 0.5 – 1.0 km northeast to east. The closest runway at O'Hare Airport is located 2.5 km to the northeast. Irving Park Road is 1.2 km to the north and Mannheim Road is 1.7 km to the southeast at its closest point. The Chicago loop is approximately 25 km to the southeast. The following picture is from Bensenville looking northeast.

Schiller Park

This monitoring site is located on a trailer at 4743 Mannheim Road just south or Lawrence Ave. and between Mannheim Road and I-294. The closest runway at O'Hare Airport is 0.5 km to the northwest. The immediate vicinity is mostly commercial. Residential areas are located east across I-294. Mannheim Road is 30 m to the west and I-294 is 100 m to the east. The Chicago loop is located approximately 21 km to the southeast. The following picture is from Schiller Park looking northwest.

Chicago – Washington High School

This monitoring site is located on Washington High School at 3535 E. 114th Street in the Lake Calumet industrial region. Residential areas are located east of the site (from north to south). Industrial areas are located west (northwest to southwest) of the site. The Indiana border is approximately 1 km to the east. The Chicago loop is approximately 23 km to the northwest. The following picture is from Washington H.S. looking northwest.

Northbrook

The village of Northbrook is located in northeast Cook County. This monitoring site is located at the Northbrook Water Filtration Station at 750 Dundee Road. A forest preserve is located immediately south with residential areas further south (southeast to southwest). Residential areas are also immediately to the west. Commercial areas are located along Dundee Road and to the east. A major expressway (I94) is located 1 km to the east and north. O'Hare Airport is located 18 km to the southwest and the Chicago loop is located 32 km to the southeast. The following picture is from the Northbrook site looking northeast.

Lemont

The village of Lemont is located in southwest Cook County approximately 38 km from the Chicago loop. This monitoring site is located on Lemont High School at 800 Porter Street. The building is situated on the edge of the bluffs overlooking the Des Plaines River valley. The area surrounding the site is residential to the south (southwest to southeast) and to the immediate north (down the bluff). Several industrial and commercial facilities are located along the Des Plaines River to the west and southwest in the valley. The following picture is from the Lemont site looking north.

Appendix II
Toxic Air Pollutants

HAPs	Analytical Method	HAPs	Analytical Method
Category I Volatile Organics (VOC)		**Category IV Semi-volatiles**	
benzene	TO-14A/TO-15	acenaphthene	TO-13A
carbon tetrachloride	TO-14A-TO-15	acenaphthylene	TO-13A
chloroform	TO-14A/TO-15	anthracene	TO-13A
chloroprene	TO-14A-TO-15	benzo(ghi)perylne	TO-13A
1,4-dichlorobenzene	TO-14A-TO-15	fluoranthene	TO-13A
ethylene dibromide	TO-14A-TO-15	fluorene	TO-13A
ethylene dichloride	TO-14A-TO-15	naphthalene	TO-13A
hexachlorobenzene	TO-14A-TO-15	phenanthrene	TO-13A
methyl bromide	TO-14A-TO-15	pyrene	TO-13A
methyl chloride	TO-14A-TO-15	benz(a)anthracene	TO-13A
styrene	TO-14A-TO-15	benzo(a)pyrene	TO-13A
tetrachloroethylene	TO-14A-TO-15	benzo(b)fluoranthene	TO-13A
toluene	TO-14A-TO-15	benzo(k)fluoranthene	TO-13A
trichloroethylene	TO-14A-TO-15	chrysene	TO-13A
vinyl chloride	TO-14A-TO-15	dibenz(a,h)anthracene	TO-13A
xylenes	TO-14A-TO-15	indeno(1,2,3-cd)pyrene	TO-13A
1,3-butadiene	TO-14A-TO-15	2,3,7,8-Tetrachlorodibenzo-p -dioxin (and congeners and TCDF congeners)	TO-13A
acrylonitrile	TO-14A-TO-15		
Category II Carbonyls		**Category V Metals**	
acetaldehyde	TO-11A	antimony & compounds	IO-3.5
acrolein	TO-11A	arsenic & compounds	IO-3.5
formaldehyde	TO-11A	beryllium & compounds	IO-3.5
		cadimum & compounds	IO-3.5
		chromium & compounds*	IO-3.5
		lead & compounds	IO-3.5
		manganese & compounds	IO-3.5
		mercury & compounds	IO-3.5
		nickel & compounds	IO-3.5

***Chromium determined from a filter is total chromium, not chromium VI. Chromium VI oxidizes when sampled on a filter.**

Appendix IIIA
Bensenville Air Toxic Data *

Urban Air Toxic Compounds	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31	11/8	11/20	12/14	12/26	Average
acetaldehyde	0.43			1.29	1.82	1.33	1.62	1.02	1	1.53	1.19	1.31	0.45	0.23	1.1	0.63	1.07
acrolein	0			0	0	0	0	0	0	0	0	0.04	0	0	0	0	0.00
acrylonitrile									0	0	0	0	0	0	0	0	0.00
arsenic		1	1	1	1	2	2	0	1	0	4	0	1	0	1	1	1.1
benzene	0.3	0.3		0.9					0.09	0.61	1.51	0.42	0.22	0.13	1.07	0.5	0.55
beryllium (1)		0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3
1,3-butadiene	0	0		0					0	0.11	0.43	0	0	0	0.3	0.08	0.08
cadmium (1)		2	2	2	2	2	2	2	1	2	2	2	3	3	3	3	2.2
carbon tetrachloride									0	0.04	0.09	0.04	0.1	0.1	0.08	0.11	0.07
chloroform	0	2		0					0	0	0	0	0	0	0	0	0.18
chromium (1)		5	5	5	7	6	6	2	2	7	6	6	3	3	3	1	4.5
1,2-dibromoethane	0	0.5		0.6					0	0	0	0	0	0	0	0	0.10
1,2-dichloropropane	0	0		0.4					0	0	0	0	0	0	0	0	0.04
1,2-dichloropropene	0	0		0.7					0	0	0	0	0	0	0	0	0.06
1,2-dichloroethane	0	0		2.7					0	0	0	0	0	0	0	0	0.25
formaldehyde	1.2			2.56	4.17	3.32	4.03	2.31	1.89	3.01	1.72	1.98	0.81	0.32	1.73	1.14	2.16
lead (1)		10	10	30	30	60	20	10	20	30	20	40	10	20	20	10	22.7
manganese (1)		8	14	2	33	43	52	18	12	45	38	67	14	19	17	3	25.7
methylene chloride	0	0		1.6					0	0.38	2.34	0.26	0.16	0	0.26	0.07	0.46
nickel (1)		6	5	7	9	11	8	5	4	10	8	10	6	7	5	4	7.0
polycyclic organics(PAH) (1)			157	311	220	175	95		37	136	85	319	220	46	350	90	172
1,1,2,2-tetrachloroethane	0	0		0					0	0	0	0	0	0	0	0	0.00
perchloroethylene	0.1	1.2	3.2	1.1					0	0.08	0.26	0	0.16	0	0.09	0	0.52
trichloroethylene	1	4.4		4.7					0	0.27	2.81	0	1.47	0	0.4	0.04	1.37
vinyl chloride	0	0		0					0	0	0	0	0	0	0	0	0.00
dioxins(2,3,7,8) (2)			0.156	0.742	0.584	2.09	1.58		2.24	1.53	1.7	0.228	2.59	1.33	2.36	1.06	1.399
furans(2,3,7,8) (2)			0.066	0.165	0.15	0.646	0.25		0.25	0.226	0.143	0.107	0.304	0.475	0.616	0.259	0.281

Appendix IIIA
Bensenville Air Toxic Data *

	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31	11/8	11/20	12/14	12/26	Average
Hazardous Air Pollutants																	
1,4-dichlorobenzene	0	0.2		0.9					0	0	0	0	0	0	0.08	0	0.11
1,2,4-trimethylbenzene	0	0.1		0.4					0	0.57	1	0.18	0.09	0	0.66	0.09	0.28
1,3,5-trimethylbenzene	0.1	0.1		0.2					0	0.2	0.32	0.05	0.02	0	0.23	0.02	0.11
ethyl benzene	0.06	0.1		0.3					0	0.31	0.71	0.18	0.06	0.02	0.35	0.07	0.20
hexachlorobutadiene	0	0.2		0					0	0	0	0	0	0	0	0	0.02
methyl bromide	0	0		0					0	0	0	0	0	0	0	0	0.00
styrene	0.2	0.2		0.06					0	0.06	0.26	0	0.07	0	0.06	0	0.08
toluene	0.6	1.1	2.1	2.5	5.6				0.21	2.87	5.28	1.17	1.19	0.1	2.52	0.68	1.99
xylenes	0.4	0.5		1.2	1.3				0.07	1.35	3.04	0.65	0.28	0.02	1.61	0.34	0.90
propionaldehyde	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
crotonaldehyde	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
butyraldehyde	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
isovaleraldehyde	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
valeraldehyde	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
tolualdehydes	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
hexanaldehyde	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
2,5-dimethylbenzaldehyde	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
acenaphthene (1)			8.7	33.1	19.1	13	6.2		1.7	7.4	2.7	15.8	9.5	1.2	5.8	1.6	9.7
acenaphthylene (1)			0	0	0	0	0		0	0	0	6.4	19.2	0	9.8	0	2.7
anathracene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
benzo(ghi)perylene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
fluoranthene (1)			9.1	7.5	10.1	8.2	3.6		1.5	3.4	1.4	4.5	6	1.3	3.3	1.5	4.7
fluorene (1)			12.2	31.7	20.9	14	9.2		2.5	8.4	3.6	15.4	14.4	1.9	9.4	3.4	11.3
naphthalene (1)			75.1	144	89.5	88	49.5		20.8	89.7	64	238	127	37.2	294	73.5	106.9
phenanthrene (1)			46.8	90.5	70.2	42.9	25		9.5	25.4	13.3	36	35.9	4.9	22.3	8.7	33.2
pyrene (1)			0.7	3.8	5.9	5	2		1.1	2.1	0	3.3	5.1	0	3.5	1.2	2.6
benza(a)anthracene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
benzo(a)pyrene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
benzo(b)fluoranthene (1)			0	0	2.6	2.1	0		0	0	0	0	1.6	0	1	0	0.6
benzo(k)fluoranthene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
chrysene (1)			0	0.9	1.6	1.5	0		0	0	0	0	1.6	0	1.1	0	0.5
dibenzo(a,h)anthracene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
indeno(1,2,3-cd)pyrene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0

Appendix IIIB
Schiller Park Air Toxic Data *

Urban Air Toxic Compounds	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31	11/8	11/20	12/14	12/26	Average
acetaldehyde	0.78	0.85	0.67	0.53	1.02	0.76	1.09	0.17	0.56	1.5		1.46		0.36	1.73	0.8	0.88
acrolein	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0.00
acrylonitrile								0	0	0	0	0	0	0	0		0.00
arsenic (1)		1	1	1	2	4	1	0	1	1	3	0	0	0	0	0	1.0
benzene	0.08	0.6		0.5				0.49	0.24	0.8	0.61	0.66	0.29	0.19	1.07		0.50
beryllium (1)		0	4	1	0	0	0	0	0	1	0	0	0	0	1	1	0.5
1,3-butadiene	0	0.6		0				0	0	0.11	0.14	0	0.08	0	0.28		0.11
cadmium (1)		2	2	2	2	2	2	6	2	2	1	2	4	3	5	4	2.7
carbon tetrachloride								0.09	0.04	0.05	0.04	0.03	0.12	0.1	0.08		0.07
chloroform	1.4	3.4		0				0	0	0	0	0	0	0	0		0.44
chromium (1)		5	7	5	8	7	9	21	5	10	9	1	6	5	5	4	7.1
1,2-dibromoethane	0	0		0.7				0	0	0	0	0	0	0	0		0.06
1,2-dichloropropane	0	0		0				0	0	0	0	0	0	0	0		0.00
1,2-dichloropropene	0	0.3		0.5				0	0	0	0	0	0	0	0		0.07
1,2-dichloroethane	0.3	1.3		1.3				0	0	0	0	0	0	0	0		0.26
formaldehyde	2.29	3.32	2.28	1.72	3.26	3.04	4.04	17.92	1.64	2.19		2.26		0.94	3.09	1.61	3.54
lead (1)		10	0	10	10	10	20	10	10	30	20	50	10	20	30	10	16.7
manganese (1)		30	20	17	24	27	57	22	21	42	47	91	21	18	23	12	31.5
methylene chloride	0	0		0				0.06	0	0.15	0.12	0.16	0.11	0	0.21		0.07
nickel (1)		8	5	7	9	10	8	6	6	11	8	12	8	8	16	7	8.6
polycyclic organics(PAH) (1)			173	220	164	10	150		48	26	252	306	140	126	440	165	171
1,1,2,2-tetrachloroethane	0	0		0				0	0	0	0	0	0	0	0		0.00
perchloroethylene	0.4	1.2		1.8				0	0.08	0	0.04	0	0.08	0	0.1		0.34
trichloroethylene	1.6	2.5		2.1				0	0	0.12	0.06	0.4	0.31	0	0.22		0.66
vinyl chloride	0	0		0				0	0	0	0	0	0	0	0		0.00
dioxins(2,3,7,8) (2)			0.164	0.316	0.51	0.925	1.61		1.08	2.64	1.8	2.62	1.73	1.05	2.66	1.93	1.464
furans(2,3,7,8) (2)			0	0.289	0.07	0.196	0.503		0.108	0.053	0.113	0.834	0.165	0.322	0.795	0.768	0.324

Appendix IIIB
Schiller Park Air Toxic Data *

	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31	11/8	11/20	12/14	12/26	Average
Hazardous Air Pollutants																	
1,4-dichlorobenzene	0.3	0.2		0				0	0	0	0	0	0	0	0		0.05
1,2,4-trimethylbenzene	0.2	0.1		0.2				0.15	0.08	0.24	0.28	0.19	0.15	0	0.51		0.19
1,3,5-trimethylbenzene	0	0.1		0.09				0.03	0	0.07	0.1	0.05	0.05	0	0.16		0.06
ethyl benzene	0.09	0.1		0.1				0.15	0.06	0.24	0.2	0.16	0.12	0.05	0.33		0.15
hexachlorobutadiene	0.3	0.2		0.4				0	0	0	0	0	0	0	0		0.08
methyl bromide	0	0		0				0	0	0	0	0	0	0	0		0.00
styrene	0.2	0.2		0.05				0.64	0	0.03	0.12	0.03	0.04	0	0.08		0.13
toluene	1.2	1.1		1				0.65	0.31	1.96	1.21	1.13	0.82	0.16	1.63		1.02
xylenes	0.39	0.5		0.6				0.51	0.25	0.98	0.8	0.66	0.54	0.15	1.33		0.61
propionaldehyde	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0.00
crotonaldehyde	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0.00
butyraldehyde	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0.00
isovaleraldehyde	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0.00
valeraldehyde	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0.00
tolualdehydes	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0.00
hexanaldehyde	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0.00
2,5-dimethylbenzaldehyde	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0.00
acenaphthene (1)			10.7	16.8	13.1		10.5		1.6	1.5	3.4	17.2	4.6	2.6	10.2	3.3	8.0
acenaphthylene (1)			0	0	0		0		0	0	0	7.6	0	0	15.3	0	1.9
anathracene (1)			0	0	0		0		0	0	0	0	0	0	0	0	0.0
benzo(ghi)perylene (1)			0	0	0		0		0	0	0	0	0	0	0	0	0.0
fluoranthene (1)			10.4	9	6.5		4.6		1.3	0.8	1.9	5.9	2.9	2.4	4.5	2.4	4.4
fluorene (1)			15.2	17.6	15		12.9		2.1	0	4.2	15.6	8	4.6	18.1	7.4	10.1
naphthalene (1)			69.6	118	79.4		87.2		35	16.7	224	214	106	103	350	132	127.9
phenanthrene (1)			60.9	53.8	45.5		32.4		7.5	6.6	17.8	38.4	16.8	10.4	34.9	17.1	28.5
pyrene (1)			5.7	4.7	3.3		2.4		1.2	0	1.4	4.6	2.3	2.4	5.6	2.5	3.0
benza(a)anthracene (1)			0	0	0		0		0	0	0	0	0	0	0	0	0.0
benzo(a)pyrene (1)			0	0	0		0		0	0	0	0	0	0	0	0	0.0
benzo(b)fluoranthene (1)			0	0	0		0		0	0	0	1.7	0	0	0	0	0.1
benzo(k)fluoranthene (1)			0	0	0		0		0	0	0	0	0	0	0	0	0.0
chrysene (1)			0	0	0.9		0		0	0	0	1.2	0	0	1.4	0.6	0.3
dibenzo(a,h)anthracene (1)			0	0	0		0		0	0	0	0	0	0	0	0	0.0
indeno(1,2,3-cd)pyrene (1)			0	0	0		0		0	0	0	0	0	0	0	0	0.0

Appendix IIIC
Chicago - Washington Air Toxic Data *

Urban Air Toxic Compounds	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31	11/8	11/20	12/14	12/26	Average
acetaldehyde	0.52	0.78	0.6	0.52	1.04	0.41	0.86	0.65	0.61	0.42	1.12	0.86	0.57	0.35	1.48	0.66	0.72
acrolein	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0	0.01
acrylonitrile									0	0	0	0	0	0	0	0	0.00
arsenic (1)		1	1	1	2	2	1	1	1	1			0	0	2	0	1.0
benzene	0.6	1	0.3	0.6	0.7				1.22	0.19	0.49	0.39	0.51	0.66	1.87	0.5	0.69
beryllium (1)		0	2	2	0	0	0	0	0	1			0	0	1	0	0.46
1,3-butadiene	0	0	0	0	1.1				0.1	0	0	0	0.04	0	0.2	0.06	0.12
cadmium (1)		2	1	2	1	2	1	1	2	2			3	5	7	5	2.6
carbon tetrachloride									0.08	0.04	0.09	0.05	0.04	0.1	0.1	0.1	0.08
chloroform	0	3	0	0	3.9				0.2	0	0	0	0	0	0	0	0.55
chromium (1)		14	6	1	8	5	7	6	9	8			9	38	4	4	9.2
1,2-dibromoethane	0	0	0	0.9	0.6				0	0	0	0	0	0	0	0	0.12
1,2-dichloropropane	0	0	0	0.9	0				0	0	0	0	0	0	0	0	0.07
1,2-dichloropropene	0	0	0	0	0.5				0	0	0	0	0	0	0	0	0.04
1,2-dichloroethane	0	0.6	0	0.9	0.5				0	0	0	0	0	0	0	0	0.15
formaldehyde	1.69	2.07	1.98	1.5	2.61	1.36	3.07	1.8	1.5	1.36	3.86	1.75	1.48	0.57	2.57	1.25	1.90
lead (1)		40	10	10	20	10	20	20	40	40			30	110	30	30	31.5
manganese (1)		106	84	50	114	60	98	103	143	198			93	628	53	89	139.9
methylene chloride	0	0	0	0	0.6				0.32	0	4.5	0.1	0.33	0	0.22	0.07	0.47
nickel (1)		7	5	6	8	6	7	5	5	6			8	15	6	5	6.8
polycyclic organics(PAH) (1)			128	163	111	129	192		328	521	220	115	193	750	500	530	298
1,1,2,2-tetrachloroethane	0	0	0	0	0				0	0	0	0	0	0	0	0	0.00
perchloroethylene	0.4	0.7	1.2	2.8	1.3				0.04	0	0.2	0	0	0	0.12	0	0.52
trichloroethylene	0.9	1.9	0	2	2.9				0.05	0	0.12	0	0	0.13	0.3	0.18	0.65
vinyl chloride	0	0	0	0	0				0	0	0	0	0	0	0	0	0.00
dioxins(2,3,7,8) (2)			0.187	0.325	0.511	1.24	2.63		2.5	8.34	1.91	2.21	1.37	2.84	2.19	4.8	2.389
furans(2,3,7,8) (2)			0.025	0.058	0.049	0.577	0.207		0.15	2.05	0.267	0.398	0.422	3.62	0.386	5.35	1.043

Appendix IIIC
Chicago - Washington Air Toxic Data *

Hazardous Air Pollutants	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31	11/8	11/20	12/14	12/26	Average
1,4-dichlorobenzene	0	0.1	0.2	0	0.3				0.1	0	0.07	0.09	0.07	0	0	0	0.07
1,2,4-trimethylbenzene	0.08	0.2	0.09	0.2	0.5				0.57	0.08	0.19	0.17	0.16	0	0.41	0.11	0.21
1,3,5-trimethylbenzene	0.3	0.3	0	0.2	0.3				0.18	0	0.06	0.05	0.05	0	0.12	0.03	0.12
ethyl benzene	0	0.1	0	0.1	0.3				0.3	0.05	0.23	0.15	0.15	0.05	0.31	0.11	0.14
hexachlorobutadiene	0	0.2	0	4.1	0.9				0	0	0	0	0	0	0	0	0.40
methyl bromide	0	0	0	0	0				0	0	0	0	0	0	0	0	0.00
styrene	0.3	0.3	0	0	0.2				0.11	0	0.11	0	0.09	0	0.19	0.03	0.10
toluene	0.4	1	0.6	1.3	1.8				47.18[#]	0.45	1.42	0.85	0.93	0.35	1.82	0.66	0.97
xylenes	0.29	0.5	0.26	0.2	0.5				1.06	0.14	0.79	0.55	0.55	0.21	1.44	0.42	0.53
propionaldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
crotonaldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
butyraldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
isovaleraldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
valeraldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
tolualdehydes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
hexanaldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
2,5-dimethylbenzaldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
acenaphthene (1)			13.1	18.8	14.7	13	18.2		6.4	34.6	7.5	6.4	7.9	7.7	9.8	7.7	12.8
acenaphthylene (1)			0	0	0	0	0		0	0	0	0	0	15.9	16.4	14.9	3.6
anathracene (1)			0	0	0	0	0		2	0	0	0	0	7.5	3.2	6.4	1.5
benzo(ghi)perylene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
fluoranthene (1)			8.8	5.7	3.7	4.3	6.1		9.1	20.9	0	2.7	4.6	20.8	7.2	18.4	8.6
fluorene (1)			13	19.5	11.3	14.6	18.6		10.3	30	6.7	7.1	10	16.9	17	15.9	14.7
naphthalene (1)			42.2	50.8	49.5	55.2	92.6		256	299	181	80.1	144	597	400	390	202.9
phenanthrene (1)			47.1	66.5	30.7	40.3	53.8		36.8	126	24.9	16.8	24	50.2	38.1	53.6	46.8
pyrene (1)			4.2	2.3	1.5	1.9	2.9		5.4	10	0	2.1	2.8	13.1	6.4	10.9	4.9
benza(a)anthracene (1)			0	0	0	0	0		1.9	0	0	0	0	5.8	0	4.7	1.0
benzo(a)pyrene (1)			0	0	0	0	0		0	0	0	0	0	0	0	1.7	0.1
benzo(b)fluoranthene (1)			0	0	0	0	0		0	0	0	0	0	7.5	0	0	0.6
benzo(k)fluoranthene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
chrysene (1)			0	0	0	0	0		0	0	0	0	0	7.3	2.2	6.5	1.2
dibenzo(a,h)anthracene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
indeno(1,2,3-cd)pyrene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0

- toluene value on 9/21/00 has been excluded from the average as it is a suspected anomaly and needs further investigation.

Appendix IIID
Northbrook Air Toxic Data *

Urban Air Toxic Compounds	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31*	11/8	11/20	12/14	12/26	Average
acetaldehyde	0.50	0.42	0.41	0.34	0.59	0.44	0.63	0.69	0.37	0.69	1.13	1.06	0.40	0.27	1.01	0.70	0.60
acrolein	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01
acrylonitrile									0	0	0	0	0	0	0	0	0.00
arsenic (1)		1	0	1	2	1	1	1	0	0	3	0	0	0	1	0	0.7
benzene	0.3	0.3	0.3	0.5					0.17	0.4	0.49	0.09	0.28	0.14	0.47	0.49	0.33
beryllium (1)		0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3
1,3-butadiene	0	0	0	0					0	0	0.04	0.03	0	0	0.05	0.13	0.02
cadmium (1)		2	1	1	1	2	2	1	2	2	2	3	2	3	4	4	2.1
carbon tetrachloride									0.04	0.04	0.04	0.04	0.08	0.09	0.11	0.09	0.07
chloroform	0	1.5	0	0					0.06	0	0	0	0	0.05	0.06	0.02	0.14
chromium (1)		5	4	1	5	3	5	3	2	3	5	8	2	2	2	2	3.5
1,2-dibromoethane	0	0	0	0.5					0	0	0	0	0	0	0	0	0.04
1,2-dichloropropane	0	0	0	0					0	0	0	0	0	0	0	0	0.00
1,2-dichloropropene	0	0	0	0.4					0	0	0	0	0	0	0	0	0.03
1,2-dichloroethane	0	0.5	0	2.5					0	0	0	0	0	0	0	0	0.25
formaldehyde	1.53	1.47	1.32	0.94	1.58	1.42	2.17	1.92	1.04	1.46	2.33	1.59	1.26	1.99	3.12	1.6	1.67
lead (1)		10	0	10	10	10	20	10	10	10	20	30	10	10	10	10	12.0
manganese (1)		8	6	5	13	8	42	12	11	15	21	90	8	8	8	8	17.5
methylene chloride	0	0	0	1.4					0.04	0.2	0.17	0.32	0.91	0	0.16	0	0.27
nickel (1)		6	5	8	7	6	4	4	2	3	5	9	5	6	5	5	5.3
polycyclic organics(PAH) (1)			102	326	119	94	135		44	71	217	227	80	50	293	67	140
1,1,2,2-tetrachloroethane	0	0	0	0					0	0	0	0	0	0	0	0	0.00
perchloroethylene	0	0.7	1.1	5.3					0	0.04	0.06	0.08	0.03	0	0.03	0	0.61
trichloroethylene	0	0.9	0.4	5.4					0	0.21	0.14	0	0	0	0.03	0	0.59
vinyl chloride	0	0	0	0					0	0	0	0	0	0	0	0	0.00
dioxins(2,3,7,8) (2)			0.321	0.752	0.086	1.44	1.54		0.179	1.76	1.05	1.38	2.01	2.98	2.61	9.32	1.956
furans(2,3,7,8) (2)			0.065	0.57	0	0.397	0.378		0.18	0.128	0.071	0.334	0.22	1.49	1.13	5.27	0.787

* VOC sampling date 10/27

Appendix IIID
Northbrook Air Toxic Data *

Hazardous Air Pollutants	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31*	11/8	11/20	12/14	12/26	Average
1,4-dichlorobenzene	0	0.9	0	0.1					0	0	0	0	0	0	0	0	0.08
1,2,4-trimethylbenzene	0.09	0.12	0.09	0.3					0.06	0.17	0.41	0.19	0.07	0	0.17	0.12	0.15
1,3,5-trimethylbenzene	0	0.02	0	0.1					0	0.05	0.14	0.06	0.02	0	0.05	0.04	0.04
ethyl benzene	0.06	0.08	0	0.2					0.07	0.15	0.23	0.17	0.09	0	0.12	0.09	0.11
hexachlorobutadiene	0	0.3	0.2	0					0	0	0	0	0	0	0	0	0.04
methyl bromide	0	0	0	0					0	0	0	0	0	0	0	0	0.00
styrene	0.06	0.08	0	0.1					0	0	0.1	0	0	0	0	0.03	0.03
toluene	0.3	0.6	0.2	1.4	1.9				0.34	1.06	1.77	0.92	0.55	0.1	0.79	0.5	0.80
xylenes	0.16	0.39	0.2	0.9					0.22	0.61	0.63	0.62	0.31	0.09	0.55	0.35	0.42
propionaldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
crotonaldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
butyraldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
isovaleraldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
valeraldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
tolualdehydes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
hexanaldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
2,5-dimethylbenzaldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
acenaphthene (1)			8	22.2	11.4	8.1	9.1		2.2	5	6.2	5.3	3.3	0.8	4.7	1.3	6.7
acenaphthylene (1)			0	0	0	0	0		0	0	0	0	0	0	8.2	0	0.6
anathracene (1)			0	0	1.5	0	0		0	0	0	7.4	0	0	0	0	0.7
benzo(ghi)perylene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
fluoranthene (1)			8.8	10.7	7	4.6	6.9		1.6	2.8	2.3	4.2	2.4	1.1	2.4	11.5	5.1
fluorene (1)			10.3	21.3	12	8.8	13.4		2.3	4.3	6.8	7.1	4.7	1.6	6.6	39.3	10.7
naphthalene (1)			19.3	165	43	41.7	62.8		28.6	41.2	174	187	57.3	41.4	254	51.6	89.8
phenanthrene (1)			52	104	41.7	28.4	40.5		9.2	17.1	18.1	20.2	12	4.2	14	8.2	28.4
pyrene (1)			3.9	3.7	2.8	2.1	2.6		0	1.1	0	2.8	0	0.8	2.2	0.8	1.8
benza(a)anthracene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
benzo(a)pyrene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
benzo(b)fluoranthene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
benzo(k)fluoranthene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
chrysene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
dibenzo(a,h)anthracene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0
indeno(1,2,3-cd)pyrene (1)			0	0	0	0	0		0	0	0	0	0	0	0	0	0.0

* VOC sampling date 10/27

Appendix IIIE
Lemont Air Toxic Data *

Urban Air Toxic Compounds	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31	11/8	11/20	12/14	12/26	Average
acetaldehyde								1.13	0.96	1.32	1.16	0.96	0.47	0.3	0.64	1.02	0.88
acrolein								0	0	0	0	0	0	0	0	0	0.00
acrylonitrile									0	0	0	0	0	0	0	0	0.00
arsenic (1)								1	0	0	0	3	0	0	1	1	0.7
benzene									0.24	0.46	0.75	0.34	0.37	0.28	0.7	0.44	0.45
beryllium (1)								0	0	0	0	0	0	0	0	1	0.1
1,3-butadiene									0	0.04	0.04	0	0	0	0.1	0	0.02
cadmium (1)								1	2	1	1	1	3	3	3	3	2.0
carbon tetrachloride									0.05	0.04	0.09	0.04	0	0.08	0.1	0.1	0.06
chloroform									0	0	0	0	0	0	0.05	0	0.01
chromium (1)								3	2	4	3	4	3	4	2	1	2.9
1,2-dibromoethane									0	0	0	0	0	0	0	0	0.00
1,2-dichloropropane									0	0	0	0	0	0	0	0	0.00
1,2-dichloropropene									0	0	0	0	0	0	0	0	0.00
1,2-dichloroethane									0	0	0	0	0	0	0	0	0.00
formaldehyde								2.34	1.8	2.42	2.04	1.91	0.91	0.64	1.04	1.96	1.67
lead (1)								20	10	20	10	20	20	10	10	10	14.4
manganese (1)								26	9	52	14	36	18	49	16	6	25.1
methylene chloride									0.04	0.26	0.19	0.07	0.04	0.91	0.25	0.05	0.23
nickel (1)								3	3	5	3	6	5	6	5	5	4.6
polycyclic organics(PAH) (1)																	
1,1,2,2-tetrachloroethane									0	0	0	0	0	0	0	0	0.00
perchloroethylene									0	0.07	0.18	0	0	0.03	0.1	0	0.05
trichloroethylene									0	0.11	0.12	0	0	0	0.04	0	0.03
vinyl chloride									0	0	0	0	0	0	0	0	0.00
dioxins(2,3,7,8) (2)																	
furans(2,3,7,8) (2)																	

Appendix IIIE
Lemont Air Toxic Data *

	6/17	6/29	7/11	7/23	8/4	8/16	8/28	9/9	9/21	10/3	10/18	10/31	11/8	11/20	12/14	12/26	Average
Hazardous Air Pollutants																	
1,4-dichlorobenzene									0	0	0	0	0	0	0	0	0.00
1,2,4-trimethylbenzene									0.09	0.17	0.27	0.09	0.09	0.07	0.23	0.1	0.14
1,3,5-trimethylbenzene									0	0.05	0.09	0.02	0	0.02	0.08	0.02	0.04
ethyl benzene									0.08	0.18	0.21	0.17	0.09	0.09	0.18	0.07	0.13
hexachlorobutadiene									0	0	0	0	0	0	0	0	0.00
methyl bromide									0	0	0	0	0	0	0	0	0.00
styrene									0.03	0.02	0.27	0	0.06	0	0.15	0.05	0.07
toluene									0.56	1.26	1.21	0.57	0.46	0.55	1.12	0.39	0.77
xylenes									0.33	0.71	0.83	0.93	0.33	0.31	0.74	0.27	0.56
propionaldehyde								0	0	0	0	0	0	0	0	0	0.00
crotonaldehyde								0	0	0	0	0	0	0	0	0	0.00
butyraldehyde								0	0	0	0	0	0	0	0	0	0.00
isovaleraldehyde								0	0	0	0	0	0	0	0	0	0.00
valeraldehyde								0	0	0	0	0	0	0	0	0	0.00
tolualdehydes								0	0	0	0	0	0	0	0	0	0.00
hexanaldehyde								0	0	0	0	0	0	0	0	0	0.00
2,5-dimethylbenzaldehyde								0	0	0	0	0	0	0	0	0	0.00
acenaphthene (1)																	
acenaphthylene (1)																	
anathracene (1)																	
benzo(ghi)perylene (1)																	
fluoranthene (1)																	
fluorene (1)																	
naphthalene (1)																	
phenanthrene (1)																	
pyrene (1)																	
benza(a)anthracene (1)																	
benzo(a)pyrene (1)																	
benzo(b)fluoranthene (1)																	
benzo(k)fluoranthene (1)																	
chrysene (1)																	
dibenzo(a,h)anthracene (1)																	
indeno(1,2,3-cd)pyrene (1)																	

Footnotes for Appendices IIIA-E

* - values expressed in parts per billion volume (ppbv) unless otherwise noted
(1) - values expressed in nanograms per cubic meter (ng/m3)
(2) - values expressed in picograms per cubic meter (pg/m3)

Appendix IIIF
Summary of PCDDs, PCDFs, PAHs, Nitro-PAHs, and Semivolatile Vapor Plus Particulate Results

Field ID	MRI ID	Collection Date	Air volume $(m^3)^a$	2378-PCDFs pg/m^3	2378-PCDDs pg/m^3	Total PCDD/F pg/m^3	PAH $\mu g/m^3$	N-PAH $\mu g/m^3$	Other $\mu g/m^3$
Bensenville	00001134	7/11/00	299.5	0.0661	0.156	0.778	0.157	ND	0.0588
North Brook	00001135	7/11/00	143.8	0.0647	0.321	0.532	0.102	ND	0.0570
Schiller Park	00001136	7/11/00	238.2	ND	0.164	0.473	0.173	ND	0.0443
Washington HS	00001137	7/11/00	314.8	0.0250	0.187	0.549	0.128	ND	0.0434
Bensenville	00001156	7/23/00	335.0	0.165	0.742	1.18	0.311	ND	0.00873
North Brook	00001154	7/23/00	385.8	0.570	0.752	1.55	0.326	ND	0.00827
Schiller Park	00001153	7/23/00	365.3	0.289	0.316	0.605	0.220	ND	0.0100
Washington HS	00001155	7/23/00	299.7	0.0579	0.325	0.641	0.163	ND	0.0137
Bensenville	00001251	8/4/00	333.4	0.150	0.584	1.00	0.220	ND	0.0231
North Brook	00001249	8/4/00	343.6	ND	0.0856	0.117	0.119	ND	0.0763
Schiller Park	00001248	8/4/00	345.6	0.0700	0.510	0.804	0.164	ND	0.0220
Washington HS	00001247	8/4/00	153.2	0.0492	0.511	0.711	0.111	ND	0.0240
Bensenville	00001326	8/16/00	236.7	0.646	2.09	4.64	0.175	ND	0.309
North Brook	00001329	8/16/00	227.6	0.397	1.44	2.75	0.0938	ND	0.0351
Schiller Park	00001328	8/16/00	307.4	0.196	0.925	1.65	0.00972	ND	0.0634
Washington HS	00001330	8/16/00	299.6	0.577	1.24	4.67	0.129	ND	0.241
Bensenville	00001486	8/28/00	238.2	0.250	1.58	2.48	0.0953	ND	0.144
North Brook	00001485	8/28/00	229.0	0.378	1.54	2.44	0.135	ND	0.0435
Schiller Park	00001487	8/28/00	275.7	0.503	1.61	3.14	0.150	ND	0.0317
Washington HS	00001489	8/28/00	149.9	0.207	2.63	4.00	0.192	ND	0.0640
Bensenville	00001650	9/20/00	258.5	0.250	2.24	2.71	0.0371	ND	0.0274
North Brook	00001653	9/20/00	204.0	0.180	0.179	0.613	0.0440	ND	0.0451
Schiller Park	00001651	9/20/00	268.6	0.108	1.08	1.19	0.0485	ND	0.0183
Washington HS	00001654	9/20/00	150.9	0.150	2.50	3.57	0.328	ND	0.0424
Bensenville	00001722	10/3/00	230.0	0.226	1.53	2.01	0.136	ND	0.111
North Brook	00001720	10/3/00	225.8	0.128	1.76	1.91	0.0714	ND	0.0807
Schiller Park	00001723	10/3/00	299.6	0.0527	2.64	2.82	0.0256	ND	0.0593
Washington HS	00001721	10/3/00	38.7	2.05	8.34	11.4	0.521	ND	0.355

Appendix IIIF (continued)
Summary of PCDDs, PCDFs, PAHs, Nitro-PAHs, and Semivolatile Vapor Plus Particulate Results

Field ID	MRI ID	Collection Date	Air volume (m^3)[a]	2378-PCDFs pg/m^3	2378-PCDDs pg/m^3	Total PCDD/F pg/m^3	PAH µg/m^3	N-PAH µg/m^3	Other µg/m^3
Bensenville	00001808	10/18/00	240.9	0.143	1.70	2.40	0.0850	ND	2.76
North Brook	00001807	10/18/00	226.4	0.0710	1.05	1.47	0.207	ND	0.255
Schiller Park	00001809	10/18/00	324.0	0.113	1.80	2.66	0.252	ND	0.0618
Washington HS	00001810	10/18/00	155.9	0.266	1.91	3.53	0.220	ND	6.41
Bensenville	00001901	11/1/00	317.8	0.107	0.228	1.83	0.319	ND	0.00906
North Brook	00001899	11/1/00	281.8	0.334	1.38	3.38	0.227	ND	0.00565
Schiller Park	00001900	11/1/00	326.1	0.834	2.62	7.19	0.306	ND	0.0327
Washington HS	00001903	11/1/00	224.5	0.398	2.21	4.07	0.115	ND	0.225
Bensenville	00001920	11/9/00	304.2	0.304	2.59	3.26	0.220	ND	0.0287
North Brook	00001922	11/9/00	273.4	0.220	2.01	2.79	0.0797	ND	0.0210
Schiller Park	00001921	11/9/00	326.7	0.165	1.73	2.24	0.140	ND	0.0411
Washington HS	00001925	11/9/00	234.3	0.422	1.37	2.80	0.193	ND	0.0352
Bensenville	00002076	11/21/00	319.0	0.475	1.33	2.27	0.0465	ND	0.0302
North Brook	00002077	11/21/00	274.4	1.49	2.98	5.57	0.0500	ND	0.0438
Schiller Park	00002075	11/21/00	334.5	0.322	1.05	1.69	0.126	ND	0.0300
Washington HS	00002079	11/21/00	234.9	3.62	2.84	16.4	0.750	ND	0.0579
Bensenville	00002205	12/15/00	315.1	0.616	2.36	4.21	0.350	ND	0.0638
North Brook	00002207	12/15/00	292.4	1.13	2.61	4.57	0.293	ND	0.0329
Schiller Park	00002206	12/15/00	341.6	0.795	2.66	4.90	0.440	ND	0.0510
Washington HS	00002208	12/15/00	231.6	0.386	2.19	4.15	0.500	ND	0.0573
Bensenville	01000060	12/27/00	321.0	0.259	1.06	1.92	0.0899	ND	0.0277
North Brook	01000059	12/27/00	384.8	5.27	9.32	18.1	0.0668	ND	0.0162
Schiller Park	01000061	12/27/00	346.0	0.768	1.93	3.46	0.165	ND	0.0333
Washington HS	01000063	12/27/00	230.3	5.35	4.80	26.1	0.530	ND	0.125

[a] Concentration data calculated from air volume sampled corrected to 25 ^{o}C and 760mm pressure based on 24-hr average temperature and pressure recorded at O'Hare International, Chicago IL.

Appendix IV
Meteorological Summary on Sampling Days

A meteorological summary of each sampling day is provided below. The large-scale weather pattern is discussed and the local weather conditions in the Chicago area are listed. A wind rose/frequency distribution (Figure 5) is also provided which is a composite of the wind conditions on the sampling days only as provided in the following table.

June 17

A cold front had passed through the area on June 16 and was located along the Ohio River. High pressure over northern Iowa was the dominate feature. There were clouds and a few showers throughout the Chicago area, bur precipitation amounts were light, less than 0.1 in. At O'Hare the maximum temperature was 64 deg F, winds were generally from the northeast with an average speed of 8.4 mph.

June 29

High pressure over Kansas was dominating the weather throughout the region. Some light rainfall had occurred over the Chicago area during the past day. At O'Hare the maximum temperature was 76 deg F with a low of 55 deg F. Winds were from the west to northwest at an average speed of 7.7 mph.

July 11

High pressure over southern Ontario was providing a flow of Canadian air into the region. A stationary front was located over central Illinois. Moderate rainfall, over 1 in., had occurred in the Chicago area the previous day. At O'Hare the maximum temperature was 75 deg F with a minimum of 65 deg F. Winds were from the northeast at an average speed of 7.1 mph.

July 23

High pressure over northern Lake Michigan dominated the weather in the region providing a flow of Canadian air. Skies were mostly clear and there had been no rainfall in the Chicago area for the last three days. At O'Hare the maximum temperature was 73 deg F and the minimum was 52 deg F, the lowest in July. Winds were northwest early in the day, shifting to northeast by 8 a.m., at an average speed of 5.8 mph.

August 4

High pressure located over central Lake Michigan provided a light flow of Canadian air into the region. The high pressure moved southeast during the day. There was no rain on August 4 but some scattered showers in the Chicago area the previous day. At O'Hare the maximum temperature was 80 deg F and the minimum was 54 deg F, the lowest in

August. Winds were from the north early in the day and shifted around the south by late in the day. Wind speeds were light, averaging 4.7 mph.

August 16

A cold front had moved through the region late on the previous day and was located in southern Illinois. High pressure was moving south out of southwest Ontario. The maximum temperature the previous day was 92 deg F, the warmest day in August. The cold front brought much cooler temperatures on August 16. There was no rainfall that day or the previous day. At O'Hare the maximum temperature was 77 deg F and the minimum was 77 deg F. Winds were north in the morning shifting to east by evening at an average speed of 9.5 mph

August 28

A high pressure system located over Quebec was providing southeast flow into the region. A stationary front was located to the southwest over Missouri and another stationary front was starting to move east as a cold front out of the plains. There was no rainfall that day or the previous day. At O'Hare the maximum temperature was 85 deg F and the minimum was 64 deg F. Winds were southeast at an average speed of 8.7 mph.

September 9

High pressure was located east over the Virginia/North Carolina border providing southerly flow into the region. A warm front was located over Wisconsin and a cold front was moving in from the west. There was no rainfall on this day but some scattered precipitation occurred the previous morning. At O'Hare the maximum temperature was 85 deg F and the minimum was 67 deg F. Winds were from the south all day at an average speed of 9.4 mph.

September 21

High pressure was located over Missouri providing westerly flow into the region. A cold front had moved through the area the previous day with rainfall amounts around 0.25 in. There was no precipitation on this day. Winds were west to northwest most of the day shifting to east by evening. Winds speeds averaged 8.5 mph but were stronger prior to the wind shift.

October 3

A cold front had moved through the area the previous day and was located in southern Illinois. A second cold front was moving southeast into northern Wisconsin. Scattered showers occurred throughout the Chicago area with rainfall amounts above 0.5 in.   At O'Hare the maximum temperature was 73 deg F and the minimum was 44 deg F. Winds were light and variable until afternoon when a shift to the northeast occurred. The average speed was 6.0 mph but was higher after the wind shift.

October 18

A high pressure system located over the southern plains (from southern Colorado to southern Missouri) dominated the weather in the region. A cold front was moving into southern Wisconsin in the morning but no precipitation occurred in the area. At O'Hare the maximum temperature was 70 deg F and the minimum was 38 deg F. Winds were from the southwest at an average speed of 6.1 mph.

October 31

High pressure located over eastern Canada dominated the weather in the region. A weak stationary front was located southwest over the Mississippi Valley. There had been no precipitation in the Chicago area for several days. At O'Hare the maximum temperature was 70 deg F and the minimum was 47 deg F. Winds were southeast at an average speed of 7.7 mph.

November 8

A cold front had moved through the area the previous day with light precipitation and a weak surface trough was moving into northwest Illinois. Rainfall this day was less than 0.1 in. At O'Hare the maximum temperature was 48 deg F and the minimum was 32 deg F. Winds were southwest early shifting to west by afternoon and north by evening. The average speed was 5.8 mph.

November 20

A strong cold front had moved through the area the previous day. Low pressure located north of Lake Huron dominated the weather. Traces of snow fell this day and on the previous day. At O'Hare the maximum temperature was 29 deg F and the minimum was 18 deg F. Winds were strong out of the west all day. The average speed was 16.2 mph.

December 14

A low pressure system was located east over western New York State and high pressure was located over eastern Kansas. A trace of snow fell in the morning; however there had been 6 in. of snow the previous day and a total of 15 in. were on the ground. At O'Hare the maximum temperature was 27 deg F and the minimum was 7 deg F. Winds were northwest early, shifting to west be early afternoon and to south by evening. This average speed was 6.5 mph.

December 26

Low pressure over Lake Superior was pulling a cold front into northwest Wisconsin. A high pressure system located from Illinois east to North Carolina dominated the weather. Light snow totaling 0.5 in. fell throughout the day. At O'Hare the maximum temperature was 19 deg F and the minimum was 3 deg F. Winds were southwest early shifting to west by evening. The average speed was 8.3 mph.

Appendix IV (continued)
Frequency of Wind Direction on Sampling Days

Sampling Day	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
June 17, 2000	7	5	4	6											1	1	
June 29, 2000					1	1		1				1	5	3	11	1	
July 11, 2000	3	3	14	4													
July 23, 2000	3	4	7	4	1											5	
August 4, 2000	4		1	2	3	5	1	1	1	2						4	
August 16, 2000	8	4	4	6	1											1	
August 28, 2000				1	2	5	7	7	2								
September 9, 2000									17	7							
September 21, 2000					4	1	1					4	6	7			1
October 3, 2000	1	3	2	4	1	1	1		2	3		1		1		4	
October 18, 2000										7	9	7					1
October 31, 2000					3	2	8	9	2								
November 8, 2000	2									1	9	6	3		1	2	
November 20, 2000												5	14	5			
December 14, 2000	1							1	1	1		6	3	1	10		
December 26, 2001										1	10	9	4				
Total Hours	29	19	32	27	16	15	18	19	25	22	28	39	35	17	23	18	2
Percent of Time	7.6	4.9	8.3	7.0	4.2	3.9	4.7	4.9	6.5	5.7	7.3	10.2	9.1	4.4	6.0	4.7	0.5

Appendix V
General Information for Selected Target Compounds

The following is a general discussion of the nature and sources for each of selected target compounds (Reference 3).

Acetaldehyde and Formaldehyde

These compounds are both from a large family of chemical compounds called volatile organic compounds (VOCs) and fall within a chemical group called aldehydes and ketones which are structured to include a carbonyl group, double-bonded carbon and oxygen atoms.

Formaldehyde is released into the air by burning wood, kerosene or natural gas, by automobiles, trucks and aircraft through the burning of motor fuels and by cigarettes. Formaldehyde can off-gas from materials made with it, e.g., from glue or adhesive in press wood products, from preservatives in some paints and cosmetics, the coating that provides permanent press quality to fabrics and draperies. Formaldehyde is also a naturally occurring substance.

Acetaldehyde is ubiquitous in the ambient environment. It is an intermediate product of higher plant respiration and is formed from the burning of wood, tobacco and roasting coffee. It is also released from automobiles, trucks and aircraft burning motor fuels, from industrial processes which synthesize other chemicals, e.g., production of perfumes, polyester resins and basic dyes, and from its use as a solvent in the rubber, tanning and paper industries.

Benzene

Benzene is also a volatile organic compound and is from a chemical family called aromatics or cyclic compounds. Aromatic compounds are formed in a ring with a series of single and doubled bonded carbon atoms, e.g., benzene, which has six carbon atoms with one hydrogen atom attached to each carbon in the ring.

Benzene is a constituent in motor fuels, is used as a solvent for fats, waxes, resins, oils inks, paint, plastics and rubber, in the extraction of oils from nuts and seeds and is used in photogravure printing. Benzene is also used in the manufacture of detergents, explosives, pharmaceuticals, and dyestuffs. Benzene is released in the air from the combustion of motor fuels, fugitive emissions from vehicle fueling and fuel storage, burning of coal and oil, industrial process and fugitive emissions and from tobacco smoking.

1,3-butadiene

This compound is also a volatile organic compound and is from a chemical family of straight chain compounds called alkenes that, when formed, contain carbon-carbon double bonds are called dienes. 1,3-butadiene is the most common and is used in the production of rubber and plastics. It is also used in copolymers including acrylics.

1,3-butadiene is released from the burning motor fuels by automobiles, trucks and aircraft, from refineries and chemical manufacturing facilities (especially the plastic and rubber industries). It is also released by incineration of products in which it is contained, e.g. rubber, plastics and resins.

Chromium

Chromium is a naturally occurring element found in rocks, animals, plants, soil and in volcanic dust and gases. It occurs in the environment in two major valence states, trivalent chromium (Cr III) and hexavalent chromium Cr (VI). Chromium (III) is essential to normal glucose, protein and fat metabolism and is thus an essential dietary element. Chromium (VI) is much more toxic than Chromium (III) and is know human carcinogen.

The metal chromium is used mainly for making steel and other alloys. Chromium compounds, in either Chromium (III) or (VI) forms, are used for chrome plating, the manufacture of dyes and pigments, leather and wood preservation, and treatment of cooling tower water. Smaller amounts are used in drilling muds, textiles, and toner for coping machines.

Dioxins

A dioxin is any compound that contains the dibenzo-p-dioxin nucleus and remains one of the most toxic compounds known to man. Dioxins have no known technical use and are not intentionally produced. They are formed as unwanted byproducts of certain chemical processes during the manufacture of chlorinated intermediates and in the combustion of chlorinated materials.

Dioxins are emitted into the atmosphere from a wide variety of processes such as waste incineration, combustion of solid and liquid fuels in stationary sources for heat and power generation, crematories, iron and steel foundries/scrap metal melting, combustion-aided metal recovery, kraft pulp and paper production/black liquor combustion, internal combustion engines, carbon regeneration, forest fires, organic chemical manufacture and use and Portland cement manufacture.

Polycyclic Organic Compounds (PAHs)

The term polycyclic organic compounds defines not one compound, but a broad class of compounds which generally includes all organic compounds with more than one benzene ring, and which have a boiling point above 212 degrees (F). Sixteen polycyclic aromatic hydocarbons (PAHs), a subset of the class of polycyclic compounds, were designated by USEPA as the compounds of interest as Urban Air Toxics. Notable such compounds are napthalene, anthracene, phenanthrene and chrysene.

The principal formation mechanism for PAHs occurs as part of the fuel combustion process in many different types of source categories. The combustion processes which are much more significant in terms of air emissions include stationary external combustion for heat and electricity generation, internal combustion engines and turbines, motor vehicles (cars, trucks, and aircraft), and a variety of industrial fuel combustion sources.

Tetrachloroethylene (perchloroethylene)

Perchloroethylene is an organic chemical used in many industrial processes and is considered as a probable and possible human carcinogen. Perchloroethylene is used for dry cleaning and textile processing, as a chemical intermediate and as a degreasing agent. It is also used for rubber coatings, solvent soaps, printing inks, adhesives and glues, sealants, polishes, lubricants and silicones.

Nickel

Nickel is a silvery-white metal that is usually found in nature as a component of silicate, sulfide or arsenic ores. The most predominant forms of nickel in the atmosphere are nickel sulfate, sulfide and complex oxides of nickel. Various forms of nickel are considered to be human carcinogens.

Nickel is used for nickel alloys, electroplating baths, batteries, textile dyes, coins, spark plugs, machinery parts, stainless-steel, nickel-chrome wires and catalysts.

Toluene

Toluene is a man-made aromatic hydrocarbon produced mostly from petroleum. The chemical intermediate is the predominant feedstock in benzene production and a key octane-boosting component for gasoline blending. Toluene is also used as a raw material in the production of other chemicals and as a solvent in paints and coatings, inks, adhesives, cosmetics and pharmaceuticals.

Toluene is released into the air from several man-made sources including emissions from motor vehicles and aircraft exhaust, gasoline marketing, chemical and paint manufacturing and cigarette smoke. Air emissions also result from the production of polymers (nylon), plastic soda bottles and polyurethanes.