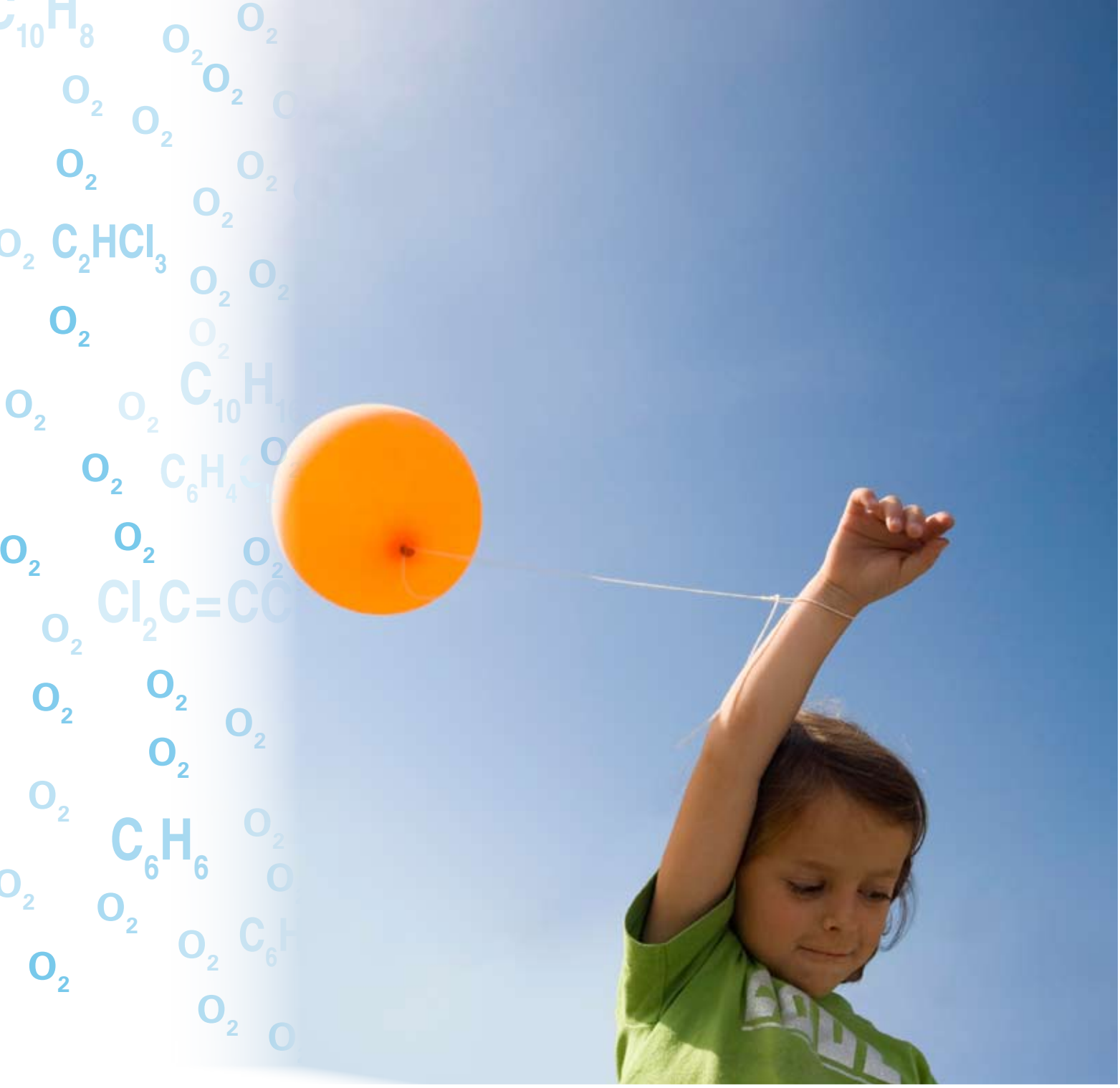
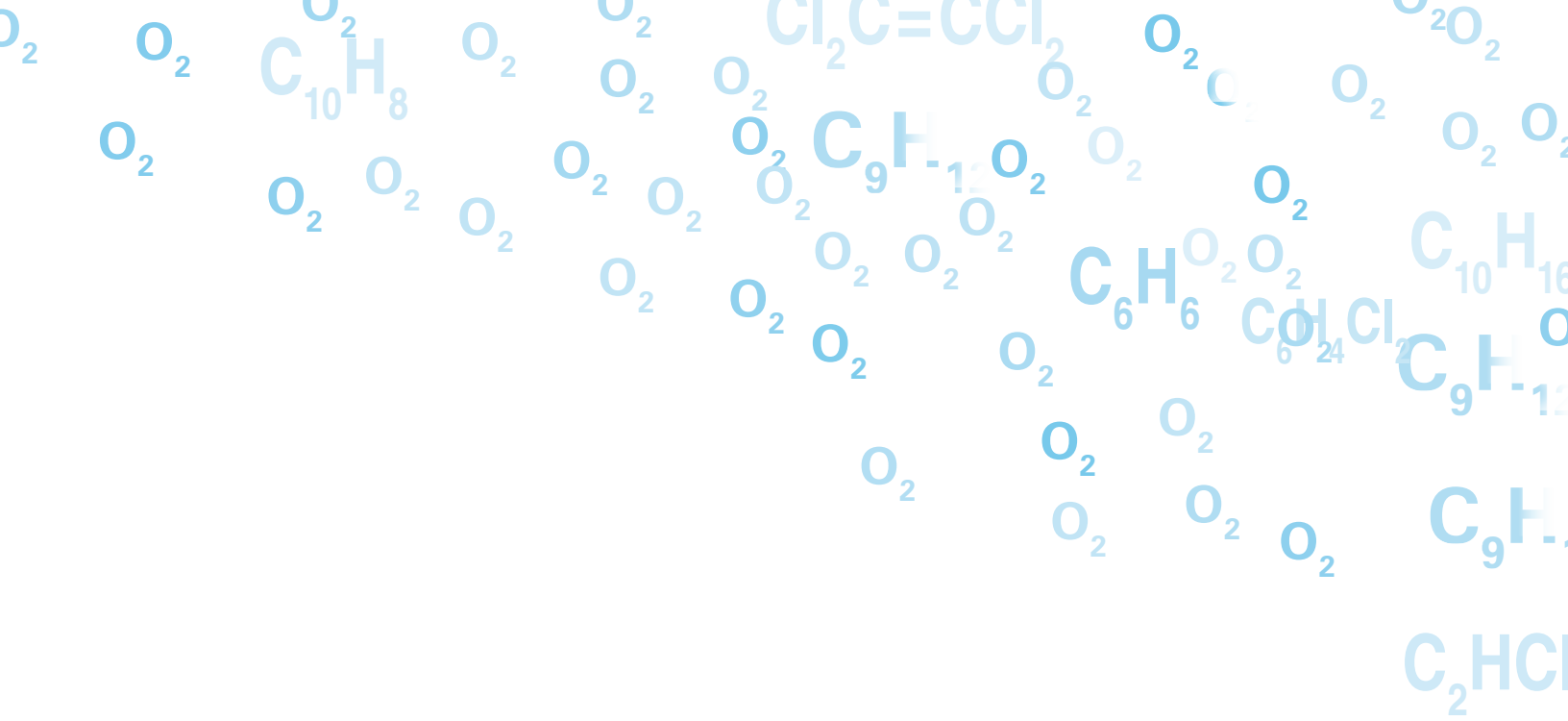


Minneapolis Air Quality Study

City of Minneapolis
Environmental Management & Safety

Winter 2008



Minneapolis
City of Lakes

Acknowledgements

We would like to thank the individuals who participated in this study. We acknowledge the contributions of the field team including staff from Minneapolis Regulatory Services and Public Works. We also acknowledge the help and support of the Minnesota Pollution Control Agency (MPCA) staff and University of Texas, School of Public Health.

The study was funded by the City of Minneapolis Department of Regulatory Services.

Minneapolis Air Quality Study

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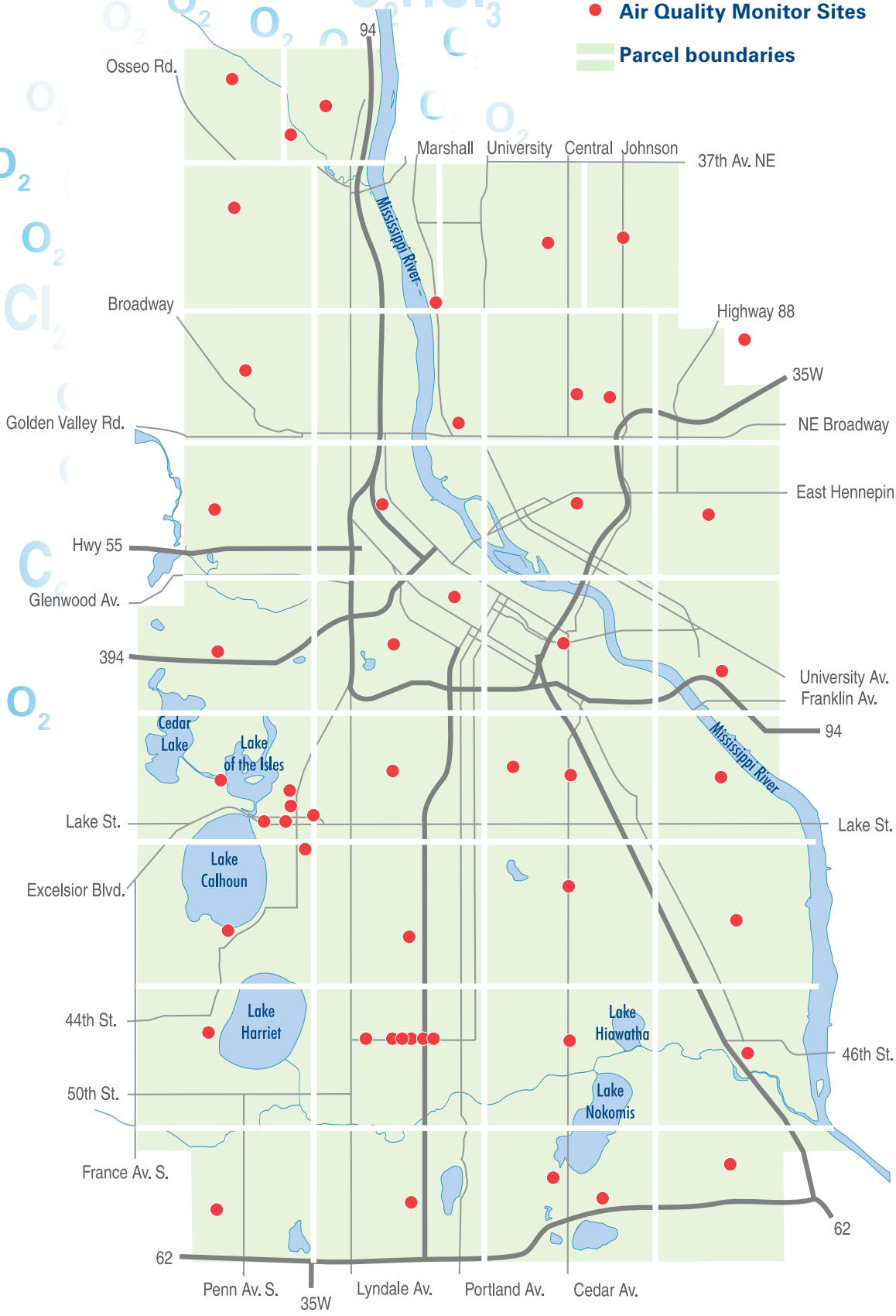


Introduction

Hazardous air pollutants (HAPs) are chemicals that cause cancer and other serious health and environmental problems. Hazardous air pollutants are a concern in urban areas because of the variety of sources that can emit them and because of the high density of people who could be harmed. Hazardous air pollutants can also fall into an air pollution category called volatile organic compounds. Volatile means that they easily evaporate at room temperature and normal atmospheric pressure. Benzene is a hazardous air pollutant ***and*** a volatile organic compound – a hazardous air pollutant because it may cause cancer or other health problems and a volatile organic compound because it easily turns into a vapor and gets into the air.

The Minneapolis study goals

The goals of the Minneapolis air quality study were to sample our air quality at ground level and to collect data about the air people breathe where we live, work and play.

Testing monitor

Testing periods

The study monitored air quality once for each season: in May, August and October of 2005 and in January of 2006. Each testing period ran for 72 hours.

Testing locations

We tested 33 locations throughout Minneapolis including homes, parks and office buildings.

Interstate 35W

We know that traffic has a large impact on local air quality, so we also tested the air over Interstate 35W where it crosses 46th Street.

Uptown testing

In August 2005, six additional monitors were placed around the Uptown area to measure how traffic affects the air quality here. Uptown is a highly populated automobile-dominated area.

Results

The results show that over all, the air quality in Minneapolis is good. However, in certain conditions some chemicals may exceed the level where they are considered reasonably safe in the air.

Of the 31 chemicals in the study, 15 have inhalation benchmarks associated with them. Inhalation benchmarks are levels at which a chemical is considered reasonably safe in the air people breathe. Our study shows that only two of the 15 chemicals with an inhalation benchmark exceeded the benchmark at any of the locations during any of the test periods. The remaining 13 chemicals did not exceed their benchmarks. The two chemicals that exceeded their inhalation benchmarks were benzene and tetrachloroethylene.

Benzene levels ran higher than the level considered reasonably safe in several locations. The benzene health benchmark runs in a range from 1.3 micrograms of pollutant per cubic meter of air or "$\mu g/m^3$" to 4.5 $\mu g/m^3$. In May and August, four, of the 55 locations were higher than the lower inhalation benchmark of 1.3 $\mu g/m^3$.

In October, 35 locations exceeded the benzene benchmark, but October's relatively still air seems to have caused an anomaly, with many of the 31 chemicals showing higher levels in the October tests than other times of year.

In May, tetrachloroethylene in the air tested higher than is considered reasonably safe in three locations. One of those locations showed the higher results during three of the four testing periods. That location is an intersection with heavy traffic and several other pollution sources such as small businesses and gas stations.

There were a few locations that generally had results higher than is considered reasonably safe. These locations were in high-traffic areas such as Interstate 35W at 46th Street and 34th Street at Cedar Avenue South. Overall, the residential sites showed lower levels of chemicals in the air than high-traffic intersections. An exception is the 16XX Polk St. NE site, which is a residential property, but it is adjacent to a parcel of land that is zoned for light industrial activity. That location showed higher results for some of the chemicals in May, apparently because of an idling diesel truck.

Benzene

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which in turn are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also part of crude oil, gasoline and cigarette smoke.

--ToxFAQs for Benzene, U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Division of Toxicology
www.atsdr.cdc.gov/tfacts3.html

Benzene is the only chemical with a range for the inhalation health benchmark. The range indicates that benzene is considered unhealthy somewhere between the upper and lower range. It is difficult to determine an exact level that a chemical is considered unsafe and therefore scientists used a range of 1.3 $\mu g/m^3$ and 4.5 $\mu g/m^3$ for benzene. Several results for benzene went above the lower range of its inhalation benchmark in May, August and January (the October results for benzene will be discussed later in the report). In all four test periods, four testing locations exceeded the lower end of the inhalation benchmark: 46th Street and Interstate 35W, 46th Street and First Avenue South, 46th Street and Nicollet Avenue South (these three are about a block from each other), and 34th Street and Cedar Avenue South. None of the locations reached the upper end of benzene's range.

Interstate 35W & 46th Street

Exhaust from diesel engines such as buses and trucks, cars, lawnmowers, idling and accelerating traffic at stop lights and bus stops are all emission sources in this area. There are also a few area sources in the immediate vicinity including three gas stations (two of which are located very near the testing monitors) and three repair garages (one of which is an auto body shop). There are no "point sources" or large industrial pollution sources in the immediate area. The air here exceeded benzene's inhalation benchmark during all four of the testing periods.

34th Street & Cedar Avenue South

All four testing periods at 34th Street and Cedar Avenue South also exceeded the lower range of the benzene inhalation benchmark of 1.3 $\mu g/m^3$.

This intersection generally has heavy bus and truck traffic including two bus stops on Cedar Avenue nearby. There are no area sources/licensed businesses in the immediate area that would emit benzene. Area sources individually have small quantities of emissions but cumulatively are a significant piece of the air pollution puzzle. Dry cleaners, gasoline filling stations, woodstoves, painting/solvent use, auto body shops and bakeries are all area sources. There are no point sources (such as industrial and manufacturing sources that would have a significant quantity of emissions by themselves) in the immediate location either.

The monitor was placed under an awning near the bus stop to protect it from the rain, snow and direct sunlight. Bus riders would sometimes smoke cigarettes beneath the awning to escape the elements while waiting for the bus. Cigarette smoke is a source of benzene, so it is likely that cigarette smoke contributed to the benzene results. It is impossible to determine, however, what percentage of benzene resulted from cigarette smoke and what percentage came from traffic exhaust.

In summary, several testing locations in the city exceeded the lower range of the benzene inhalation benchmark. No location in this study ever exceeded the upper end of the range. The locations that exceeded the benchmark more than once were mostly at busy intersections, indicating that traffic exhaust likely contributed to the result. Other benzene sources include gasoline and cigarette smoke. There were two gasoline service stations near the Interstate 35W and 46th Street testing location, so they likely contributed to exceeding the benzene benchmark there. The cigarette smoke near the Cedar Avenue bus stop likely contributed to the result there.

Gas station venting near residential units

Tetrachloroethylene

Tetrachloroethylene is a manufactured chemical used widely for dry cleaning fabrics and degreasing metal. It is also used to make other chemicals and is used in some consumer products.

$Cl_2C=CCl_2$

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor.

-- Agency for Toxic Substances and Disease Registry, Division of Toxicology, **www.atsdr.cdc.gov/tfacts18.html**

The tetrachloroethylene safety benchmark is 1.7 $\mu g/m^3$. In May, tetrachloroethylene exceeded the inhalation benchmark at three locations:

Carl W. Kroening Interpretive Center (Interstate 94 at the 49th Street exit)	1.72 $\mu g/m^3$
31st Avenue and Ulysses Street NE	2.48 $\mu g/m^3$
46th Street and Nicollet Avenue (one of the points in the Interstate 35W & 46th Street location)	6.83 $\mu g/m^3$

Kroening Interpretive Center

This testing site is located in north Minneapolis along Interstate 94 at the 49th Street exit. The monitor was hung from the Minneapolis Parks and Recreation sign at the Carl W. Kroening Interpretive Center. There are no known sources of tetrachloroethylene in the immediate vicinity. It is unclear why this sampling site exceeded the inhalation benchmark in May and more tests would be needed to get a better understanding.

31st Avenue & Ulysses Street NE

In May the 31XX Ulysses St. NE location exceeded the inhalation benchmark of 1.7 $\mu g/m^3$ with its result of 2.48 $\mu g/m^3$. This site is a residential property set in the center of a city block surrounded by residential homes. There is a licensed repair garage and a dry cleaner within four blocks.

46th Street & Nicollet Avenue

As previously discussed, this location exceeded the benzene inhalation benchmark for all testing periods. It also exceeded the tetrachloroethylene inhalation benchmark in three of the four test periods. This is the only location in the study that exceeded the tetrachloroethylene benchmark more than once.

This site is in a commercial setting with gasoline service stations, repair garages and dry cleaners all within blocks.

Intersection of 46th Street & Nicollet Avenue

Tetrachloroethylene exceeded the inhalation benchmark at a few locations in the city. Since tetrachloroethylene is frequently used in the dry cleaning process, it is likely that it may be detected in commercial locations. It is unclear why the chemical was detected above the inhalation benchmark at the two non-commercial sites.

October 2005

Many of the results throughout the city showed a much higher concentration of chemicals in the air in October than in the other three periods. The weather conditions in October likely played a role in the elevated results. The average wind speed in October was roughly half that of the other three periods. In May the average four-day wind speed was about 8.75 mph; in August it was 9 mph, in October it was 4.25 mph, and in January it was 9.75 mph. A slower average wind speed would have kept the air pollutants in the area longer, allowing the chemicals to be absorbed into the carbon filter in higher concentrations.

The chemicals that showed high October readings include benzene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, 1,2,3-trimethylbenzene, decane, pentane, styrene, p-dichlorobenzene, o-xylene, m&p-xylenes, ethylbenzene, toluene and trichloroethylene.

16th Avenue & Polk Street NE

This testing site is a residential property that is next to a parcel zoned for light industrial use. The light industrial property is used as a storage parking lot for construction equipment, including diesel trucks. The diesel trucks park just over the property line about 25 feet from the home. The trucks idle for hours, sometimes, to warm the engines and pressurize the brakes, especially on cold days. Neighbors have complained in the past that the diesel emissions drift over the property line causing noxious odors, and City inspectors have verified the complaints.

equipment yard

During the May testing period, the property owner noted the emissions on the citizen's comment log. The resident described the emission on May 4, 2005, as an idling diesel engine, described the odor as diesel exhaust and rated the intensity of the odor from the emission as a five on a scale of one to five.

The property showed a high concentration of trimethylbenzene in the air, and the U.S. Occupational Safety and Health Administration (OSHA) identifies the trimethlybenzene compounds as commonly associated with exhaust emitted by diesel engines.

Source: **www.osha.gov/SLTC/dieselexhaust/chemical.html**

Uptown

The Uptown test location was added after the beginning of the study, so there are no results for May.

Of the three testing periods in Uptown, benzene was the only chemical that exceeded its safety benchmark.

Suggestions & recommendations

Based on the study's findings, we recommend:

Utilize City and State regulations, tools and resources to better administer air quality standards

- Use tools such as business licenses and building permits to reduce emissions. Strategies may include techniques to prevent pollution, adding or upgrading pollution control equipment and modifying work practices (for example, restricting idling of vehicles).
- Conduct annual inspections of facilities and businesses that have MPCA air quality permits to ensure that they are operating properly.
- Review all applications for MPCA air quality permits in Minneapolis to make sure that they are protective of nearby residents as Minneapolis is a high density city.
- Continue to advocate for cleaner air.

Learning more from the study's data

- Continue to analyze the current data and review some of the sites more closely for their air emissions sources such as bus stops, truck routes, gasoline stations, congested intersections and area sources to understand their effects on the study.
- Share the data with the University of Minnesota for further analysis.

Working within City departments

- Continue working with the City's sustainability office to implement strategies to improve air quality (with an increased emphasis on ozone) and meet sustainability goals.

Work with Minneapolis Development Review to:

- Encourage green building techniques
- Consider the impact of new development on air quality while its plan is under review
- Develop stricter standards for issuing permits on projects that impact air quality (coffee roasters and paint booths)
- Improve air quality on construction sites (idling, sandblasting, excavation dust)

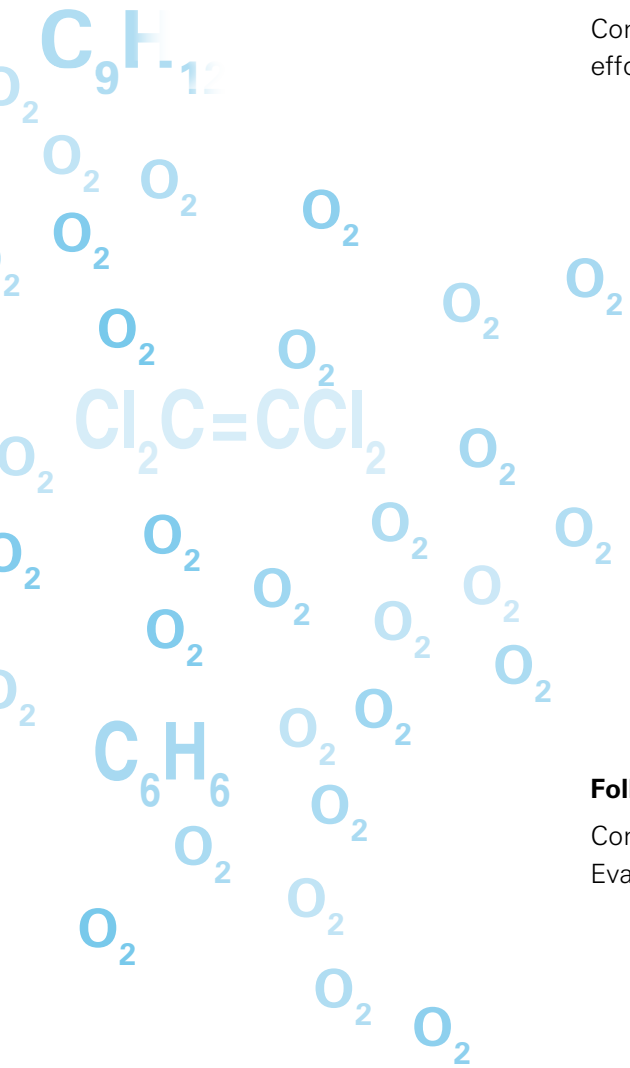
Share the air quality data with all City departments and divisions, especially the ones that can affect air quality including Public Works, Zoning,

Regulatory Services and Community Planning and Economic Development

- Help departments and divisions develop comprehensive air quality strategies and policies
- Develop citywide strategies for reducing traffic congestion at intersections to reduce idling

Minimize air pollutant exposure for sensitive populations such as children and the elderly. For example, work with Zoning/Planning to locate daycare centers, schools and senior centers away from known emission sources.

Work with Public Works to plan commuter bike routes off of main roadways to reduce bike riders' exposure to auto exhaust.



Strengthening partnerships

Continue to maintain and improve partnerships with sister agencies to pool our efforts and share information, resources and ideas.

Increase the City's commitment to Clean Air Minnesota to reduce volatile organic compounds (VOCs) and nitrogen oxides (both precursors of smog) throughout Minneapolis and the state. Increase staff time devoted to Clean Air Minnesota and fund projects that directly reduce VOCs in Minneapolis.

Partner with the Minnesota Pollution Control Agency on air quality strategies. Concentrate on areas where the City can focus resources to reduce emissions and improve air quality in Minneapolis.

Continue to work with:

- Minnesota Department of Health
- Minnesota Department of Transportation
- School of Public Health at the University of Minnesota
- Hennepin County
- America Lung Association
- Metropolitan Council
- Other metropolitan cities

Follow-up testing

Conduct further air quality tests to look at if air quality has improved. Evaluate feasibility of additional air quality studies.

- Respond to complaints from the public — test locations in the city that have a history of air quality complaints.
- Conduct more intensive testing at known sources of air pollution such as industries or high-traffic intersections. Identify what pollutants we need to measure, and purchase appropriate equipment.
- Conduct multiple tests within the same season for a more accurate picture of air quality within a season.
- Test for other pollutants of concern such as formaldehyde, as they become a concern.

Glossary

What are the sources of hazardous air pollutants?

Mobile sources include construction vehicles, trucks, trains, airplanes, automobiles, lawnmowers and off-road vehicles such as snowmobiles and all-terrain vehicles (ATVs).

Point sources are industrial and manufacturing sources such as power plants, refineries, waste incinerators, etc. Each point source has a significant quantity of emissions by itself.

Area sources individually have smaller quantities of emissions but cumulatively are a significant piece of the air pollution puzzle. Dry cleaners, gasoline filling stations, woodstoves, painting/solvent use, auto body shops and bakeries are all area sources.

More information

For more information about the air quality study with data, maps and analysis, please visit **www.ci.minneapolis.mn.us/airquality** Click on link called Air Quality Study.

Environmental Management & Safety
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Winter 2008

For questions about this report, contact:

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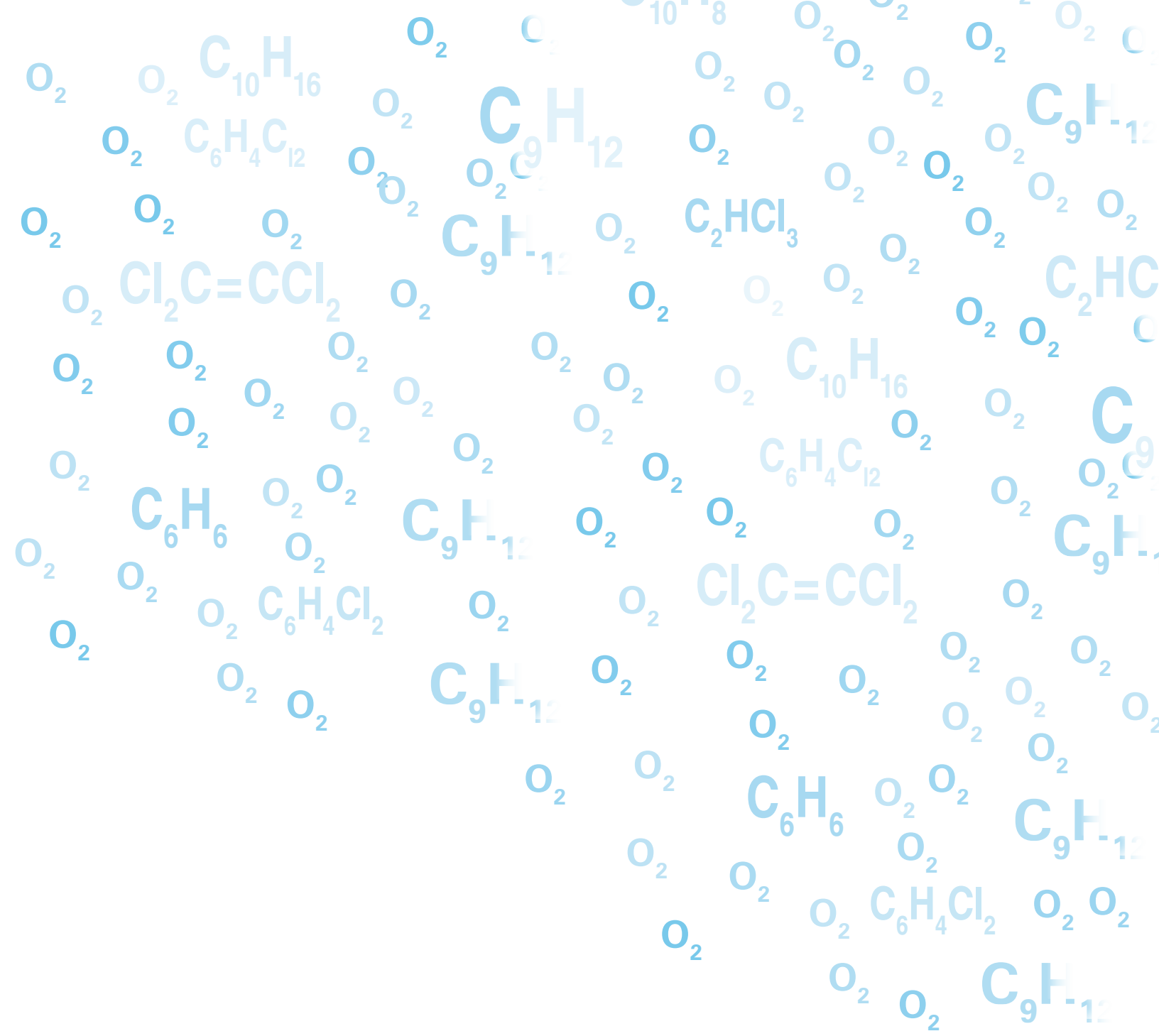

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