Community Air Monitoring Project Results Summary

St. Paul: St. Anthony Park Neighborhood

Project overview

The Community Air Monitoring Project (CAMP) is an air monitoring study, funded by the Minnesota Legislature and conducted by the MPCA, designed to measure air quality in Minnesota communities where low income or communities of color might be disproportionately impacted by pollution from highway traffic, air traffic, or industrial sources. For more information, visit www.pca.state.mn.us/air/community-air-monitoring-project.

Select air pollutants were monitored in St. Paul's St. Anthony Park neighborhood from January 1 through December 31, 2016. This site is located at 2265 Robbins Street in a mixed residential/industrial area in close proximity to a high-traffic highway (I-280) and a large railroad switchyard. This summary describes the monitoring results, including comparisons to applicable air quality standards or risk-based inhalation health benchmarks and to pollution levels measured at other St. Paul and Minneapolis area monitoring sites.

What we monitored and how the measured concentrations were evaluated

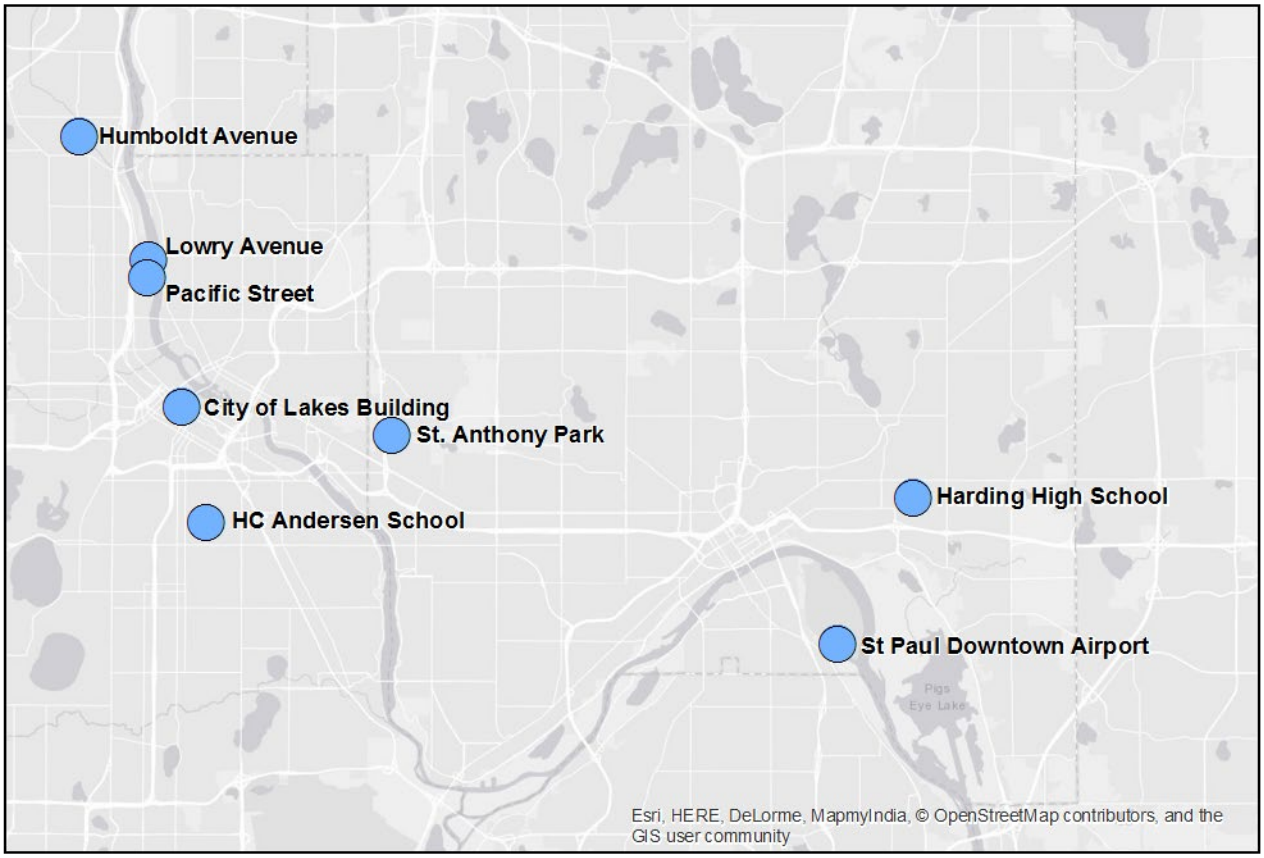
Air quality was monitored for air pollutants that cause or may be associated with adverse health effects. We measured three air pollutants regulated by air quality standards: fine particles ($PM_{2.5}$), total suspended particulate matter (TSP), and lead.

This study also monitored 68 air pollutants without air quality standards known as "air toxics". Air toxics monitored at St. Anthony Park include metals, carbonyls, and volatile organic compounds (VOC). There are currently no regulatory standards for air toxics, but these pollutants have potential health risks. Minnesota uses guidelines called inhalation health benchmarks to evaluate the level of health risk for the community of a specific air toxic pollutant.

Air monitoring locations

To put the St. Anthony Park results into context, this report compares measured results to other monitoring sites in the Twin Cities Area. The following map and table show the locations of air monitoring sites included in this report.

Map of air monitoring sites



Air monitoring sites and pollutants measured

Site name	City	Street address	Pollutants monitored
St. Anthony Park	St. Paul	2265 Robbins Street	$PM_{2.5}$, TSP, carbonyls, metals, VOCs
Harding High School	St. Paul	1540 East 6th Street	$PM_{2.5}$, TSP, carbonyls, metals, VOCs
St. Paul Downtown Airport	St. Paul	719 Eaton Street	TSP, metals
Lowry Avenue	Minneapolis	3104 Pacific Street	TSP, carbonyls, metals, VOCs
Pacific Street	Minneapolis	2710 North Pacific Street	TSP, metals
HC Anderson School	Minneapolis	2727 10th Avenue South	$PM_{2.5}$, TSP, carbonyls, metals, VOCs
City of Lakes Building	Minneapolis	309 2nd Avenue South	TSP, carbonyls, metals, VOCs
Humboldt Avenue	Minneapolis	4646 North Humboldt	TSP, carbonyls, metals, VOCs

Findings at a glance

Generally, air pollution levels measured in the St. Anthony Park neighborhood are similar to levels measured at other Twin Cities-area sites with levels of TSP and some metals and VOCs slightly elevated compared to other sites. The St. Anthony Park monitoring site did not meet the state daily public welfare standard for TSP, but all other state and federal standards were either met or would be expected to be met if monitoring continued. For air toxics, arsenic, cobalt, and formaldehyde were above health benchmarks, but all other air toxics were below health benchmarks.

Fine particles

Fine particle pollution ($PM_{2.5}$) is a complex mixture of extremely small particles and liquid droplets that are created during combustion and can also be formed as other gaseous pollutants react in the air. The U.S. Environmental Protection Agency (EPA) has established standards for daily and annual fine particle concentrations to protect the public from adverse health effects associated with exposure to fine particle

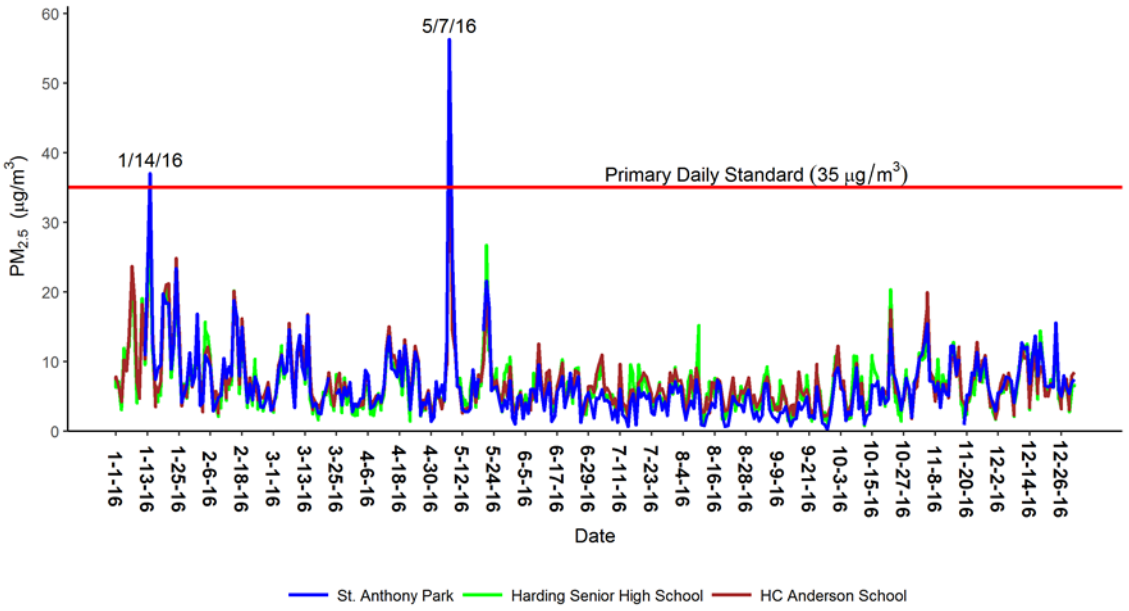
pollution. A minimum of three years of monitoring data are required to determine compliance with the $PM_{2.5}$ standards. Exposure to high levels of fine particles can impact heart and lung health, resulting in increased hospital and emergency room visits, lost work and school days, and premature death.

Comparison to daily standard

A monitoring site meets the daily (24-hour) $PM_{2.5}$ standard if the 98th percentile of the 24-hour $PM_{2.5}$ concentrations in a year, averaged over three years, is less than or equal to 35 µg/m^3. Based on data collected in 2016, $PM_{2.5}$ levels measured in St. Anthony Park would be expected to meet the daily $PM_{2.5}$ standard if monitoring continued for three years and concentrations remained similar to levels measured in 2016.

On two days, January 14 and May 7, the St. Anthony Park monitor measured daily $PM_{2.5}$ concentrations that were greater than the level of the daily $PM_{2.5}$ standard. These high days were associated with regional air pollution events that affected all monitors in the Twin Cities area. A monitoring site can measure several days above the standard and still meet the standard.

Daily $PM_{2.5}$ concentrations at air monitoring sites, 2016

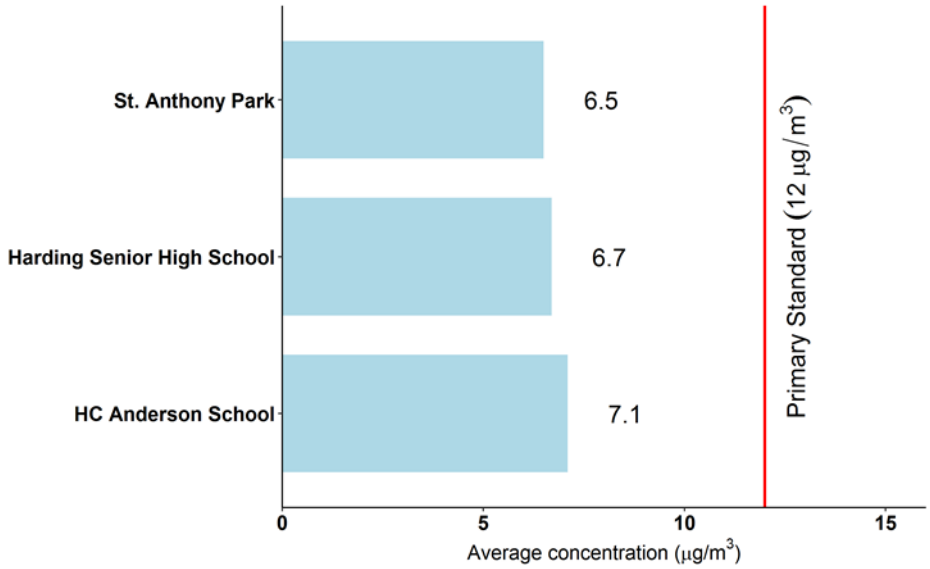


Daily $PM_{2.5}$ concentrations at St. Anthony Park followed a similar daily pattern compared to other metro area monitoring sites. Daily $PM_{2.5}$ concentrations were higher than the level of the standard on two days. These high days were associated with regional air pollution events and affected all monitors in the Twin Cities.

Comparison to annual standard

A monitoring site meets the annual $PM_{2.5}$ standard if the three-year average of the annual average $PM_{2.5}$ concentration is less than or equal to 12 µg/m^3. The figure below shows the annual average concentrations of $PM_{2.5}$ at St. Anthony Park and selected air monitoring sites in the Twin Cities Metro Area (TCMA) in 2016. The annual average $PM_{2.5}$ concentration at St. Anthony Park was below the annual $PM_{2.5}$ standard in 2016, but three years of monitoring are required to demonstrate compliance with the standard. The annual average concentration at St. Anthony Park was similar to the other sites and would be expected to meet the standard if monitoring continued.

Annual average $PM_{2.5}$ concentrations at air monitoring sites, 2016



The 2016 annual average $PM_{2.5}$ concentration at St. Anthony Park was similar to other Twin Cities area monitoring sites. The annual average $PM_{2.5}$ concentration was below the level of the annual standard and would be expected to meet the standard if monitoring continued.

Total suspended particulate

Total suspended particulate, TSP, includes the total mass of particles of solid or liquid matter – such as soot, dust, aerosols, fumes, and mist – found in the air. Elevated TSP concentrations may contribute to respiratory irritation and nuisance dust. The majority of the particles in this size range are removed by the body before reaching the lungs.

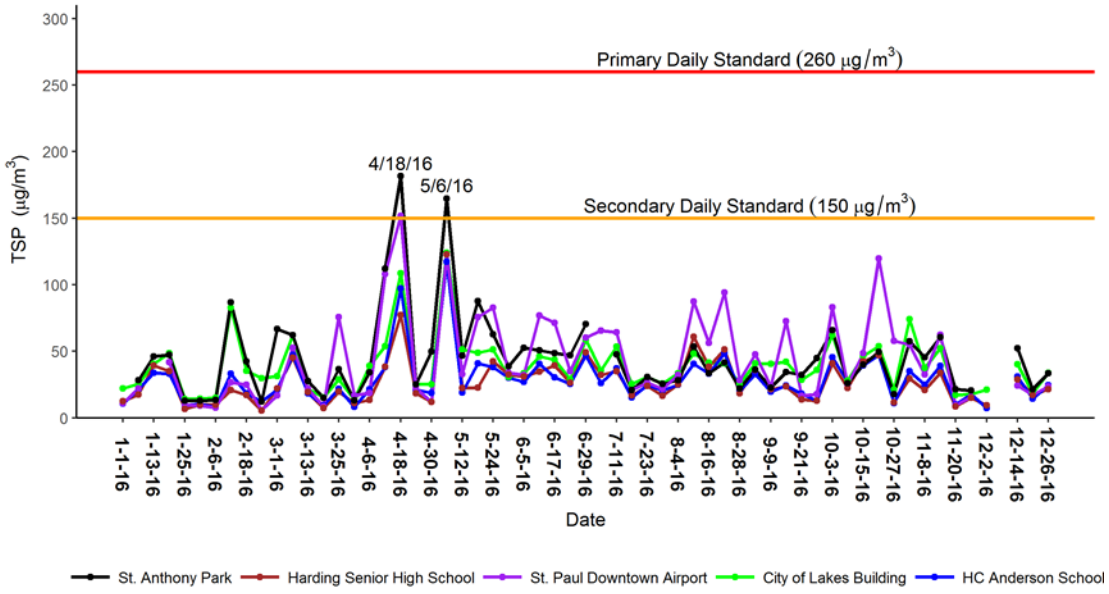
TSP is a pollutant with state air quality standards, known as Minnesota Ambient Air Quality Standards (MAAQS). There are no federal standards for TSP. The MAAQS for TSP include a health-based (primary) and public welfare (secondary) standards for both short-term (acute) and long-term (chronic) exposure that are in the form of a daily and annual standard, respectively.

Comparison to daily standard

A monitoring site meets the primary daily (24-hour) TSP MAAQS when the second highest daily average TSP concentration is less than or equal to 260 µg/m^3. A monitoring site meets the secondary daily TSP MAAQS when the second highest daily average TSP concentration is less than or equal to 150 µg/m^3.

In 2016, the St. Anthony Park monitoring site violated the secondary daily TSP MAAQS, but met the less stringent primary standard. The monitor recorded two days with 24-hour concentrations greater than 150 µg/m^3. These exceedances occurred on April 18 and May 6. On these days, all Twin Cities area TSP sites had elevated TSP concentrations, and several sites measured concentrations greater than 150 µg/m^3. The high concentrations on those days were primarily caused by strong winds carrying dust. The land use in the area surrounding the St. Anthony Park site may make it more susceptible to blowing dust on high wind days.

Daily TSP concentrations at air monitoring sites, 2016



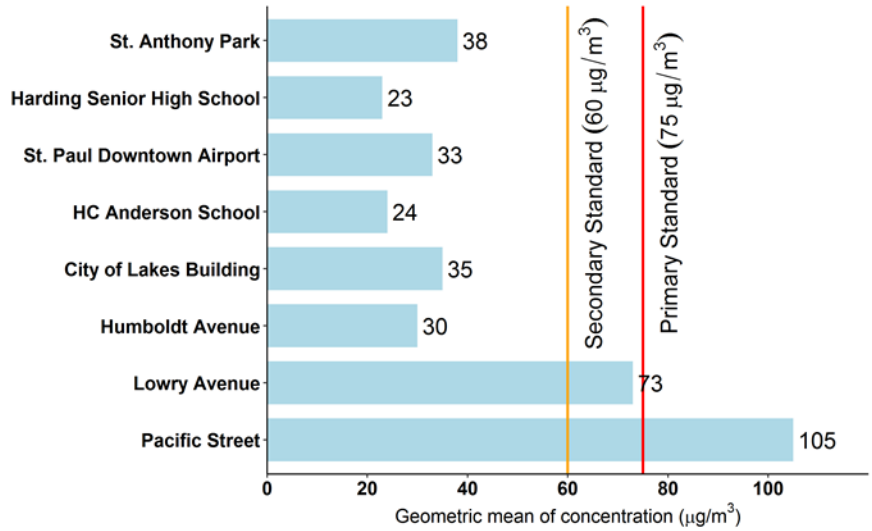
Daily TSP concentrations at St. Anthony Park followed a similar daily pattern compared to other metro area monitoring sites. Daily TSP concentrations were higher than the secondary standard on two days. These high days were associated with high wind days with blowing dust that affected all monitors in the Twin Cities.

Comparison to annual standard

A monitoring site meets the primary annual TSP MAAQS when the annual geometric mean of measured TSP concentrations is less than or equal to 75 µg/m^3. A monitoring site meets the secondary annual TSP MAAQS when the annual geometric mean of measured TSP concentrations is less than or equal to 60 µg/m^3.

In 2016, the St. Anthony Park monitoring site met both the primary and secondary annual TSP MAAQS. The figure below compares the annual geometric means of TSP for St. Anthony Park and other selected sites in the TCMA to the annual TSP standards. The annual geometric mean for TSP was well below both TSP standards, but was slightly higher at St. Anthony Park compared to most of the other sites with the exceptions of Lowry Avenue and Pacific Street in Minneapolis.

Annual geometric mean of TSP concentrations at air monitoring sites, 2016



The 2016 annual average TSP concentration at St. Anthony Park was slightly higher than most Twin Cities area monitoring sites. TSP concentrations at St. Anthony Park met both annual TSP standards.

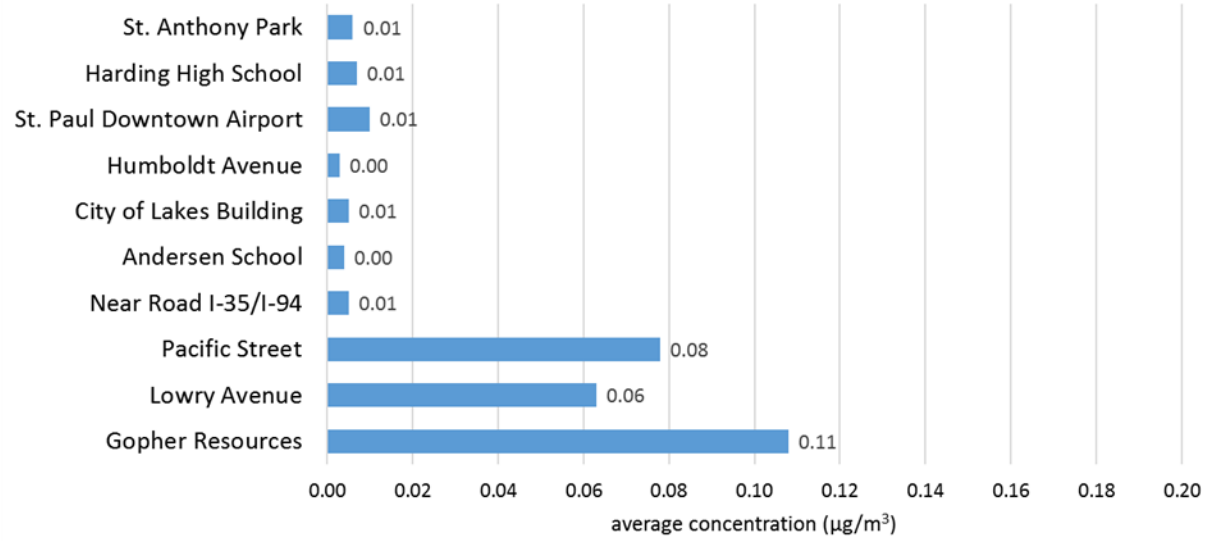
Lead

Lead is a metal found naturally in the environment, as well as in manufactured products. After lead was removed from gasoline in the 1990s, air emissions and measured levels of lead in the air decreased dramatically. Currently, metals processing facilities (lead and other metals smelters) and leaded aviation fuel are the primary sources of lead air emissions. Exposures to low levels of lead early in life have been linked to effects on IQ, learning, memory, and behavior.

Lead is a pollutant with a federal air quality standard in the form of a rolling 3-month standard. A monitoring site meets the rolling 3-month lead standard when the maximum 3-month rolling average lead concentration is less than or equal to 0.15 µg/m^3, over three years.

In 2016, the maximum three-month average lead concentration measured in St. Anthony Park was 0.01 µg/m^3, which is well below the standard of 0.15 µg/m^3. Lead levels measured in St. Anthony Park are expected to meet the lead standard if monitors remained there long-term and concentrations remained similar to levels measured in 2016.

Maximum 3-month average lead concentration at monitoring sites, 2016



The 2016 maximum 3-month rolling average lead concentration at St. Anthony Park was well below the lead standard. Lead levels measured in St. Anthony Park are expected to meet the lead standard if monitors remained there long-term and concentrations remained similar to levels measured in 2016.

Air toxics

The EPA defines air toxics as those pollutants that cause or may cause cancer or other serious health effects (such as reproductive or birth defects), or adverse environmental and ecological effects. Air toxics include, but are not limited to, the 188 Hazardous Air Pollutants (HAPs) specified in the 1990 Clean Air Act Amendments, http://www.epa.gov/ttn/atw/orig189.html.

The MPCA's air toxics monitoring network analyzes air samples for 54 volatile organic compounds (VOCs), 7 carbonyls, and 13 metals. Air toxics do not have standards. Instead, the MPCA uses guidelines called health benchmarks. However, many air toxic pollutants have no established health benchmarks. Pollutant benchmarks come from a variety of sources including:

- Minnesota Department of Health's Health Risk Values (HRVs), Health Based Values (HBVs), and other Risk Assessment Advice, http://www.health.state.mn.us/divs/eh/risk/guidance/air/table.html
- EPA's Integrated Risk Information System (IRIS), http://www.epa.gov/iris/
- California's Office of Health Hazard Assessment, http://www.oehha.ca.gov/air.html.

- Provisional Peer Reviewed Toxicity Values for Superfund (PPRTV), http://hhpprtv.ornl.gov/

Inhalation health benchmarks are established to protect against both short and long-term exposures to air pollutants.

- An **acute inhalation health benchmark** is a concentration in ambient air at or below which a chemical is unlikely to cause an adverse health effect to sensitive populations when exposure occurs for one-hour.
- **A chronic health benchmark** is a concentration in ambient air at or below which a chemical is unlikely to cause an adverse health effect to sensitive populations when exposure occurs over a lifetime. Chronic health benchmarks are set separately for cancer (carcinogenic) and noncancer related health outcomes. With respect to carcinogenic effects, the health benchmarks are developed so the additional lifetime risk of developing cancer is less than or equal to one additional chance in 100,000 for continuous exposure to the inhalation health benchmark concentration for a lifetime.

The MPCA uses a 95% upper confidence limit (UCL) of the annual mean concentration of an air toxic pollutant to compare to that pollutant's lowest chronic health benchmark value. An upper confidence limit is a conservative (biased high) estimate of the annual mean concentration of a pollutant, which accounts for uncertainty in the long-term average concentration of a pollutant based on limited monitoring data. The long-term average concentration of a pollutant at a monitoring site is expected to be less than or equal to the 95% UCL calculated for that pollutant at least 95% of the time.

Air toxics monitoring results at St. Anthony Park

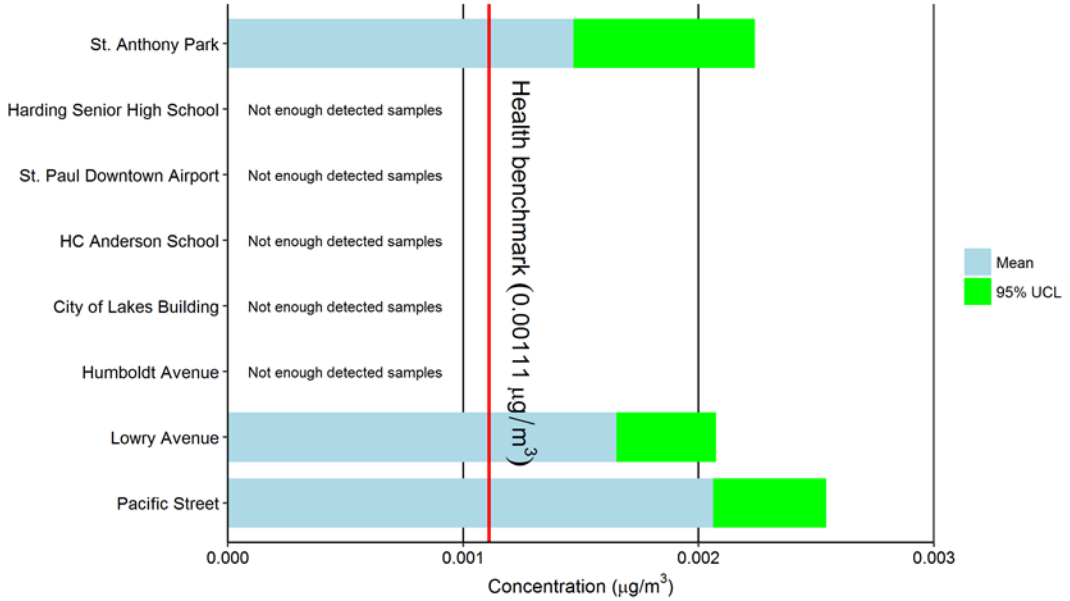
The following section describes air toxics monitoring results at St. Anthony Park. To report a numeric result, a pollutant must meet the 75% data completeness criteria and have at least 20% of samples measured above the method detection limit. Pollutants that do not meet these criteria are reported as "not enough valid samples" or "not enough detected samples", respectively. The majority of air toxics measured at St. Anthony Park had 95% UCLs below applicable health benchmark guidelines. Three pollutants were measured at levels above the health benchmark: cobalt, arsenic and formaldehyde.

Cobalt

Cobalt is natural element that is mined to make superalloys (alloys that maintain their strength at high temperatures approaching their melting points) and used in pigment manufacturing. Chronic exposure to elevated levels of cobalt can result in respiratory effects including irritation, wheezing, asthma, pneumonia, and fibrosis.

In 2016, cobalt was found more frequently and at higher levels in St. Anthony Park compared to other Twin Cities area sites. This suggests a local source may be contributing to elevated cobalt levels in the area near the monitor. The annual average and 95% UCL concentration at St. Anthony Park was above the health benchmark for cobalt.

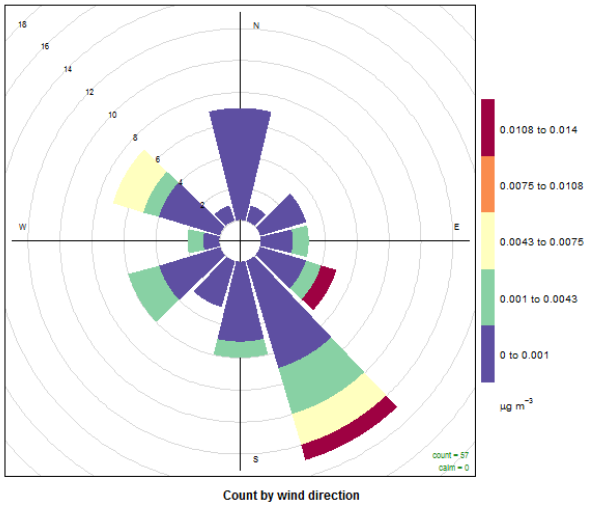
Annual average and 95% UCL cobalt concentrations at monitoring sites, 2016



The 2016 annual average and 95% UCL cobalt concentration at St. Anthony Park was above the chronic inhalation health benchmark. The elevated cobalt concentrations at St. Anthony Park suggest a local source may be emitting cobalt in the area near the monitor.

To identify potential sources contributing to elevated cobalt concentrations at the St. Anthony Park monitor, we combined wind data with air monitoring results. The figure below is a pollution rose for measured cobalt concentrations at St. Anthony Park in 2016. The center of the rose represents the air-monitoring site, and the segments radiating from it represent the direction the wind blew from on the day the cobalt sample was collected. The length of the segments show how frequently the wind blew from that direction and the color corresponds to the cobalt concentrations. This pollution rose suggests that the highest cobalt concentrations occurred when the wind blew from the southeast.

Cobalt pollution rose for St. Anthony Park, 2016

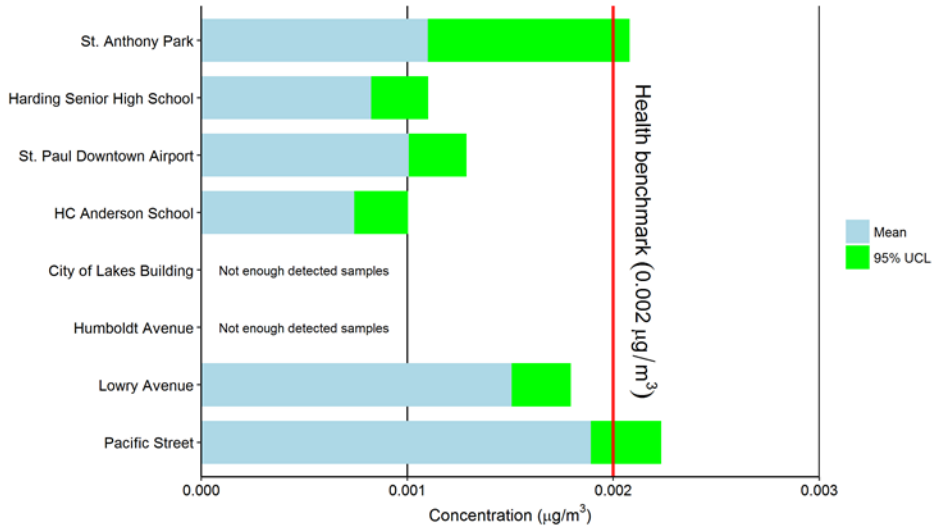


A pollution rose describes air pollution monitoring results in the context of wind direction. In 2016, measured cobalt concentrations were highest when the wind blew from the southeast.

Arsenic

Arsenic is a naturally occurring element used in wood preservation. Arsenic is also present in the soil and in some inorganic fertilizers. Chronic exposure to elevated levels of arsenic can result in irritation of the skin and mucous membranes and effects in the brain and nervous system. On most days, arsenic levels at St. Anthony Park were similar to other monitoring sites. On two sampling days, arsenic levels were significantly higher than other sites. Following these two high days, arsenic levels returned to lower levels. However, these two high days drove the 95% UCL above the inhalation health benchmark.

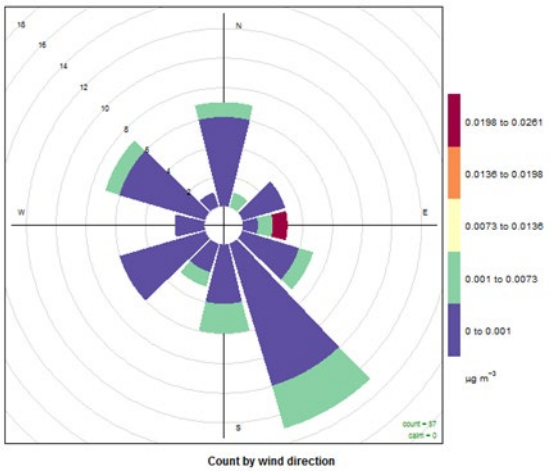
Annual average and 95% UCL arsenic concentrations at monitoring sites, 2016



The 2016 95% UCL of the annual average arsenic concentration at St. Anthony Park was above the chronic inhalation health benchmark. This result was driven by two days with very high measurements.

To identify potential sources contributing to elevated arsenic concentrations at the St. Anthony Park monitor, we combined wind data with air monitoring results. The figure below is a pollution rose for measured arsenic concentrations at St. Anthony Park in 2016. The center of the rose represents the air-monitoring site, and the segments radiating from it represent the direction the wind blew from on the day the cobalt sample was collected. The length of the segments show how frequently the wind blew from that direction and the color corresponds to the arsenic concentrations. This pollution rose suggests that the highest arsenic concentrations occurred when the wind blew from the east.

Arsenic pollution rose for St. Anthony Park, 2016



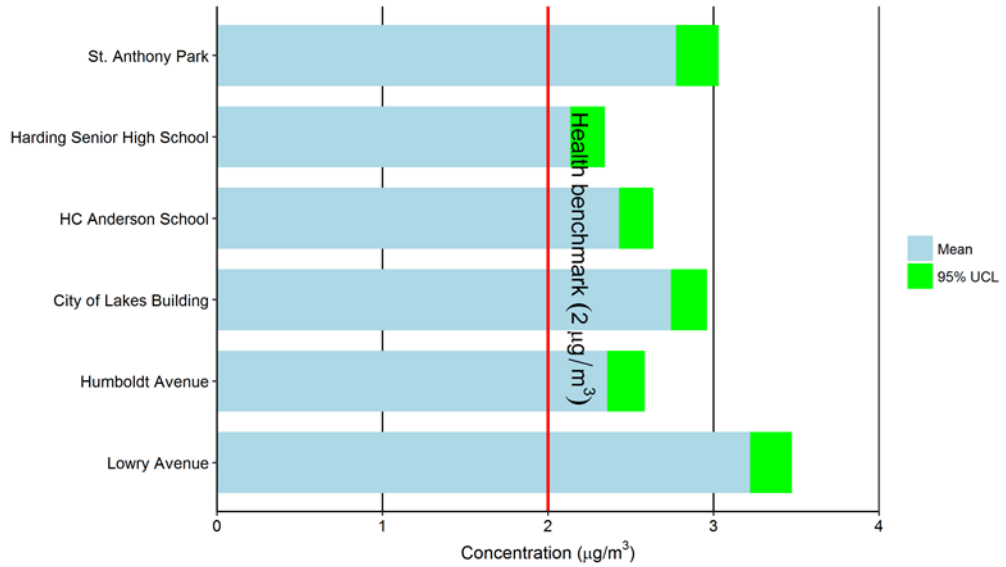
A pollution rose describes air pollution monitoring results in the context of wind direction. In 2016, measured arsenic concentrations were highest when the wind blew from the east

Formaldehyde

Formaldehyde is a common pollutant found in indoor and outdoor air. It is used in the production of particleboard and as an intermediary in the production of other chemicals. Formaldehyde is also produced in the environment when other pollutants react in the air. Exposure to high levels of formaldehyde can result in respiratory symptoms and eye, nose, and throat irritation. Formaldehyde is above the long-term health benchmark at all air monitoring sites in Minneapolis and St. Paul. The MPCA is actively working to better understand what factors are contributing to elevated formaldehyde levels in the TCMA.

The figure below shows the annual average concentration and the 95% UCL for the average concentration of formaldehyde at St. Anthony Park compared to select metro area air monitoring sites in 2016. The annual average concentrations at St. Anthony Park and all of the other metro area air monitoring sites were above the health benchmark for formaldehyde in 2016.

Annual average and 95% UCL formaldehyde concentrations at monitoring sites, 2016



The 2016 annual average and 95% UCL formaldehyde concentration at St. Anthony Park were above the chronic inhalation health benchmark. Formaldehyde is above the inhalation health benchmark at all monitoring site in Minneapolis and St. Paul.

Summary of all air toxics monitored at St. Anthony Park

The following tables summarize all air toxics monitoring results at St. Anthony Park. The first table shows pollutants that had a 95% UCL greater than the health benchmark for that pollutant. The other tables show pollutants grouped by whether they are carbonyls, metals, or VOCs.

For each pollutant, the tables include the following information:

- Average concentration and 95% UCL
- Lowest (most health protective) inhalation health benchmark
- The monitored result as a percentage of the lowest inhalation health benchmark. Values greater than 100% indicate monitored results are above the inhalation health benchmark.
- A comparison indicating whether the pollutant was significantly higher than, significantly lower than or not significantly different from the average concentration of the pollutant across all Minneapolis and St. Paul monitoring sites[1].

[1] Monitoring sites used for the comparison to Minneapolis and St. Paul include Andersen School, Humboldt Ave., and the City of Lakes building in Minneapolis, and Harding High School in St. Paul.

Air toxics pollutants above health benchmarks values at St. Anthony Park, 2016

Pollutant	Average (µg/m³)	95% UCL (µg/m³)	Inhalation Health Benchmark (IHB)	Percent of IHB	Average compared to rest of metro
Arsenic	0.001	0.002	0.002	103	Higher**
Cobalt	0.001	0.002	0.0011	206	Higher**
Formaldehyde	2.8	3.0	2	151	Higher

**There are not enough samples above the detection limit at other metro sites to numerically compare St. Anthony Park to the other metro sites, but concentrations at St. Anthony Park are likely higher due to most samples at the other sites being below the detection limit.

Carbonyls results at St. Anthony Park, 2016

Pollutant	Average (µg/m³)	95% UCL (µg/m³)	Inhalation Health Benchmark (IHB)	Percent of IHB	Average compared to rest of metro
Acetaldehyde	1.2	1.3	5	26	Higher
Benzaldehyde	0.1	0.1	No IHB		Same
Butyraldehyde	0.2	0.2	No IHB		Same
Formaldehyde	2.7	3.0	2	151	Higher
Propionaldehyde	0.3	0.3	8	3	Higher
Trans-Crotonaldehyde	Not enough detected samples		No IHB		

Metals results at St. Anthony Park, 2016

Pollutant	Average (µg/m³)	95% UCL (µg/m³)	Inhalation Health Benchmark (IHB)	Percent of IHB	Average compared to rest of metro
Antimony	0.002	0.003	0.2	1	Same
Arsenic	0.001	0.002	0.002	103	Higher**
Barium	Not enough valid samples		No IHB		
Beryllium	Not enough detected samples		0.004		
Cadmium	Not enough detected samples		0.006		
Chromium	0.002	0.003	0.008	33	Higher
Cobalt	0.001	0.002	0.0011	206	Higher**
Iron	0.9	1.1	No IHB		Higher
Lead	0.004	0.005	0.15	3	Same
Manganese	0.03	0.03	0.2	16	Higher
Nickel	0.002	0.002	0.014	15	Higher
Selenium	0.0008	0.0009	20	0	Same
Zinc	0.04	0.05	No IHB		Same

**There are not enough samples above the detection limit at other metro sites to numerically compare St. Anthony Park to the other metro sites, but concentrations at St. Anthony Park are likely higher due to most samples at the other sites being below the detection limit.

VOC results at St. Anthony Park, 2016

Pollutant	Average (µg/m³)	95% UCL (µg/m³)	Inhalation Health Benchmark (IHB)	Percent of IHB	Average compared to rest of metro
1,1-Dichloroethane	Not enough detected samples		6.3		
1,1-Dichloroethylene	0.02*	0.03*	200	0	
1,1,2-Trichloroethane	Not enough detected samples		0.63		
1,1,2,2-Tetrachloroethane	Not enough detected samples		0.17		
1,2-Dichlorobenzene	Not enough detected samples		No IHB		
1,2-Dichloropropane	Not enough detected samples		4		
1,2,4-Trichlorobenzene	Not enough detected samples		2		
1,2,4-Trimethylbenzene	0.4*	0.4*	60	1	Same
1,3-Butadiene	0.07*	0.09*	0.2	47	Same
1,3-Dichlorobenzene	Not enough detected samples		No IHB		
1,3,5-Trimethylbenzene	0.1*	0.1*	No IHB		Same
1,4-Dichlorobenzene	0.04*	0.05*	0.91	6	Lower
Benzene	0.5*	0.6*	1.3	48	Same
Benzene, 1-Ethenyl-4-Methyl	0.1*	0.2*	No IHB		Higher
Benzyl Chloride	Not enough detected samples		0.2		
Bromodichloromethane	Not enough detected samples		No IHB		
Bromoform	Not enough detected samples		9.1		
Bromomethane	0.03*	0.05*	5	1	Same
Carbon Disulfide	0.09*	0.1*	700	0	Lower
Carbon Tetrachloride	0.6*	0.6*	1.7	35	Same
Chlorobenzene	0.03*	0.04*	1000	0	Same
Chloroethane	Not enough detected samples		10000		
Chloroform	0.1*	0.1*	0.43	28	Same
Chloromethane	Not enough valid samples		90		
Cis-1,2-Dichloroethene	Not enough detected samples		No IHB		
Cis-1,3-Dichloropropene	Not enough valid samples		No IHB		
Cyclohexane	0.1*	0.1*	6000	0	Same
Dibromochloromethane	Not enough detected samples		No IHB		
Dichlorodifluoromethane	2.8*	2.9*	No IHB		Same
Dichloromethane	0.5*	0.6*	20	3	Same
Ethylbenzene	0.2*	0.3*	4	7	Same
Ethylene Dibromide	Not enough detected samples		0.05		
Ethylene Dichloride	0.07*	0.08*	0.38	20	Same
Freon 113	0.6*	0.8*	No IHB		Same
Freon 114	0.1*	0.1*	No IHB		Same
Furan, Tetrahydro-	0.07*	0.09*	2000	0	Same
M/P Xylene	0.8*	0.9*	100	1	Same
Methyl Butyl Ketone	0.1*	0.2*	30	1	Same
Methyl Chloroform	0.05*	0.06*	5000	0	Same
Methyl Tert-Butyl Ether	Not enough detected samples		38		
N-Heptane	Not enough valid samples		No IHB		

Pollutant	Average (µg/m³)	95% UCL (µg/m³)	Inhalation Health Benchmark (IHB)	Percent of IHB	Average compared to rest of metro
N-Hexane	0.6*	0.9*	50	2	Same
O-Xylene	0.2*	0.3*	100	0	Same
Styrene	0.1*	0.1*	1000	0	Same
Tetrachloroethylene	0.5*	0.6*	2	31	Higher
Toluene	1.3*	1.6*	400	0	Same
Trans-1,2-Dichloroethylene	0.1*	0.1*	60	0	Higher**
Trans-1,3-Dichloropropene	0.04*	0.08*	No IHB		Same
Trichloroethylene	0.2*	0.3*	2	16	Higher
Trichlorofluoromethane	1.5*	1.6*	No IHB		Same
Vinyl Chloride	0.1*	0.2*	1	17	Higher**

*At least one quarter did not meet the 75% completeness requirement

**There are not enough samples above the detection limit at other metro sites to numerically compare St. Anthony Park to the other metro sites, but concentrations at St. Anthony Park are likely higher due to most samples at the other sites being below the detection limit.

Additional information

- To view current air quality conditions and to sign up for Minnesota air quality forecasts and alerts, visit www.pca.state.mn.us/aqi.
- For statewide air monitoring results, visit the Air Toxics Data Explorer at www.pca.state.mn.us/air/air-toxics-data-explorer and the Criteria Pollutant Data Explorer at www.pca.state.mn.us/air/criteria-pollutant-data-explorer.
- For more information about the Community Air Monitoring Project, visit www.pca.state.mn.us/air/community-air-monitoring-project.
- For questions regarding ambient air monitoring in the St. Anthony Park neighborhood or community air monitoring in general, call the MPCA, 651-296-6300 or 800-657-3864.