2015 Air Toxics Summary

New Jersey Department of Environmental Protection

INTRODUCTION

Air pollutants can be divided into two categories: criteria pollutants (ozone, sulfur dioxide, carbon monoxide, nitrogen dioxide, particulate matter, and lead); and air toxics. The criteria pollutants have been addressed at the national level since the 1970s. The United States Environmental Protection Agency (USEPA) has set National Ambient Air Quality Standards (NAAQS) for them, and they are subject to a standard planning process that includes monitoring, reporting, and control requirements. Each of these pollutants is discussed in its own section of this New Jersey Department of Environmental Protection (NJDEP) 2015 Air Quality Report.

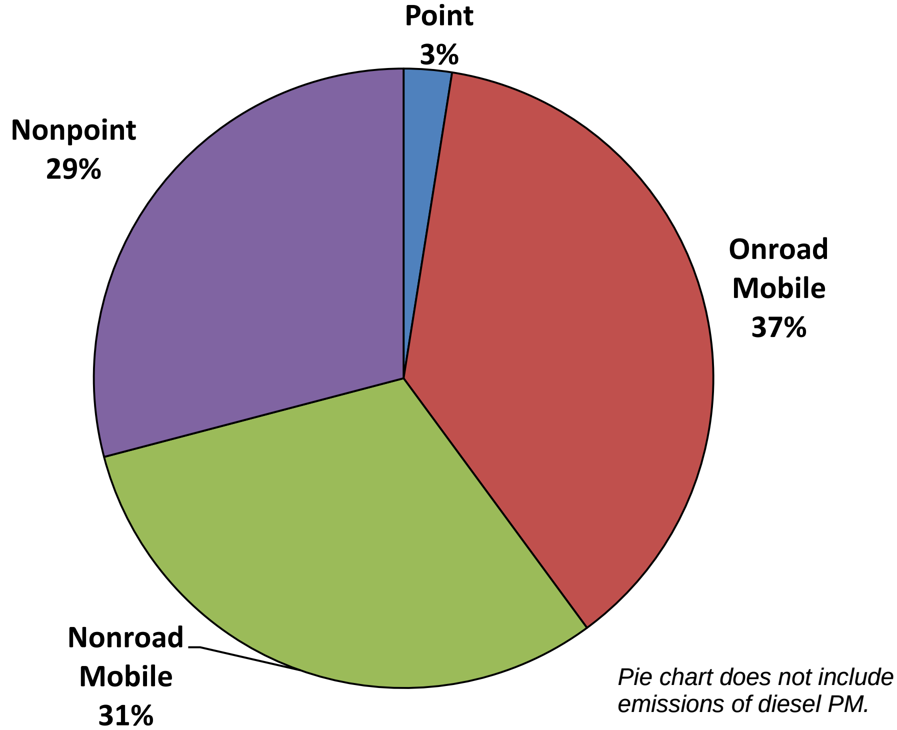
Air toxics are basically all the other chemicals released into the air that have the potential to cause adverse health effects in humans. These effects cover a wide range of conditions, from lung irritation to birth defects to cancer. There are no NAAQS for these pollutants, but in 1990 the U.S. Congress directed the USEPA to begin addressing a list of almost 200 air toxics by developing control technology standards for specific categories of sources that emit them. These air toxics are known as the Clean Air Act Hazardous Air Pollutants (HAPs). You can get more information about HAPs at the USEPA Air Toxics web site at www.epa.gov/ttn/atw. NJDEP also has several web pages dedicated to air toxics. They can be accessed at www.nj.gov/dep/airtoxics.

SOURCES OF AIR TOXICS

USEPA compiles a National Emissions Inventory (NEI) every three years. In addition to criteria pollutants and criteria precursors, it also collects information on emissions of hazardous air pollutants. This data is then used for the National-Scale Air Toxics Assessment (NATA), which combines emissions data and complex dispersion and exposure models to estimate people's exposure to air toxics around the country. The pie chart in Figure 1, taken from the 2011 NEI, shows that mobile sources are the largest contributors of air toxics emissions in New Jersey. More information can be found at www.epa.gov/national-air-toxics-assessment.

On-road mobile sources (cars and trucks) account for 37% of the air toxics emissions, and non-road mobile sources (airplanes, trains, construction equipment, lawnmowers, boats, dirt bikes, etc.) contribute an additional 31%. Nonpoint sources (residential, commercial, and small industrial sources) represent 29% of the inventory, and point sources (such as factories and power plants) account for the remaining 3%.

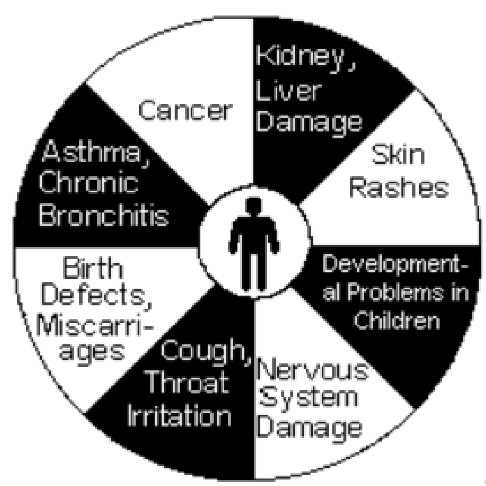
Figure 1
2011 Air Toxics Emissions Source
Estimates for New Jersey



Health Effects

People exposed to significant amounts of air toxics may have an increased chance of getting cancer or experiencing other serious health effects. The noncancer health effects can range from respiratory, neurological, reproductive, developmental, or immune system damage, to irritation and effects on specific organs (see Figure 2). In addition to inhalation exposure, there can be risks from the deposition of toxic pollutants onto soil or surface water. There, they can be taken up by plants and animals which are later consumed by humans.

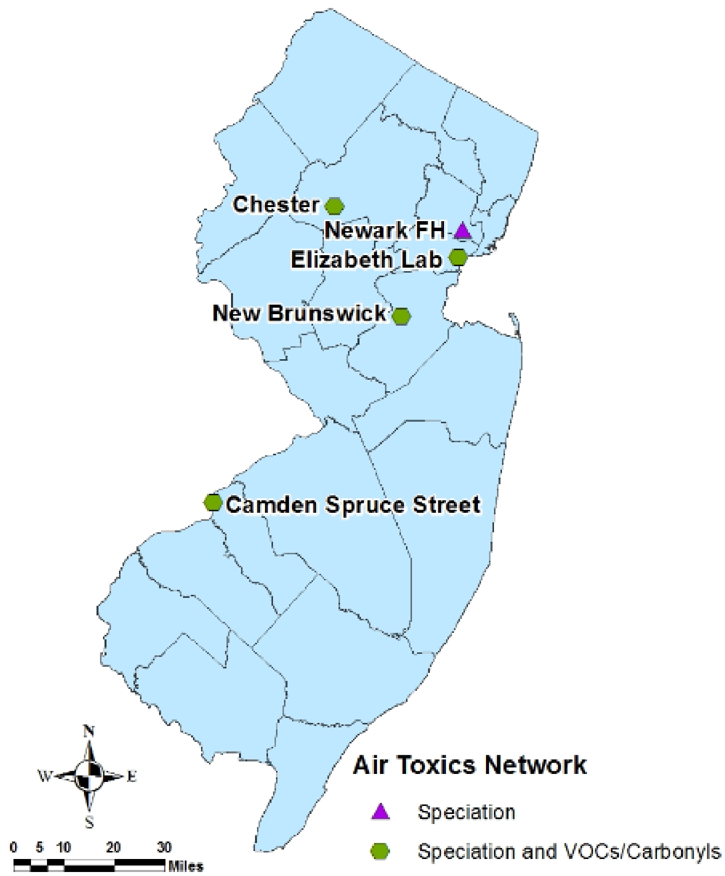
Figure 2
Potential Effects of Air Toxics



Source: www3.epa.gov/ttn/atw/3_90_024.html

Monitoring Locations

Figure 3
2015 Air Toxics Monitoring Network



NJDEP has four air toxics monitoring sites around the state that measure volatile organic compounds (VOCs) and carbonyls, a subset of VOCs that includes formaldehyde, acetaldehyde and other related compounds. They are located in Camden, Chester, Elizabeth, and New Brunswick. Toxic metals data is collected at five monitoring stations, Camden Spruce Street, Chester, Elizabeth Lab, New Brunswick, and Newark Firehouse.

The Chester monitoring site is in rural Morris County, away from known sources, and serves as kind of a "background" monitor. The New Brunswick monitoring station is in a suburban setting. The Elizabeth Lab monitoring station sits next to the Exit 13 tollbooths on the New Jersey Turnpike. The Camden Spruce Street monitoring station is located in an industrial urban setting. The Newark Firehouse monitoring station is in an urban residential area. More information about the air monitoring sites can be found in the Network Summary section of the annual Air Quality Report at www.njaqinow.net/.

A previous monitoring site in Camden (officially called the Camden Lab site) had been measuring several toxics since 1989. It was shut down on September 29, 2008, because NJDEP lost access to the location. A new monitoring station in Camden, the Camden Spruce Street monitoring site, became operational in 2013. The Elizabeth Lab site began measuring VOCs in 2000, and the New Brunswick and Chester sites started in July 2001. New Jersey's VOC monitors are part of the Urban Air Toxics Monitoring Program (UATMP), sponsored by the USEPA. A 24-hour integrated air sample is collected in a canister every six days, and then sent to the USEPA contract laboratory (ERG, located in North Carolina) to be analyzed for VOCs and carbonyls.

Analysis of metals at Camden Spruce Street, Chester, Elizabeth Lab and New Brunswick also began in 2001 as part of USEPA's Chemical Speciation Network (CSN), with the Newark Firehouse site added in 2010. The CSN was established to characterize the metals, ions and carbon constituents of $PM_{2.5}$. Filters are collected every three days and sent to a national lab for analysis. This report focuses on the toxic metals collected through the CSN program. Additional data from the CSN monitors can be found in Appendix B (Fine Particulate Speciation Summary) of the annual Air Quality Report (www.njaqinow.net/).

NEW JERSEY AIR TOXICS MONITORING RESULTS FOR 2015

2015 air toxic monitoring results for VOCs and carbonyls are shown in Table 1. This table contains the annual average concentration for each air toxic measured at the four New Jersey monitoring sites. All values are in micrograms per cubic meter ($\mu g/m^3$). More detail can be found in Tables 4 through 7, including additional statistics, detection limit information, health benchmarks used by NJDEP, risk ratios, and concentrations in parts per billion by volume (ppbv). The ppbv units are more common in air monitoring, while $\mu g/m^3$ units are generally used in air dispersion modeling and health studies. A number of compounds that were analyzed were mostly below the detection limit of the method used. However, this does not mean they are not present in the air below the detection limit level. Chemical-specific detection limits for VOCs can be found in Tables 4 through 7. Detection limits for the metals can be found in Appendix B of the annual Air Quality Report.

Reported averages for chemicals with less than 50% of the samples above the detection limit should be viewed with caution. Median values (the value of the middle sample value when the results are ranked) are reported in Tables 4 through 7 along with the mean (average) concentrations because for some compounds only a single or very few high values were recorded. These high values will tend to increase the average concentration significantly, but would have less effect on the median value. In such cases, the median value may be a better indicator of long-term exposures.

USEPA has determined that the methods used to collect and analyze acrolein in ambient air are not producing reliable results. More information is available at http://archive.epa.gov/schoolair/web/html/acrolein.html. Although we are including the 2015 New Jersey acrolein data in this report, the concentrations are highly uncertain and should be viewed as such.

Table 3 presents the annual average concentrations for the toxic metals collected through the CSN monitors in Camden, Chester, Elizabeth, New Brunswick, and Newark, along with chemical-specific health benchmarks and estimated risk ratios. For more information see the section on “Estimating Health Risk” below. Chromium and nickel have health benchmarks that are based on carcinogenicity of specific compounds. Since the monitoring method only measures total chromium or nickel and cannot distinguish between different types of compounds, cancer risk ratios are not calculated with those benchmarks. However, risk ratios are calculated for nickel based on noncancer effects.

Table 1

2015 Summary of Toxic Volatile Organic Compounds Monitored in New Jersey

Annual Average Concentration

Micrograms per Cubic Meter (μg/m³)

	Pollutant	Synonym	HAP	CAS No.	Camden	Chester	Elizabeth	New Bruns-wick
1	Acetaldehyde		*	75-07-0	1.880	0.536	1.732	1.446
2	Acetone			67-64-1	1.972	1.030	2.111	1.987
3	Acetonitrile		*	75-05-8	0.970	0.359	0.669	1.129
4	Acetylene			74-86-2	1.062	0.510	1.227	0.750
5	Acrolein[a]		*	107-02-8	0.924	0.682	0.949	0.696
6	Acrylonitrile		*	107-13-1	*ND*	*ND*	*ND*	*0.001*
7	tert-Amyl Methyl Ether			994-05-8	*0*	*0.001*	*0.0005*	*0.002*
8	Benzaldehyde			100-52-7	0.671	*0.027*	0.761	0.100
9	Benzene		*	71-43-2	0.857	0.397	0.818	0.528
10	Bromochloromethane			74-97-5	*ND*	*ND*	*ND*	*ND*
11	Bromodichloromethane			75-27-4	*0.008*	*0.004*	*0.001*	*0.006*
12	Bromoform		*	75-25-2	*0.011*	*0.008*	*0.009*	*0.006*
13	Bromomethane	Methyl bromide	*	74-83-9	0.931	0.049	0.057	0.048
14	1,3-Butadiene		*	106-99-0	0.089	0.022	0.117	0.048
15	Butyraldehyde			123-72-8	0.294	0.113	0.517	0.258
16	Carbon Disulfide		*	75-15-0	0.083	0.062	0.046	0.090
17	Carbon Tetrachloride		*	56-23-5	0.623	0.641	0.615	0.641
18	Chlorobenzene		*	108-90-7	*0.005*	*0.006*	*0.003*	*0.006*
19	Chloroethane	Ethyl chloride	*	75-00-3	0.082	0.066	0.074	0.100
20	Chloroform		*	67-66-3	0.148	0.114	0.151	0.137
21	Chloromethane	Methyl chloride	*	74-87-3	1.253	1.222	1.258	1.218
22	Chloroprene	2-Chloro-1,3-butadiene	*	126-99-8	*ND*	*ND*	*ND*	*ND*
23	Crotonaldehyde			123-73-9	0.273	0.081	0.445	0.333
24	Dibromochloromethane	Chlorodibromomethane		124-48-1	*0.021*	*0.016*	*0.015*	*0.015*
25	1,2-Dibromoethane	Ethylene dibromide	*	106-93-4	*0.005*	*0.002*	*0.003*	*0.002*
26	m-Dichlorobenzene	1,3-Dichlorobenzene		541-73-1	*0.005*	*0.006*	*0.004*	*0.003*
27	o-Dichlorobenzene	1,2-Dichlorobenzene		95-50-1	*0.006*	*0.006*	*0.005*	*0.003*
28	p-Dichlorobenzene	1,4-Dichlorobenzene	*	106-46-7	0.046	*0.016*	0.036	*0.017*
29	Dichlorodifluoromethane			75-71-8	2.612	2.547	2.533	2.520
30	1,1-Dichloroethane	Ethylidene dichloride	*	75-34-3	*0.001*	*0.002*	*ND*	*0.002*
31	1,2-Dichloroethane	Ethylene dichloride	*	107-06-2	0.085	0.068	0.074	0.073
32	1,1-Dichloroethylene	Vinylidene chloride	*	75-35-4	*0.005*	*0.004*	*0.004*	*0.003*
33	cis-1,2-Dichloroethylene	cis-1,2-Dichloroethene		156-59-2	*ND*	*0.005*	*ND*	*ND*
34	trans-1,2-Dichloroethylene	trans-1,2-Dichloroethene		156-60-5	*0.010*	*0.001*	*0.003*	*0.001*

- *Values in **italics** indicate averages based on less than 50% of samples above the detection limit.*
- **ND** indicates that all samples were below the detection limit.
- HAP = Hazardous air pollutant as listed in the Clean Air Act.

[a] Acrolein concentrations are highly uncertain because of problems with collection and analysis methods.

Table 1 (continued)
2015 Summary of Toxic Volatile Organic Compounds Monitored in New Jersey

Annual Average Concentration
Micrograms per Cubic Meter (μg/m3)

	Pollutant	Synonym	HAP	CAS No.	Camden	Chester	Elizabeth	New Bruns-wick
35	Dichloromethane	Methylene chloride	*	75-09-2	2.614	0.517	0.607	0.516
36	1,2-Dichloropropane	Propylene dichloride	*	78-87-5	*0.002*	*0.006*	*0.002*	*0.001*
37	cis-1,3-Dichloropropene	cis-1,3-Dichloropropylene	*	542-75-6	*ND*	*ND*	*ND*	*ND*
38	trans-1,3-Dichloropropene	trans-1,3-Dichloropropylene	*	542-75-6	*ND*	*ND*	*ND*	*ND*
39	Dichlorotetrafluoroethane	Freon 114		76-14-2	0.123	0.121	0.119	0.119
40	2,5-Dimethylbenzaldehyde			5799-94-2	*0.287*	*ND*	*0.003*	*0.043*
41	Ethyl Acrylate		*	140-88-5	*0.001*	*ND*	*0.002*	*ND*
42	Ethyl tert-Butyl Ether	tert-Butyl ethyl ether		637-92-3	*0.002*	0.077	*0.003*	*0.016*
43	Ethylbenzene		*	100-41-4	0.422	0.084	0.276	0.135
44	Formaldehyde		*	50-00-0	2.667	1.002	3.147	2.942
45	Hexachloro-1,3-butadiene	Hexachlorobutadiene	*	87-68-3	*0.017*	*0.021*	*0.020*	*0.018*
46	Hexaldehyde	Hexanaldehyde		66-25-1	0.132	0.026	1.610	0.090
47	Isovaleraldehyde			590-86-3	*0.059*	*0.004*	*0.365*	*0.098*
48	Methyl Ethyl Ketone	MEK		78-93-3	0.397	0.191	0.483	0.343
49	Methyl Isobutyl Ketone	MIBK	*	108-10-1	0.248	0.084	0.184	0.093
50	Methyl Methacrylate		*	80-62-6	*0.027*	*0.003*	*0.037*	*0.005*
51	Methyl tert-Butyl Ether	MTBE	*	1634-04-4	*0.003*	*0.009*	*0.005*	*0.008*
52	n-Octane			111-65-9	0.231	0.098	0.282	0.106
53	Propionaldehyde		*	123-38-6	1.151	0.194	0.353	0.672
54	Propylene			115-07-1	1.128	0.372	2.616	0.510
55	Styrene		*	100-42-5	3.078	*0.020*	0.054	0.042
56	1,1,2,2-Tetrachloroethane		*	79-34-5	*0.007*	*0.007*	*0.007*	*0.005*
57	Tetrachloroethylene	Perchloroethylene	*	127-18-4	0.161	0.066	0.163	0.084
58	Tolualdehydes				0.234	0.052	0.120	0.078
59	Toluene		*	108-88-3	6.145	0.475	1.845	0.814
60	1,2,4-Trichlorobenzene		*	102-82-1	*0.004*	*ND*	*ND*	*0.004*
61	1,1,1-Trichloroethane	Methyl chloroform	*	71-55-6	0.039	0.027	0.033	0.030
62	1,1,2-Trichloroethane		*	79-00-5	*ND*	*0.002*	*ND*	*0.001*
63	Trichloroethylene		*	79-01-6	0.073	*0.006*	*0.016*	*0.006*
64	Trichlorofluoromethane			75-69-4	2.283	1.348	1.371	1.348
65	Trichlorotrifluoroethane	1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	0.628	0.626	0.618	0.619
66	1,2,4-Trimethylbenzene			95-63-6	0.592	0.075	0.275	0.119
67	1,3,5-Trimethylbenzene			108-67-8	0.175	0.023	0.089	0.037
68	Valeraldehyde			110-62-3	0.089	0.023	0.223	0.582
69	Vinyl chloride		*	75-01-4	*0.014*	*0.004*	*0.006*	*0.004*
70	m,p-Xylene		*	1330-20-7	0.939	0.165	0.693	0.286
71	o-Xylene		*	95-47-6	0.459	0.084	0.309	0.135

- *Values in **italics** indicate averages based on less than 50% of samples above the detection limit.*
- **ND** indicates that all samples were below the detection limit.
- HAP = Hazardous air pollutant as listed in the Clean Air Act.

Table 2
2015 New Jersey Toxic Metals Summary & Risk Ratios

Pollutant	HAP[a]	Annual average concentration ($\mu g/m^3$)					Health Benchmark ($\mu g/m^3$)[b]	Risk Ratio[c]				
		Camden	Chester	Elizabeth	New Brunswick	Newark		Camden	Chester	Elizabeth	New Brunswick	Newark
Antimony	*	0.018	0.016	0.018	0.017	0.019	0.2	0.1	0.1	0.1	0.1	0.1
Arsenic	*	*0.001*	*0.0004*	*0.0004*	*0.001*	*0.0003*	*2.30E-04*	*4.3*	*1.7*	*1.7*	*2.2*	*1.3*
Cadmium	*	*0.002*	*0.002*	*0.003*	*0.002*	*0.001*	*2.40E-04*	*8*	*7*	*12*	*8*	*5*
Chlorine	*	0.215	0.007	0.077	0.034	0.064	0.2	1	0.04	0.4	0.2	0.3
Chromium[d]	*	0.003	*0.002*	0.002	0.003	0.005	*8.30E-05*	See "e" below				
Cobalt	*	0.001	0.001	0.001	0.001	0.001	*1.10E-04*	7	5	7	6	6
Lead	*	0.003	*0.001*	0.003	0.002	0.002	*0.083*	0.03	0.01	0.03	0.02	0.02
Manganese	*	0.003	*0.001*	0.002	0.001	0.002	0.05	0.05	0.01	0.04	0.02	0.03
Nickel	*	0.001	*0.001*	0.001	0.001	0.002	0.014	0.1	0.1	0.1	0.1	0.1
Nickel[e]	*	0.001	*0.001*	0.001	0.001	0.002	*2.10E-03*	See "f" below				
Phosphorus	*	0.005	0.005	0.005	0.005	0.005	0.07	0.07	0.07	0.07	0.07	0.07
Selenium	*	0.001	0.001	0.001	0.001	0.001	20	0.0001	0.00005	0.0001	0.0001	0.00005
Silicon		0.079	0.046	0.149	0.057	0.108	3	0.03	0.02	0.05	0.02	0.04
Vanadium		0.001	0.001	0.002	0.001	0.002	0.1	0.01	0.01	0.02	0.01	0.02

NOTE: Concentrations and risk ratios in ***italics*** are based on less than 50% of samples above the detection limit.

[a] HAP = Hazardous air pollutant listed in the Clean Air Act.

[b] The health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. Toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html.

- *Health benchmarks in italics have a cancer endpoint.*
- For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one-in-a-million increase in the likelihood of getting cancer, even after a lifetime of exposure.
- For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime.

[c] The risk ratio for a chemical is a comparison of the annual mean air concentration to the health benchmark. A risk ratio greater than one may be of concern.

[d] Chromium - The health benchmark is based on carcinogenicity of hexavalent chromium (Cr^{+6}). It is not known how much of the chromium measured by the monitor is hexavalent.

[e] Nickel - The cancer-based health benchmark for nickel is based on specific nickel compounds. It is not known how much of the nickel measured by the monitor is in that form.

More information on speciated fine particulate matter measured in New Jersey can be found in the NJDEP's 2015 Air Quality Report, Appendix B - Fine Particulate Speciation Summary, at www.njaqinow.net/.

ESTIMATING HEALTH RISK

The effects on human health resulting from exposure to specific air toxics can be estimated by using chemical-specific **health benchmarks**. These are based on toxicity values developed by the USEPA and other agencies, using chemical-specific animal or human health studies. For carcinogens, chemicals suspected of causing cancer, the health benchmark is the concentration of the pollutant that corresponds to a one-in-a-million increase in the risk of getting cancer if a person was to breathe that concentration over his or her entire lifetime. The health benchmark for a noncarcinogen is the air concentration at which no adverse health effect is expected to occur, even if a person is exposed to that concentration on a daily basis for a lifetime (this is also known as a reference concentration). Not all air toxics have health benchmarks, because of a lack of toxicity studies. Available health benchmarks for the VOCs and carbonyls monitored in New Jersey are listed in Tables 4 through 7.

If ambient air concentrations exceed health benchmarks, regulatory agencies can focus their efforts on reducing emissions or exposure to those chemicals. Dividing the air concentration of a chemical by its health benchmark gives us a number referred to as a **risk ratio**. If the risk ratio is less than one, the air concentration should not pose a health risk. If it is greater than one, it may be of concern. The risk ratio also indicates how much higher or lower the estimated air concentration is compared to the health benchmark.

The pollutants with risk ratios greater than one for at least one monitoring site are summarized in Table 3. Camden had fourteen pollutants with annual average concentrations that exceeded their health benchmarks. Elizabeth had twelve, and New Brunswick and Chester had eleven. The Newark Firehouse site does not have a VOC monitor. The toxic VOCs with risk ratios greater than one at all sites are acetaldehyde, acrylonitrile, benzene, carbon tetrachloride, chloroform, chloromethane (methyl chloride), 1,2-dichloroethane (ethylene dichloride), and formaldehyde. Toxic metals that had risk ratios greater than one at the five CSN monitoring sites were arsenic, cadmium, and cobalt.

Although the mean concentrations of acrolein exceeded the health benchmark at all sites (see Tables 4 through 7), risk ratios were not calculated because of problems with the sampling and analysis method. Formaldehyde contributed the highest risks, but note that the risks varied substantially. Risk ratios for ethylbenzene and styrene were of concern only at the Camden site.

Table 3
Monitored Toxic Air Pollutants with Risk Ratios Greater Than One in NJ for 2015

POLLUTANT		Risk Ratio				
		Camden	**Chester**	**Elizabeth**	**New Brunswick**	**Newark**
1	Acetaldehyde	4	1.2	4	3	
2	Arsenic	*2.6*	*1.7*	*1.7*	*2.2*	*1.3*
3	Benzene	7	3	6	4	
4	1,3-Butadiene	3		4	1.5	
5	Cadmium	*6*	*7*	*12*	*8*	*5*
6	Carbon Tetrachloride	4	4	4	4	
7	Chloroform	3	3	4	3	
8	Chloromethane	2.2	2.2	2.2	2.2	
9	Cobalt	7	5	7	6	6
10	1,2 Dibromoethane	*3*	1.1	1.6		
11	1,2-Dichloroethane	2.2	1.8	2	1.9	
12	Ethylbenzene	1.1				
13	Formaldehyde	35	13	41	38	
14	Styrene	1.7				

NOTE: Values in italics are based on less than 50% of samples above the detection limit.

TRENDS AND COMPARISONS

Monitoring of air toxics in New Jersey has been going on for over a decade, although it continues to evolve, with improvements in the ability to detect given chemicals at lower concentrations. Figures 5 through 15 present data for some of the VOCs that have been sampled over the past decade. As mentioned previously, the first toxics monitoring site in Camden (Camden Lab) was shut down in 2008. It is identified in Figures 4 through 20 as "Camden 1." The new Camden site (Camden Spruce Street), located about two miles from the old site, is designated "Camden 2."

According to USEPA's National Air Toxics Assessment (NATA), **acetaldehyde** concentrations in New Jersey (Figure 4) are primarily influenced by secondary formation, a process in which chemicals in the air are transformed into other chemicals by chemical reactions. Mobile sources also contribute to ambient levels. In 2003, no data was collected in Camden after September, which could have had an influence on the low annual average for that year. In 2004 in both Camden and New Brunswick, high levels of acetaldehyde were measured over a number of weeks.

Figure 5 shows a gradual decrease in **benzene** concentrations over the past decade. Most benzene now comes from mobile and area sources, and is also transported from other regions (background). Sources of **1,3-butadiene** (Figure 6) are similar to those of benzene.

Carbon tetrachloride (Figure 7) was once used extensively as a degreaser, household cleaner, propellant, refrigerant, and fumigant. It has been phased out of most production and use because of its toxicity and its ability to deplete stratospheric ozone. However, about 100 tons are still emitted annually by industry in the U.S, although no emissions have been reported in New Jersey for a number of years. It degrades slowly in the environment, so it can be transported from other area and levels in the air can remain relatively steady.

Some of the increase in **chloroform** concentrations shown in Figure 8 is believed to be from improvements in the detection limit. Nonpoint sources and background are the major contributors to ambient chloroform levels. The high annual average concentration for New Brunswick in 2014 is attributable to a period of high values in May and June.

Chloromethane (also known as methyl chloride) levels are influenced primarily by background. Figure 9 shows that concentrations have remained relatively stable from year to year, and that all the sites show similar levels.

1,2-Dibromoethane (or ethylene dibromide) (Figure 10) is currently used in the treatment of felled logs for bark beetles and termites, and control of wax moths in beehives. It is also used as an intermediate for dyes, resins, waxes, and gums. It was once used as an additive to leaded gasoline and as a soil and grain fumigant, but those uses have been banned by USEPA.

1,4-Dichlorobenzene (Figure 11) is emitted primarily from nonpoint sources. It is used in products such as pesticides, disinfectant, mothballs and toilet deodorizer blocks. There is also a significant background level. The high annual average for New Brunswick in 2005 is attributable to an exceptionally high reading on July 27th that may be a lab error.

1,2-Dichloroethane (also called ethylene dichloride) (Figure 12) is primarily used in the production of vinyl chloride, as well as other chemicals. It is used in solvents for various extraction and cleaning purposes in organic synthesis. It is also used as a dispersant in rubber and plastics, as a wetting and penetrating agent.

Ethylbenzene is associated with mobile sources, which is probably why it is lowest at Chester (Figure 13). 2001 data for Chester and New Brunswick have been omitted from the graph because of technical problems encountered when sampling was begun that May.

Formaldehyde (Figure 14) is a ubiquitous pollutant that is often found at higher concentrations indoors rather than outdoors because of its use in many consumer goods. It is used in the production of fertilizer, paper, plywood, urea-formaldehyde resins, and many other products. In New Jersey the primary emitters of formaldehyde are on-road mobile sources, although secondary formation and transport contribute significantly to high outdoor concentrations. In 2014, concentrations at the New Brunswick site were consistently higher than at the other monitors, although levels dropped in 2015.

Styrene is used predominantly in the production of polystyrene plastics and resins. It is also used as an intermediate in the synthesis of materials used for ion exchange resins and to produce copolymers. A possible source of the higher concentrations at the Camden Spruce Street monitor (see Figure 15) has not been identified.

Figure 4
ACETALDEHYDE – New Jersey Monitored Concentrations

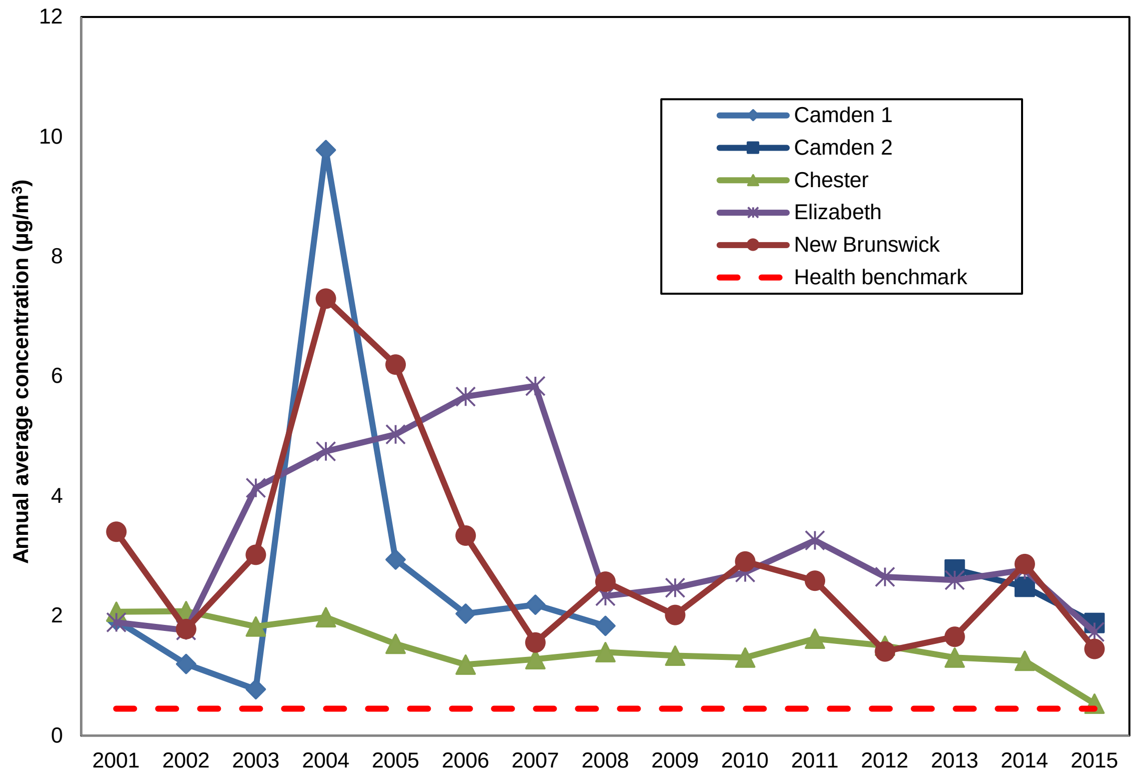


Figure 5
BENZENE – New Jersey Monitored Concentrations

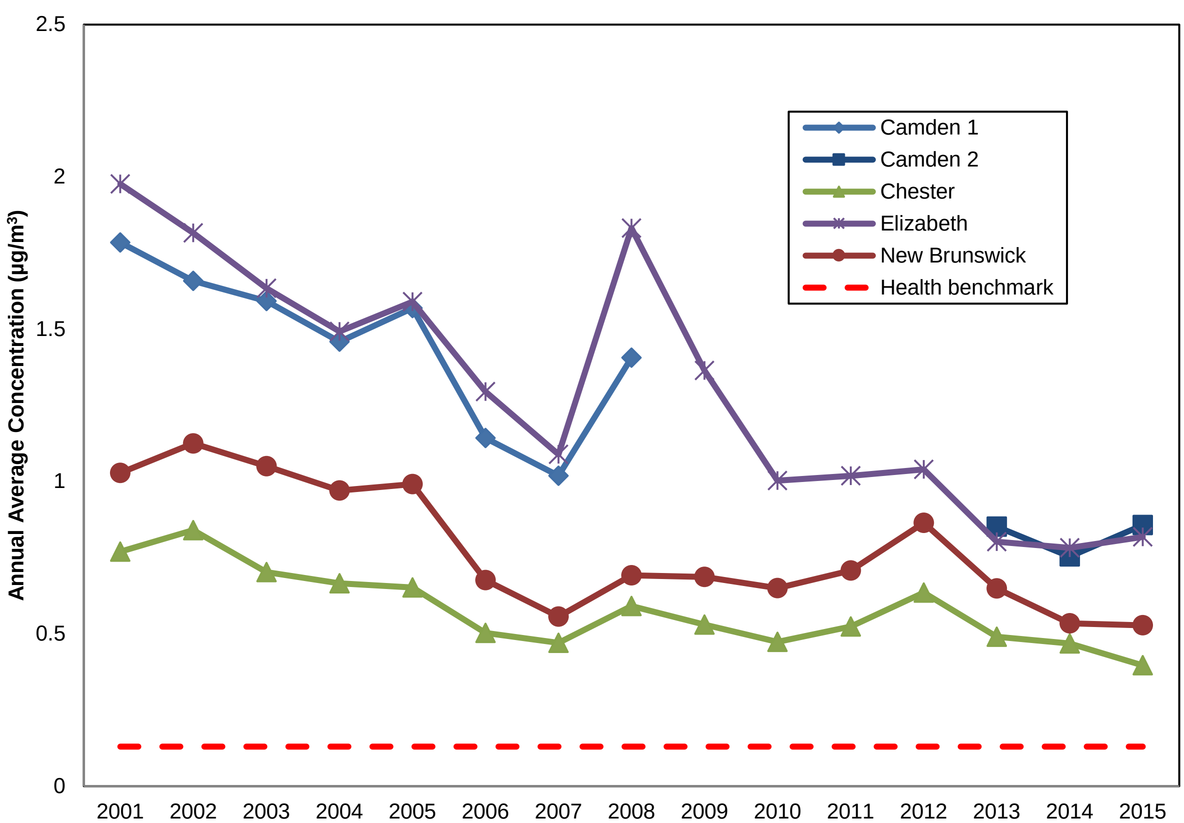


Figure 6
1,3-BUTADIENE – New Jersey Monitored Concentrations

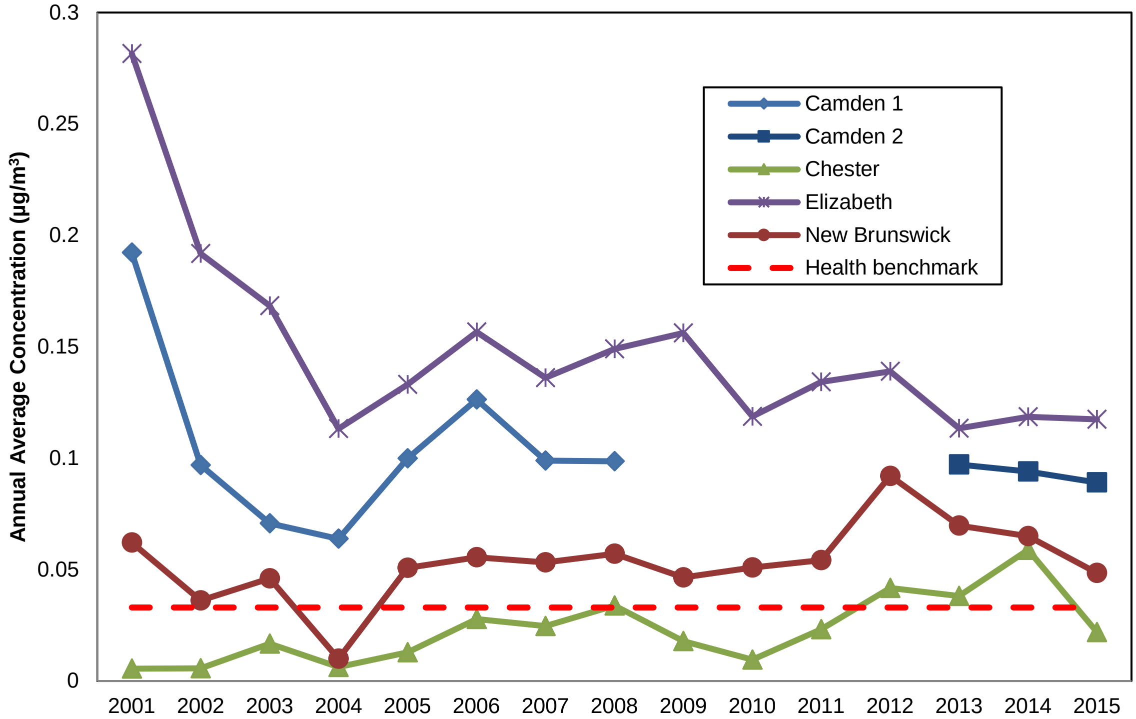


Figure 7
CARBON TETRACHLORIDE – New Jersey Monitored Concentrations

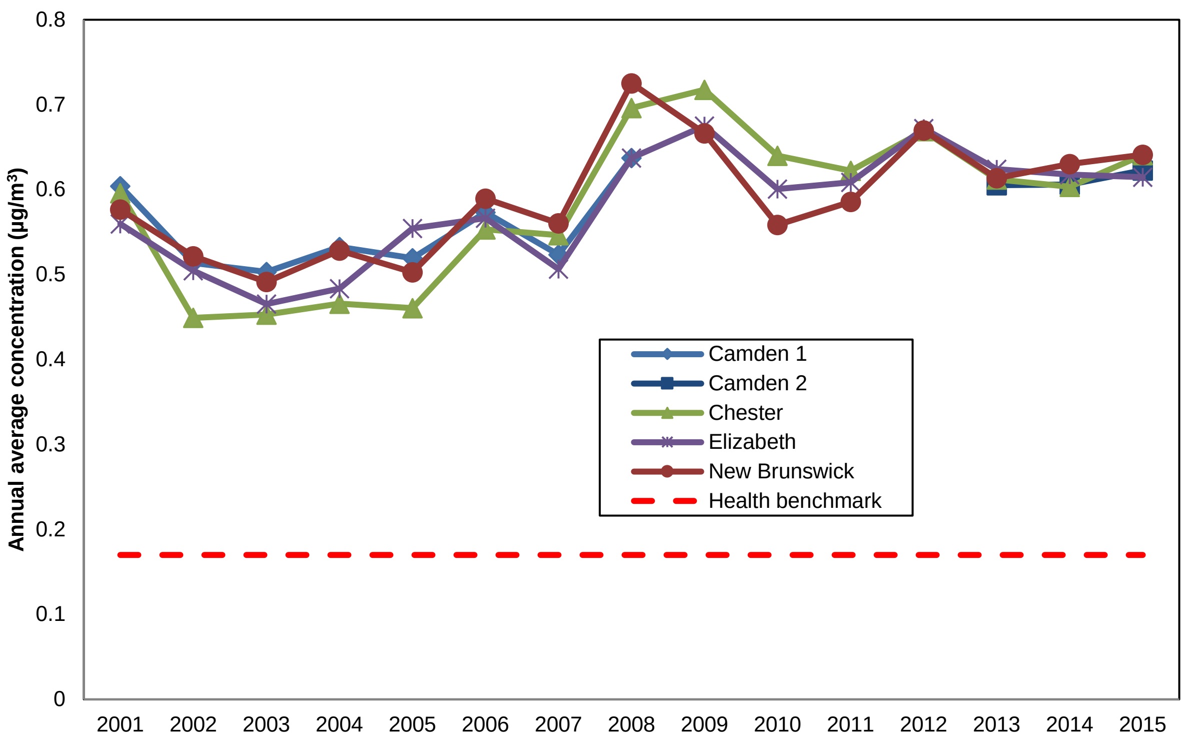


Figure 8

CHLOROFORM – New Jersey Monitored Concentrations

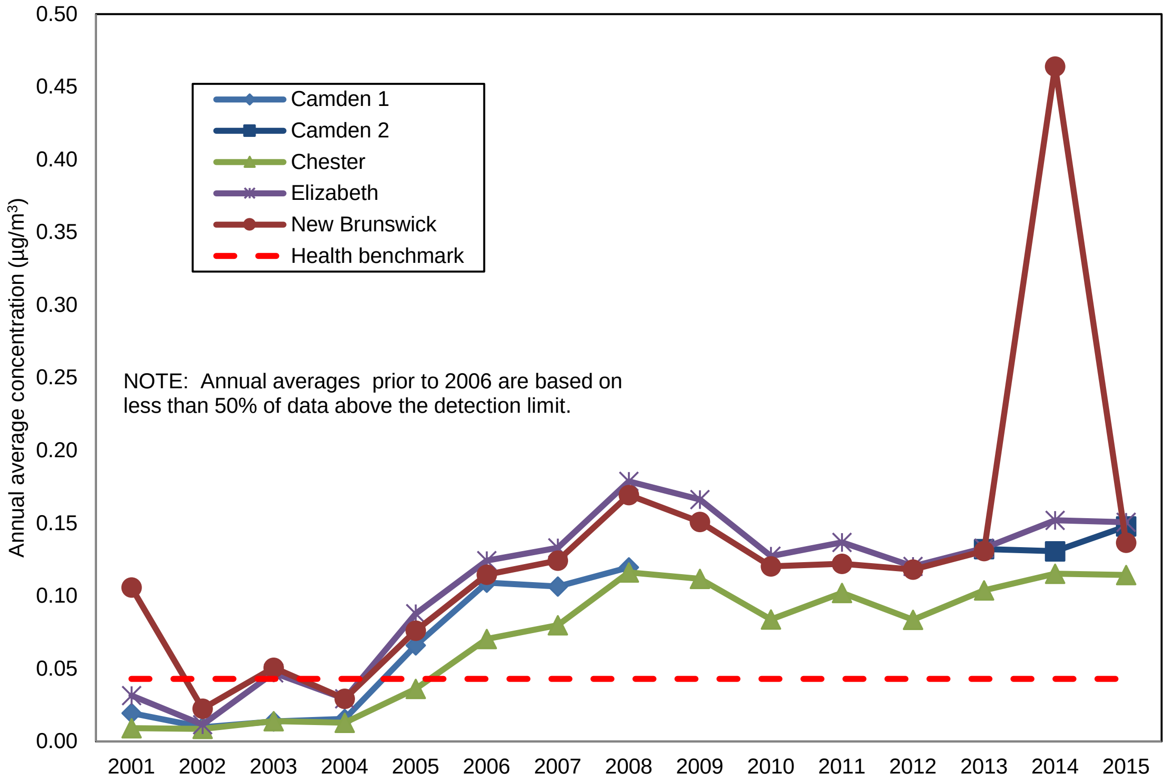


Figure 9

CHLOROMETHANE (Methyl Chloride) – New Jersey Monitored Concentrations

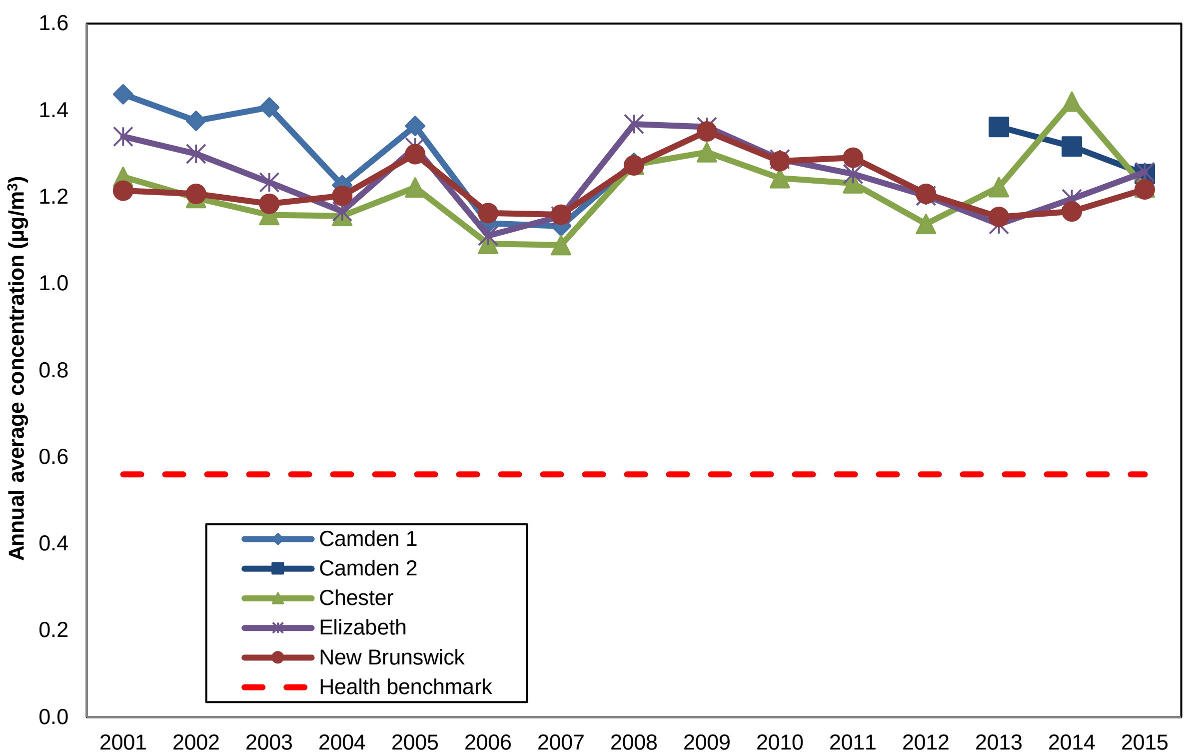


Figure 10

1,2-DIBROMOETHANE (Ethylene Dibromide) – New Jersey Monitored Concentrations

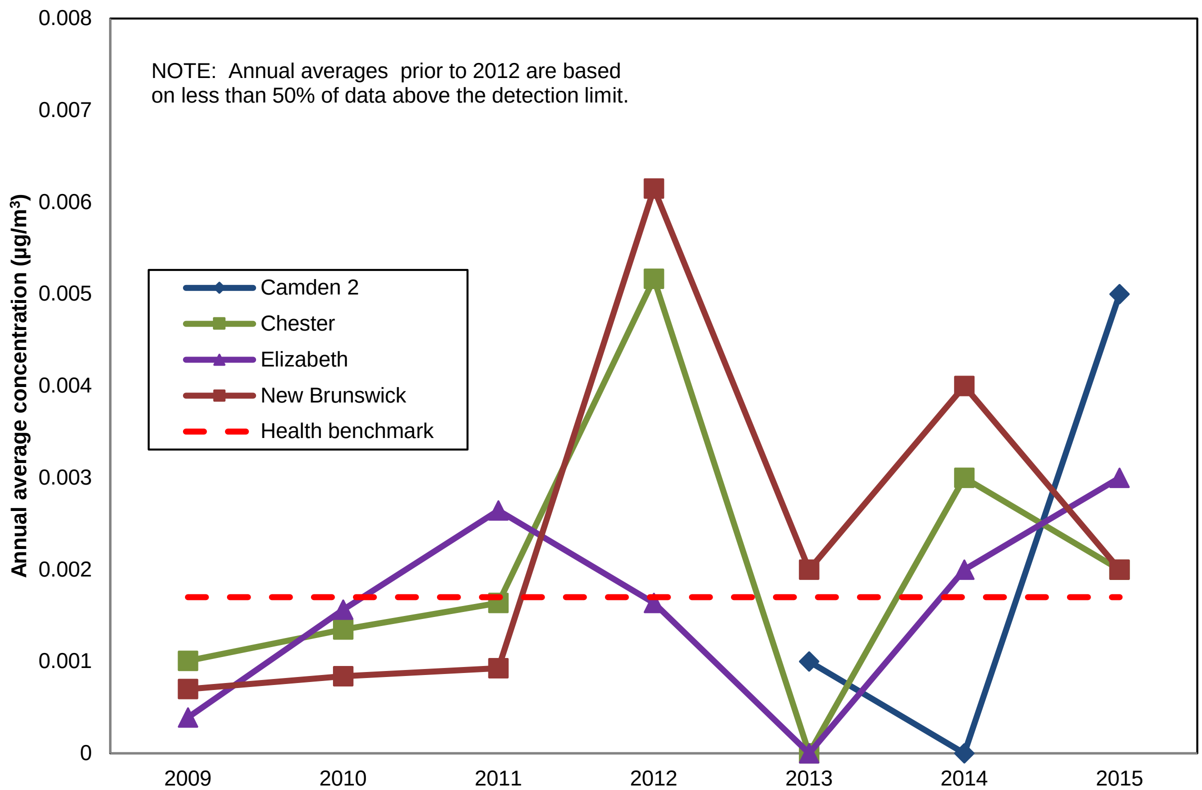


Figure 11

1,4-DICHLOROBENZENE – New Jersey Monitored Concentrations

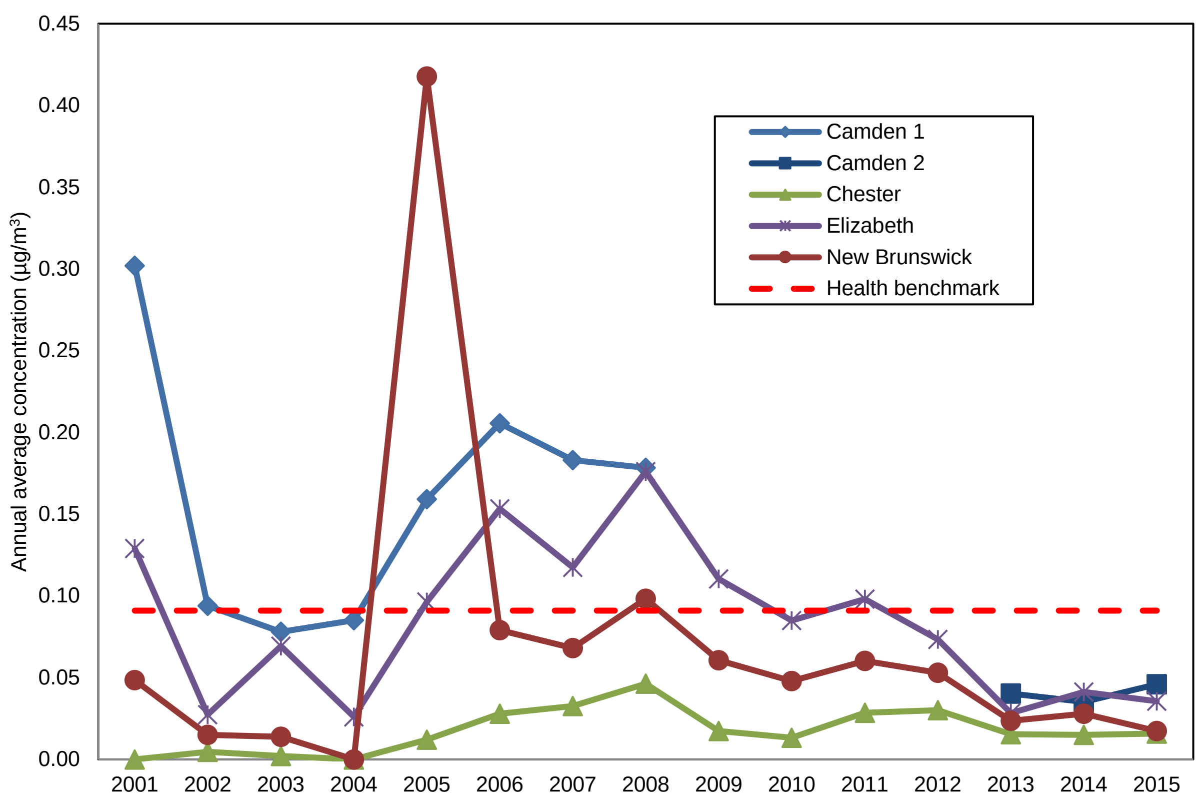


Figure 12
1,2-DICHLOROETHANE (Ethylene Dichloride) – New Jersey Monitored Concentrations

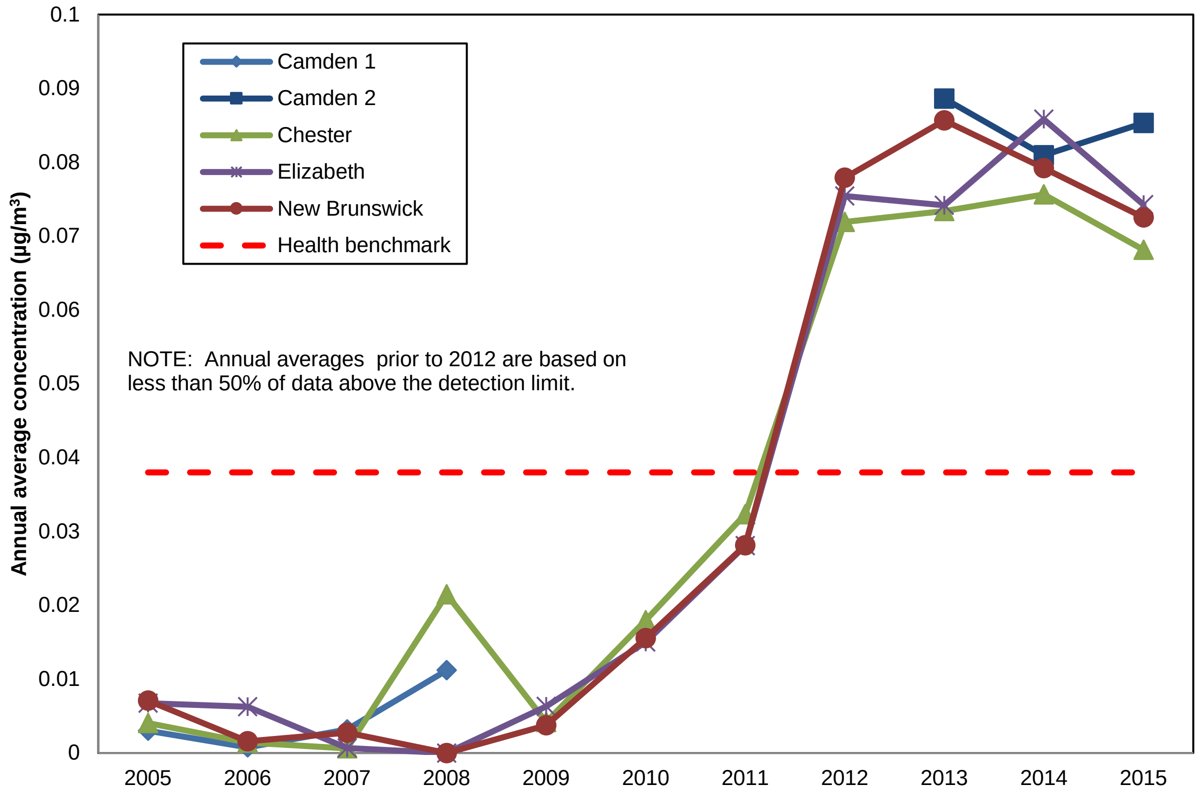


Figure 13
ETHYLBENZENE – New Jersey Monitored Concentrations

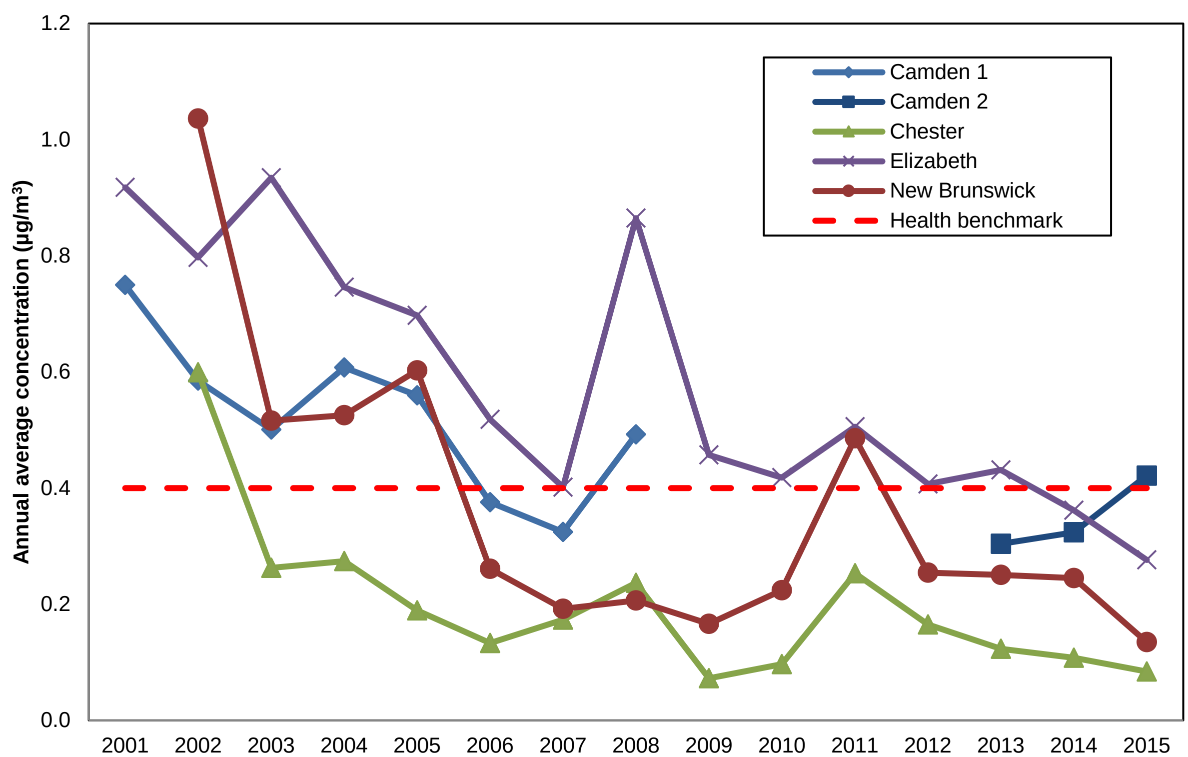


Figure 14
FORMALDEHYDE – New Jersey Monitored Concentrations

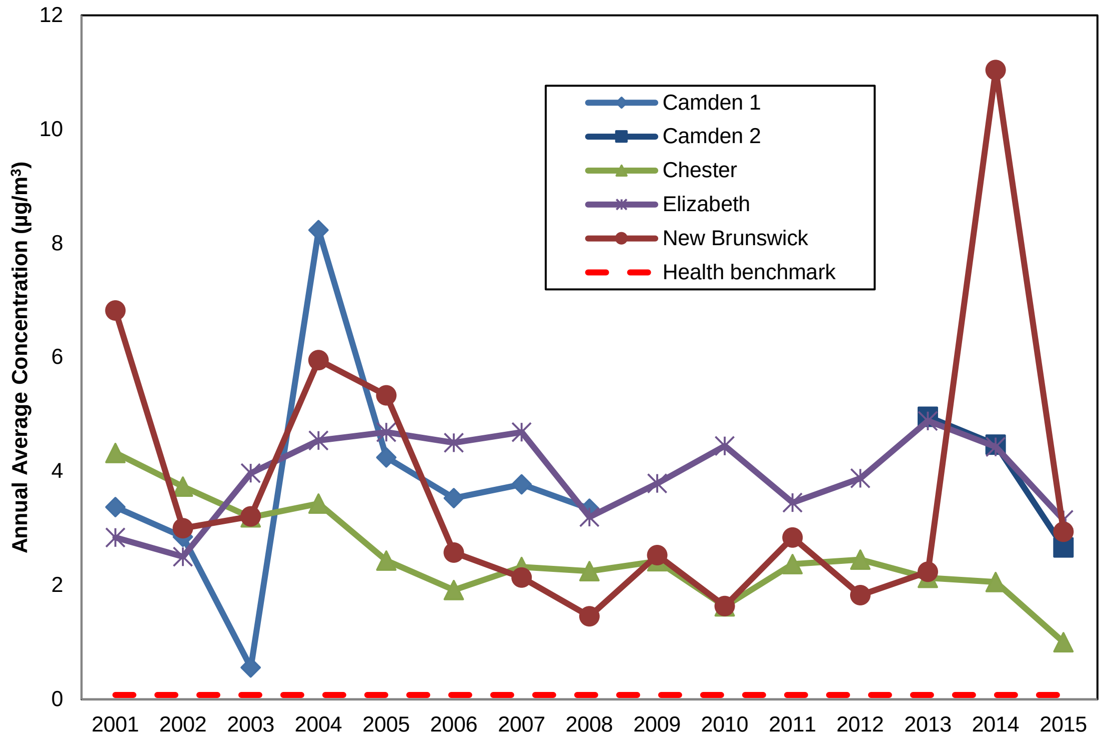
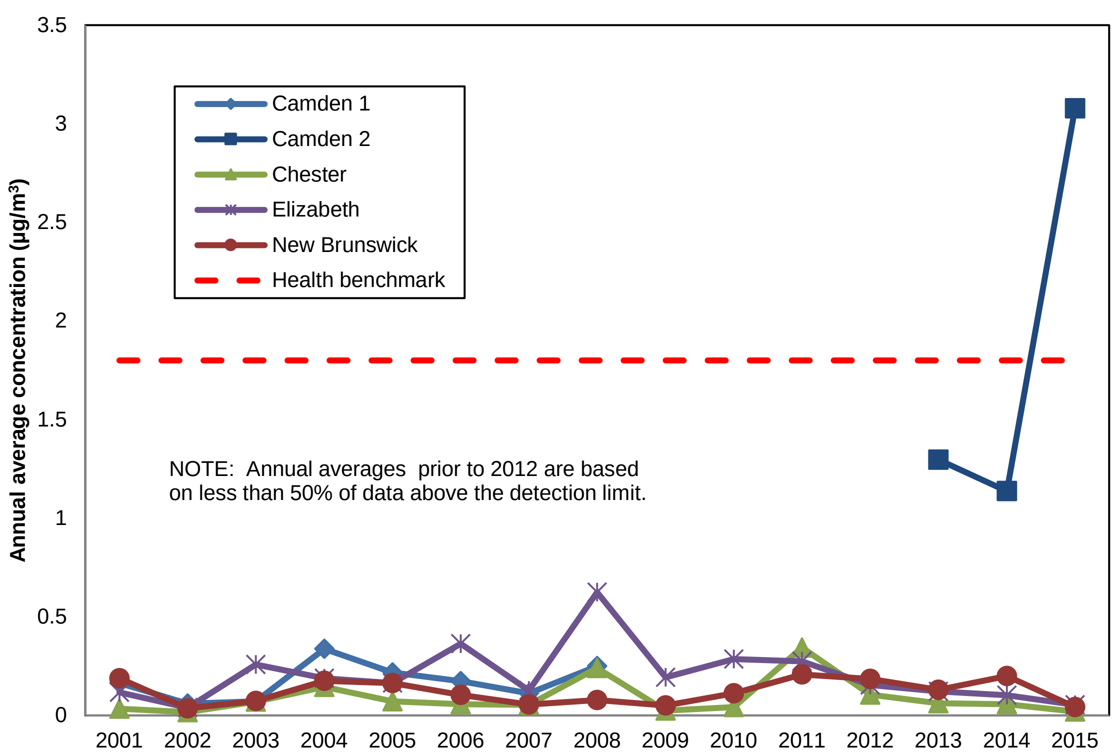


Figure 15
STYRENE – New Jersey Monitored Concentrations



Toxic metals data from the $PM_{2.5}$ speciation monitors at Camden Spruce Street, Chester, Elizabeth Lab, New Brunswick and Newark Firehouse are presented in Figures 16 through 20. The Newark site became operational in 2010, and a new Camden site was established in 2013. The original Camden site was shut down in 2008.

Chromium and nickel are shown here because USEPA NATA modeling indicated that there are levels of their carcinogenic forms in the air above the one-in-a-million cancer risk level. The data in Figures 18 and 20 are for total chromium and total nickel. The specific carcinogenic compounds cannot be measured with available monitoring methods.

Arsenic, cadmium, and cobalt concentrations are all influenced by combustion, industrial processes, and transport.

Note that in some of the graphs specific years are marked with an asterisk, indicating that less than 50% of the samples used to calculate the annual average were above the detection limit. Values below the detection limit are considered to be zero.

Figure 16
ARSENIC – New Jersey Monitored Concentrations

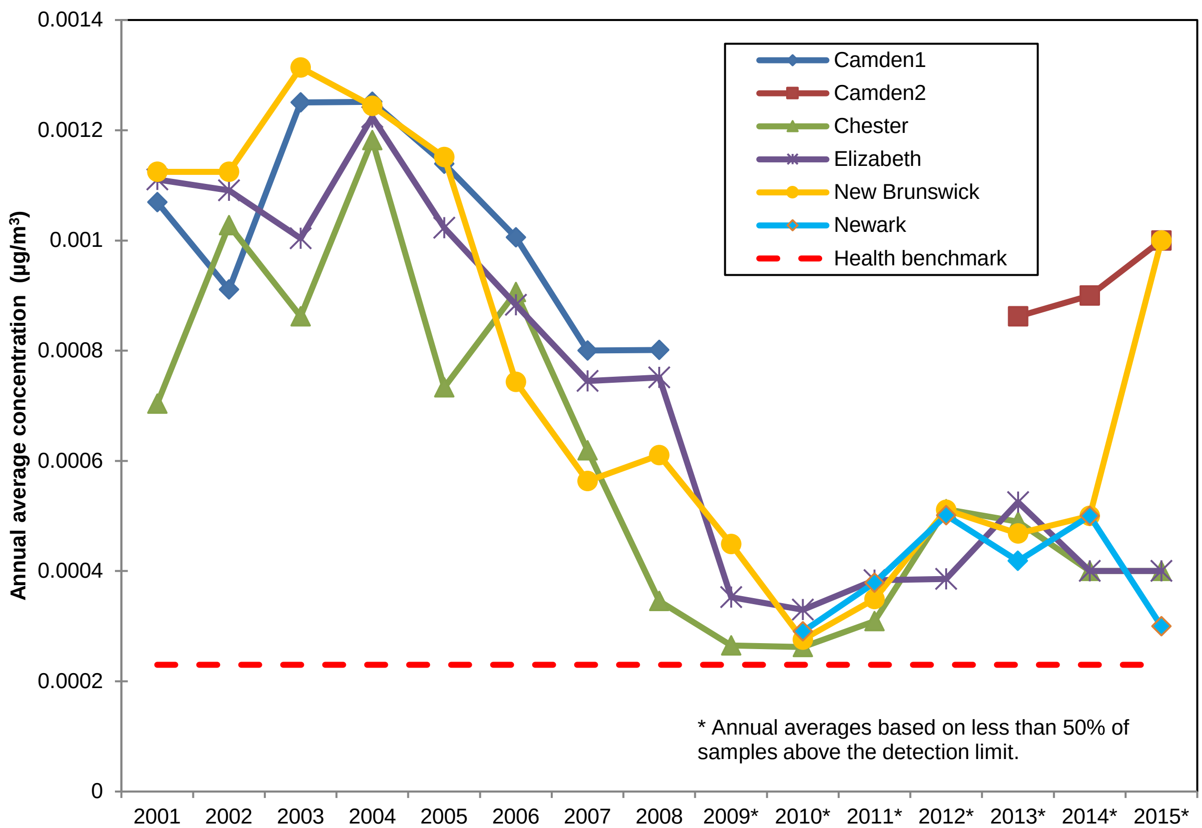


Figure 17
CADMIUM – New Jersey Monitored Concentrations

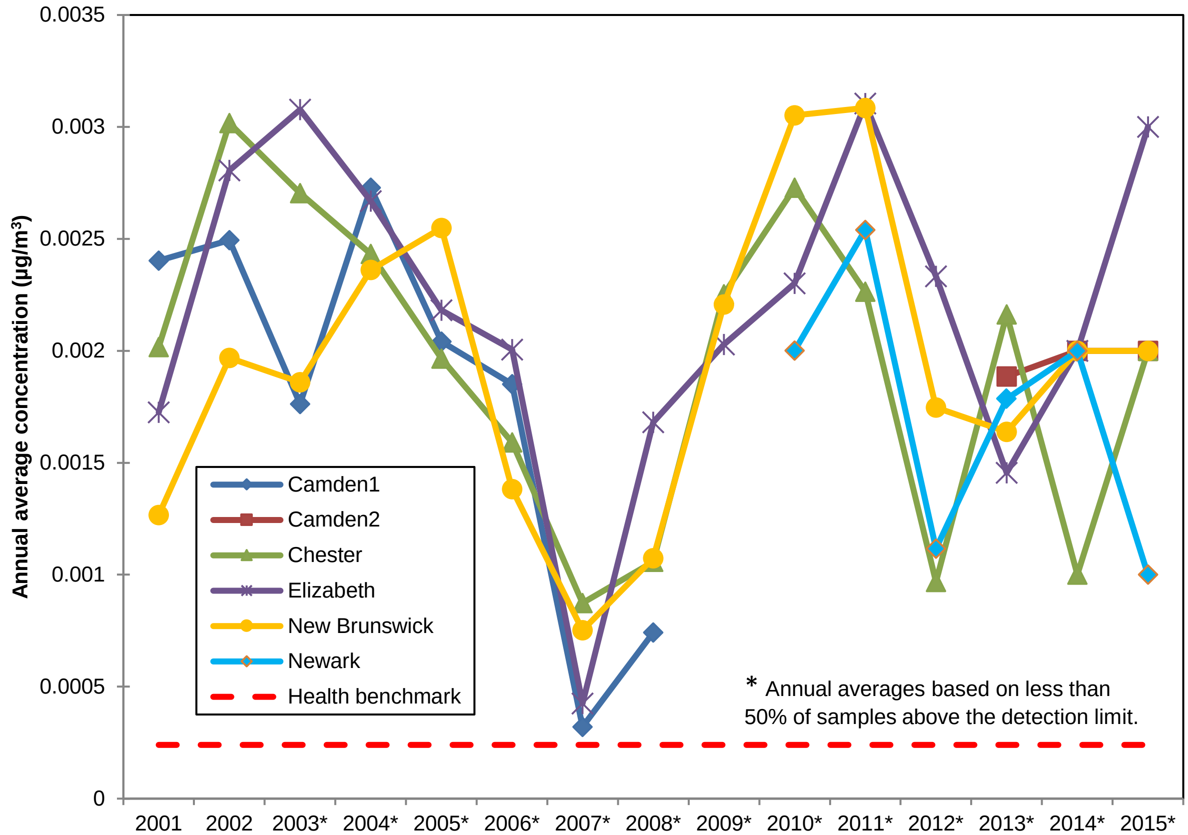


Figure 18
CHROMIUM – New Jersey Monitored Concentrations

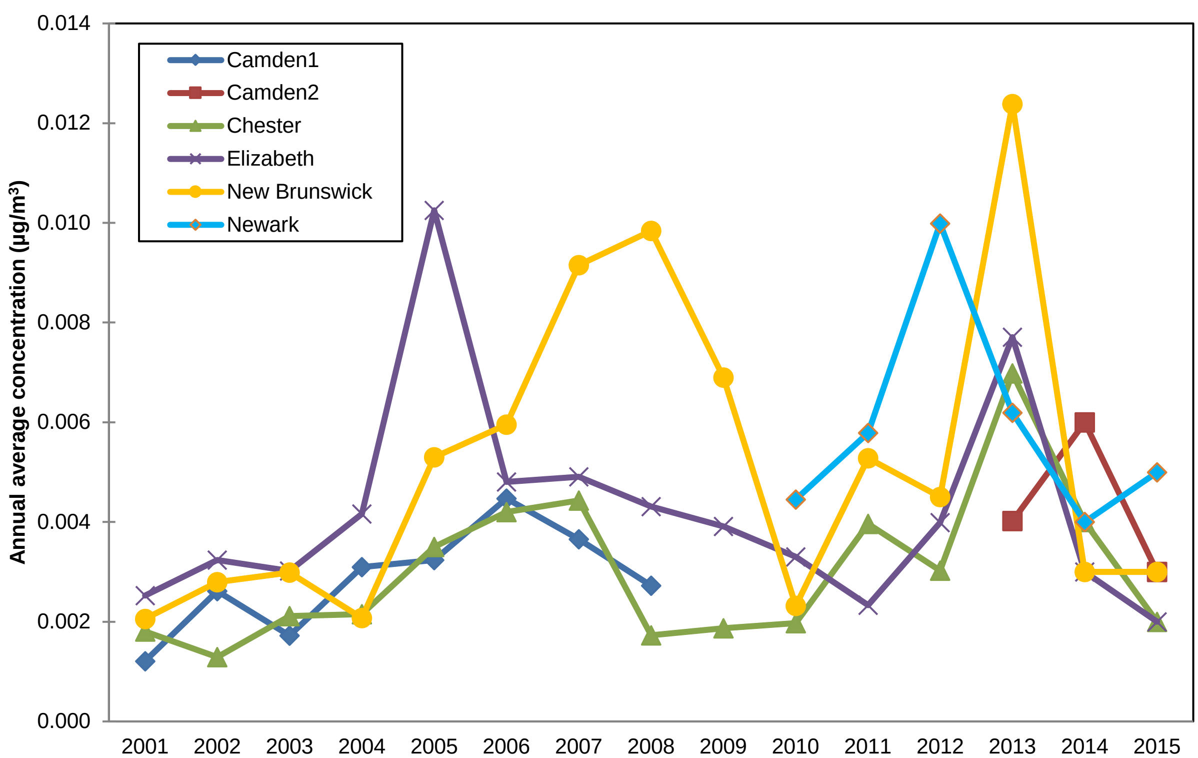


Figure 19
COBALT – New Jersey Monitored Concentrations

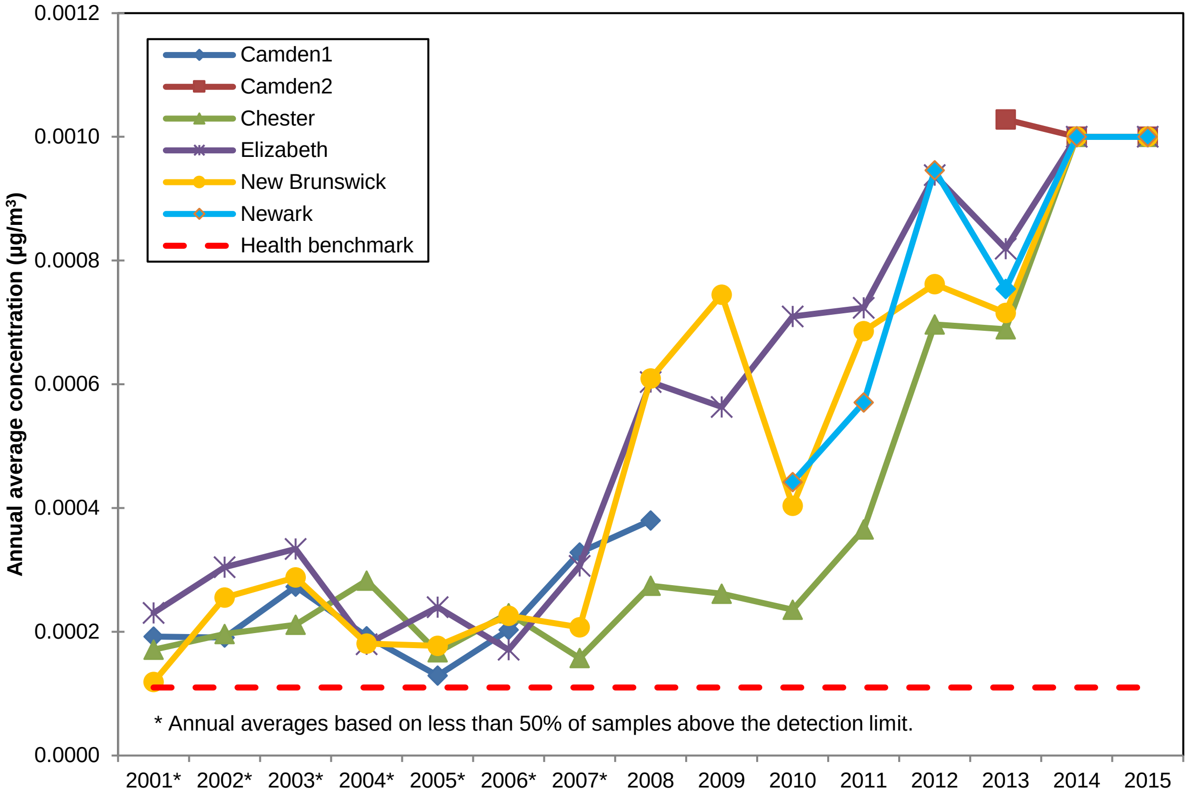


Figure 20
NICKEL – New Jersey Monitored Concentrations

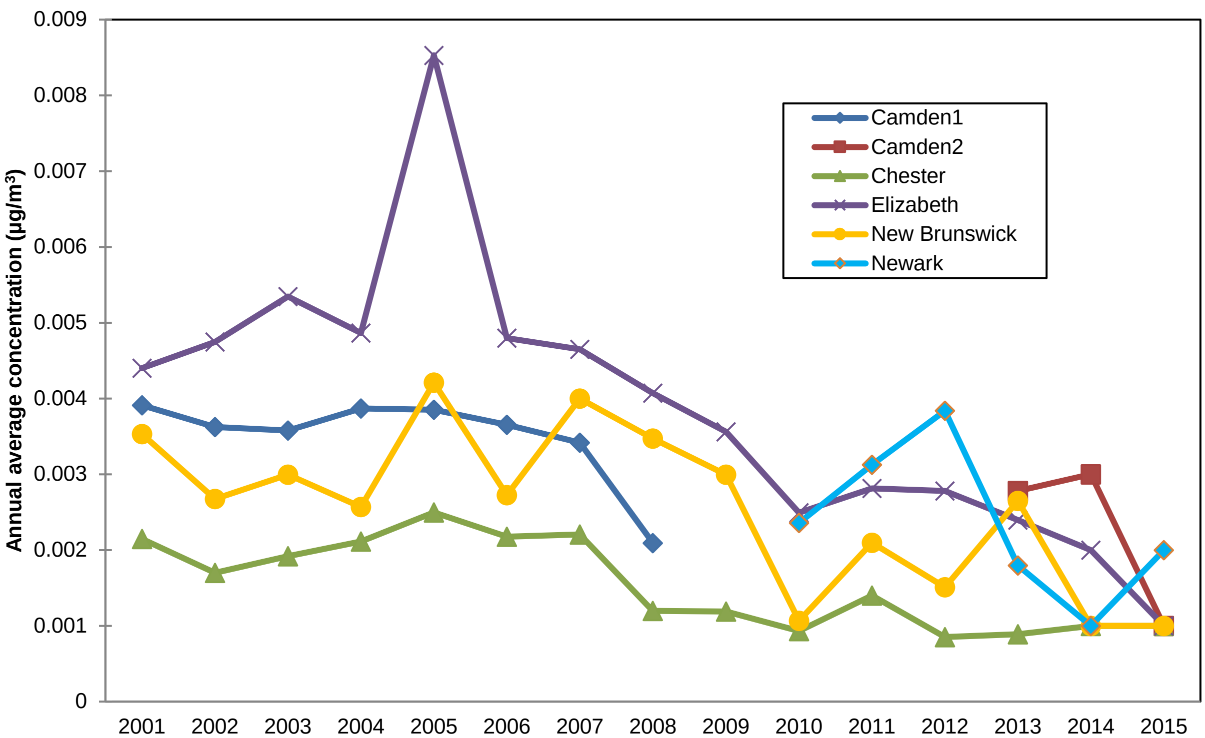


Table 4

CAMDEN SPRUCE ST-NJ 2015 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	1.044	0.978	3.750	1.880	1.762	6.757	0.45	**4**	0.005	100
Acetone	67-64-1	0.830	0.812	2.570	1.972	1.929	6.105	31000	0.0001	0.014	75
Acetonitrile	75-05-8	0.578	0.481	6.460	0.970	0.808	10.847	60	0.02	0.020	100
Acetylene	74-86-2	0.997	0.845	3.130	1.062	0.900	3.333			0.033	100
Acrolein[g]	107-02-8	0.403	0.386	0.968	0.924	0.885	2.220	0.02		0.046	100
Acrylonitrile	107-13-1	*0*	0	0	*0*	0	0	0.015		0.065	2
tert-Amyl Methyl Ether	994-05-8	*0*	0	0	*0*	0	0			0.033	2
Benzaldehyde	100-52-7	0.155	0.036	1.33	0.671	0.156	5.773			0.074	100
Benzene	71-43-2	0.268	0.224	1.24	0.857	0.716	3.962	0.13	**7**	0.010	100
Bromochloromethane	74-97-5	*0*	0	0	*0*	0	0	40		0.206	2
Bromodichloromethane	75-27-4	*0.001*	0	0.012	*0.008*	0	0.080	0.027	0.3	0.101	13
Bromoform	75-25-2	*0.001*	0	0.012	*0.011*	0	0.124	0.91	0.01	0.186	15
Bromomethane	74-83-9	0.240	0.018	5.14	0.931	0.070	19.958	5	0.2	0.066	100
1,3-Butadiene	106-99-0	0.040	0.029	0.18	0.089	0.064	0.398	0.033	**3**	0.031	100
Butyraldehyde	123-72-8	0.100	0.089	0.305	0.294	0.262	0.899			0.027	100
Carbon Disulfide	75-15-0	0.027	0.024	0.162	0.083	0.075	0.505	700	0.0001	0.009	100
Carbon Tetrachloride	56-23-5	0.099	0.1	0.125	0.623	0.629	0.786	0.17	**4**	0.075	100
Chlorobenzene	108-90-7	0.001	0	0.014	*0.005*	0	0.064	1000	0.00001	0.046	15
Chloroethane	75-00-3	0.031	0.028	0.087	0.082	0.074	0.230	10000	0.00001	0.047	94
Chloroform	67-66-3	0.030	0.029	0.056	0.148	0.142	0.273	0.043	**3**	0.044	100
Chloromethane	74-87-3	0.607	0.6	0.873	1.253	1.239	1.803	0.56	**2.2**	0.033	100
Chloroprene	126-99-8	*0*	0	0	*0*	0	0	0.002		0.040	2
Crotonaldehyde	123-73-9	0.095	0.04	0.462	0.273	0.115	1.324			0.049	75
Dibromochloromethane	124-48-1	*0.002*	0	0.011	*0.021*	0	0.094	0.037	0.6	0.051	44
1,2-Dibromoethane	106-93-4	*0.001*	0	0.01	*0.005*	0	0.077	0.0017	**3**	0.138	10
m-Dichlorobenzene	541-73-1	*0.001*	0	0.009	*0.005*	0	0.054			0.168	16
o-Dichlorobenzene	95-50-1	*0.001*	0	0.01	*0.006*	0	0.060	200	0.00003	0.144	16
p-Dichlorobenzene	106-46-7	0.008	0.008	0.031	0.046	0.048	0.186	0.091	0.5	0.156	56
Dichlorodifluoromethane	75-71-8	0.528	0.522	0.708	2.612	2.581	3.501	100	0.03	0.064	100
1,1-Dichloroethane	75-34-3	*0.000*	0	0.021	*0.001*	0	0.085	0.63	0.002	0.061	3
1,2-Dichloroethane	107-06-2	0.021	0.02	0.062	0.085	0.081	0.251	0.038	**2.2**	0.053	98
1,1-Dichloroethene	75-35-4	0.001	0	0.01	0.005	0	0.040	200	0.00002	0.032	19
cis-1,2-Dichloroethylene	156-59-2	*0*	0	0	*0*	0	0			0.048	2
trans-1,2-Dichloroethylene	156-60-5	*0.002*	0	0.044	*0.010*	0	0.174			0.048	19
Dichloromethane	75-09-2	0.752	0.129	36.800	2.614	0.448	127.833	77	0.03	0.028	100

[a] See page 31 for footnotes.

Table 4 (continued)

CAMDEN SPRUCE ST-NJ 2015 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	*0.0004*	0	0.015	*0.002*	0	0.069	0.1	0.02	0.079	5
cis-1,3-Dichloropropene	542-75-6	*0*	0	0	*0*	0	0			0.064	2
trans-1,3-Dichloropropene	542-75-6	*0*	0	0	*0*	0	0			0.095	2
Dichlorotetrafluoroethane	76-14-2	0.018	0.017	0.027	0.123	0.119	0.189			0.133	100
2,5-Dimethylbenzaldehyde	5799-94-2	*0.052*	0	0.56	*0.287*	0	3.073			0.011	23
Ethyl Acrylate	140-88-5	*0.000*	0	0.008	*0.001*	0	0.033	8	0.0001	0.033	3
Ethyl tert-Butyl Ether	637-92-3	*0.000*	0	0.009	*0.002*	0	0.038			0.046	6
Ethylbenzene	100-41-4	0.097	0.088	0.323	0.422	0.382	1.403	0.4	**1.1**	0.035	100
Formaldehyde	50-00-0	2.172	2.05	6.55	2.667	2.518	8.044	0.077	**35**	0.023	100
Hexachloro-1,3-butadiene	87-68-3	*0.002*	0	0.007	*0.017*	0	0.075	0.045	0.4	0.117	33
Hexaldehyde	66-25-1	0.032	0.025	0.361	0.132	0.102	1.479			0.139	77
Isovaleraldehyde	590-86-3	*0.017*	0	0.134	*0.059*	0	0.472			0.007	28
Methyl Ethyl Ketone	78-93-3	0.135	0.128	0.538	0.397	0.377	1.586	5000	0.0001	0.074	84
Methyl Isobutyl Ketone	108-10-1	0.061	0.05	0.262	0.248	0.205	1.073	3000	0.0001	0.057	100
Methyl Methacrylate	80-62-6	*0.007*	0	0.045	*0.027*	0	0.184	700	0.00004	0.115	35
Methyl tert-Butyl Ether	1634-04-4	*0.001*	0	0.017	*0.003*	0	0.061	3.8	0.001	0.050	8
n-Octane	111-65-9	0.049	0.045	0.134	0.231	0.210	0.626			0.079	98
Propionaldehyde	123-38-6	0.484	0.190	3.130	1.151	0.451	7.435	8	0.1	0.007	100
Propylene	115-07-1	0.656	0.548	3.540	1.128	0.943	6.093	3000	0.0004	0.055	100
Styrene	100-42-5	0.722	0.622	2.520	3.078	2.650	10.735	1.8	**1.7**	0.068	100
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.012	*0.007*	0	0.082	0.017	0.4	0.124	16
Tetrachloroethylene	127-18-4	0.024	0.021	0.058	0.161	0.142	0.393	0.17	0.9	0.095	100
Tolualdehydes		0.048	0.0315	0.453	0.234	0.155	2.226			0.020	100
Toluene	108-88-3	1.631	1.43	6.970	6.145	5.389	26.267	5000	0.001	0.068	100
1,2,4-Trichlorobenzene	102-82-1	*0.001*	0	0.006	*0.004*	0	0.045	2	0.002	0.371	17
1,1,1-Trichloroethane	71-55-6	0.007	0.007	0.018	0.039	0.038	0.098	1000	0.00004	0.071	87
1,1,2-Trichloroethane	79-00-5	*0*	0	0	*0*	0	0	0.063		0.093	2
Trichloroethylene	79-01-6	0.014	0.008	0.136	0.073	0.043	0.731	0.2	0.4	0.091	55
Trichlorofluoromethane	75-69-4	0.406	0.320	1.230	2.283	1.798	6.911	700	0.003	0.045	100
Trichlorotrifluoroethane	76-13-1	0.082	0.081	0.106	0.628	0.621	0.812	30000	0.00002	0.069	100
1,2,4-Trimethylbenzene	95-63-6	0.120	0.115	0.374	0.592	0.565	1.839			0.103	100
1,3,5-Trimethylbenzene	108-67-8	0.036	0.033	0.115	0.175	0.162	0.565			0.103	100
Valeraldehyde	110-62-3	0.025	0.022	0.161	0.089	0.078	0.567			0.007	73
Vinyl chloride	75-01-4	*0.005*	0	0.031	*0.014*	0	0.079	0.11	0.1	0.020	44
m,p-Xylene	1330-20-7	0.216	0.179	0.905	0.939	0.777	3.930	100	0.01	0.017	100
o-Xylene	95-47-6	0.106	0.092	0.418	0.459	0.399	1.815	100	0.005	0.069	100

[a] See page 31 for footnotes.

Table 5

CHESTER-NJ 2015 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[c,d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[c,d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	0.693	0.669	1.800	1.249	1.205	3.243	0.45	**3**	0.007	100
Acetone	67-64-1	0.905	0.832	2.790	2.149	1.975	6.628	31000	0.0001	0.014	100
Acetonitrile	75-05-8	0.397	0.369	0.896	0.666	0.620	1.504	60	0.01	0.012	100
Acetylene	74-86-2	0.450	0.360	1.580	0.479	0.383	1.681			0.078	100
Acrolein[g]	107-02-8	0.499	0.469	0.902	1.145	1.075	2.068	0.02	57[g]	0.165	100
Acrylonitrile	107-13-1	*0.037*	0	0.134	*0.081*	0	0.291	0.015	**5**	0.130	48
tert-Amyl Methyl Ether	994-05-8	*0.0001*	0	0.005	*0.0003*	0	0.021			0.067	2
Benzaldehyde	100-52-7	0.014	0.012	0.064	0.059	0.052	0.278			0.087	100
Benzene	71-43-2	0.147	0.128	0.412	0.469	0.409	1.316	0.13	**4**	0.010	100
Bromochloromethane	74-97-5	0	0	0	0	0	0			0.323	0
Bromodichloromethane	75-27-4	*0.0003*	0	0.010	*0.002*	0	0.067			0.094	3
Bromoform	75-25-2	*0.0009*	0	0.016	*0.009*	0	0.165	0.91	0.01	0.217	10
Bromomethane	74-83-9	0.0159	0.015	0.069	0.062	0.058	0.268	5	0.01	0.078	97
1,3-Butadiene	106-99-0	0.0266	0.026	0.079	0.059	0.058	0.175	0.033	**1.8**	0.024	93
Butyraldehyde	123-72-8	0.0532	0.049	0.176	0.157	0.145	0.519			0.035	100
Carbon Disulfide	75-15-0	0.7773	0.794	1.810	2.420	2.473	5.637	700	0.003	0.009	100
Carbon Tetrachloride	56-23-5	0.0959	0.098	0.124	0.604	0.617	0.780	0.067	**9**	0.088	100
Chlorobenzene	108-90-7	*0.0008*	0	0.013	*0.004*	0	0.060	1000	0.000004	0.110	7
Chloroethane	75-00-3	*0.0147*	0	0.060	*0.039*	0	0.158	10000	0.000004	0.066	49
Chloroform	67-66-3	0.0236	0.022	0.040	0.115	0.107	0.195	0.043	**3**	0.083	100
Chloromethane	74-87-3	0.6877	0.612	2.530	1.420	1.264	5.225	0.56	**3**	0.029	100
Chloroprene	126-99-8	0	0	0	0	0	0	7		0.119	0
Crotonaldehyde	123-73-9	0.087	0.0225	0.478	0.250	0.065	1.370			0.043	100
Dibromochloromethane	124-48-1	0.003	0.003	0.011	0.032	0.030	0.109			0.030	52
1,2-Dibromoethane	106-93-4	*0.0004*	0	0.013	*0.003*	0	0.100	0.0017	**1.7**	0.131	3
m-Dichlorobenzene	541-73-1	*0.004*	0	0.014	*0.024*	0	0.084			0.222	43
o-Dichlorobenzene	95-50-1	*0.001*	0	0.009	*0.004*	0	0.054	200	0.00002	0.126	8
p-Dichlorobenzene	106-46-7	*0.003*	0	0.017	*0.015*	0	0.102	0.091	0.2	0.114	26
Dichlorodifluoromethane	75-71-8	0.502	0.508	0.551	2.482	2.512	2.725	200	0.01	0.089	100
1,1-Dichloroethane	75-34-3	0.0004	0	0.012	0.001	0	0.049	0.63	0.002	0.061	3
1,2-Dichloroethane	107-06-2	0.019	0.019	0.029	0.076	0.077	0.117	0.038	**2**	0.065	97
1,1-Dichloroethylene	75-35-4	*0.0001*	0	0.009	*0.001*	0	0.036	200	0.000003	0.056	2
cis-1,2-Dichloroethylene	156-59-2	0	0	0	0	0	0			0.048	0
trans-1,2-Dichloroethylene	156-60-5	0	0	0	0	0	0			0.048	0
Dichloromethane	75-09-2	0.14285	0.1135	0.401	0.496	0.394	1.393	2.1	0.2	0.080	100

[a] See page 31 for footnotes.

Table 5 (continued)

CHESTER-NJ 2015 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Max. (ppbv)	Annual Mean (µg/m3)[c,d]	Annual Median (µg/m3)[d]	24-Hour Max. (µg/m3)	Health Bench-mark (µg/m3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (µg/m3)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	0	0	0	0	0	0	0.1		0.088	0
cis-1,3-Dichloropropene	542-75-6	*0.0002*	0	0.010	*0.001*	0	0.045			0.082	2
trans-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.073	0
Dichlorotetrafluoroethane	76-14-2	0.018	0.017	0.024	0.123	0.119	0.168			0.161	100
2,5-Dimethylbenzaldehyde	5799-94-2	0	0	0	0	0	0			0.016	0
Ethyl Acrylate	140-88-5	0	0	0	0	0	0	2		0.049	0
Ethyl tert-Butyl Ether	637-92-3	*0.008*	0	0.176	*0.034*	0	0.736			0.059	28
Ethylbenzene	100-41-4	0.025	0.019	0.093	0.108	0.082	0.404	0.40	0.3	0.048	100
Formaldehyde	50-00-0	1.677	1.395	4.930	2.059	1.713	6.054	0.077	**27**	0.028	100
Hexachloro-1,3-butadiene	87-68-3	*0.002*	0	0.012	*0.023*	0	0.128	0.045	0.5	0.085	26
Hexaldehyde	66-25-1	0.011	0.009	0.032	0.046	0.037	0.131			0.090	100
Isovaleraldehyde	590-86-3	0	0	0	0	0	0			0.007	0
Methyl Ethyl Ketone	78-93-3	0.107	0.095	0.434	0.315	0.278	1.278	5000	0.0001	0.071	100
Methyl Isobutyl Ketone	108-10-1	0.029	0.024	0.095	0.117	0.098	0.389	3000	0.00004	0.061	100
Methyl Methacrylate	80-62-6	*0.001*	0	0.010	*0.003*	0	0.035	700	0.000004	0.088	8
Methyl tert-Butyl Ether	1634-04-4	0.049	0.047	0.142	0.178	0.169	0.512	3.8	0.05	0.040	97
n-Octane	111-65-9	0.039	0.038	0.073	0.183	0.178	0.341			0.093	100
Propionaldehyde	123-38-6	0.083	0.072	0.211	0.198	0.171	0.501	8	0.02	0.007	100
Propylene	115-07-1	0.327	0.295	0.714	0.563	0.508	1.229	3000	0.0002	0.057	100
Styrene	100-42-5	0.013	0.013	0.031	0.057	0.055	0.132	1.8	0.03	0.102	79
1,1,2,2-Tetrachloroethane	79-34-5	*0.002*	0	0.012	*0.011*	0	0.082	0.017	0.7	0.124	18
Tetrachloroethylene	127-18-4	0.010	0.010	0.042	0.069	0.068	0.285	0.17	0.4	0.136	77
Tolualdehydes		0.012	0.010	0.053	0.057	0.049	0.260			0.025	85
Toluene	108-88-3	0.163	0.143	0.520	0.615	0.539	1.959	5000	0.0001	0.170	100
1,2,4-Trichlorobenzene	102-82-1	*0.001*	0	0.021	*0.004*	0	0.156	4	0.001	0.163	5
1,1,1-Trichloroethane	71-55-6	0.006	0.007	0.016	0.032	0.038	0.087	1000	0.00003	0.109	69
1,1,2-Trichloroethane	79-00-5	0	0	0	0	0	0	0.063		0.115	0
Trichloroethylene	79-01-6	*0.001*	0	0.012	*0.003*	0	0.064	0.5	0.01	0.118	5
Trichlorofluoromethane	75-69-4	0.232	0.233	0.260	1.304	1.309	1.461	700	0.002	0.084	100
Trichlorotrifluoroethane	76-13-1	0.081	0.081	0.090	0.619	0.621	0.690	30000	0.00002	0.130	100
1,2,4-Trimethylbenzene	95-63-6	0.022	0.018	0.067	0.111	0.088	0.329			0.123	98
1,3,5-Trimethylbenzene	108-67-8	0.012	0.010	0.031	0.060	0.049	0.152			0.108	87
Valeraldehyde	110-62-3	0.013	0.011	0.043	0.047	0.039	0.151			0.011	100
Vinyl chloride	75-01-4	*0.0004*	0	0.011	*0.001*	0	0.028	0.11	0.01	0.028	5
m,p-Xylene	1330-20-7	0.051	0.040	0.278	0.220	0.174	1.207	100	0.002	0.009	100
o-Xylene	95-47-6	0.024	0.019	0.104	0.103	0.082	0.452	100	0.001	0.087	100

[a] See page 31 for footnotes.

Table 6

ELIZABETH LAB-NJ 2015 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	0.961	1.045	2.830	1.732	1.883	5.099	0.45	**4**	0.005	76
Acetone	67-64-1	0.889	0.962	2.630	2.111	2.284	6.247	31000	0.0001	0.014	100
Acetonitrile	75-05-8	0.399	0.172	12.500	0.669	0.288	20.988	60	0.01	0.020	100
Acetylene	74-86-2	1.152	0.891	4.860	1.227	0.948	5.176			0.033	100
Acrolein[g]	107-02-8	0.414	0.409	0.938	0.949	0.938	2.151	0.02		0.046	100
Acrylonitrile	107-13-1	0	0	0	0	0	0	0.015		0.065	0
tert-Amyl Methyl Ether	994-05-8	*0.0001*	0	0.007	*0.0005*	0	0.029			0.033	2
Benzaldehyde	100-52-7	0.175	0.032	1.520	0.761	0.139	6.597			0.074	100
Benzene	71-43-2	0.256	0.224	0.553	0.818	0.714	1.767	0.13	**6**	0.010	100
Bromochloromethane	74-97-5	0	0	0	0	0	0	40		0.206	0
Bromodichloromethane	75-27-4	*0.0002*	0	0.005	*0.001*	0	0.034	0.027	0.04	0.101	3
Bromoform	75-25-2	*0.001*	0	0.01	*0.009*	0	0.103	0.91	0.01	0.186	12
Bromomethane	74-83-9	0.015	0.013	0.088	0.057	0.049	0.342	5	0.01	0.066	100
1,3-Butadiene	106-99-0	0.053	0.045	0.171	0.117	0.098	0.378	0.033	**4**	0.031	100
Butyraldehyde	123-72-8	0.175	0.129	0.905	0.517	0.380	2.669			0.027	100
Carbon Disulfide	75-15-0	0.015	0.014	0.045	0.046	0.044	0.140	700	0.0001	0.009	100
Carbon Tetrachloride	56-23-5	0.098	0.099	0.128	0.615	0.623	0.805	0.17	**4**	0.075	100
Chlorobenzene	108-90-7	*0.001*	0	0.010	*0.003*	0	0.046	1000	0.000003	0.046	10
Chloroethane	75-00-3	0.028	0.029	0.059	0.074	0.077	0.156	10000	0.00001	0.047	87
Chloroform	67-66-3	0.031	0.030	0.051	0.151	0.146	0.249	0.043	**4**	0.044	100
Chloromethane	74-87-3	0.609	0.584	1.390	1.258	1.205	2.870	0.56	**2.2**	0.033	100
Chloroprene	126-99-8	0	0	0	0	0	0	0.002		0.040	0
Crotonaldehyde	123-73-9	0.155	0.089	0.604	0.445	0.254	1.731			0.049	100
Dibromochloromethane	594-18-3	*0.002*	0	0.009	*0.015*	0	0.077	0.037	0.4	0.051	33
1,2-Dibromoethane	106-93-4	*0.0004*	0	0.008	*0.003*	0	0.061	0.0017	**1.6**	0.138	5
m-Dichlorobenzene	541-73-1	*0.001*	0	0.008	*0.004*	0	0.048			0.168	12
o-Dichlorobenzene	95-50-1	*0.001*	0	0.008	*0.005*	0	0.048	200	0.00002	0.144	13
p-Dichlorobenzene	106-46-7	0.006	0.006	0.026	0.036	0.033	0.156	0.091	0.4	0.156	57
Dichlorodifluoromethane	75-71-8	0.512	0.508	0.691	2.533	2.512	3.417	100	0.03	0.064	100
1,1-Dichloroethane	75-34-3	0	0	0	0	0	0	0.63		0.061	0
1,2-Dichloroethane	107-06-2	0.018	0.019	0.029	0.074	0.077	0.117	0.038	**2.0**	0.053	95
1,1-Dichloroethene	75-35-4	*0.001*	0	0.009	*0.004*	0	0.036	200	0.00002	0.032	17
cis-1,2-Dichloroethylene	156-59-2	0	0	0	0	0	0			0.048	0
trans-1,2-Dichloroethylene	156-60-5	*0.001*	0	0.016	*0.003*	0	0.063			0.048	7
Dichloromethane	75-09-2	0.175	0.144	1.160	0.607	0.498	4.030	77	0.01	0.028	100

[a] See page 31 for footnotes.

Table 6 (continued)

ELIZABETH LAB-NJ 2015 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	*0.0004*	0	0.013	*0.002*	0	0.060	0.1	0.02	0.079	3
cis-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.064	0
trans-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.095	0
Dichlorotetrafluoroethane	76-14-2	0.017	0.016	0.024	0.119	0.112	0.168			0.133	100
2,5-Dimethylbenzaldehyde	5799-94-2	*0.001*	0	0.014	*0.003*	0	0.077			0.011	5
Ethyl Acrylate	140-88-5	*0.0005*	0	0.012	*0.002*	0	0.049	8	0.0002	0.033	5
Ethyl tert-Butyl Ether	637-92-3	*0.001*	0	0.012	*0.003*	0	0.050			0.046	8
Ethylbenzene	100-41-4	0.064	0.055	0.167	0.276	0.237	0.725	0.40	0.7	0.035	100
Formaldehyde	50-00-0	2.562	2.2	10.200	3.147	2.702	12.526	0.077	**41**	0.023	73
Hexachloro-1,3-butadiene	87-68-3	*0.002*	0	0.006	*0.020*	0	0.064	0.045	0.5	0.117	40
Hexaldehyde	66-25-1	0.393	0.051	3.450	1.610	0.207	14.133			0.139	100
Isovaleraldehyde	590-86-3	*0.103*	0	1.240	*0.365*	0	4.368			0.007	27
Methyl Ethyl Ketone	78-93-3	0.164	0.153	0.422	0.483	0.451	1.244	5000	0.0001	0.074	100
Methyl Isobutyl Ketone	108-10-1	0.045	0.040	0.346	0.184	0.164	1.417	3000	0.0001	0.057	97
Methyl Methacrylate	80-62-6	*0.009*	0	0.236	*0.037*	0	0.966	700	0.0001	0.115	15
Methyl tert-Butyl Ether	1634-04-4	*0.001*	0	0.025	*0.005*	0	0.090	3.8	0.001	0.050	7
n-Octane	111-65-9	0.060	0.055	0.174	0.282	0.257	0.813			0.079	100
Propionaldehyde	123-38-6	0.149	0.136	0.456	0.353	0.323	1.083	8	0.04	0.007	94
Propylene	115-07-1	1.520	0.721	9.390	2.616	1.240	16.161	3000	0.001	0.055	100
Styrene	100-42-5	0.013	0.013	0.036	0.054	0.055	0.153	1.8	0.03	0.068	72
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.011	*0.007*	0	0.076	0.017	0.4	0.124	15
Tetrachloroethylene	127-18-4	0.024	0.017	0.170	0.163	0.115	1.153	0.17	1.0	0.095	92
Tolualdehydes		0.024	0.024	0.076	0.120	0.118	0.373			0.020	75
Toluene	108-88-3	0.490	0.461	1.040	1.845	1.737	3.919	5000	0.0004	0.068	100
1,2,4-Trichlorobenzene	102-82-1	0	0	0	0	0	0	2		0.371	0
1,1,1-Trichloroethane	71-55-6	0.006	0.006	0.013	0.033	0.033	0.071	1000	0.00003	0.071	90
1,1,2-Trichloroethane	79-00-5	0	0	0	0	0	0	0.063		0.093	0
Trichloroethylene	79-01-6	*0.003*	0	0.022	*0.016*	0	0.118	0.2	0.1	0.091	28
Trichlorofluoromethane	75-69-4	0.244	0.242	0.305	1.371	1.360	1.714	700	0.002	0.045	100
Trichlorotrifluoroethane	76-13-1	0.081	0.080	0.109	0.618	0.613	0.835	30000	0.00002	0.069	100
1,2,4-Trimethylbenzene	95-63-6	0.056	0.051	0.169	0.275	0.248	0.831			0.103	98
1,3,5-Trimethylbenzene	108-67-8	0.018	0.017	0.052	0.089	0.084	0.256			0.103	92
Valeraldehyde	110-62-3	0.063	0.044	0.323	0.223	0.155	1.138			0.007	100
Vinyl chloride	75-01-4	*0.002*	0	0.011	*0.006*	0	0.028	0.11	0.1	0.020	30
m,p-Xylene	1330-20-7	0.160	0.130	0.440	0.693	0.564	1.911	100	0.01	0.017	100
o-Xylene	95-47-6	0.071	0.064	0.203	0.309	0.276	0.881	100	0.003	0.069	100

[a] See page 31 for footnotes.

Table 7

NEW BRUNSWICK-NJ 2015 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Max. (ppbv)	Annual Mean (ug/m[3])[c,d]	Annual Median (ug/m[3])[d]	24-Hour Max. (ug/m[3])	Health Bench-mark (ug/m[3])[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m[3])	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	0.803	0.819	2.230	1.446	1.476	4.018	0.45	**3**	0.005	73
Acetone	67-64-1	0.837	0.890	2.300	1.987	2.113	5.464	31000	0.0001	0.014	74
Acetonitrile	75-05-8	0.673	0.276	5.640	1.129	0.463	9.470	60	0.02	0.020	100
Acetylene	74-86-2	0.704	0.540	2.710	0.750	0.575	2.886			0.033	100
Acrolein[g]	107-02-8	0.303	0.260	0.682	0.696	0.596	1.564	0.02		0.046	100
Acrylonitrile	107-13-1	*0.000*	0	0.025	*0.001*	0	0.054	0.015	0.1	0.065	2
tert-Amyl Methyl Ether	994-05-8	*0.000*	0	0.009	*0.002*	0	0.038			0.033	5
Benzaldehyde	100-52-7	0.023	0.022	0.066	0.100	0.095	0.286			0.074	98
Benzene	71-43-2	0.165	0.145	0.411	0.528	0.463	1.313	0.13	**4**	0.010	100
Bromochloromethane	74-97-5	0	0	0	0	0	0	40		0.206	0
Bromodichloromethane	75-27-4	*0.001*	0	0.012	*0.006*	0	0.080	0.027	0.2	0.101	12
Bromoform	75-25-2	*0.001*	0	0.009	*0.006*	0	0.093	0.91	0.01	0.186	8
Bromomethane	74-83-9	0.012	0.011	0.062	0.048	0.043	0.241	5	0.01	0.066	100
1,3-Butadiene	106-99-0	0.022	0.021	0.083	0.048	0.046	0.184	0.033	**1.5**	0.031	92
Butyraldehyde	123-72-8	0.088	0.085	0.191	0.258	0.251	0.563			0.027	100
Carbon Disulfide	75-15-0	0.029	0.024	0.124	0.090	0.075	0.386	700	0.0001	0.009	100
Carbon Tetrachloride	56-23-5	0.102	0.101	0.124	0.641	0.635	0.780	0.17	**4**	0.075	100
Chlorobenzene	108-90-7	*0.001*	0	0.017	*0.006*	0	0.078	1000	0.00001	0.046	14
Chloroethane	75-00-3	0.038	0.027	0.152	0.100	0.071	0.401	10000	0.00001	0.047	90
Chloroform	67-66-3	0.028	0.027	0.045	0.137	0.132	0.220	0.043	**3**	0.044	100
Chloromethane	74-87-3	0.590	0.588	0.787	1.218	1.214	1.625	0.56	**2.2**	0.033	100
Chloroprene	126-99-8	0	0	0	0	0	0	0.002		0.040	0
Crotonaldehyde	123-73-9	0.116	0.045	0.531	0.333	0.129	1.522			0.049	100
Dibromochloromethane	594-18-3	*0.002*	0	0.010	*0.015*	0	0.085	0.037	0.4	0.051	36
1,2-Dibromoethane	106-93-4	*0.0002*	0	0.007	*0.002*	0	0.054	0.0017	1.0	0.138	3
m-Dichlorobenzene	541-73-1	*0.001*	0	0.009	*0.003*	0	0.054			0.168	8
o-Dichlorobenzene	95-50-1	*0.001*	0	0.009	*0.003*	0	0.054	200	0.00002	0.144	8
p-Dichlorobenzene	106-46-7	*0.003*	0	0.019	*0.017*	0	0.114	0.091	0.2	0.156	37
Dichlorodifluoromethane	75-71-8	0.510	0.508	0.660	2.520	2.512	3.264	100	0.03	0.064	100
1,1-Dichloroethane	75-34-3	*0.001*	0	0.012	*0.002*	0	0.049	0.63	0.004	0.061	7
1,2-Dichloroethane	107-06-2	0.018	0.018	0.032	0.073	0.073	0.130	0.038	**1.9**	0.053	100
1,1-Dichloroethene	75-35-4	*0.001*	0	0.010	*0.003*	0	0.040	200	0.00002	0.032	12
cis-1,2-Dichloroethylene	156-59-2	0	0	0	0	0	0			0.048	0
trans-1,2-Dichloroethylene	156-60-5	*0.0003*	0	0.008	*0.001*	0	0.032			0.048	3
Dichloromethane	75-09-2	0.149	0.128	0.828	0.516	0.445	2.876	77	0.01	0.028	100

[a] See page 31 for footnotes.

Table 7 (continued)

NEW BRUNSWICK-NJ 2015 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Max. (ppbv)	Annual Mean (ug/m³)[c,d]	Annual Median (ug/m³)[d]	24-Hour Max. (ug/m³)	Health Bench-mark (ug/m³)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m³)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	*0.0003*	0	0.018	*0.001*	0	0.083	0.1	0.01	0.079	2
cis-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.064	0
trans-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.095	0
Dichlorotetrafluoroethane	76-14-2	0.017	0.016	0.026	0.119	0.112	0.182			0.133	100
2,5-Dimethylbenzaldehyde	5799-94-2	*0.008*	0	0.056	*0.043*	0	0.307			0.011	27
Ethyl Acrylate	140-88-5	0	0	0	0	0	0	8		0.033	0
Ethyl tert-Butyl Ether	637-92-3	*0.004*	0	0.022	*0.016*	0	0.092			0.046	24
Ethylbenzene	100-41-4	0.031	0.029	0.081	0.135	0.126	0.352	0.40	0.3	0.035	100
Formaldehyde	50-00-0	2.396	2.240	8.210	2.942	2.751	10.082	0.077	**38**	0.023	100
Hexachloro-1,3-butadiene	87-68-3	*0.002*	0	0.006	*0.018*	0	0.064	0.045	0.4	0.117	30
Hexaldehyde	66-25-1	0.022	0.020	0.068	0.090	0.082	0.279			0.139	76
Isovaleraldehyde	590-86-3	*0.028*	0	0.121	*0.098*	0	0.426			0.007	27
Methyl Ethyl Ketone	78-93-3	0.116	0.130	0.265	0.343	0.383	0.781	5000	0.0001	0.074	100
Methyl Isobutyl Ketone	108-10-1	0.023	0.021	0.052	0.093	0.086	0.213	3000	0.00003	0.057	98
Methyl Methacrylate	80-62-6	*0.001*	0	0.016	*0.005*	0	0.066	700	0.00001	0.115	12
Methyl tert-Butyl Ether	1634-04-4	*0.002*	0	0.028	*0.008*	0	0.101	3.8	0.002	0.050	14
n-Octane	111-65-9	0.023	0.021	0.047	0.106	0.098	0.220			0.079	100
Propionaldehyde	123-38-6	0.283	0.187	0.767	0.672	0.443	1.822	8	0.1	0.007	100
Propylene	115-07-1	0.296	0.252	0.817	0.510	0.434	1.406	3000	0.0002	0.055	100
Styrene	100-42-5	0.010	0.010	0.034	0.042	0.043	0.145	1.8	0.02	0.068	66
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.009	*0.005*	0	0.062	0.017	0.3	0.124	12
Tetrachloroethylene	127-18-4	0.012	0.011	0.041	0.084	0.075	0.278	0.17	0.5	0.095	81
Tolualdehydes		0.016	0.017	0.056	0.078	0.081	0.275			0.020	73
Toluene	108-88-3	0.216	0.189	0.587	0.814	0.712	2.212	5000	0.0002	0.068	100
1,2,4-Trichlorobenzene	102-82-1	*0.001*	0	0.005	*0.004*	0	0.037	2	0.002	0.371	10
1,1,1-Trichloroethane	71-55-6	0.005	0.005	0.012	0.030	0.027	0.065	1000	0.00003	0.071	85
1,1,2-Trichloroethane	79-00-5	*0.0002*	0	0.010	*0.001*	0	0.055	0.063	0.01	0.093	2
Trichloroethylene	79-01-6	*0.001*	0	0.012	*0.006*	0	0.064	0.2	0.03	0.091	10
Trichlorofluoromethane	75-69-4	0.240	0.236	0.298	1.348	1.326	1.674	700	0.002	0.045	100
Trichlorotrifluoroethane	76-13-1	0.081	0.081	0.100	0.619	0.621	0.766	30000	0.00002	0.069	100
1,2,4-Trimethylbenzene	95-63-6	0.024	0.024	0.068	0.119	0.118	0.334			0.103	97
1,3,5-Trimethylbenzene	108-67-8	0.008	0.008	0.020	0.037	0.039	0.098			0.103	78
Valeraldehyde	110-62-3	0.165	0.048	1.110	0.582	0.169	3.910			0.007	100
Vinyl chloride	75-01-4	*0.002*	0	0.014	*0.004*	0	0.036	0.11	0.04	0.020	20
m,p-Xylene	1330-20-7	0.066	0.059	0.200	0.286	0.256	0.868	100	0.003	0.017	100
o-Xylene	95-47-6	0.031	0.029	0.085	0.135	0.126	0.369	100	0.001	0.069	100

[a] See page 31 for footnotes.

Footnotes for Tables 4 through 7

[b] Analytes in bold text had annual means above the long-term health benchmark.

[c] Numbers in italics are arithmetic means (or averages) based on less than 50% of the samples above the detection limit.

[d] For a valid 24-hour sampling event, when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection.

[e] The health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one-in-a-million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html.

[f] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is not calculated.

[g] Acrolein concentrations are highly uncertain because of problems with collection and analysis methods.

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