2017 Air Toxics Summary

New Jersey Department of Environmental Protection

Introduction

Air pollutants can be generally 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) 2016 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 types 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 the public's exposure to air toxics around the country. The pie chart in Figure 10-1, taken from the 2014 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.

In New Jersey, on-road mobile sources (cars and trucks) account for 32% of the air toxics emissions, and non-road mobile sources (airplanes, trains, construction equipment, lawnmowers, boats, dirt bikes, etc.) contribute an additional 39%. Nonpoint sources (residential, commercial, and small industrial sources) represent 26% of the inventory, and point sources (such as factories and power plants) account for the remaining 3%.

Figure 10-1
2014 Air Toxics Emissions Source Estimates for New Jersey

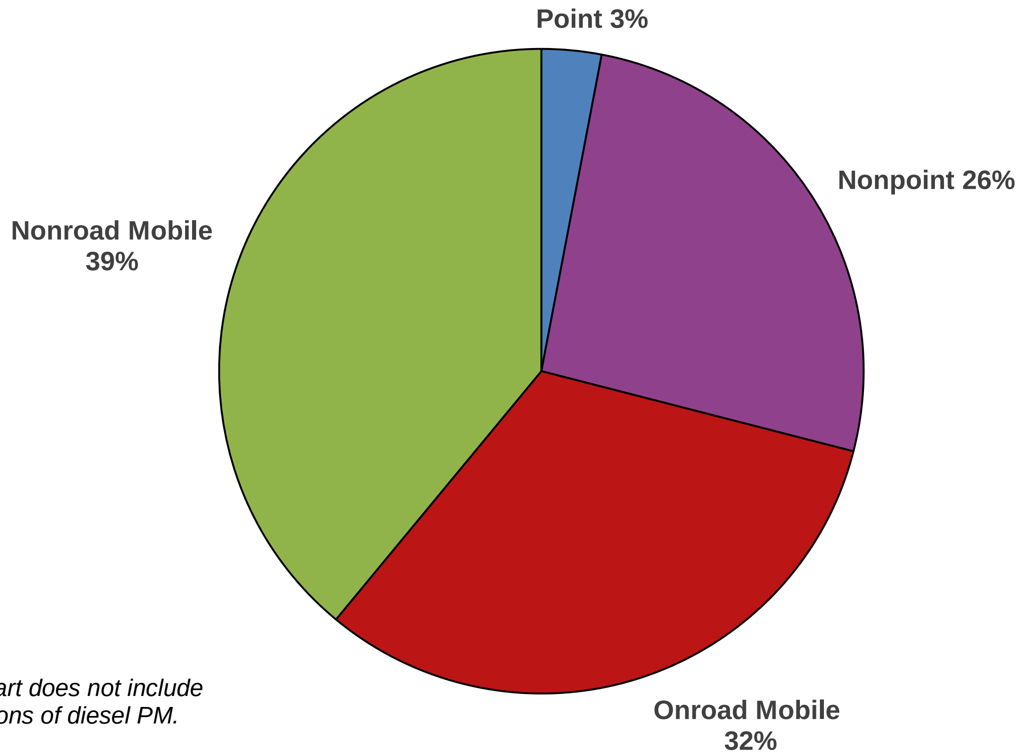
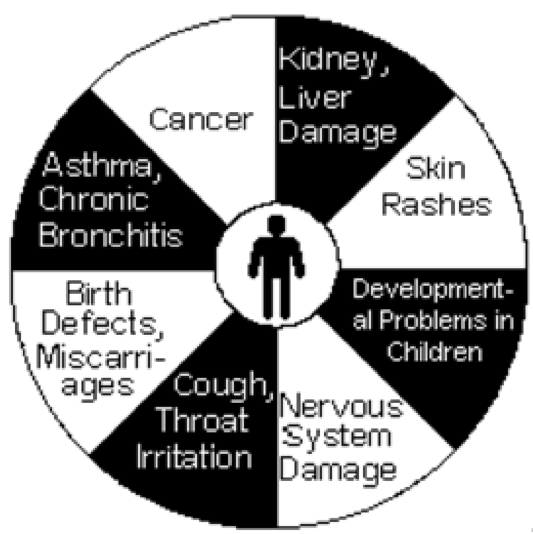


Figure 10-2
Potential Effects of Air Toxics



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

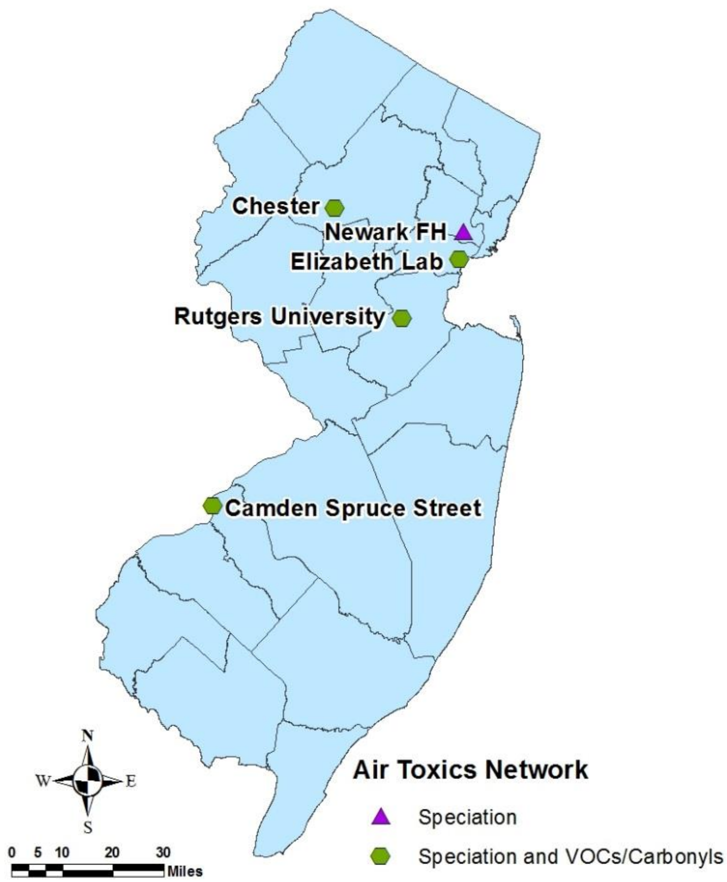
HEALTH EFFECTS

People exposed to significant amounts of air toxics may have an increased chance of developing 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 10-2). 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 humans directly, or by consuming exposed plants and animals.

MONITORING LOCATIONS

In 2017 NJDEP had four air toxics monitoring sites that measure volatile organic compounds (VOCs) and carbonyls (a subset of VOCs that includes formaldehyde, acetaldehyde and other related compounds). As shown in Figure 10-3, the monitors are located at Camden Spruce Street, Chester, Elizabeth Lab, and at Rutgers University in East Brunswick. Toxic metals data are collected at the same four monitoring stations, plus Newark Firehouse.

Figure 10-3
2017 Air Toxics Monitoring Network



The Chester monitoring site is in rural Morris County, away from known sources, and serves as kind of a "background" monitor. The Rutgers University monitoring station is in a suburban setting on Rutgers agricultural lands in East Brunswick. 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 Air Monitoring Network section and Appendix A of the annual Air Quality Report.

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. A previous monitoring site in Camden (officially called the Camden Lab site) had been measuring toxic VOCs for the UATMP since 1989. It was shut down in 2008 when NJDEP lost access to the location. A new monitoring station, 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. In 2016 the New Brunswick VOC monitor was replaced by one at a new station at Rutgers University, less than a mile away.

Analysis of some toxic metals and other elements also began in 2001, at Camden, Chester, Elizabeth Lab and New Brunswick, as part of USEPA's Chemical Speciation Network (CSN). The Newark Firehouse site was added in 2010, and the New Brunswick CSN monitor was moved to Rutgers University in 2016. The CSN was established to characterize the metals, ions and carbon constituents of $PM_{2.5}$. Filters are collected every three or six days and sent to a national lab for analysis.

NEW JERSEY AIR TOXICS MONITORING RESULTS FOR 2017

2017 annual average concentrations of VOCs and carbonyls for the four New Jersey monitoring sites are shown in Table 10-1. All values are in micrograms per cubic meter ($\mu g/m^3$). More detail can be found in Tables 10-5 through 10-8, 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 (see Table 10-9). However, this does not mean they are not present in the air below the detection limit level. For chemicals with less than 50% of the samples above the detection limit, there is significant uncertainty in the calculated averages. Median values (the value of the middle sample value when the results are ranked) are reported in Tables 10-5 through 10-8 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 concentrations, but would have less effect on the median value. In such cases, the median value may be a better indicator of long-term exposure concentrations.

For acrolein, USEPA has determined that the methods used to collect and analyze it 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 2017 New Jersey acrolein data in this report, the concentrations are highly uncertain.

Table 10-2 presents the annual average concentrations of toxic metals and elements, along with their health benchmarks (see the "Estimating Health Risk" section below for an explanation). No risk ratios were calculated, because most of the chemicals were below the detection limit and the resulting average concentrations are highly uncertain. Additional data from the CSN monitors can be found in Appendix B (Fine Particulate Speciation Summary) of the annual Air Quality Report.

Table 10-1
2017 Summary of Toxic Volatile Organic Compounds Monitored in New Jersey

Annual Average Concentrations
Micrograms per Cubic Meter ($\mu g/m^3$)

	Pollutant	Synonym	HAP	CAS No.	Camden	Chester	Elizabeth	Rutgers
1	Acetaldehyde		*	75-07-0	2.145	1.100	*2.471*	1.045
2	Acetone			67-64-1	2.694	1.820	*2.430*	2.199
3	Acetonitrile		*	75-05-8	3.837	1.181	*0.565*	0.384
4	Acetylene			74-86-2	0.758	0.436	*0.988*	0.612
5	Acrolein[a]		*	107-02-8	0.810	0.862	*0.976*	0.893
6	Acrylonitrile		*	107-13-1	ND	*0.001*	ND	ND
7	tert-Amyl Methyl Ether			994-05-8	*0.002*	*0.002*	*0.003*	*0.003*
8	Benzaldehyde			100-52-7	0.281	0.071	*0.124*	0.080
9	Benzene		*	71-43-2	0.700	0.378	*0.811*	0.498
10	Bromochloromethane			74-97-5	*0.029*	*0.032*	*0.025*	*0.025*
11	Bromodichloromethane			75-27-4	*0.008*	*0.005*	*0.009*	*0.007*
12	Bromoform		*	75-25-2	*0.013*	*0.005*	*0.014*	*0.013*
13	Bromomethane	Methyl bromide	*	74-83-9	0.691	0.052	*0.055*	0.050
14	1,3-Butadiene		*	106-99-0	0.073	0.022	*0.112*	0.046
15	Butyraldehyde			123-72-8	0.353	0.168	*0.312*	0.166
16	Carbon Disulfide		*	75-15-0	0.062	0.036	*0.047*	ND
17	Carbon Tetrachloride		*	56-23-5	0.577	0.570	*0.571*	0.559
18	Chlorobenzene		*	108-90-7	*0.012*	*0.010*	*0.016*	*0.010*
19	Chloroethane	Ethyl chloride	*	75-00-3	*0.027*	*0.026*	*0.027*	*0.051*
20	Chloroform		*	67-66-3	0.148	0.125	*0.168*	0.151
21	Chloromethane	Methyl chloride	*	74-87-3	1.127	1.130	*1.132*	1.127
22	Chloroprene	2-Chloro-1,3-butadiene	*	126-99-8	*0.002*	*0.001*	*0.002*	*0.002*
23	Crotonaldehyde			123-73-9	0.325	0.247	*0.280*	0.209
24	Dibromochloromethane	Chlorodibromomethane		124-48-1	*0.025*	*0.021*	*0.030*	*0.023*
25	1,2-Dibromoethane	Ethylene dibromide	*	106-93-4	*0.005*	*0.005*	*0.007*	*0.008*
26	m-Dichlorobenzene	1,3-Dichlorobenzene		541-73-1	*0.003*	*0.001*	*0.005*	*0.004*
27	o-Dichlorobenzene	1,2-Dichlorobenzene		95-50-1	*0.005*	*0.002*	*0.006*	*0.004*
28	p-Dichlorobenzene	1,4-Dichlorobenzene	*	106-46-7	0.042	*0.007*	*0.042*	*0.018*
29	Dichlorodifluoromethane			75-71-8	2.598	2.482	*2.460*	2.459
30	1,1-Dichloroethane	Ethylidene dichloride	*	75-34-3	*0.004*	*0.005*	*0.009*	*0.005*
31	1,2-Dichloroethane	Ethylene dichloride	*	107-06-2	0.080	0.064	*0.080*	0.072
32	1,1-Dichloroethylene	Vinylidene chloride	*	75-35-4	*0.004*	*0.004*	*0.006*	*0.004*
33	cis-1,2-Dichloroethylene	cis-1,2-Dichloroethene		156-59-2	ND	ND	ND	ND
34	trans-1,2-Dichloroethylene	trans-1,2-Dichloroethene		156-60-5	0.010	0.002	0.008	0.005
35	Dichloromethane	Methylene chloride	*	75-09-2	0.419	0.338	0.537	0.430
36	1,2-Dichloropropane	Propylene dichloride	*	78-87-5	0.003	0.004	0.003	0.002

- *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 10-1 (continued)
2017 Summary of Toxic Volatile Organic Compounds Monitored in New Jersey

Annual Average Concentrations
Micrograms per Cubic Meter ($\mu g/m^3$)

	Pollutant	Synonym	HAP	CAS No.	Camden	Chester	Elizabeth	Rutgers
37	cis-1,3-Dichloropropene	cis-1,3-Dichloropropylene	*	542-75-6	*0.002*	*0.002*	*0.003*	*0.002*
38	trans-1,3-Dichloropropene	trans-1,3-Dichloropropylene	*	542-75-6	ND	ND	ND	*0.001*
39	Dichlorotetrafluoroethane	Freon 114		76-14-2	0.136	0.136	*0.138*	0.134
40	2,5-Dimethylbenzaldehyde			5799-94-2	ND	ND	ND	ND
41	Ethyl Acrylate		*	140-88-5	ND	ND	*0.0004*	ND
42	Ethyl tert-Butyl Ether	tert-Butyl ethyl ether		637-92-3	*0.010*	*0.012*	*0.076*	0.065
43	Ethylbenzene		*	100-41-4	0.556	0.313	*0.561*	0.442
44	Formaldehyde		*	50-00-0	3.909	1.901	*3.821*	1.803
45	Hexachloro-1,3-butadiene	Hexachlorobutadiene	*	87-68-3	*0.022*	*0.014*	*0.029*	*0.021*
46	Hexaldehyde	Hexanaldehyde		66-25-1	0.189	0.055	*0.136*	0.081
47	Isovaleraldehyde			590-86-3	ND	ND	ND	ND
48	Methyl Ethyl Ketone	MEK		78-93-3	0.502	0.304	*0.462*	0.364
49	Methyl Isobutyl Ketone	MIBK	*	108-10-1	0.196	0.102	*0.188*	0.124
50	Methyl Methacrylate		*	80-62-6	*0.024*	*0.006*	*0.041*	*0.014*
51	Methyl tert-Butyl Ether	MTBE	*	1634-04-4	*0.011*	*0.005*	*0.025*	*0.019*
52	n-Octane			111-65-9	0.281	0.092	*0.367*	0.132
53	Propionaldehyde		*	123-38-6	0.395	0.237	*0.407*	0.219
54	Propylene			115-07-1	0.815	0.349	*2.968*	0.531
55	Styrene		*	100-42-5	1.070	0.073	*0.143*	0.126
56	1,1,2,2-Tetrachloroethane		*	79-34-5	*0.004*	*0.004*	*0.010*	*0.007*
57	Tetrachloroethylene	Perchloroethylene	*	127-18-4	0.144	0.071	*0.179*	0.103
58	Tolualdehydes				0.158	0.090	*0.126*	0.115
59	Toluene		*	108-88-3	2.766	0.604	*1.843*	0.916
60	1,2,4-Trichlorobenzene		*	102-82-1	*0.005*	*0.004*	*0.006*	*0.008*
61	1,1,1-Trichloroethane	Methyl chloroform	*	71-55-6	0.026	*0.016*	*0.028*	0.022
62	1,1,2-Trichloroethane		*	79-00-5	*0.002*	ND	*0.004*	*0.002*
63	Trichloroethylene		*	79-01-6	*0.058*	*0.009*	*0.024*	*0.011*
64	Trichlorofluoromethane			75-69-4	2.163	1.324	*1.332*	1.319
65	Trichlorotrifluoroethane	1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	0.605	0.600	*0.604*	*0.013*
66	1,2,4-Trimethylbenzene			95-63-6	0.482	0.110	*0.385*	0.175
67	1,3,5-Trimethylbenzene			108-67-8	0.161	0.044	*0.131*	0.067
68	Valeraldehyde			110-62-3	0.133	0.057	*0.115*	0.053
69	Vinyl chloride		*	75-01-4	*0.011*	*0.006*	*0.008*	*0.006*
70	m,p-Xylene		*	1330-20-7	0.954	0.181	*0.914*	0.432
71	o-Xylene		*	95-47-6	0.627	0.320	*0.612*	0.421

- *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 10-2
2017 Summary of Toxic Metals and Elements Monitored in New Jersey

Annual Average Concentrations[a]
Micrograms per Cubic Meter (μg/m³)

Pollutant	HAP[b]	Camden	Chester	Elizabeth	Newark	Rutgers	Health Benchmark (μg/m³)[c]
Antimony	*	0.032	0.006	0.002	0.003	0.0002	
Arsenic	*	0.0004	0.0002	0.0001	0.0004	0.0002	*0.00023*
Cadmium	*	0.001	0.002	0.0001	0.001	0	*0.00024*
Chlorine	*	0.297	0.001	0.008	0.014	0.005	0.2
Chromium[d]	*	0.003	0.003	0.004	0.005	0.005	*0.000083*
Cobalt	*	0.00001	0.0001	0	0	0	*0.00011*
Lead	*	0.004	0.002	0.002	0.001	0.002	*0.083*
Manganese	*	0.002	0.0003	0.002	0.001	0.001	0.05
Nickel[e]	*	0.002	0.001	0.001	0.002	0.002	*0.0021*
Phosphorus	*	0.0004	0.0003	0.001	0.001	0.0003	0.07
Selenium	*	0.0003	0.001	0.001	0.0002	0.001	20
Silicon		0.058	0.030	0.087	0.077	0.043	3
Vanadium		0.0004	0.0004	0.0002	0.0002	0.0003	0.1

[a] Most samples were below detection limits, so the annual averages are highly uncertain.
[b] HAP = Hazardous air pollutant listed in the Clean Air Act.
[c] Health benchmarks in italics have a cancer endpoint. See section below on "Estimating Health Risk" for more information.
[d] Chromium's 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's health benchmark is based on specific nickel compounds. It is not known how much of the nickel measured by the monitor is in that form.

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 10-5 through 10-8.

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 10-3. Table 10-4 shows the different types of sources that contribute to the levels of those pollutants in the air. Formaldehyde showed the highest risk at all four monitoring sites. Risk ratios for formaldehyde at Camden and Elizabeth were double those at Chester and Rutgers.

Other pollutants above health benchmarks at all four sites were acetaldehyde, benzene, carbon tetrachloride, chloroform, chloromethane (methyl chloride), and 1,2-dichloroethane (ethylene dichloride). 1,2-Dibromoethane had a risk ratio above one at all sites as well, but most of the samples were below the detection limit. 1,3-Butadiene and ethylbenzene were above the health benchmark at all sites except Chester. Tetrachloroethylene was barely over the health benchmark at Elizabeth. To summarize, the Elizabeth Lab site had eleven pollutants with annual average concentrations that exceeded their health benchmarks, Camden and Rutgers had ten, and Chester had eight.

Although the mean concentrations of **acrolein** exceeded the health benchmark at all sites (see Tables 10-5 through 10-8), risk ratios were not calculated because of problems with the sampling and analysis method, as previously mentioned. 50% of ambient acrolein in New Jersey is attributed to mobile sources, 27% to nonpoint sources, 21% to secondary formation, and 2% to point sources.

Table 10-3
Monitored Toxic Air Pollutants with Risk Ratios Greater Than One in NJ for 2017

Pollutant		CAS No.	Risk Ratio			
			Camden	**Chester**	**Elizabeth**	**Rutgers**
1	Acetaldehyde	75-07-0	5	2	5	2
2	Benzene	71-43-2	5	3	6	4
3	1,3-Butadiene	106-99-0	2		3	1.4
4	Carbon Tetrachloride	56-23-5	9	9	9	8
5	Chloroform	67-66-3	3	3	4	4
6	Chloromethane	74-87-3	2	2	2	2
7	*1,2-Dibromoethane*	106-93-4	3	3	4	5
8	1,2-Dichloroethane	107-06-2	2	1.7	2	1.9
9	Ethylbenzene	100-41-4	1.4		1.4	1.1
10	Formaldehyde	50-00-0	51	25	50	23
11	Tetrachloroethylene	127-18-4			1.1	

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

Table 10-4
Sources of Air Toxics with Risk Ratios >1 in NJ

Pollutant	% Contribution from						
	Point Sources	Nonpoint Sources	On-Road Mobile Sources	Nonroad Mobile Sources	Back-ground[a]	Secondary Formation[b]	Bio-genics[c]
Acetaldehyde	0.1%	5%	7%	2%	0%	74%	11%
Benzene	1.5%	29%	50%	20%	0%	0%	0%
1,3-Butadiene	0.1%	21%	59%	19%	0%	0%	0%
Carbon Tetrachloride	0.002%	0.01%	0%	0%	100%	0%	0%
Chloroform	69%	31%	0%	0%	0%	0%	0%
Chloromethane	27%	73%	0%	0%	0%	0%	0%
1,2-Dibromoethane	100%	0.02%	0%	0%	0%	0%	0%
1,2-Dichloroethane	7%	93%	0%	0%	0%	0%	0%
Ethylbenzene	1.6%	8%	66%	24%	0%	0%	0%
Formaldehyde	0.8%	7%	6%	4%	0%	73%	9%
Tetrachloroethylene	6%	94%	0%	0%	0%	0%	0%

[a] Background concentrations are levels of pollutants that would be found in in the air in a given year even if there had been no recent human-caused emissions, because of persistence in the environment of past years' emissions and long-range transport from distant sources.
[b] Secondary formation occurs when some volatile organic compounds (VOCs) react chemically in the air with other emitted compounds (usually oxides of nitrogen).
[c] Biogenic emissions are those directly emitted from trees, plants and soil microbes (excludes secondary formation).

TRENDS AND COMPARISONS

Monitoring of air toxics in New Jersey has been going on since a UATMP site was established in Camden in 1989. Sampling and analysis methods continue to evolve, most notably with improvements in the ability to detect chemicals at lower concentrations. Figures 10-4 through 10-15 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 10-4 through 10-15 as "Camden 1." The new Camden site (Camden Spruce Street), located about two miles from the old site, is designated "Camden 2" in the trend graphs. The New Brunswick monitoring station was shut down in 2016, and most of the monitors were moved less than a mile to the Rutgers University site.

According to USEPA's National Air Toxics Assessment (NATA), **acetaldehyde** concentrations in New Jersey (Figure 10-4) are primarily influenced by secondary formation, a process in which chemicals in the air react with each other and are transformed into other chemicals. 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, high levels of acetaldehyde were measured over a number of weeks at both Camden and New Brunswick.

Figures 10-5 and 10-6 show a general decrease in **benzene** and **1,3-butadiene** concentrations over the past decade. Over 50% of New Jersey's ambient benzene and 1,3-butadiene comes from on-road mobile sources, and about 20% comes from non-road mobile sources.

Carbon tetrachloride (Figure 10-7) was once used widely 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 years. It degrades slowly in the environment, so it can be transported from other areas, and levels in the air can remain relatively steady for a long time.

Some of the increase in **chloroform** concentrations shown in Figure 10-8 is believed to be from improvements in the detection limit. The high annual average concentration for New Brunswick in 2014 is attributable to a period of high values in May and June. Point and nonpoint sources (related to waste disposal) are the major contributors to ambient chloroform levels in New Jersey. Chloroform can be formed in small amounts by chlorination of water. It breaks down slowly in ambient air.

As seen in Figure 10-9, **chloromethane** (also known as methyl chloride) levels have remained relatively stable from year to year, and all the sites show similar levels. It was once commonly used as a refrigerant and in the chemical industry, but was phased out because of its toxicity. According to the USEPA's 2014 National Emissions Inventory, about 73% of the chloromethane in New Jersey's air is from nonpoint sources, primarily waste disposal, while 27% is from point sources.

1,2-Dibromoethane (or ethylene dibromide) (Figure 10-10) is currently used as a pesticide in the treatment of felled logs for bark beetles and termites, and control of wax moths in beehives. 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. Most of the monitoring results fall below the detection limit, so the data in the graph is fairly uncertain.

1,2-Dichloroethane (also called ethylene dichloride) (Figure 10-11) is primarily used in the production of chemicals, as a solvent, dispersant and wetting and penetrating agent. The increase in concentrations after 2011 is related to an improvement in the detection limit, resulting in over 90% of samples having detectable levels of 1,2-dichloroethane. The most recent National Emissions Inventory estimates that 93% of 1,2-dichloroethane in New Jersey's air is from point sources, and 7% from nonpoint sources.

About 90% of **ethylbenzene** is emitted from mobile sources. Improvements in mobile source emissions controls have contributed to the downward trend in air concentrations. 2001 data for Chester and New Brunswick have been omitted from the graph because of technical problems encountered when sampling began that year (Figure 10-12).

Formaldehyde (Figure 10-13) 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 mobile sources, although secondary formation contributes the most to high outdoor levels. In 2014, concentrations at the New Brunswick site were consistently higher than at the other monitors, although they dropped in 2015.

The annual average **styrene** concentration at the Camden Spruce Street monitor dropped below the health benchmark in 2017, although levels are still higher than at the other New Jersey monitors (see Figure 10-14). NJDEP has not been able to find the source of the styrene in Camden. Styrene used in the production of polystyrene plastics and resins, but a significant amount also comes from vehicles.

Tetrachloroethylene (commonly known as perchloroethylene) (Figure 10-15) is widely used as an industrial solvent and in dry cleaning. It is a common contaminant of hazardous waste sites because of a tendency to dispose of it improperly. In recent years, production and demand for it by industry and dry cleaners has been declining.

Figure 10-4
ACETALDEHYDE – New Jersey Monitored Concentrations

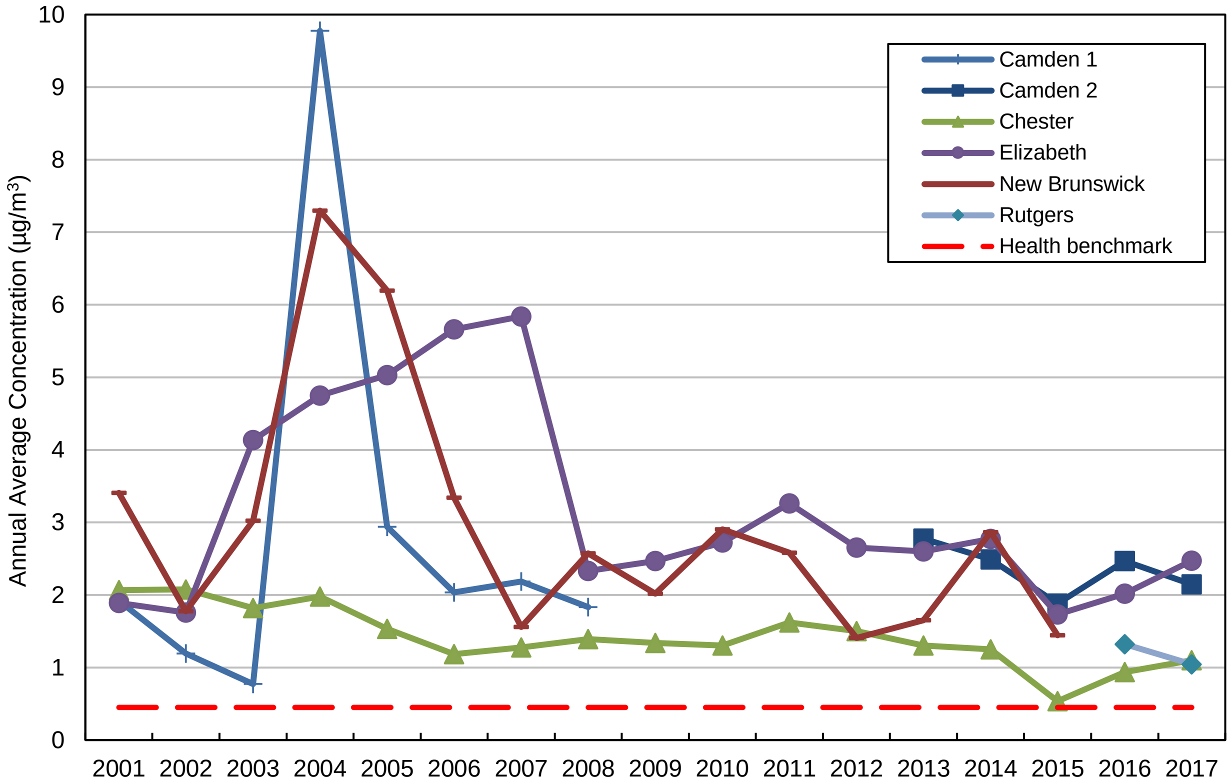


Figure 10-5
BENZENE – New Jersey Monitored Concentrations

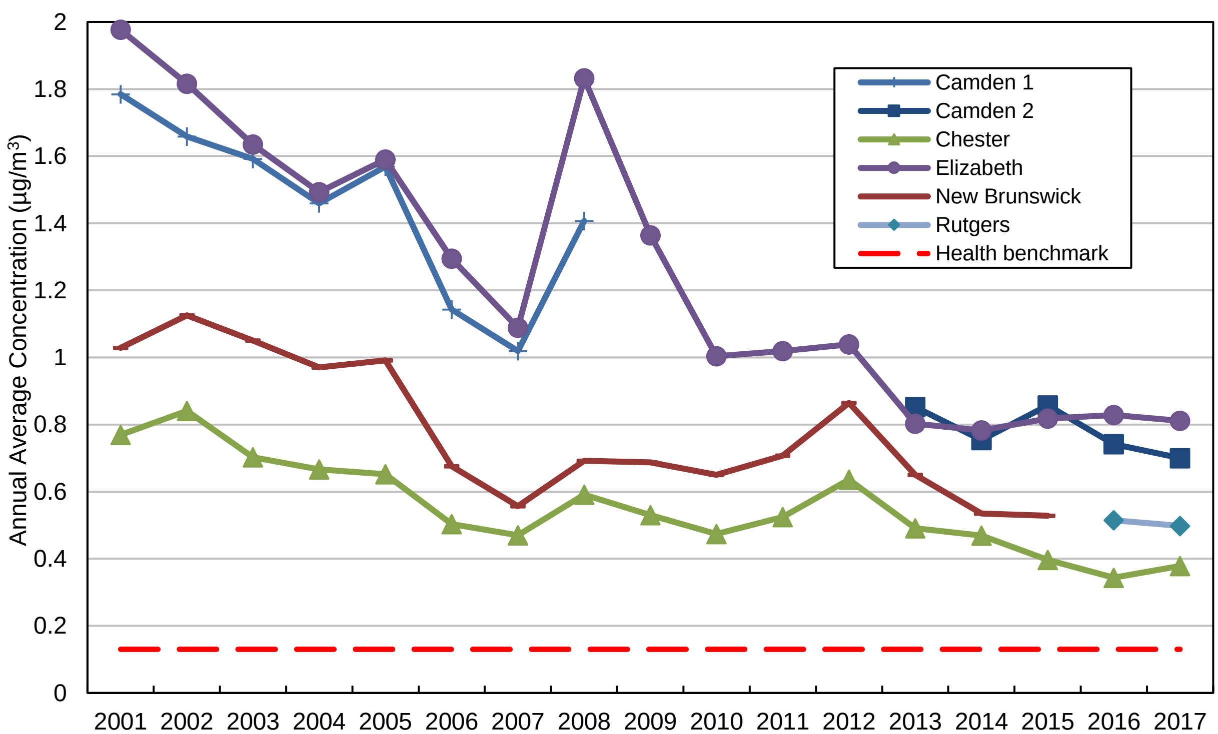


Figure 10-6
1,3-BUTADIENE – New Jersey Monitored Concentrations

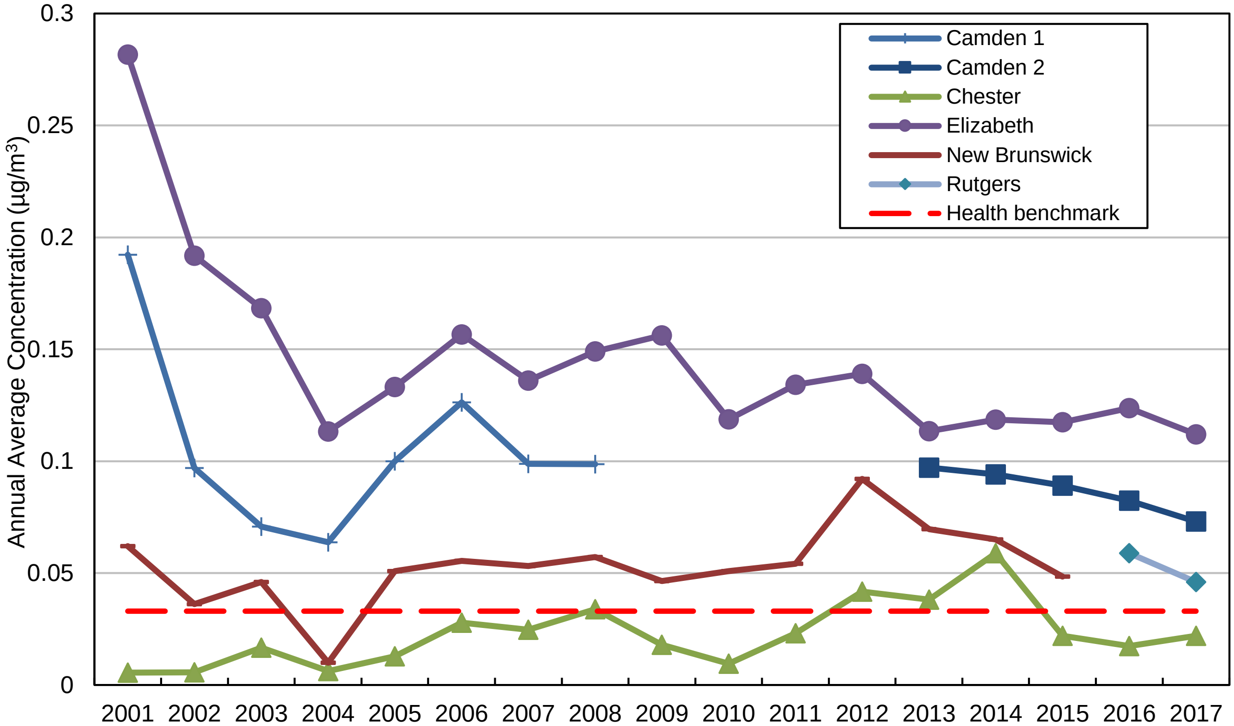


Figure 10-7
CARBON TETRACHLORIDE – New Jersey Monitored Concentrations

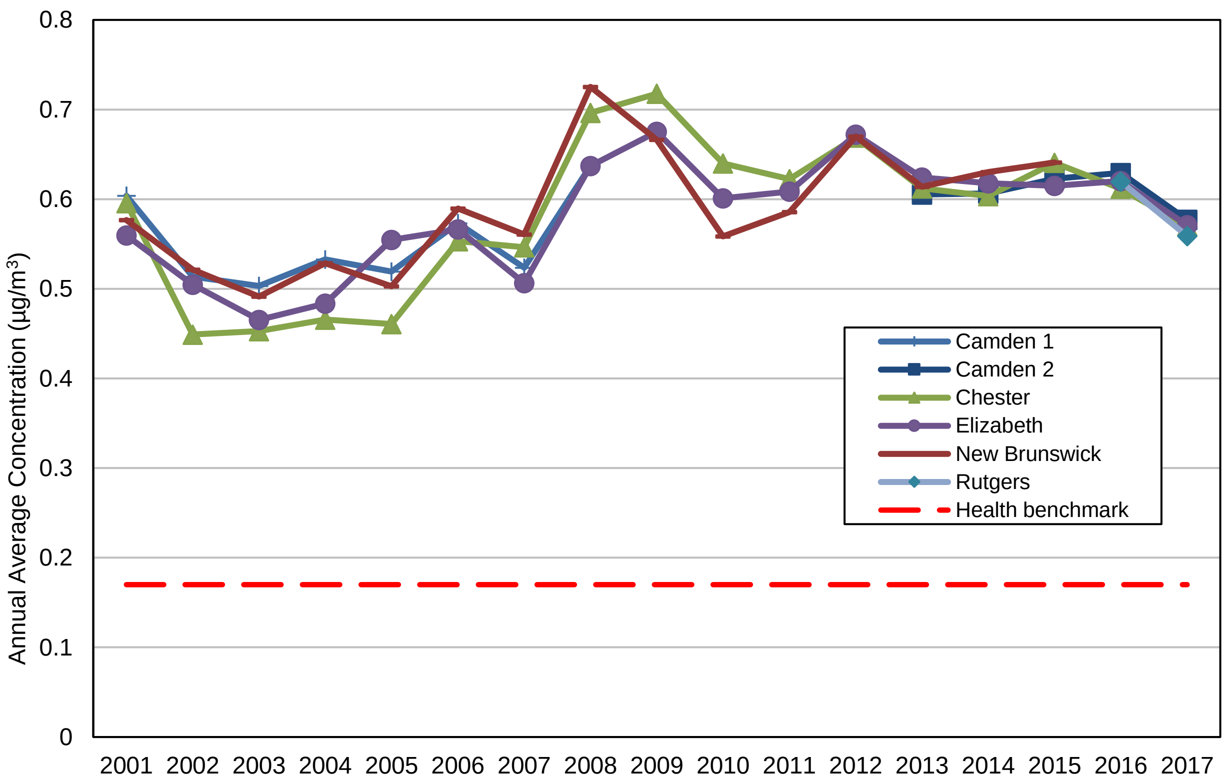


Figure 10-8

CHLOROFORM – New Jersey Monitored Concentrations

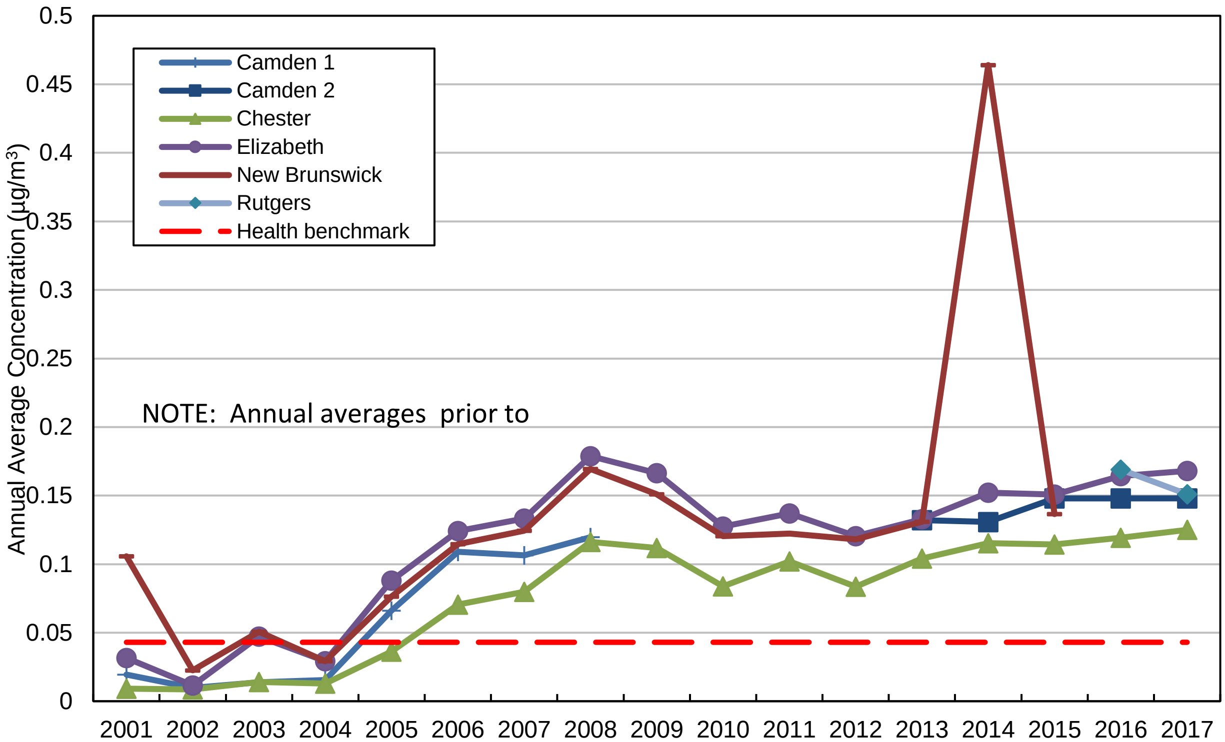


Figure 10-9

CHLOROMETHANE (Methyl Chloride) – New Jersey Monitored Concentrations

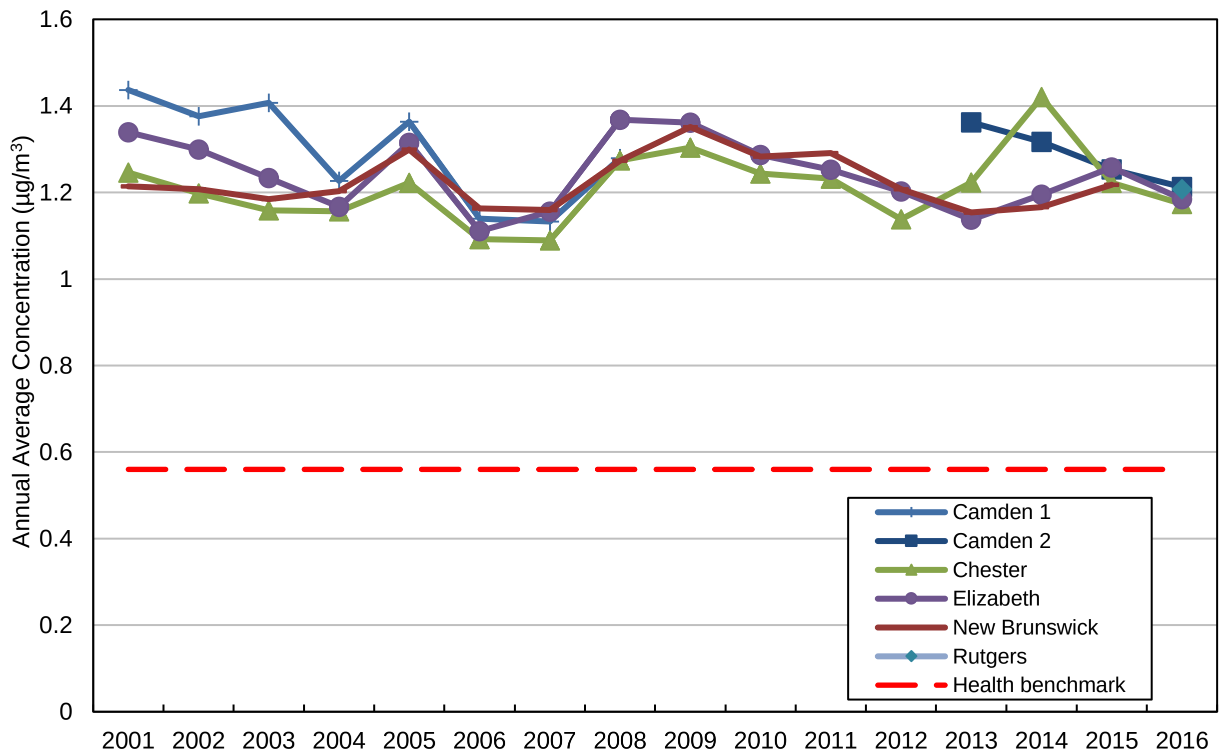


Figure 10-10
1,2-DIBROMOETHANE (Ethylene Dibromide) – New Jersey Monitored Concentrations

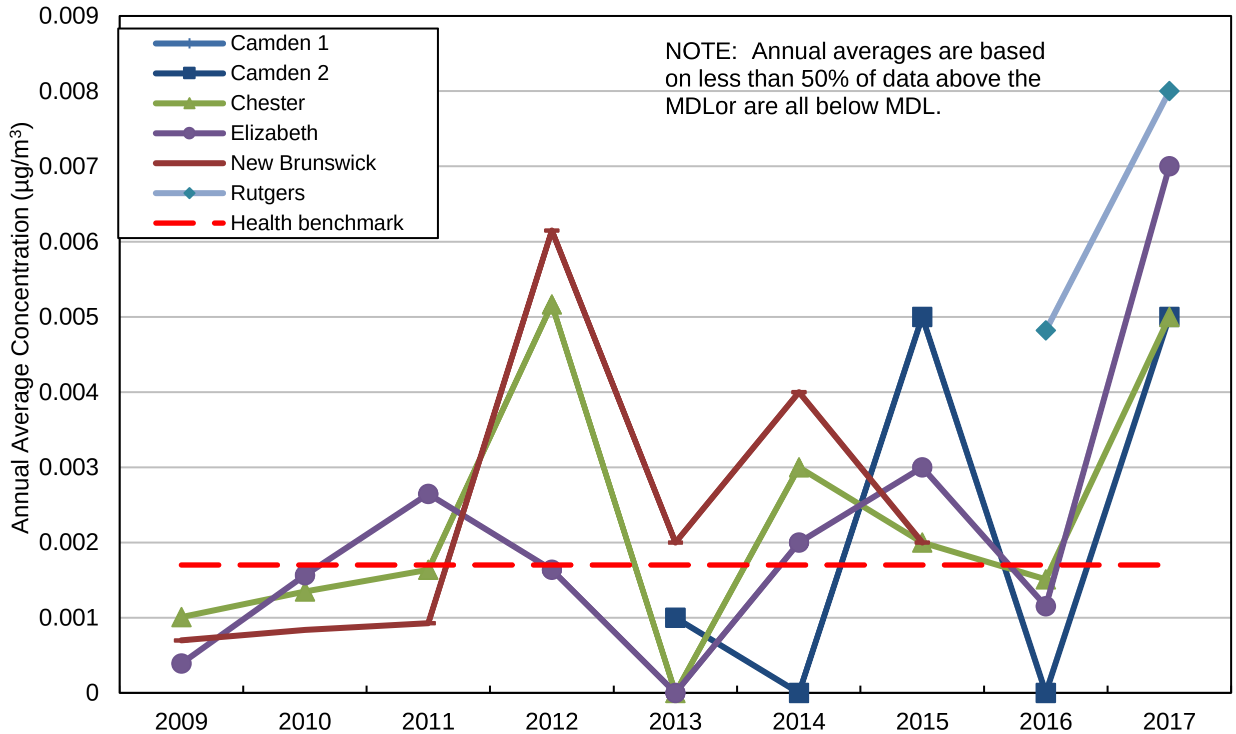


Figure 10-11
1,2-DICHLOROETHANE (Ethylene Dichloride) – New Jersey Monitored Concentrations

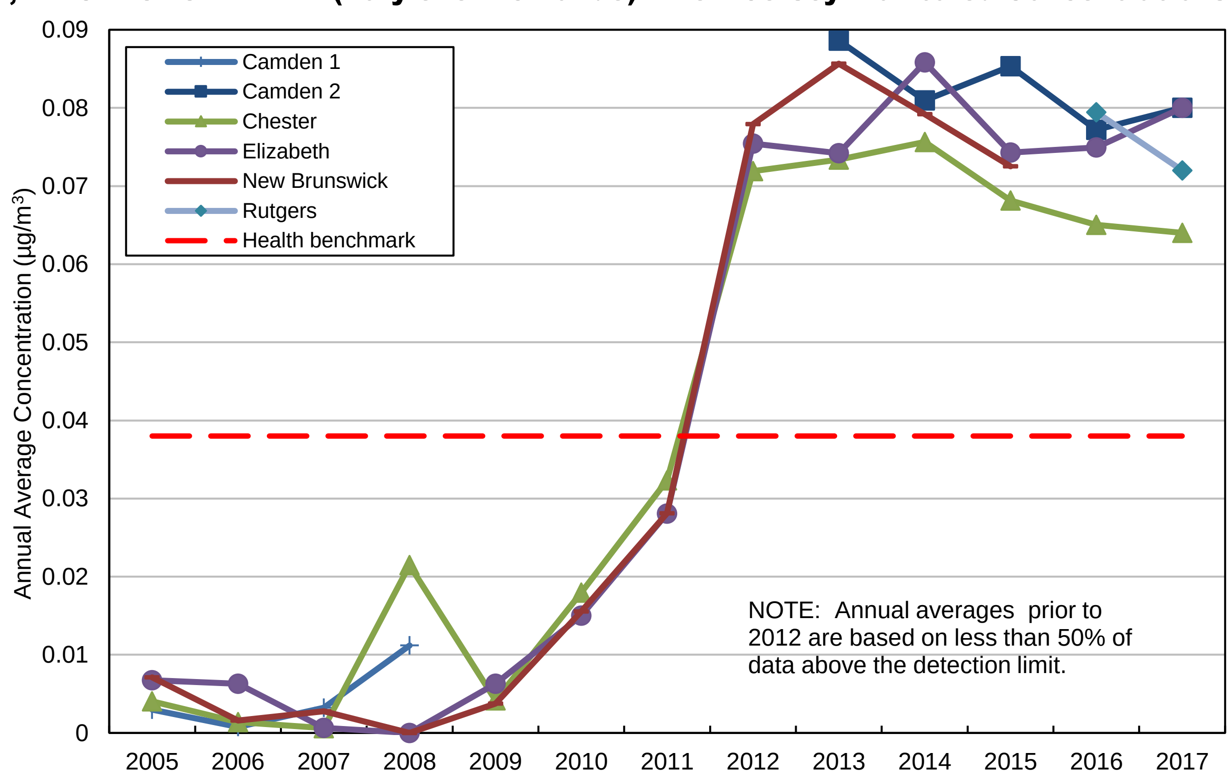


Figure 10-12
ETHYLBENZENE – New Jersey Monitored Concentrations

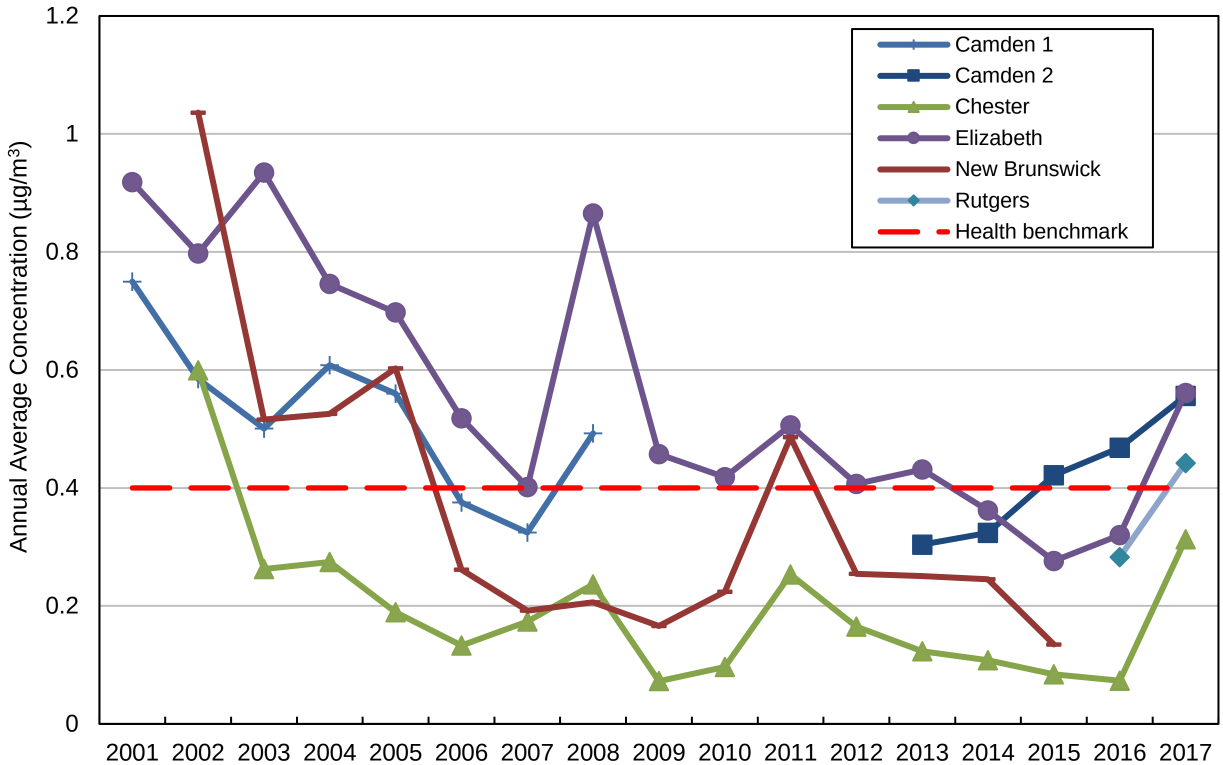


Figure 10-13
FORMALDEHYDE – New Jersey Monitored Concentrations

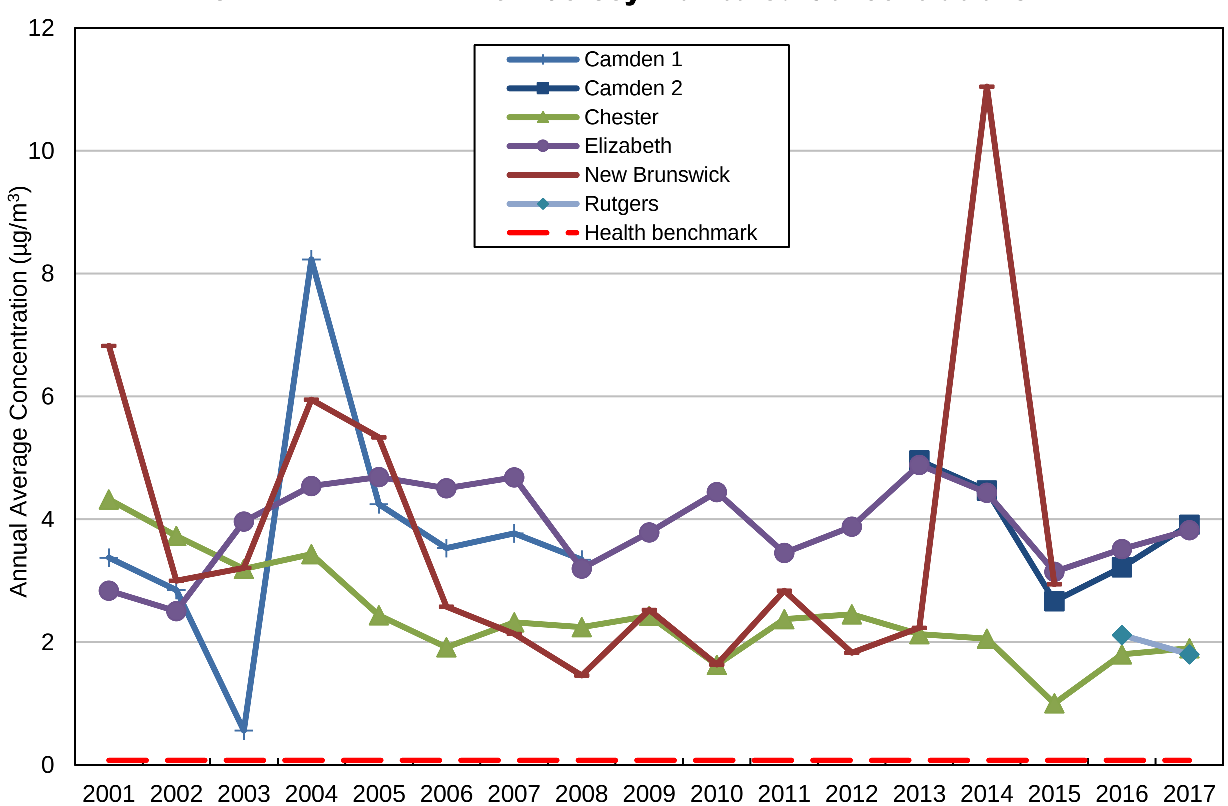


Figure 10-14

STYRENE – New Jersey Monitored Concentrations

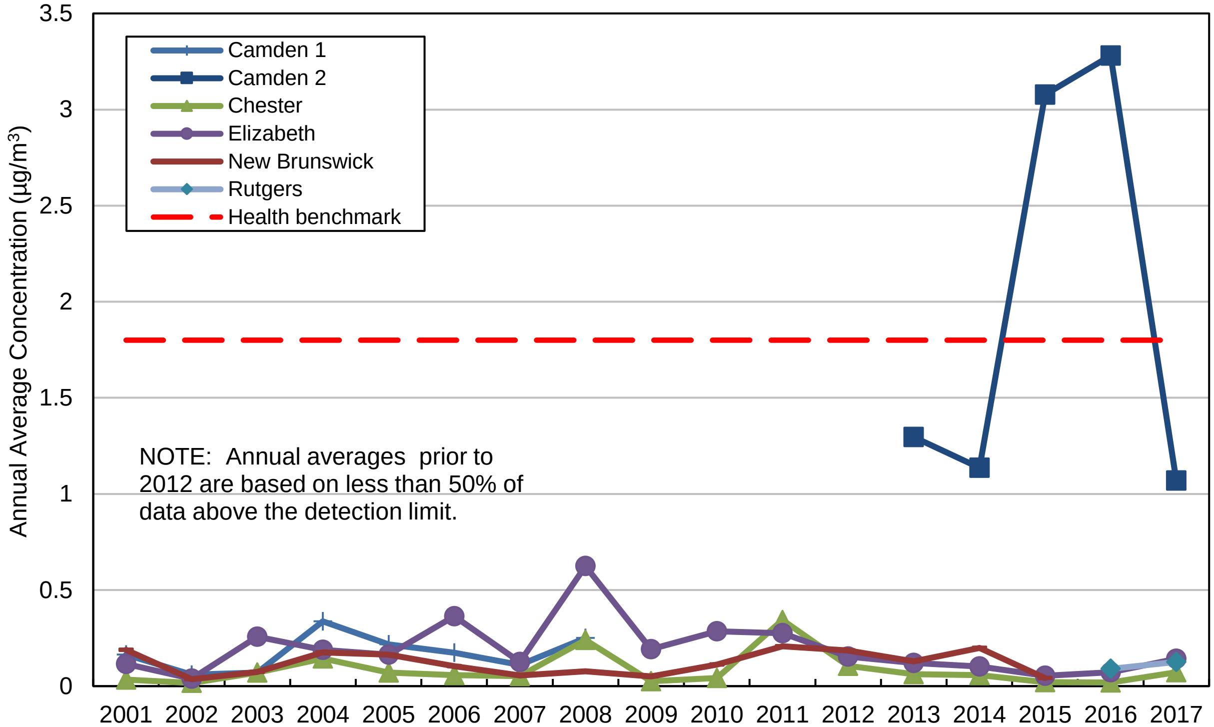


Figure 10-15

TETRACHLOROETHYLENE – New Jersey Monitored Concentrations

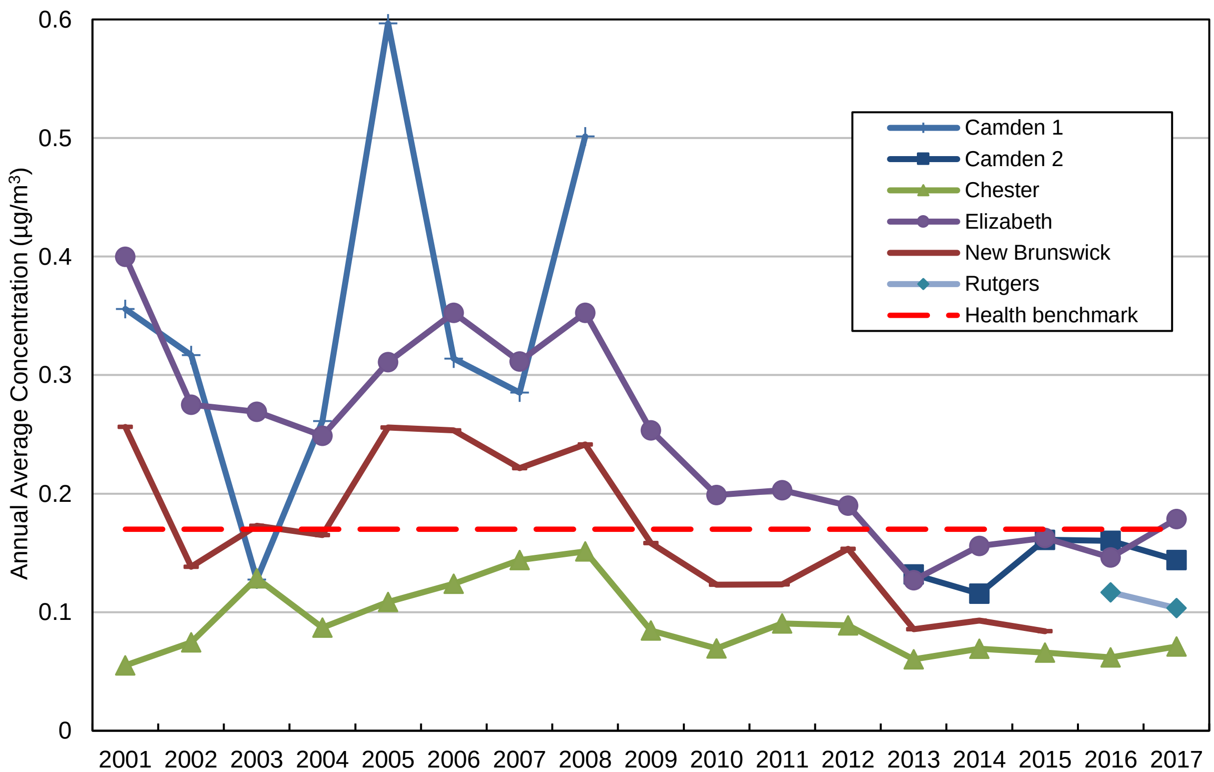


Table 10-5
CAMDEN SPRUCE STREET - 2017 NJ Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Maximum (ppbv)	Annual Mean ($\mu g/m^3$)[c,d]	Annual Median ($\mu g/m^3$)[d]	24-Hour Maximum ($\mu g/m^3$)	Health Bench-mark ($\mu g/m^3$)[e]	Annual Mean Risk Ratio[f]	Detection Limit ($\mu g/m^3$)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	1.191	1.090	2.930	2.145	1.964	5.279	0.45	**5**	0.005	100
Acetone	67-64-1	1.134	0.914	2.790	2.694	2.171	6.627	31000	0.0001	0.014	100
Acetonitrile	75-05-8	2.285	0.192	94.400	3.837	0.322	158.502	60	0.1	0.020	100
Acetylene	74-86-2	0.712	0.495	3.020	0.758	0.527	3.216			0.033	100
Acrolein[g]	107-02-8	0.353	0.327	0.908	0.810	0.750	2.082	0.02	40	0.046	100
Acrylonitrile	107-13-1	ND	ND	ND	ND	ND	ND	0.015	0	0.065	0
tert-Amyl Methyl Ether	994-05-8	*0.0004*	0	0.007	*0.002*	0	0.029			0.033	7
Benzaldehyde	100-52-7	0.065	0.038	0.347	0.281	0.163	1.506			0.074	100
Benzene	71-43-2	0.219	0.203	0.479	0.700	0.647	1.530	0.13	**5**	0.010	100
Bromochloromethane	74-97-5	*0.005*	0	0.045	*0.029*	0	0.238			0.206	15
Bromodichloromethane	75-27-4	*0.001*	0	0.011	*0.008*	0	0.074			0.101	15
Bromoform	75-25-2	*0.001*	0	0.014	*0.013*	0	0.145	0.91	0.01	0.186	15
Bromomethane	74-83-9	0.178	0.017	6.150	0.691	0.064	23.880	5	0.1	0.066	96
1,3-Butadiene	106-99-0	0.033	0.026	0.122	0.073	0.058	0.270	0.033	**2**	0.031	96
Butyraldehyde	123-72-8	0.120	0.114	0.224	0.353	0.336	0.661			0.027	100
Carbon Disulfide	75-15-0	0.020	0.017	0.095	0.062	0.053	0.296	700	0.0001	0.009	100
Carbon Tetrachloride	56-23-5	0.092	0.093	0.114	0.577	0.582	0.717	0.067	**9**	0.075	100
Chlorobenzene	108-90-7	*0.003*	0	0.013	*0.012*	0	0.060	1000	0.00001	0.046	30
Chloroethane	75-00-3	*0.010*	0	0.038	*0.027*	0	0.100	10000	0.000003	0.047	46
Chloroform	67-66-3	0.030	0.030	0.056	0.148	0.146	0.273	0.043	**3**	0.044	100
Chloromethane	74-87-3	0.546	0.541	0.683	1.127	1.116	1.410	0.56	**2**	0.033	100
Chloroprene	126-99-8	*0.0004*	0	0.012	*0.002*	0	0.043	7	0.0002	0.040	6
Crotonaldehyde	123-73-9	0.114	0.048	0.501	0.325	0.138	1.436			0.049	100
Dibromochloromethane	594-18-3	*0.003*	0	0.013	*0.025*	0	0.111			0.051	44
1,2-Dibromoethane	106-93-4	*0.001*	0	0.013	*0.005*	0	0.100	0.0017	**3**	0.138	7
m-Dichlorobenzene	541-73-1	*0.001*	0	0.011	*0.003*	0	0.066			0.168	7
o-Dichlorobenzene	95-50-1	*0.001*	0	0.012	*0.005*	0	0.072	200	0.00002	0.144	9
p-Dichlorobenzene	106-46-7	0.007	0.009	0.030	0.042	0.051	0.180	0.091	0.5	0.156	52
Dichlorodifluoromethane	75-71-8	0.525	0.518	0.740	2.598	2.562	3.660	200	0.01	0.064	100
1,1-Dichloroethane	75-34-3	*0.001*	0	0.013	*0.004*	0	0.053	0.63	0.01	0.061	9
1,2-Dichloroethane	107-06-2	0.020	0.019	0.046	0.080	0.077	0.186	0.038	**2**	0.053	98
1,1-Dichloroethene	75-35-4	*0.001*	0	0.010	*0.004*	0	0.040	200	0.00002	0.032	15
cis-1,2-Dichloroethylene	156-59-2	ND	ND	ND	ND	ND	ND			0.048	0
trans-1,2-Dichloroethylene	156-60-5	*0.003*	0	0.027	*0.010*	0	0.107			0.048	20
Dichloromethane	75-09-2	0.121	0.113	0.380	0.419	0.391	1.320	2.1	0.2	0.028	100

[a] See page 10-25 for footnotes.

Table 10-5 (continued)
CAMDEN SPRUCE STREET - 2017 NJ Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Maximum (ppbv)	Annual Mean (µg/m³)[c,d]	Annual Median (µg/m³)[d]	24-Hour Maximum (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	*0.001*	0	0.014	*0.003*	0	0.065	0.1	0.03	0.079	6
cis-1,3-Dichloropropene	542-75-6	*0.0004*	0	0.011	*0.002*	0	0.050			0.064	4
trans-1,3-Dichloropropene	542-75-6	ND	ND	ND	ND	ND	ND			0.095	0
Dichlorotetrafluoroethane	76-14-2	0.020	0.018	0.030	0.136	0.126	0.210			0.133	100
2,5-Dimethylbenzaldehyde	5799-94-2	ND	ND	ND	ND	ND	ND			0.011	0
Ethyl Acrylate	140-88-5	ND	ND	ND	ND	ND	ND	2	0	0.033	0
Ethyl tert-Butyl Ether	637-92-3	*0.002*	0	0.012	*0.010*	0	0.050			0.046	31
Ethylbenzene	100-41-4	0.128	0.120	0.348	0.556	0.521	1.511	0.40	**1.4**	0.035	100
Formaldehyde	50-00-0	3.183	2.520	9.440	3.909	3.095	11.593	0.077	**51**	0.023	100
Hexachloro-1,3-butadiene	87-68-3	*0.002*	0	0.012	*0.022*	0	0.128	0.045	0.5	0.117	28
Hexaldehyde	66-25-1	0.046	0.035	0.146	0.189	0.143	0.598			0.139	100
Isovaleraldehyde	590-86-3	ND	ND	ND	ND	ND	ND			0.007	0
Methyl Ethyl Ketone	78-93-3	0.170	0.142	0.495	0.502	0.419	1.459	5000	0.0001	0.074	100
Methyl Isobutyl Ketone	108-10-1	0.048	0.043	0.307	0.196	0.174	1.258	3000	0.0001	0.057	93
Methyl Methacrylate	80-62-6	*0.006*	0	0.058	*0.024*	0	0.237	700	0.00003	0.115	33
Methyl tert-Butyl Ether	1634-04-4	*0.003*	0	0.042	*0.011*	0	0.151	3.8	0.003	0.050	22
n-Octane	111-65-9	0.060	0.041	0.241	0.281	0.192	1.126			0.079	100
Propionaldehyde	123-38-6	0.166	0.141	0.382	0.395	0.335	0.907	8	0.05	0.007	100
Propylene	115-07-1	0.474	0.382	1.460	0.815	0.657	2.513	3000	0.0003	0.055	100
Styrene	100-42-5	0.251	0.074	2.700	1.070	0.315	11.501	1.8	0.6	0.068	98
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.012	*0.004*	0	0.082	0.017	0.2	0.124	7
Tetrachloroethylene	127-18-4	0.021	0.019	0.048	0.144	0.129	0.326	0.17	0.8	0.095	98
Tolualdehydes		0.032	0.023	0.130	0.158	0.113	0.639			0.020	98
Toluene	108-88-3	0.734	0.469	6.980	2.766	1.767	26.304	5000	0.001	0.068	100
1,2,4-Trichlorobenzene	102-82-1	*0.001*	0	0.014	*0.005*	0	0.104	4	0.001	0.371	6
1,1,1-Trichloroethane	71-55-6	0.005	0.005	0.013	0.026	0.027	0.071	1000	0.00003	0.071	63
1,1,2-Trichloroethane	79-00-5	*0.0003*	0	0.010	*0.002*	0	0.055	0.063	0.03	0.093	4
Trichloroethylene	79-01-6	*0.011*	0	0.076	*0.058*	0	0.408	0.5	0.1	0.091	44
Trichlorofluoromethane	75-69-4	0.385	0.268	1.560	2.163	1.506	8.765	700	0.003	0.045	100
Trichlorotrifluoroethane	76-13-1	0.079	0.080	0.096	0.605	0.609	0.736	30000	0.00002	0.069	100
1,2,4-Trimethylbenzene	95-63-6	0.098	0.073	0.461	0.482	0.356	2.266			0.103	100
1,3,5-Trimethylbenzene	108-67-8	0.033	0.026	0.140	0.161	0.128	0.688			0.103	100
Valeraldehyde	110-62-3	0.038	0.037	0.084	0.133	0.130	0.296			0.007	100
Vinyl chloride	75-01-4	*0.004*	0	0.032	*0.011*	0	0.082	0.11	0.1	0.020	37
m,p-Xylene	1330-20-7	0.220	0.155	0.850	0.954	0.673	3.691	100	0.01	0.017	100
o-Xylene	95-47-6	0.144	0.124	0.423	0.627	0.536	1.837	100	0.01	0.069	100

[a] See page 10-25 for footnotes.

Table 10-6
CHESTER - 2017 NJ Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Maximum (ppbv)	Annual Mean (µg/m³)[c,d]	Annual Median (µg/m³)[d]	24-Hour Maximum (µg/m³)	Health Bench-mark (µg/m³)[e]	Annual Mean Risk Ratio[f]	Detection Limit (µg/m³)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	0.611	0.602	1.760	1.100	1.084	3.171	0.45	**2**	0.005	100
Acetone	67-64-1	0.766	0.703	1.640	1.820	1.670	3.896	31000	0.0001	0.014	100
Acetonitrile	75-05-8	0.703	0.198	13.200	1.181	0.332	22.163	60	0.02	0.020	100
Acetylene	74-86-2	0.409	0.308	2.010	0.436	0.328	2.141			0.033	100
Acrolein[g]	107-02-8	0.376	0.340	0.906	0.862	0.780	2.077	0.02	43	0.046	100
Acrylonitrile	107-13-1	*0.001*	0	0.037	*0.001*	0	0.080	0.015	0.1	0.065	2
tert-Amyl Methyl Ether	994-05-8	*0.000*	0	0.008	*0.002*	0	0.033			0.033	7
Benzaldehyde	100-52-7	0.016	0.016	0.037	0.071	0.069	0.161			0.074	98
Benzene	71-43-2	0.118	0.103	0.260	0.378	0.329	0.831	0.13	**3**	0.010	100
Bromochloromethane	74-97-5	*0.006*	0	0.050	*0.032*	0	0.265			0.206	16
Bromodichloromethane	75-27-4	*0.001*	0	0.011	*0.005*	0	0.074			0.101	9
Bromoform	75-25-2	*0.0004*	0	0.010	*0.005*	0	0.103	0.91	0.01	0.186	5
Bromomethane	74-83-9	0.013	0.011	0.083	0.052	0.043	0.322	5	0.01	0.066	86
1,3-Butadiene	106-99-0	0.010	0.007	0.048	0.022	0.015	0.106	0.033	0.7	0.031	61
Butyraldehyde	123-72-8	0.057	0.055	0.115	0.168	0.162	0.339			0.027	100
Carbon Disulfide	75-15-0	0.011	0.010	0.037	0.036	0.031	0.115	700	0.0001	0.009	100
Carbon Tetrachloride	56-23-5	0.091	0.091	0.113	0.570	0.573	0.711	0.067	**9**	0.075	100
Chlorobenzene	108-90-7	*0.002*	0	0.011	*0.010*	0	0.051	1000	0.00001	0.046	27
Chloroethane	75-00-3	*0.010*	0	0.042	*0.026*	0	0.111	10000	0.000003	0.047	45
Chloroform	67-66-3	0.026	0.024	0.039	0.125	0.117	0.190	0.043	**3**	0.044	100
Chloromethane	74-87-3	0.547	0.546	0.695	1.130	1.127	1.435	0.56	**2**	0.033	100
Chloroprene	126-99-8	*0.0004*	0	0.010	*0.001*	0	0.036	7	0.0002	0.040	4
Crotonaldehyde	123-73-9	0.086	0.022	0.515	0.247	0.062	1.476			0.049	96
Dibromochloromethane	594-18-3	*0.002*	0	0.011	*0.021*	0	0.094			0.051	38
1,2-Dibromoethane	106-93-4	*0.001*	0	0.012	*0.005*	0	0.092	0.0017	**3**	0.138	7
m-Dichlorobenzene	541-73-1	*0.0001*	0	0.007	*0.001*	0	0.042			0.168	2
o-Dichlorobenzene	95-50-1	*0.0003*	0	0.008	*0.002*	0	0.048	200	0.00001	0.144	4
p-Dichlorobenzene	106-46-7	*0.001*	0	0.016	*0.007*	0	0.096	0.091	0.1	0.156	9
Dichlorodifluoromethane	75-71-8	0.502	0.508	0.605	2.482	2.512	2.992	200	0.01	0.064	100
1,1-Dichloroethane	75-34-3	*0.001*	0	0.011	*0.005*	0	0.045	0.63	0.01	0.061	13
1,2-Dichloroethane	107-06-2	0.016	0.017	0.024	0.064	0.067	0.097	0.038	**1.7**	0.053	93
1,1-Dichloroethene	75-35-4	*0.001*	0	0.009	*0.004*	0	0.036	200	0.00002	0.032	14
cis-1,2-Dichloroethylene	156-59-2	ND	ND	ND	ND	ND	ND			0.048	0
trans-1,2-Dichloroethylene	156-60-5	*0.0004*	0	0.009	*0.002*	0	0.036			0.048	5
Dichloromethane	75-09-2	0.097	0.095	0.160	0.338	0.330	0.556	2.1	0.2	0.028	100

[a] See page 10-25 for footnotes.

Table 10-6 (continued)
CHESTER - 2017 NJ Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[,d]	24-Hour Maximum (ppbv)	Annual Mean (µg/m³)[c,d]	Annual Median (µg/m³)[,d]	24-Hour Maximum (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	*0.001*	0	0.013	*0.004*	0	0.060	0.1	0.04	0.079	7
cis-1,3-Dichloropropene	542-75-6	*0.0004*	0	0.012	*0.002*	0	0.054			0.064	4
trans-1,3-Dichloropropene	542-75-6	ND	ND	ND	ND	ND	ND			0.095	0
Dichlorotetrafluoroethane	76-14-2	0.019	0.018	0.034	0.136	0.126	0.238			0.133	100
2,5-Dimethylbenzaldehyde	5799-94-2	ND	ND	ND	ND	ND	ND			0.011	0
Ethyl Acrylate	140-88-5	ND	ND	ND	ND	ND	ND	2	0	0.033	0
Ethyl tert-Butyl Ether	637-92-3	*0.003*	0	0.013	*0.012*	0	0.054			0.046	36
Ethylbenzene	100-41-4	0.072	0.080	0.127	0.313	0.345	0.551	0.40	0.8	0.035	100
Formaldehyde	50-00-0	1.548	1.340	5.830	1.901	1.646	7.160	0.077	**25**	0.023	100
Hexachloro-1,3-butadiene	87-68-3	*0.001*	0	0.009	*0.014*	0	0.096	0.045	0.3	0.117	18
Hexaldehyde	66-25-1	0.013	0.012	0.051	0.055	0.049	0.209			0.139	89
Isovaleraldehyde	590-86-3	ND	ND	ND	ND	ND	ND			0.007	0
Methyl Ethyl Ketone	78-93-3	0.103	0.090	0.247	0.304	0.265	0.728	5000	0.0001	0.074	100
Methyl Isobutyl Ketone	108-10-1	0.025	0.024	0.060	0.102	0.098	0.246	3000	0.00003	0.057	95
Methyl Methacrylate	80-62-6	*0.002*	0	0.013	*0.006*	0	0.053	700	0.00001	0.115	20
Methyl tert-Butyl Ether	1634-04-4	*0.001*	0	0.010	*0.005*	0	0.036	3.8	0.001	0.050	16
n-Octane	111-65-9	0.020	0.017	0.075	0.092	0.079	0.350			0.079	96
Propionaldehyde	123-38-6	0.100	0.092	0.240	0.237	0.219	0.570	8	0.03	0.007	100
Propylene	115-07-1	0.203	0.181	0.556	0.349	0.311	0.957	3000	0.0001	0.055	100
Styrene	100-42-5	0.017	0.018	0.040	0.073	0.075	0.170	1.8	0.04	0.068	86
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.010	*0.004*	0	0.069	0.017	0.2	0.124	7
Tetrachloroethylene	127-18-4	0.010	0.011	0.026	0.071	0.075	0.176	0.17	0.4	0.095	82
Tolualdehydes		0.018	0.015	0.058	0.090	0.074	0.285			0.020	85
Toluene	108-88-3	0.160	0.140	0.516	0.604	0.528	1.945	5000	0.0001	0.068	100
1,2,4-Trichlorobenzene	102-82-1	*0.001*	0	0.016	*0.004*	0	0.119	4	0.001	0.371	4
1,1,1-Trichloroethane	71-55-6	*0.003*	0	0.011	*0.016*	0	0.060	1000	0.00002	0.071	43
1,1,2-Trichloroethane	79-00-5	ND	ND	ND	ND	ND	ND	0.063	0	0.093	0
Trichloroethylene	79-01-6	*0.002*	0	0.015	*0.009*	0	0.081	0.5	0.02	0.091	16
Trichlorofluoromethane	75-69-4	0.236	0.235	0.295	1.324	1.320	1.657	700	0.002	0.045	100
Trichlorotrifluoroethane	76-13-1	0.078	0.078	0.092	0.600	0.598	0.705	30000	0.00002	0.069	100
1,2,4-Trimethylbenzene	95-63-6	0.022	0.017	0.228	0.110	0.084	1.121			0.103	98
1,3,5-Trimethylbenzene	108-67-8	0.009	0.007	0.061	0.044	0.034	0.300			0.103	89
Valeraldehyde	110-62-3	0.016	0.015	0.044	0.057	0.053	0.155			0.007	93
Vinyl chloride	75-01-4	*0.002*	0	0.016	*0.006*	0	0.041	0.11	0.1	0.020	30
m,p-Xylene	1330-20-7	0.042	0.033	0.115	0.181	0.141	0.499	100	0.002	0.017	100
o-Xylene	95-47-6	0.074	0.083	0.130	0.320	0.358	0.565	100	0.003	0.069	100

[a] See page 10-25 for footnotes.

Table 10-7

ELIZABETH LAB - 2017 NJ Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[,d]	24-Hour Maximum (ppbv)	Annual Mean (µg/m^3)[c,d]	Annual Median (µg/m^3)[,d]	24-Hour Maximum (µg/m^3)	Health Bench-mark (µg/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (µg/m^3)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	1.372	1.010	13.300	2.471	1.820	23.963	0.45	**5**	0.005	100
Acetone	67-64-1	1.023	0.925	4.140	2.430	2.197	9.834	31000	0.0001	0.014	100
Acetonitrile	75-05-8	0.336	0.216	1.580	0.565	0.363	2.653	60	0.01	0.020	100
Acetylene	74-86-2	0.928	0.669	5.010	0.988	0.712	5.335			0.033	100
Acrolein[g]	107-02-8	0.426	0.394	0.900	0.976	0.902	2.064	0.02	49	0.046	100
Acrylonitrile	107-13-1	ND	ND	ND	ND	ND	ND	0.015	0	0.065	0
tert-Amyl Methyl Ether	994-05-8	*0.001*	0	0.009	*0.003*	0	0.038			0.033	11
Benzaldehyde	100-52-7	0.029	0.027	0.074	0.124	0.117	0.321			0.074	100
Benzene	71-43-2	0.254	0.214	1.090	0.811	0.684	3.482	0.13	**6**	0.010	100
Bromochloromethane	74-97-5	*0.005*	0	0.043	*0.025*	0	0.228			0.206	13
Bromodichloromethane	75-27-4	*0.001*	0	0.011	*0.009*	0	0.074			0.101	16
Bromoform	75-25-2	*0.001*	0	0.013	*0.014*	0	0.134	0.91	0.02	0.186	15
Bromomethane	74-83-9	0.014	0.013	0.044	0.055	0.050	0.171	5	0.01	0.066	93
1,3-Butadiene	106-99-0	0.051	0.045	0.180	0.112	0.100	0.398	0.033	**3**	0.031	98
Butyraldehyde	123-72-8	0.106	0.098	0.243	0.312	0.289	0.717			0.027	100
Carbon Disulfide	75-15-0	0.015	0.013	0.046	0.047	0.040	0.143	700	0.0001	0.009	100
Carbon Tetrachloride	56-23-5	0.091	0.091	0.118	0.571	0.573	0.742	0.067	**9**	0.075	100
Chlorobenzene	108-90-7	*0.003*	0	0.031	*0.016*	0	0.143	1000	0.00002	0.046	34
Chloroethane	75-00-3	*0.010*	0	0.071	*0.027*	0	0.187	10000	0.000003	0.047	39
Chloroform	67-66-3	0.034	0.034	0.059	0.168	0.166	0.288	0.043	**4**	0.044	100
Chloromethane	74-87-3	0.548	0.549	0.677	1.132	1.134	1.398	0.56	**2**	0.033	100
Chloroprene	126-99-8	*0.0005*	0	0.012	*0.002*	0	0.043	7	0.0002	0.040	5
Crotonaldehyde	123-73-9	0.098	0.047	0.452	0.280	0.135	1.296			0.049	100
Dibromochloromethane	594-18-3	0.004	0.002	0.013	0.030	0.017	0.111			0.051	51
1,2-Dibromoethane	106-93-4	*0.001*	0	0.010	*0.007*	0	0.077	0.0017	**4**	0.138	10
m-Dichlorobenzene	541-73-1	*0.001*	0	0.010	*0.005*	0	0.060			0.168	11
o-Dichlorobenzene	95-50-1	*0.001*	0	0.011	*0.006*	0	0.066	200	0.00003	0.144	11
p-Dichlorobenzene	106-46-7	*0.007*	0	0.034	*0.042*	0	0.204	0.091	0.5	0.156	49
Dichlorodifluoromethane	75-71-8	0.497	0.503	0.652	2.460	2.487	3.224	200	0.01	0.064	100
1,1-Dichloroethane	75-34-3	*0.002*	0	0.015	*0.009*	0	0.061	0.63	0.01	0.061	21
1,2-Dichloroethane	107-06-2	0.020	0.020	0.048	0.080	0.081	0.194	0.038	**2**	0.053	97
1,1-Dichloroethene	75-35-4	*0.002*	0	0.010	*0.006*	0	0.040	200	0.00003	0.032	18
cis-1,2-Dichloroethylene	156-59-2	ND	ND	ND	ND	ND	ND			0.048	0
trans-1,2-Dichloroethylene	156-60-5	*0.002*	0	0.023	*0.008*	0	0.091			0.048	16
Dichloromethane	75-09-2	0.155	0.134	0.612	0.537	0.465	2.126	2.1	0.3	0.028	100

[a] See page 10-25 for footnotes.

Table 10-7 (continued)

ELIZABETH LAB - 2017 NJ Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[,d]	24-Hour Maximum (ppbv)	Annual Mean (µg/m^3)[c,d]	Annual Median (µg/m^3)[,d]	24-Hour Maximum (µg/m^3)	Health Bench-mark (µg/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (µg/m^3)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	*0.0006*	0	0.014	*0.003*	0	0.065	0.1	0.03	0.079	5
cis-1,3-Dichloropropene	542-75-6	*0.0006*	0	0.012	*0.003*	0	0.054			0.064	7
trans-1,3-Dichloropropene	542-75-6	ND	ND	ND	ND	ND	ND			0.095	0
Dichlorotetrafluoroethane	76-14-2	0.020	0.019	0.029	0.138	0.133	0.203			0.133	100
2,5-Dimethylbenzaldehyde	5799-94-2	ND	ND	ND	ND	ND	ND			0.011	0
Ethyl Acrylate	140-88-5	*0.0001*	0	0.006	*0.0004*	0	0.025	2	0.0002	0.033	2
Ethyl tert-Butyl Ether	637-92-3	0.018	0.016	0.088	0.076	0.067	0.368			0.046	95
Ethylbenzene	100-41-4	0.129	0.132	0.398	0.561	0.573	1.728	0.40	**1.4**	0.035	100
Formaldehyde	50-00-0	3.112	2.430	13.400	3.821	2.984	16.456	0.077	**50**	0.023	100
Hexachloro-1,3-butadiene	87-68-3	*0.003*	0	0.011	*0.029*	0	0.117	0.045	0.6	0.117	34
Hexaldehyde	66-25-1	0.033	0.031	0.077	0.136	0.127	0.315			0.139	100
Isovaleraldehyde	590-86-3	ND	ND	ND	ND	ND	ND			0.007	0
Methyl Ethyl Ketone	78-93-3	0.157	0.133	0.534	0.462	0.392	1.574	5000	0.0001	0.074	100
Methyl Isobutyl Ketone	108-10-1	0.046	0.046	0.120	0.188	0.188	0.492	3000	0.0001	0.057	95
Methyl Methacrylate	80-62-6	*0.010*	0	0.127	*0.041*	0	0.520	700	0.0001	0.115	39
Methyl tert-Butyl Ether	1634-04-4	*0.007*	0	0.057	*0.025*	0	0.206	3.8	0.01	0.050	48
n-Octane	111-65-9	0.079	0.064	0.648	0.367	0.299	3.027			0.079	100
Propionaldehyde	123-38-6	0.171	0.147	0.465	0.407	0.349	1.105	8	0.1	0.007	100
Propylene	115-07-1	1.725	0.791	9.760	2.968	1.361	16.798	3000	0.001	0.055	100
Styrene	100-42-5	0.034	0.033	0.076	0.143	0.141	0.324	1.8	0.1	0.068	97
1,1,2,2-Tetrachloroethane	79-34-5	*0.002*	0	0.012	*0.010*	0	0.082	0.017	0.6	0.124	18
Tetrachloroethylene	127-18-4	0.026	0.020	0.081	0.179	0.136	0.549	0.17	**1.1**	0.095	98
Tolualdehydes		0.026	0.019	0.074	0.126	0.091	0.364			0.020	98
Toluene	108-88-3	0.489	0.415	2.340	1.843	1.564	8.818	5000	0.0004	0.068	100
1,2,4-Trichlorobenzene	102-82-1	*0.001*	0	0.015	*0.006*	0	0.111	4	0.002	0.371	7
1,1,1-Trichloroethane	71-55-6	0.005	0.006	0.014	0.028	0.033	0.076	1000	0.00003	0.071	69
1,1,2-Trichloroethane	79-00-5	*0.001*	0	0.011	*0.004*	0	0.060	0.063	0.1	0.093	8
Trichloroethylene	79-01-6	*0.005*	0	0.018	*0.024*	0	0.097	0.5	0.05	0.091	38
Trichlorofluoromethane	75-69-4	0.237	0.240	0.303	1.332	1.348	1.702	700	0.002	0.045	100
Trichlorotrifluoroethane	76-13-1	0.079	0.079	0.110	0.604	0.605	0.843	30000	0.00002	0.069	100
1,2,4-Trimethylbenzene	95-63-6	0.078	0.073	0.289	0.385	0.359	1.421			0.103	100
1,3,5-Trimethylbenzene	108-67-8	0.027	0.027	0.082	0.131	0.133	0.403			0.103	100
Valeraldehyde	110-62-3	0.033	0.029	0.084	0.115	0.102	0.296			0.007	100
Vinyl chloride	75-01-4	*0.003*	0	0.015	*0.008*	0	0.038	0.11	0.1	0.020	31
m,p-Xylene	1330-20-7	0.211	0.189	1.150	0.914	0.821	4.994	100	0.01	0.017	100
o-Xylene	95-47-6	0.141	0.138	0.480	0.612	0.599	2.084	100	0.01	0.069	100

[a] See page 10-25 for footnotes.

Table 10-8

RUTGERS UNIVERSITY - 2017 NJ Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Maximum (ppbv)	Annual Mean ($\mu g/m^3$)[c,d]	Annual Median ($\mu g/m^3$)[d]	24-Hour Maximum ($\mu g/m^3$)	Health Bench-mark ($\mu g/m^3$)[e]	Annual Mean Risk Ratio[f]	Detection Limit ($\mu g/m^3$)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	0.580	0.557	1.360	1.045	1.004	2.450	0.45	**2**	0.005	100
Acetone	67-64-1	0.926	0.898	2.690	2.199	2.132	6.390	31000	0.0001	0.014	100
Acetonitrile	75-05-8	0.229	0.214	0.743	0.384	0.359	1.248	60	0.01	0.020	100
Acetylene	74-86-2	0.574	0.391	3.390	0.612	0.416	3.610			0.033	100
Acrolein[g]	107-02-8	0.389	0.349	0.981	0.893	0.800	2.249	0.02	45	0.046	100
Acrylonitrile	107-13-1	ND	ND	ND	ND	ND	ND	0.015	0	0.065	0
tert-Amyl Methyl Ether	994-05-8	*0.001*	0	0.010	*0.003*	0	0.042			0.033	10
Benzaldehyde	100-52-7	0.019	0.018	0.035	0.080	0.078	0.152			0.074	100
Benzene	71-43-2	0.156	0.135	0.667	0.498	0.431	2.131	0.13	**4**	0.010	100
Bromochloromethane	74-97-5	*0.005*	0	0.045	*0.025*	0	0.238			0.206	15
Bromodichloromethane	75-27-4	*0.001*	0	0.012	*0.007*	0	0.080			0.101	12
Bromoform	75-25-2	*0.001*	0	0.012	*0.013*	0	0.124	0.91	0.01	0.186	15
Bromomethane	74-83-9	0.013	0.012	0.033	0.050	0.047	0.128	5	0.01	0.066	90
1,3-Butadiene	106-99-0	0.021	0.018	0.126	0.046	0.040	0.279	0.033	**1.4**	0.031	82
Butyraldehyde	123-72-8	0.056	0.053	0.133	0.166	0.156	0.392			0.027	100
Carbon Disulfide	75-15-0	ND	ND	ND	ND	ND	ND	700	0	0.009	0
Carbon Tetrachloride	56-23-5	0.089	0.091	0.117	0.559	0.569	0.736	0.067	**8**	0.075	100
Chlorobenzene	108-90-7	*0.002*	0	0.013	*0.010*	0	0.060	1000	0.00001	0.046	25
Chloroethane	75-00-3	*0.019*	0	0.223	*0.051*	0	0.588	10000	0.00001	0.047	48
Chloroform	67-66-3	0.031	0.029	0.058	0.151	0.139	0.283	0.043	**4**	0.044	100
Chloromethane	74-87-3	0.546	0.535	0.684	1.127	1.104	1.412	0.56	**2**	0.033	100
Chloroprene	126-99-8	*0.000*	0	0.011	*0.002*	0	0.040	7	0.000	0.040	5
Crotonaldehyde	123-73-9	0.073	0.032	0.421	0.209	0.092	1.207			0.049	100
Dibromochloromethane	594-18-3	*0.003*	0	0.012	*0.023*	0	0.102			0.051	43
1,2-Dibromoethane	106-93-4	*0.001*	0	0.013	*0.008*	0	0.100	0.0017	**5**	0.138	10
m-Dichlorobenzene	541-73-1	*0.001*	0	0.010	*0.004*	0	0.060			0.168	8
o-Dichlorobenzene	95-50-1	*0.001*	0	0.010	*0.004*	0	0.060	200	0.00002	0.144	8
p-Dichlorobenzene	106-46-7	*0.003*	0	0.026	*0.018*	0	0.156	0.091	0.2	0.156	23
Dichlorodifluoromethane	75-71-8	0.497	0.502	0.612	2.459	2.480	3.027	200	0.01	0.064	100
1,1-Dichloroethane	75-34-3	*0.001*	0	0.012	*0.005*	0	0.049	0.63	0.01	0.061	12
1,2-Dichloroethane	107-06-2	0.018	0.018	0.026	0.072	0.073	0.105	0.038	**1.9**	0.053	98
1,1-Dichloroethene	75-35-4	*0.001*	0	0.010	*0.004*	0	0.040	200	0.00002	0.032	15
cis-1,2-Dichloroethylene	156-59-2	ND	ND	ND	ND	ND	ND			0.048	0
trans-1,2-Dichloroethylene	156-60-5	*0.001*	0	0.018	*0.005*	0	0.071			0.048	12
Dichloromethane	75-09-2	0.124	0.109	0.702	0.430	0.377	2.439	2.1	0.2	0.028	100

[a] See page 10-25 for footnotes.

Table 10-8 (continued)
RUTGERS UNIVERSITY - 2017 NJ Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[d]	24-Hour Maximum (ppbv)	Annual Mean (µg/m³)[c,d]	Annual Median (µg/m³)[d]	24-Hour Maximum (µg/m³)	Health Benchmark (µg/m³)[e]	Annual Mean Risk Ratio[f]	Detection Limit (µg/m³)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	*0.000*	0	0.015	*0.002*	0	0.069	0.1	0.02	0.079	3
cis-1,3-Dichloropropene	542-75-6	*0.000*	0	0.014	*0.002*	0	0.064			0.064	3
trans-1,3-Dichloropropene	542-75-6	*0.000*	0	0.018	*0.001*	0	0.082			0.095	2
Dichlorotetrafluoroethane	76-14-2	0.019	0.018	0.028	0.134	0.126	0.196			0.133	100
2,5-Dimethylbenzaldehyde	5799-94-2	ND	ND	ND	ND	ND	ND			0.011	0
Ethyl Acrylate	140-88-5	ND	ND	ND	ND	ND	ND	2	0	0.033	0
Ethyl tert-Butyl Ether	637-92-3	0.016	0.016	0.036	0.065	0.067	0.150			0.046	97
Ethylbenzene	100-41-4	0.102	0.108	0.209	0.442	0.469	0.908	0.40	**1.1**	0.035	100
Formaldehyde	50-00-0	1.469	1.285	4.570	1.803	1.578	5.612	0.077	**24**	0.023	100
Hexachloro-1,3-butadiene	87-68-3	*0.002*	0	0.010	*0.021*	0	0.107	0.045	0.5	0.117	25
Hexaldehyde	66-25-1	0.020	0.019	0.072	0.081	0.078	0.295			0.139	98
Isovaleraldehyde	590-86-3	ND	ND	ND	ND	ND	ND			0.007	0
Methyl Ethyl Ketone	78-93-3	0.124	0.107	0.316	0.364	0.314	0.931	5000	0.0001	0.074	100
Methyl Isobutyl Ketone	108-10-1	0.030	0.029	0.110	0.124	0.117	0.451	3000	0.00004	0.057	95
Methyl Methacrylate	80-62-6	*0.003*	0	0.020	*0.014*	0	0.082	700	0.00002	0.115	30
Methyl tert-Butyl Ether	1634-04-4	*0.005*	0	0.021	*0.019*	0	0.076	3.8	0.01	0.050	43
n-Octane	111-65-9	0.028	0.026	0.070	0.132	0.121	0.327			0.079	100
Propionaldehyde	123-38-6	0.092	0.086	0.241	0.219	0.203	0.572	8	0.03	0.007	100
Propylene	115-07-1	0.308	0.291	1.190	0.531	0.501	2.048	3000	0.0002	0.055	100
Styrene	100-42-5	0.030	0.027	0.089	0.126	0.115	0.379	1.8	0.1	0.068	97
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.010	*0.007*	0	0.069	0.017	0.4	0.124	13
Tetrachloroethylene	127-18-4	0.015	0.013	0.039	0.103	0.085	0.265	0.17	0.6	0.095	93
Tolualdehydes		0.023	0.021	0.060	0.115	0.103	0.295			0.020	94
Toluene	108-88-3	0.243	0.213	0.795	0.916	0.801	2.996	5000	0.0002	0.068	100
1,2,4-Trichlorobenzene	102-82-1	*0.001*	0	0.017	*0.008*	0	0.126	4	0.002	0.371	8
1,1,1-Trichloroethane	71-55-6	0.004	0.004	0.013	0.022	0.022	0.071	1000	0.00002	0.071	60
1,1,2-Trichloroethane	79-00-5	*0.000*	0	0.011	*0.002*	0	0.060	0.063	0.03	0.093	3
Trichloroethylene	79-01-6	*0.002*	0	0.014	*0.011*	0	0.075	0.5	0.02	0.091	18
Trichlorofluoromethane	75-69-4	0.235	0.236	0.284	1.319	1.323	1.596	700	0.002	0.045	100
Trichlorotrifluoroethane	76-13-1	*0.002*	0	0.100	*0.013*	0	0.766	30000	0.0000004	0.069	2
1,2,4-Trimethylbenzene	95-63-6	0.036	0.033	0.094	0.175	0.162	0.462			0.103	100
1,3,5-Trimethylbenzene	108-67-8	0.014	0.012	0.038	0.067	0.059	0.187			0.103	97
Valeraldehyde	110-62-3	0.015	0.014	0.043	0.053	0.049	0.151			0.007	97
Vinyl chloride	75-01-4	*0.002*	0	0.015	*0.006*	0	0.038	0.11	0.1	0.020	28
m,p-Xylene	1330-20-7	0.099	0.084	0.291	0.432	0.365	1.264	100	0.004	0.017	100
o-Xylene	95-47-6	0.097	0.106	0.184	0.421	0.460	0.799	100	0.004	0.069	100

[a] See page 10-25 for footnotes.

Footnotes for Tables 10-5 through 10-8

[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] A 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] A 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.

ND indicates that all samples were below the detection limit.

Table 10-9
Analytes with 100% Non-Detects in 2017

Pollutant		CAS No.	Camden	Chester	Elizabeth	Rutgers
1	Acrylonitrile	107-13-1	X		X	X
2	Carbon Disulfide	75-15-0				X
3	cis-1,2-Dichloroethylene	156-59-2	X	X	X	X
4	trans-1,3-Dichloropropene	542-75-6	X	X	X	
5	2,5-Dimethylbenzaldehyde	5799-94-2	X	X	X	X
6	Ethyl Acrylate	140-88-5	X	X		X
7	Isovaleraldehyde	590-86-3	X	X	X	X
8	1,1,2-Trichloroethane	79-00-5		X		

In 2017, samples of the chemicals in Table 10-9 were never above the detection limit at the specified monitoring location. However, these pollutants may be present in the air below the detection limit level. Chemical-specific detection limits can be found in Tables 10-5 through 10-8.

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