2018 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 (Sections 4 through 9) of this New Jersey Department of Environmental Protection (NJDEP) 2018 Air Quality Report.

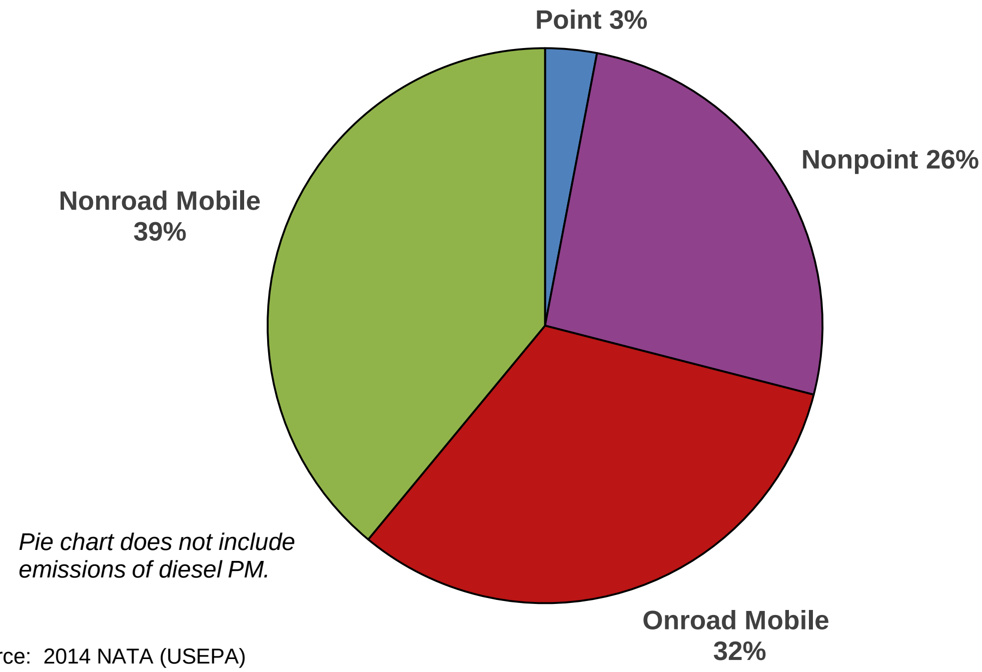
Air toxics are all the other chemicals released into the air that have the potential to cause adverse health effects in humans. These effects cover a wide range of conditions, from lung irritation to birth defects to cancer. There are no NAAQS for these pollutants, but in 1990 the U.S. Congress directed the USEPA to begin addressing a list of 187 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 most recent available NEI (for 2014), 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

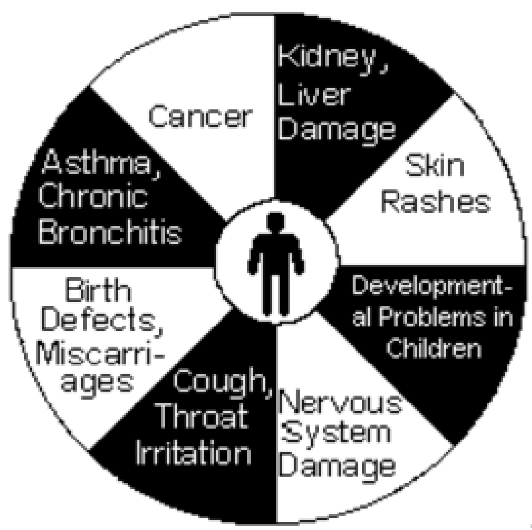


Source: 2014 NATA (USEPA)

HEALTH EFFECTS

People exposed to air toxics in significant amounts or for significant periods 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.

Figure 10-2
Potential Effects of Air Toxics

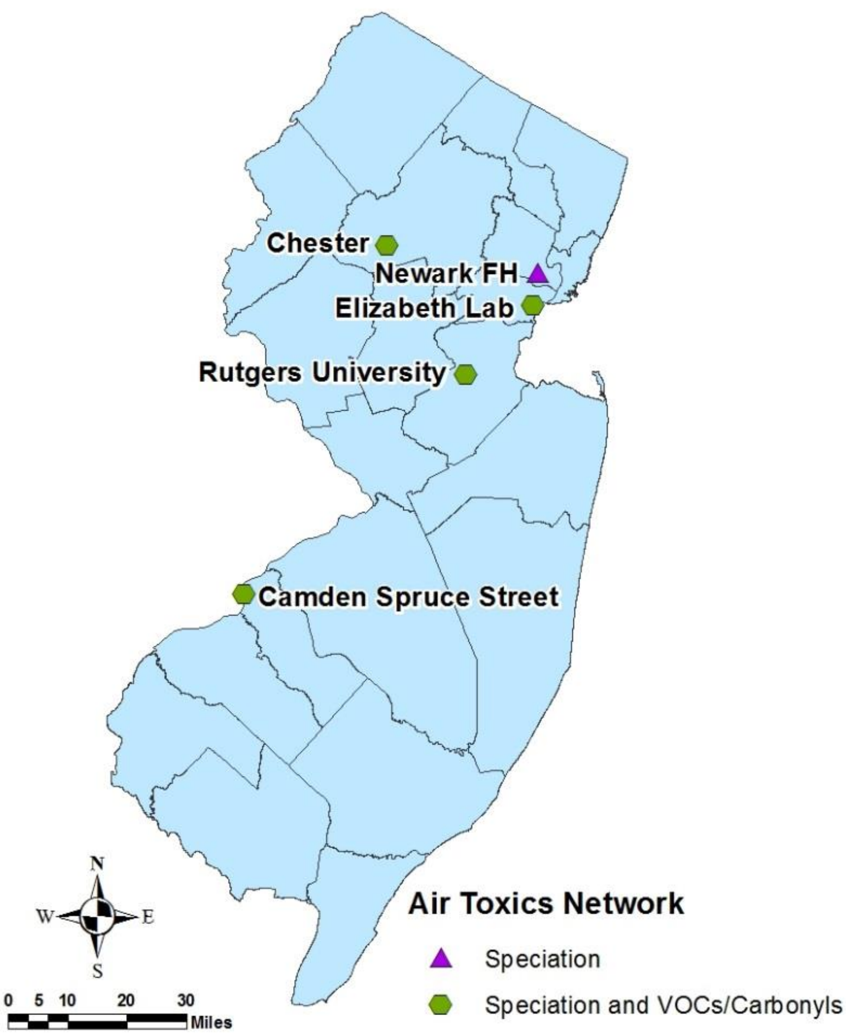


Source: www3.epa.gov/ttn/atw/3_90_024.html

Monitoring Locations

In 2018 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
2018 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 2018

2018 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 were mostly below the detection limit of the lab analysis 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 detected in less than 50% of the samples, there is significant uncertainty in the calculated averages. Median values (the value of the middle sample 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 value or a few very high values were recorded. These high values could skew 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 the past few years, acrolein measurements were considered to be highly unreliable according to the USEPA. However, since the lab that analyzes New Jersey's samples has modified their procedures according to USEPA's latest recommendations, the acrolein measurements are now considered "verified."

Table 10-1
2018 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	1.916	0.979	2.268	1.340
2	Acetone			67-64-1	2.496	1.870	2.834	2.152
3	Acetonitrile		*	75-05-8	1.325	0.833	0.824	1.147
4	Acetylene			74-86-2	0.714	0.474	0.871	0.591
5	Acrolein		*	107-02-8	0.943	0.804	0.908	0.777
6	Acrylonitrile		*	107-13-1	*0.001*	*0.001*	*0.001*	*ND*
7	tert-Amyl Methyl Ether			994-05-8	*0.002*	*0.003*	*0.002*	*0.002*
8	Benzaldehyde			100-52-7	0.208	0.079	0.119	0.108
9	Benzene		*	71-43-2	0.635	0.338	0.709	0.437
10	Bromochloromethane			74-97-5	*0.001*	*0.001*	*0.002*	*0.001*
11	Bromodichloromethane			75-27-4	*0.010*	*0.005*	*0.005*	*0.008*
12	Bromoform		*	75-25-2	*0.006*	*0.008*	*0.008*	*0.008*
13	Bromomethane	Methyl bromide	*	74-83-9	0.100	0.038	0.044	0.041
14	1,3-Butadiene		*	106-99-0	0.062	0.022	0.092	0.041
15	Butyraldehyde			123-72-8	0.297	0.157	0.304	0.237
16	Carbon Disulfide		*	75-15-0	0.057	0.056	0.060	0.062
17	Carbon Tetrachloride		*	56-23-5	0.538	0.541	0.557	0.549
18	Chlorobenzene		*	108-90-7	*0.006*	*0.006*	*0.006*	*0.007*
19	Chloroethane	Ethyl chloride	*	75-00-3	0.038	*0.024*	0.032	0.072
20	Chloroform		*	67-66-3	0.135	0.113	0.154	0.149
21	Chloromethane	Methyl chloride	*	74-87-3	1.212	1.176	1.167	1.184
22	Chloroprene	2-Chloro-1,3-butadiene	*	126-99-8	*0.002*	*0.003*	*0.001*	*0.001*
23	Crotonaldehyde			123-73-9	0.211	0.211	0.311	0.207
24	Dibromochloromethane	Chlorodibromomethane		124-48-1	*0.015*	*0.013*	*0.014*	*0.011*
25	1,2-Dibromoethane	Ethylene dibromide	*	106-93-4	*0.005*	*0.005*	*0.003*	*0.003*
26	m-Dichlorobenzene	1,3-Dichlorobenzene		541-73-1	*0.004*	*0.007*	*0.005*	*0.003*
27	o-Dichlorobenzene	1,2-Dichlorobenzene		95-50-1	*0.007*	*0.007*	*0.005*	*0.006*
28	p-Dichlorobenzene	1,4-Dichlorobenzene	*	106-46-7	0.058	*0.014*	0.053	0.034
29	Dichlorodifluoromethane			75-71-8	2.657	2.509	2.480	2.504
30	1,1-Dichloroethane	Ethylidene dichloride	*	75-34-3	*0.004*	*0.005*	*0.004*	*0.004*
31	1,2-Dichloroethane	Ethylene dichloride	*	107-06-2	0.104	0.079	0.088	0.083
32	1,1-Dichloroethylene	Vinylidene chloride	*	75-35-4	*0.004*	*0.004*	*0.004*	*0.004*
33	cis-1,2-Dichloroethylene	cis-1,2-Dichloroethene		156-59-2	*ND*	*0.001*	*ND*	*ND*
34	trans-1,2-Dichloroethylene	trans-1,2-Dichloroethene		156-60-5	*0.017*	*0.003*	*0.007*	*0.005*
35	Dichloromethane	Methylene chloride	*	75-09-2	0.495	0.392	0.537	0.482
36	1,2-Dichloropropane	Propylene dichloride	*	78-87-5	*0.002*	*0.008*	*0.002*	*0.004*

- *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 10-1 (continued)
2018 Summary of Toxic Volatile Organic Compounds Monitored in New Jersey

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

	Pollutant	Synonym	HAP	CAS No.	Camden	Chester	Elizabeth	Rutgers
37	cis-1,3-Dichloropropene	cis-1,3-Dichloropropylene	*	10061-01-5	*0.003*	*0.003*	*0.003*	*0.002*
38	trans-1,3-Dichloropropene	trans-1,3-Dichloropropylene	*	10061-02-6	*0.001*	*ND*	*0.001*	*0.002*
39	Dichlorotetrafluoroethane	Freon 114		76-14-2	0.130	0.129	0.127	0.128
40	2,5-Dimethylbenzaldehyde			5799-94-2	*ND*	*ND*	*ND*	*ND*
41	Ethyl Acrylate		*	140-88-5	*ND*	*0.002*	*ND*	*ND*
42	Ethylbenzene		*	100-41-4	0.660	0.099	0.301	0.220
43	Ethyl tert-Butyl Ether	tert-Butyl ethyl ether		637-92-3	*0.004*	*0.004*	*0.006*	0.031
44	Formaldehyde		*	50-00-0	2.833	1.998	3.971	2.427
45	Hexachlorobutadiene	Hexachloro-1,3-butadiene	*	87-68-3	0.061	0.054	0.054	0.047
46	Hexaldehyde	Hexanaldehyde		66-25-1	0.165	0.081	0.155	0.226
47	Isovaleraldehyde			590-86-3	*ND*	*ND*	*ND*	*ND*
48	Methyl Ethyl Ketone	MEK, 2-Butanone		78-93-3	0.394	0.308	0.486	0.533
49	Methyl Isobutyl Ketone	MIBK	*	108-10-1	0.166	0.102	0.183	0.122
50	Methyl Methacrylate		*	80-62-6	0.054	*0.005*	*0.024*	*0.015*
51	Methyl tert-Butyl Ether	MTBE	*	1634-04-4	*0.004*	*0.003*	*0.004*	*0.008*
52	n-Octane			111-65-9	0.261	0.093	0.331	0.123
53	Propionaldehyde		*	123-38-6	0.377	0.213	0.474	0.277
54	Propylene			115-07-1	0.812	0.346	3.007	0.511
55	Styrene		*	100-42-5	0.485	0.026	0.077	0.067
56	1,1,2,2-Tetrachloroethane		*	79-34-5	*0.003*	*0.006*	*0.004*	*0.004*
57	Tetrachloroethylene	Perchloroethylene	*	127-18-4	0.146	0.073	0.145	0.097
58	Tolualdehydes				0.246	0.138	0.212	0.163
59	Toluene		*	108-88-3	2.115	0.509	1.716	0.842
60	1,2,4-Trichlorobenzene		*	120-82-1	*0.027*	*0.028*	*0.025*	*0.021*
61	1,1,1-Trichloroethane	Methyl chloroform	*	71-55-6	0.021	*0.013*	0.020	0.017
62	1,1,2-Trichloroethane		*	79-00-5	*0.004*	*0.003*	*0.002*	*0.001*
63	Trichloroethylene		*	79-01-6	0.052	*0.008*	0.031	*0.014*
64	Trichlorofluoromethane			75-69-4	2.201	1.241	1.265	1.250
65	Trichlorotrifluoroethane	1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	0.608	0.605	0.598	0.604
66	1,2,4-Trimethylbenzene			95-63-6	0.424	0.071	0.301	0.134
67	1,3,5-Trimethylbenzene			108-67-8	0.136	0.033	0.099	0.052
68	Valeraldehyde			110-62-3	0.078	0.033	0.091	0.077
69	Vinyl chloride		*	75-01-4	*0.010*	*0.004*	*0.005*	*0.005*
70	m,p-Xylene		*	108-38-3,106-42-3	2.338	0.196	0.816	0.499
71	o-Xylene		*	95-47-6	0.919	0.106	0.361	0.232

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

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 10-2
2018 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	*	0.006	0.002	*0.002*	0.005	0.005	*0.2*
Arsenic	*	*0.001*	*0.0001*	0.0001	*0.0002*	*0.0003*	0.00023
Cadmium	*	*0.0004*	0.002	*0.0001*	0.001	*0.001*	0.00024
Chlorine	*	0.167	*0.001*	0.017	0.016	0.009	*0.2*
Chromium[d]	*	0.002	0.003	0.004	0.002	0.004	0.000083
Cobalt	*	*0.0001*	*0*	*0*	*0*	*0*	0.00011
Lead	*	0.005	0.002	0.003	0.002	0.002	0.083
Manganese	*	0.003	0.0004	0.002	0.001	0.001	*0.05*
Nickel[e]	*	0.001	0.001	0.002	0.001	0.001	0.0021
Phosphorus	*	0.001	0.0002	0.001	0.001	0.0003	*0.07*
Selenium	*	*0.0002*	0.0003	0.0004	0.0003	*0.0002*	*20*
Silicon		0.056	0.033	0.08	0.065	0.041	*3*
Vanadium		*0.0003*	*0.0002*	*0.0002*	*0.0003*	*0.0003*	*0.1*

[a] Annual average values in italics had fewer than 50% of samples detectable, so the means are highly uncertain.
[b] HAP = Hazardous air pollutant listed in the Clean Air Act.
[c] Health benchmarks in italics have a noncancer 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, which are 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 in New Jersey, according to USEPA's 2014 National Emissions Inventory.

Acrolein and formaldehyde showed the highest risk at all four monitoring sites. 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. Ethylbenzene was above the health benchmark at Camden only, while 1,3-butadiene was over the health benchmark at Camden and Elizabeth. Chloroprene concentrations were mostly below the detection limit. However, hexachlorobutadiene analysis improved in 2018, so that slightly more than 50% of samples were above detection levels.

Table 10-3
Monitored Toxic Air Pollutants with Risk Ratios Greater Than One in 2018

Pollutant		CAS No.	Risk Ratio			
			Camden	**Chester**	**Elizabeth**	**Rutgers**
1	Acetaldehyde	75-07-0	4	2	5	3
2	Acrolein	107-02-8	47	40	45	39
3	Benzene	71-43-2	5	3	5	3
4	1,3-Butadiene	106-99-0	1.9	0.7	3	1.3
5	Carbon Tetrachloride	56-23-5	3	3	3	3
6	Chloroform	67-66-3	3	3	4	3
7	Chloromethane	74-87-3	2	2	2	2
8	*Chloroprene*	126-99-8	*1.2*	*1.7*	*0.6*	*0.4*
9	*1,2-Dibromoethane*	106-93-4	*3*	*3*	*2*	*2*
10	1,2-Dichloroethane	107-06-2	3	2	2	2
11	Ethylbenzene	100-41-4	1.7	0.2	0.8	0.6
12	Formaldehyde	50-00-0	37	26	52	32
13	Hexachlorobutadiene	127-18-4	1.4	1.2	1.2	1.0

NOTE: Values in italics are based on less than 50% of samples detected.

Table 10-4
Sources of Air Toxics with Risk Ratios >1 in 2018

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%
Acrolein	2%	27%	29%	21%	0%	21%	0%
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%
Chloroprene	0%	100%	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%
Hexachlorobutadiene	97%%	3%	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 10-16 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 10-16 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 the monitors were moved less than a mile to the Rutgers University site.

Acrolein and chloroprene are not graphed below, because of a lack of data for previous years. As described above, acrolein has been difficult to measure accurately. Improvements in laboratory methods have recently been implemented. Acrolein is formed by combustion of organic matter and fuels, and the breakdown of other air pollutants.

Until recently chloroprene has been below detectable levels in New Jersey's air samples. It is used primarily in the manufacture of polychloroprene (a synthetic rubber known commercially as Neoprene), which is used to make numerous products (such as automotive parts, caulks, and wire and cable covers) resistant to other chemicals, oil and weather.

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 lab 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. 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.

Hexachlorobutadiene is used to make rubber compounds and lubricants, and is also used as a hydraulic fluid and as a solvent. It has only recently become measurable above detection limits in New Jersey's air samples (Figure 10-14), and has been found to be above its health benchmark.

The annual average **styrene** concentration at the Camden Spruce Street monitor dropped below its health benchmark in 2017, although levels are still higher than at the other New Jersey monitors (see Figure 10-15). 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 10-16) 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

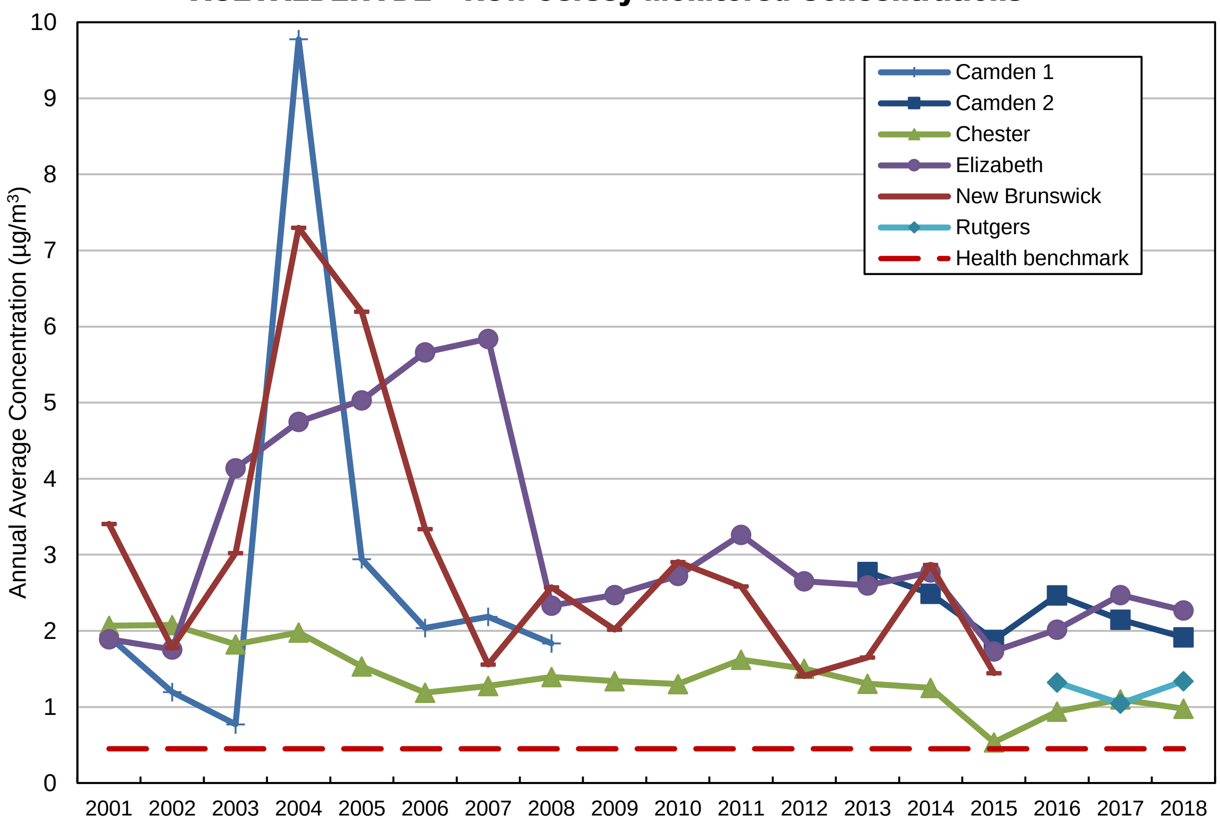


Figure 10-5
BENZENE – New Jersey Monitored Concentrations

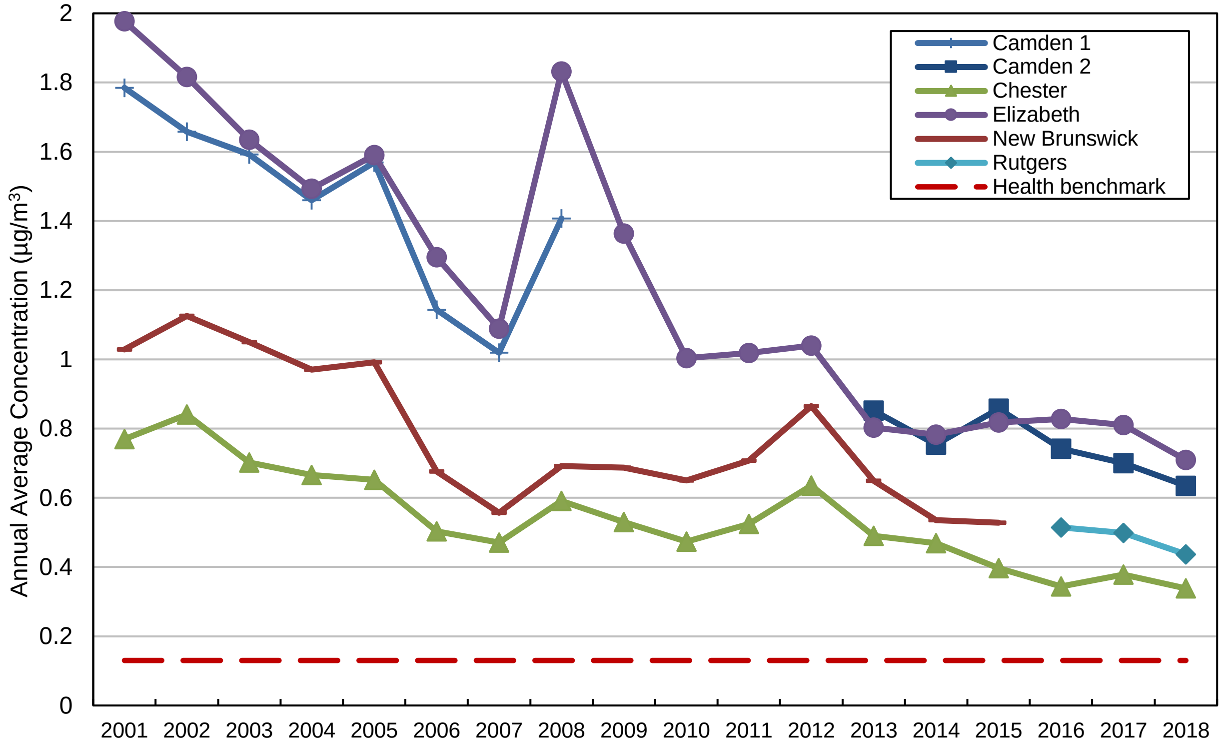


Figure 10-6
1,3-BUTADIENE – New Jersey Monitored Concentrations

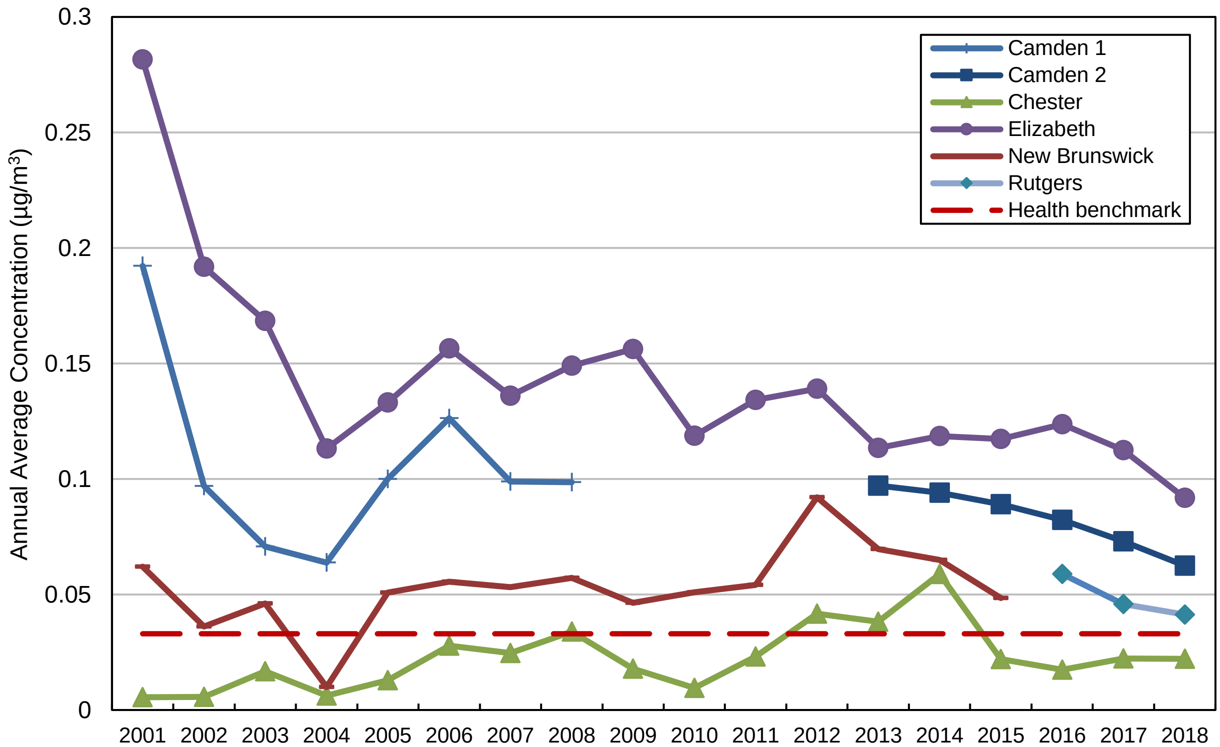


Figure 10-7
CARBON TETRACHLORIDE – New Jersey Monitored Concentrations

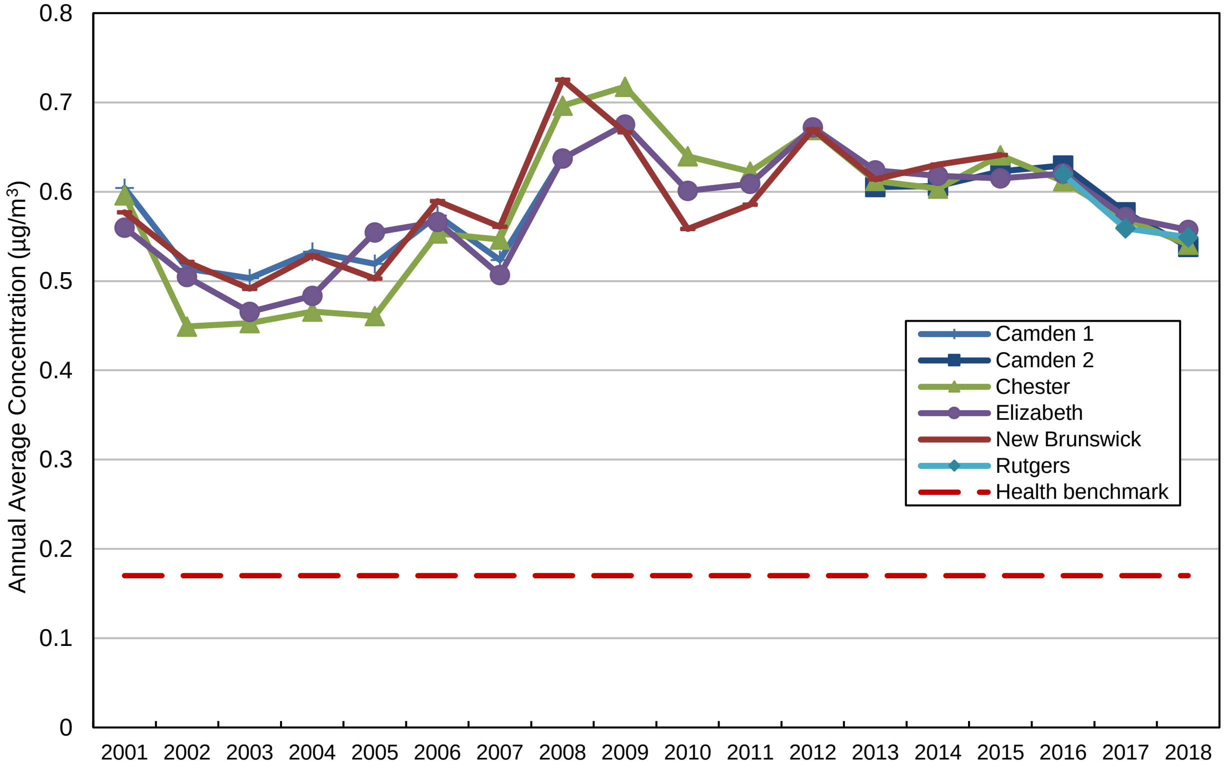


Figure 10-8
CHLOROFORM – New Jersey Monitored Concentrations

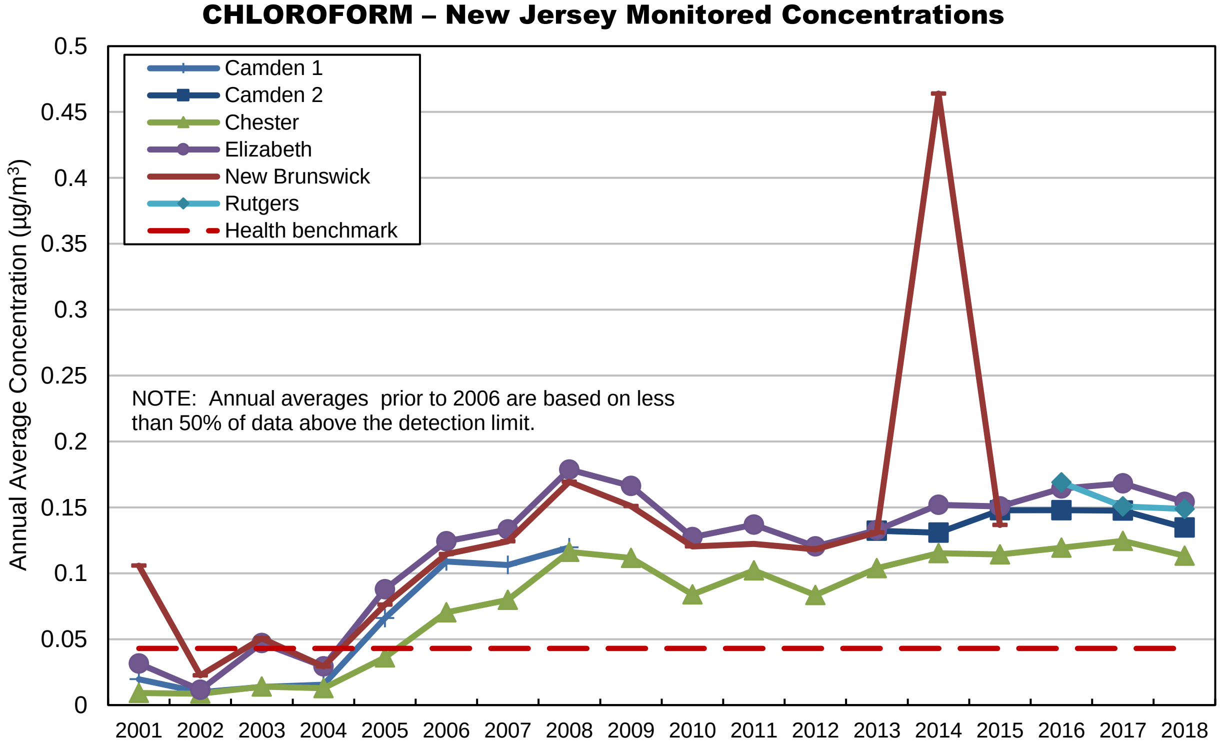


Figure 10-9
CHLOROMETHANE (Methyl Chloride) – New Jersey Monitored Concentrations

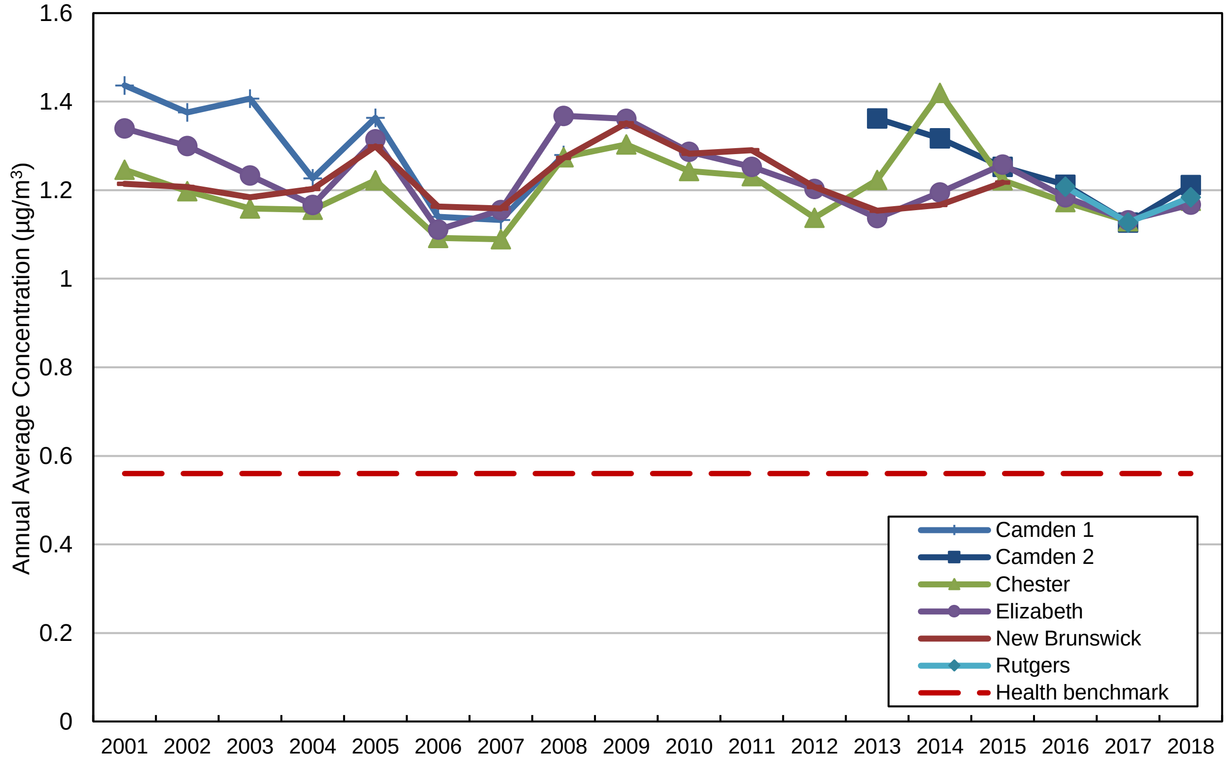


Figure 10-10
1,2-DIBROMOETHANE (Ethylene Dibromide) – New Jersey Monitored Concentrations

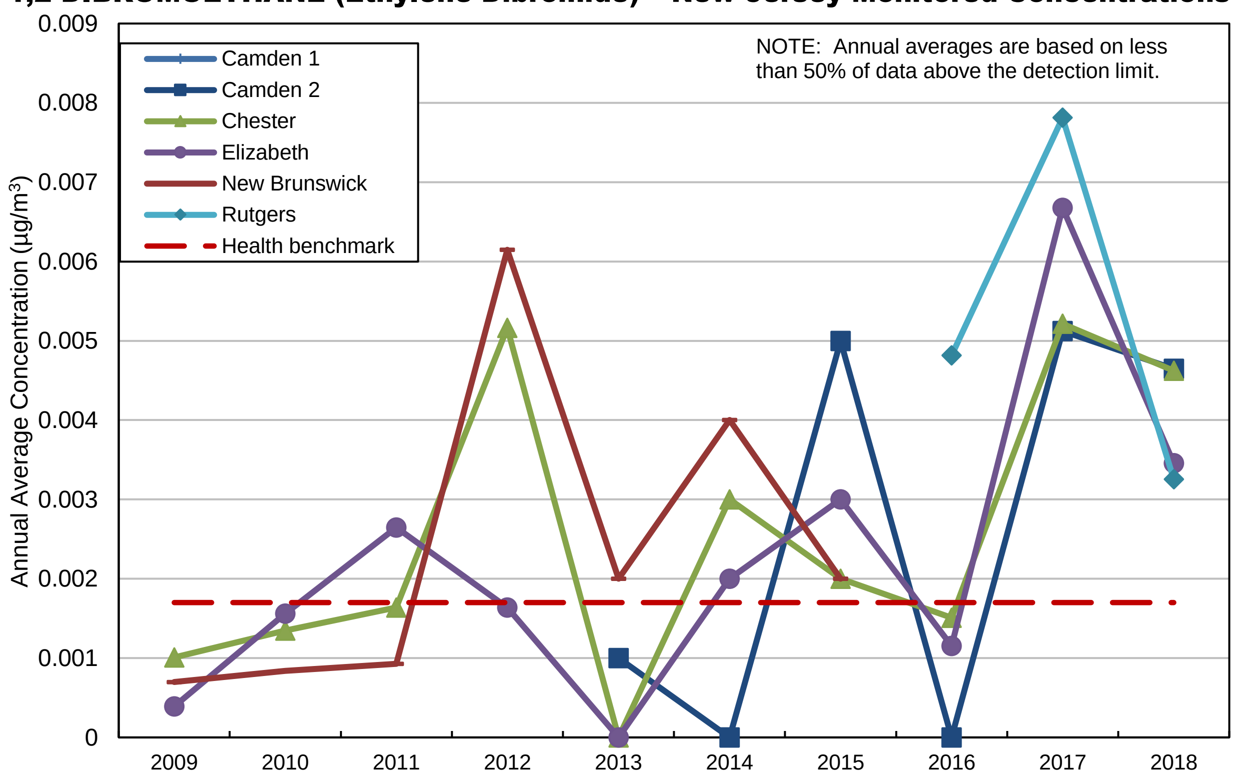


Figure 10-11

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

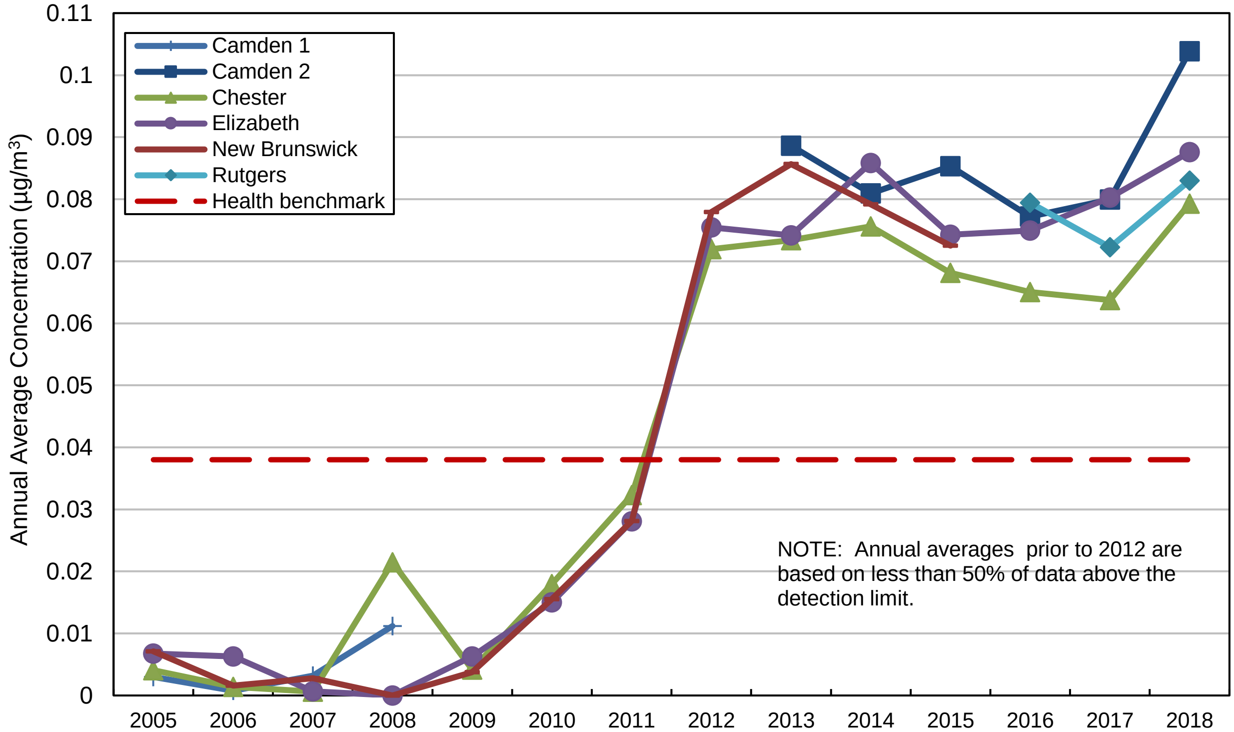


Figure 10-12

ETHYLBENZENE – New Jersey Monitored Concentrations

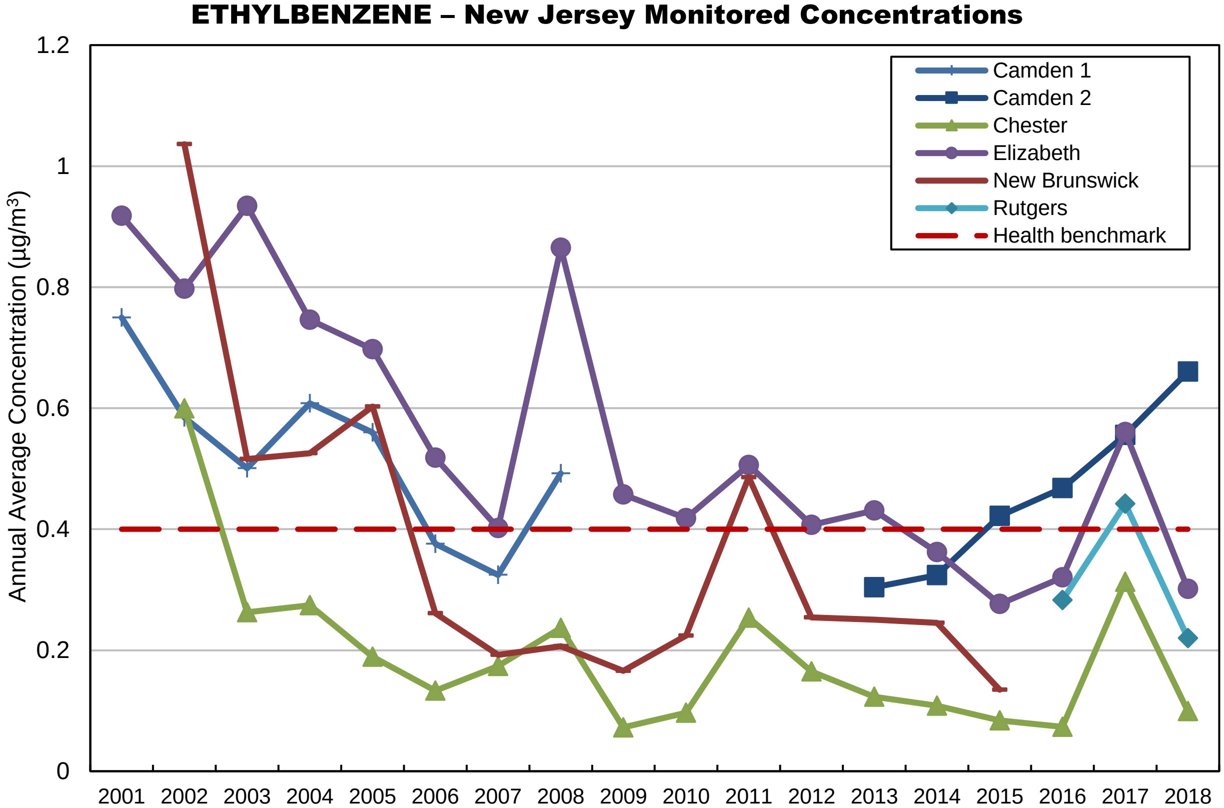


Figure 10-13
FORMALDEHYDE – New Jersey Monitored Concentrations

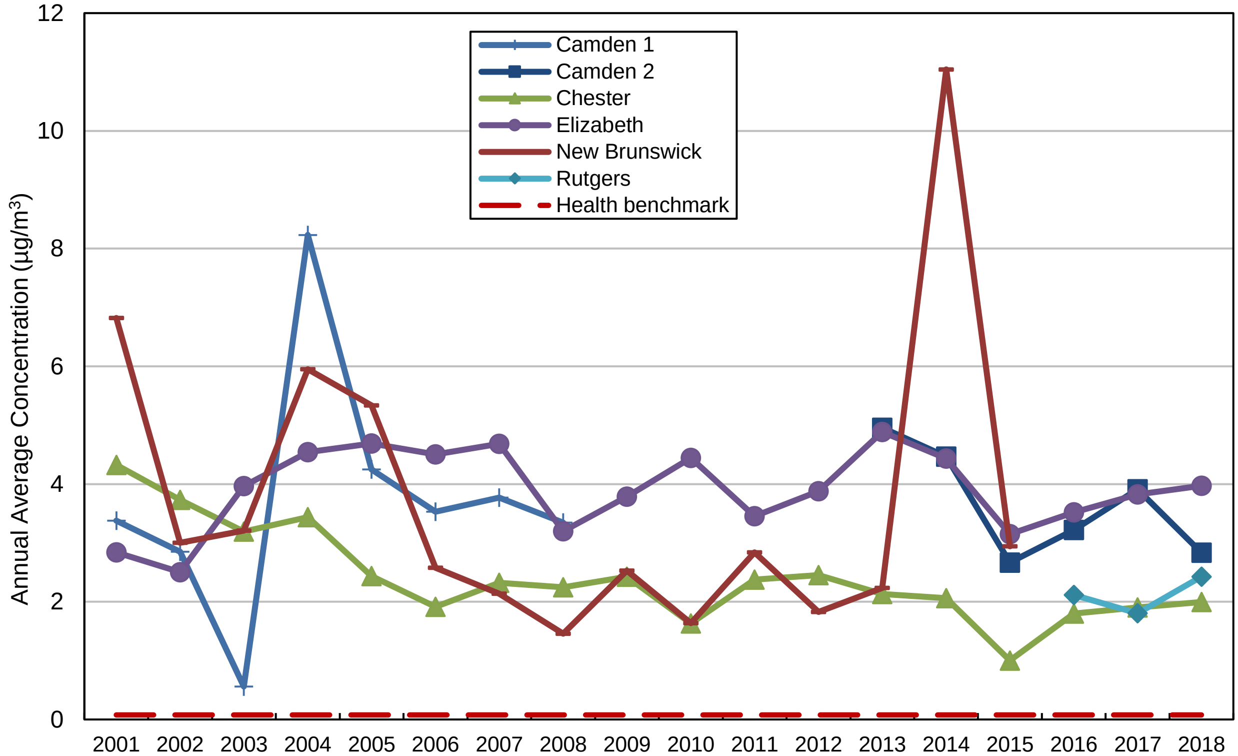


Figure 10-14
HEXACHLOROBUTADIENE – New Jersey Monitored Concentrations

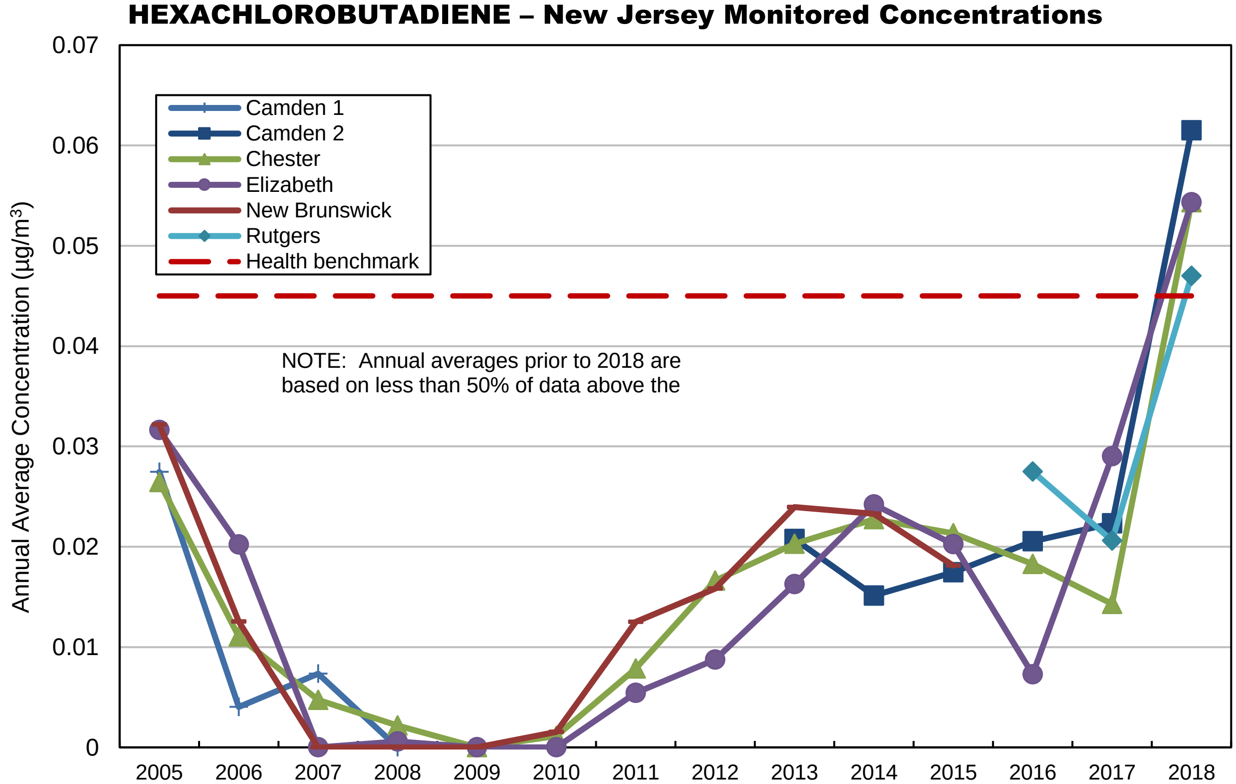


Figure 10-15
STYRENE – New Jersey Monitored Concentrations

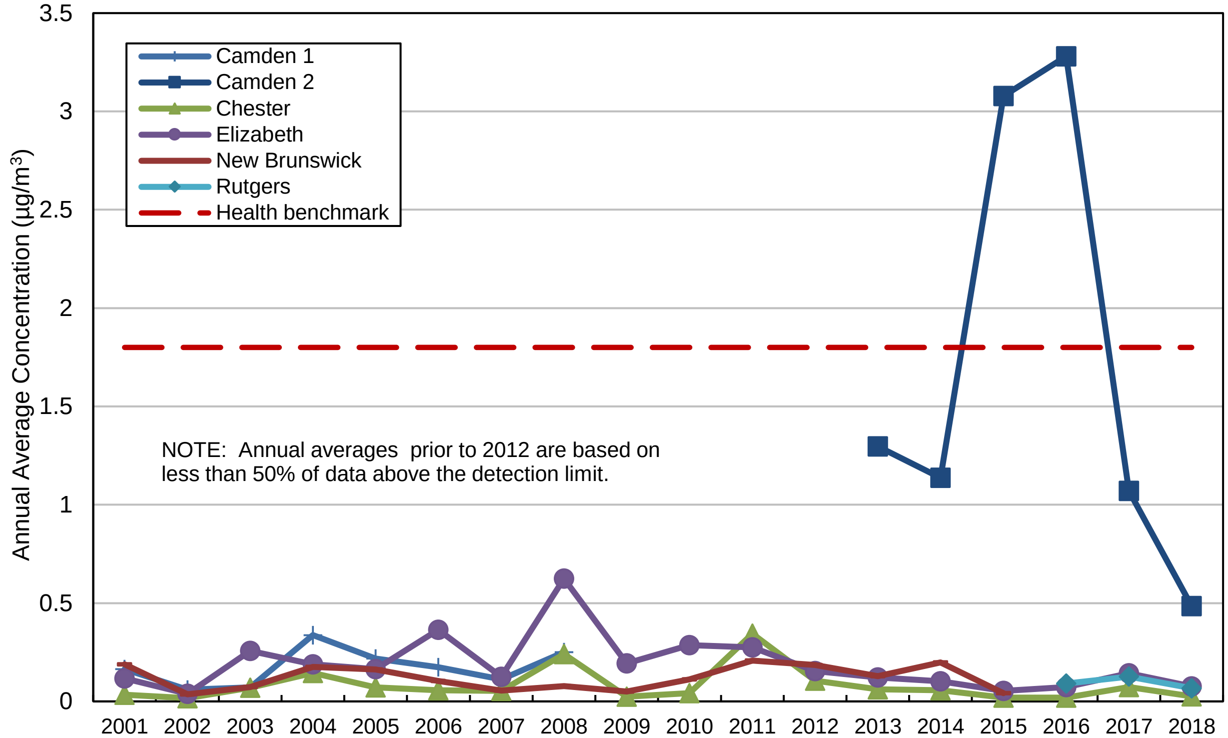


Figure 10-16
TETRACHLOROETHYLENE – New Jersey Monitored Concentrations

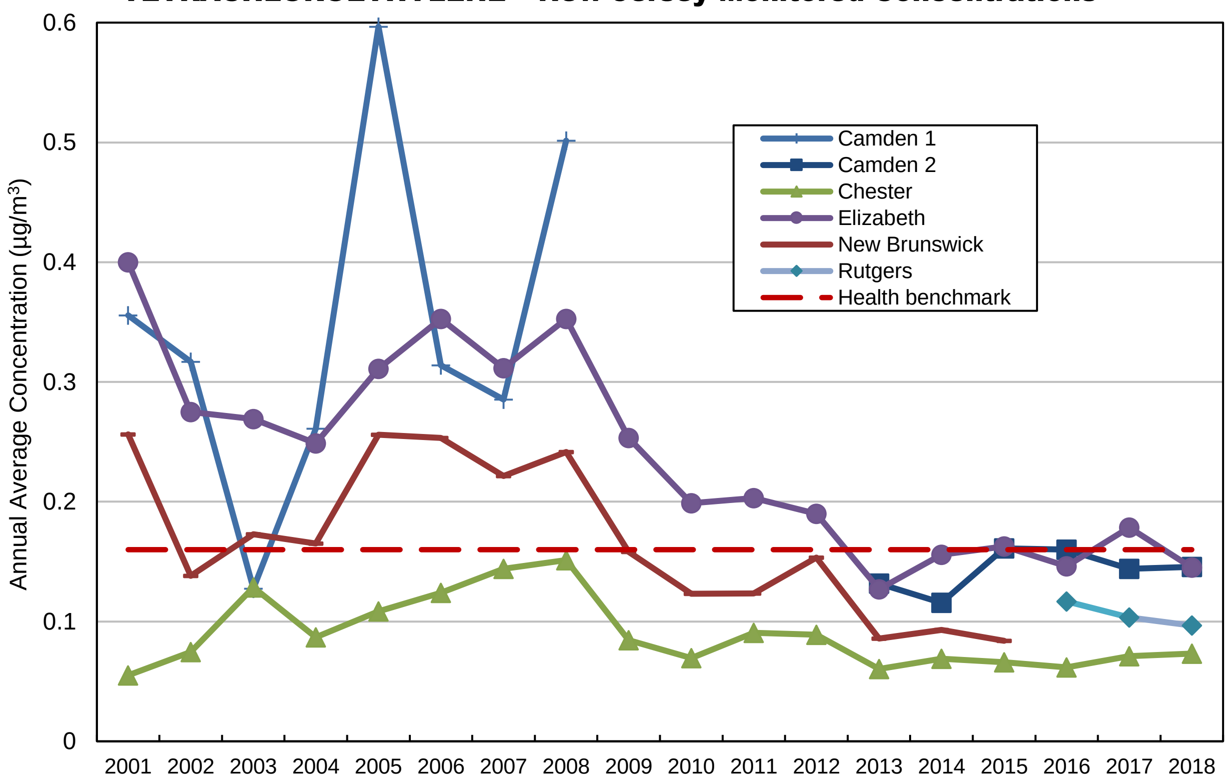


Table 10-5
CAMDEN SPRUCE STREET - 2018 NJ Toxic VOCs Monitoring Data[a]

Analyte	CAS No.	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[c]	24-Hour Maximum (ppbv)	Annual Mean (µg/m^3)[b,c]	Annual Median (µg/m^3)[c]	24-Hour Maximum (µg/m^3)	Health Bench-mark (µg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m^3)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	1.064	0.953	2.640	1.916	1.716	4.757	0.45	**4**	0.031	100
Acetone	67-64-1	1.051	0.982	2.810	2.496	2.333	6.675	*31000*	0.0001	0.328	100
Acetonitrile	75-05-8	0.789	0.177	34.400	1.325	0.297	57.755	*60*	0.02	0.027	100
Acetylene	74-86-2	0.671	0.550	3.010	0.714	0.585	3.203			0.042	100
Acrolein[g]	107-02-8	0.411	0.380	0.981	0.943	0.871	2.249	*0.02*	**47**	0.516	100
Acrylonitrile	107-13-1	*0.0005*	0	0.029	*0.001*	0	0.062	0.015	0.1	0.023	2
tert-Amyl Methyl Ether	994-05-8	*0.001*	0	0.010	*0.002*	0	0.043			0.052	8
Benzaldehyde	100-52-7	0.048	0.031	0.176	0.208	0.134	0.764			0.008	100
Benzene	71-43-2	0.199	0.175	0.525	0.635	0.559	1.677	0.13	**5**	0.046	100
Bromochloromethane	74-97-5	*0.0002*	0	0.010	*0.001*	0	0.053	*40*	0.00002	0.070	2
Bromodichloromethane	75-27-4	*0.001*	0	0.015	*0.010*	0	0.099	0.027	0.4	0.111	18
Bromoform	75-25-2	*0.001*	0	0.020	*0.006*	0	0.208	0.91	0.01	0.183	5
Bromomethane	74-83-9	0.026	0.014	0.224	0.100	0.054	0.870	*5*	0.02	0.045	93
1,3-Butadiene	106-99-0	0.028	0.026	0.078	0.062	0.058	0.173	0.033	**1.9**	0.043	100
Butyraldehyde	123-72-8	0.101	0.095	0.245	0.297	0.280	0.723			0.047	100
Carbon Disulfide	75-15-0	0.018	0.015	0.090	0.057	0.045	0.280	*700*	0.00008	0.239	98
Carbon Tetrachloride	56-23-5	0.086	0.089	0.122	0.538	0.559	0.768	0.17	**3**	0.084	100
Chlorobenzene	108-90-7	*0.001*	0	0.013	*0.006*	0	0.058	*1000*	0.00001	0.088	18
Chloroethane	75-00-3	0.014	0.014	0.048	0.038	0.036	0.125	*10000*	0.000004	0.066	66
Chloroform	67-66-3	0.028	0.026	0.055	0.135	0.126	0.270	0.043	**3**	0.063	100
Chloromethane	74-87-3	0.587	0.582	0.725	1.212	1.202	1.497	0.56	**2**	0.096	100
Chloroprene	126-99-8	*0.001*	0	0.011	*0.002*	0	0.039	0.002	***1.2***	0.047	8
Crotonaldehyde	123-73-9	0.074	0.032	0.352	0.211	0.093	1.009			0.007	100
Dibromochloromethane	124-48-1	*0.001*	0	0.014	*0.015*	0	0.136	0.037	0.4	0.153	30
1,2-Dibromoethane	106-93-4	*0.001*	0	0.011	*0.005*	0	0.081	0.0017	***3***	0.145	7
m-Dichlorobenzene	541-73-1	*0.001*	0	0.010	*0.004*	0	0.061			0.109	10
o-Dichlorobenzene	95-50-1	*0.001*	0	0.012	*0.007*	0	0.072	200	0.00003	0.124	13
p-Dichlorobenzene	106-46-7	0.010	0.011	0.026	0.058	0.063	0.156	*0.091*	0.6	0.120	77
Dichlorodifluoromethane	75-71-8	0.537	0.518	0.761	2.657	2.562	3.764	*100*	0.03	0.135	100
1,1-Dichloroethane	75-34-3	*0.001*	0	0.013	*0.004*	0	0.053	0.63	0.01	0.058	10
1,2-Dichloroethane	107-06-2	0.026	0.023	0.158	0.104	0.093	0.639	0.038	**3**	0.056	100
1,1-Dichloroethene	75-35-4	*0.001*	0	0.011	*0.004*	0	0.042	*200*	0.00002	0.047	16
cis-1,2-Dichloroethylene	156-59-2	*0*	0	0	*0*	0	0			0.074	0
trans-1,2-Dichloroethylene	156-60-5	*0.004*	0	0.044	*0.017*	0	0.176			0.053	31
Dichloromethane	75-09-2	0.143	0.12	0.742	0.495	0.417	2.578	77	0.01	0.050	100

[a] See page 10-26 for footnotes.

Table 10-5 (continued)

CAMDEN SPRUCE STREET - 2018 NJ Toxic VOCs Monitoring Data[a]

Analyte	CAS No.	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[c]	24-Hour Maximum (ppbv)	Annual Mean (µg/m³)[b,c]	Annual Median (µg/m³)[c]	24-Hour Maximum (µg/m³)	Health Bench-mark (µg/m³)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m³)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	*0.0004*	0	0.014	*0.002*	0	0.064	0.1	0.02	0.094	3
cis-1,3-Dichloropropene	10061-01-5	*0.001*	0	0.015	*0.003*	0	0.066	0.25	0.01	0.089	5
trans-1,3-Dichloropropene	10061-02-6	*0.0002*	0	0.014	*0.001*	0	0.064	0.25	0.004	0.089	2
Dichlorotetrafluoroethane	76-14-2	0.019	0.018	0.026	0.130	0.127	0.184			0.094	100
2,5-Dimethylbenzaldehyde	5779-94-2	*0*	0	0	*0*	0	0			0.013	0
Ethyl Acrylate	140-88-5	*0*	0	0	*0*	0	0	*8*		0.096	0
Ethyl tert-Butyl Ether	100-41-4	0.152	0.065	3.290	0.660	0.283	14.285	0.40	**1.7**	0.112	100
Ethylbenzene	637-92-3	*0.001*	0	0.009	*0.004*	0	0.039			0.046	16
Formaldehyde	50-00-0	2.307	1.940	9.670	2.833	2.382	11.875	0.077	**37**	0.060	100
Hexachlorobutadiene	87-68-3	0.006	0.007	0.018	0.061	0.070	0.192	0.045	**1.4**	0.292	66
Hexaldehyde	66-25-1	0.040	0.036	0.110	0.165	0.146	0.451			0.006	95
Isovaleraldehyde	590-86-3	*0*	0	0	*0*	0	0			0.009	0
Methyl Ethyl Ketone	78-93-3	0.134	0.127	0.410	0.394	0.374	1.207	*5000*	0.00008	0.110	100
Methyl Isobutyl Ketone	108-10-1	0.041	0.037	0.114	0.166	0.152	0.467	*3000*	0.00006	0.097	100
Methyl Methacrylate	80-62-6	0.015	0.008	0.215	0.054	0.029	0.757	*700*	0.0001	0.352	62
Methyl tert-Butyl Ether	1634-04-4	*0.001*	0	0.016	*0.004*	0	0.058	3.8	0.001	0.037	11
n-Octane	111-65-9	0.056	0.042	0.186	0.261	0.194	0.869			0.151	100
Propionaldehyde	123-38-6	0.159	0.148	0.377	0.377	0.352	0.896	*8*	0.05	0.004	100
Propylene	115-07-1	0.472	0.439	1.140	0.812	0.756	1.962	*3000*	0.0003	0.110	100
Styrene	100-42-5	0.114	0.053	1.300	0.485	0.224	5.537	1.8	0.3	0.155	97
1,1,2,2-Tetrachloroethane	79-34-5	*0.000*	0	0.011	*0.003*	0	0.073	0.017	0.2	0.143	7
Tetrachloroethylene	127-18-4	0.021	0.019	0.095	0.146	0.127	0.647	0.16	0.9	0.099	98
Tolualdehydes		0.050	0.040	0.098	0.246	0.199	0.484			0.014	100
Toluene	108-88-3	0.561	0.423	1.680	2.115	1.594	6.330	*3760*	0.0006	0.490	100
1,2,4-Trichlorobenzene	120-82-1	*0.004*	0	0.038	*0.027*	0	0.281	*2*	0.01	1.848	21
1,1,1-Trichloroethane	71-55-6	0.004	0.004	0.015	0.021	0.021	0.080	*1000*	0.00002	0.075	67
1,1,2-Trichloroethane	79-00-5	*0.001*	0	0.016	*0.004*	0	0.087	0.063	0.06	0.104	7
Trichloroethylene	79-01-6	0.010	0.007	0.092	0.052	0.036	0.492	0.2	0.3	0.081	59
Trichlorofluoromethane	75-69-4	0.392	0.262	1.570	2.201	1.472	8.822	*700*	0.003	0.065	100
Trichlorotrifluoroethane	76-13-1	0.079	0.080	0.091	0.608	0.609	0.698	*30000*	0.00002	0.075	100
1,2,4-Trimethylbenzene	95-63-6	0.086	0.060	0.402	0.424	0.294	1.976	*60*	0.007	0.132	98
1,3,5-Trimethylbenzene	108-67-8	0.028	0.021	0.104	0.136	0.102	0.511	*60*	0.002	0.167	98
Valeraldehyde	110-62-3	0.022	0.020	0.065	0.078	0.070	0.230			0.006	95
Vinyl chloride	75-01-4	*0.004*	0	0.036	*0.010*	0	0.093	0.11	0.09	0.033	36
m,p-Xylene	108-38-3, 106-42-3	0.539	0.176	13.600	2.338	0.764	59.050	*100*	0.02	0.156	100
o-Xylene	95-47-6	0.212	0.082	4.460	0.919	0.356	19.365	*100*	0.009	0.116	100

[a] See page 10-26 for footnotes.

Table 10-6
CHESTER - 2018 NJ Toxic VOCs Monitoring Data[a]

Analyte	CAS No.	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[c]	24-Hour Maximum (ppbv)	Annual Mean (µg/m^3)[b,c]	Annual Median (µg/m^3)[c]	24-Hour Maximum (µg/m^3)	Health Bench-mark (µg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m^3)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	0.543	0.437	1.650	0.979	0.786	2.973	0.45	**2**	0.031	100
Acetone	67-64-1	0.787	0.846	2.240	1.870	2.008	5.321	*31000*	0.0001	0.328	100
Acetonitrile	75-05-8	0.496	0.234	9.940	0.833	0.393	16.689	*60*	0.01	0.027	100
Acetylene	74-86-2	0.445	0.324	3.330	0.474	0.345	3.544			0.042	100
Acrolein[g]	107-02-8	0.351	0.322	0.973	0.804	0.738	2.231	*0.02*	**40**	0.516	100
Acrylonitrile	107-13-1	*0.0004*	0	0.024	*0.001*	0	0.052	0.015	0.1	0.023	2
tert-Amyl Methyl Ether	994-05-8	*0.001*	0	0.010	*0.003*	0	0.041			0.052	9
Benzaldehyde	100-52-7	0.018	0.016	0.081	0.079	0.068	0.352			0.008	98
Benzene	71-43-2	0.106	0.096	0.207	0.338	0.305	0.661	0.13	**3**	0.046	100
Bromochloromethane	74-97-5	*0.0003*	0	0.015	*0.001*	0	0.079	*40*	0.00004	0.070	2
Bromodichloromethane	75-27-4	*0.001*	0	0.012	*0.005*	0	0.081	0.027	0.2	0.111	11
Bromoform	75-25-2	*0.001*	0	0.016	*0.008*	0	0.164	0.91	0.01	0.183	7
Bromomethane	74-83-9	0.010	0.010	0.022	0.038	0.038	0.087	*5*	0.01	0.045	91
1,3-Butadiene	106-99-0	0.010	0.010	0.033	0.022	0.021	0.074	0.033	0.7	0.043	70
Butyraldehyde	123-72-8	0.053	0.050	0.126	0.157	0.149	0.372			0.047	100
Carbon Disulfide	75-15-0	0.018	0.017	0.039	0.056	0.054	0.123	*700*	0.0001	0.239	100
Carbon Tetrachloride	56-23-5	0.086	0.089	0.122	0.541	0.557	0.768	0.17	**3**	0.084	100
Chlorobenzene	108-90-7	*0.001*	0	0.016	*0.006*	0	0.072	*1000*	0.00001	0.088	16
Chloroethane	75-00-3	*0.009*	0	0.048	*0.024*	0	0.127	*10000*	0.000002	0.066	41
Chloroform	67-66-3	0.023	0.022	0.048	0.113	0.109	0.235	0.043	**3**	0.063	100
Chloromethane	74-87-3	0.570	0.576	0.671	1.176	1.189	1.386	0.56	**2**	0.096	100
Chloroprene	126-99-8	*0.001*	0	0.014	*0.003*	0	0.050	0.002	***1.7***	0.047	9
Crotonaldehyde	123-73-9	0.073	0.021	0.433	0.211	0.061	1.241			0.007	100
Dibromochloromethane	124-48-1	*0.001*	0	0.014	*0.013*	0	0.134	0.037	0.3	0.153	21
1,2-Dibromoethane	106-93-4	*0.001*	0	0.016	*0.005*	0	0.124	0.0017	***3***	0.145	5
m-Dichlorobenzene	541-73-1	*0.001*	0	0.014	*0.007*	0	0.083			0.109	13
o-Dichlorobenzene	95-50-1	*0.001*	0	0.014	*0.007*	0	0.082	200	0.00004	0.124	13
p-Dichlorobenzene	106-46-7	*0.002*	0	0.024	*0.014*	0	0.146	*0.091*	0.2	0.120	21
Dichlorodifluoromethane	75-71-8	0.507	0.508	0.594	2.509	2.512	2.938	*100*	0.03	0.135	100
1,1-Dichloroethane	75-34-3	*0.001*	0	0.013	*0.005*	0	0.053	0.63	0.01	0.058	14
1,2-Dichloroethane	107-06-2	0.020	0.019	0.034	0.079	0.078	0.138	0.038	**2**	0.056	100
1,1-Dichloroethene	75-35-4	*0.001*	0	0.010	*0.004*	0	0.041	*200*	0.00002	0.047	16
cis-1,2-Dichloroethylene	156-59-2	*0.0002*	0	0.010	*0.001*	0	0.038			0.074	0
trans-1,2-Dichloroethylene	156-60-5	*0.001*	0	0.011	*0.003*	0	0.045			0.053	9
Dichloromethane	75-09-2	0.113	0.104	0.348	0.392	0.361	1.209	77	0.01	0.050	100

[a] See page 10-26 for footnotes.

Table 10-6 (continued)

CHESTER - 2018 NJ Toxic VOCs Monitoring Data[a]

Analyte	CAS No.	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[c]	24-Hour Maximum (ppbv)	Annual Mean (µg/m³)[b,c]	Annual Median (µg/m³)[c]	24-Hour Maximum (µg/m³)	Health Bench-mark (µg/m³)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m³)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	*0.002*	0	0.017	*0.008*	0	0.078	0.1	0.08	0.094	14
cis-1,3-Dichloropropene	10061-01-5	*0.001*	0	0.017	*0.003*	0	0.075	0.25	0.01	0.089	5
trans-1,3-Dichloropropene	10061-02-6	*0*	0	0	*0*	0	0	0.25		0.089	0
Dichlorotetrafluoroethane	76-14-2	0.019	0.018	0.028	0.129	0.125	0.195			0.094	100
2,5-Dimethylbenzaldehyde	5779-94-2	*0*	0	0	*0*	0	0			0.013	0
Ethyl Acrylate	140-88-5	*0.001*	0	0.013	*0.002*	0	0.051999877	*8*		0.096	5
Ethylbenzene	100-41-4	0.023	0.020	0.094	0.099	0.089	0.407	0.40	0.2	0.112	100
Ethyl tert-Butyl Ether	637-92-3	*0.001*	0	0.009	*0.004*	0	0.038			0.046	16
Formaldehyde	50-00-0	1.627	1.160	6.140	1.998	1.425	7.540	0.077	**26**	0.060	100
Hexachlorobutadiene	87-68-3	0.005	0.006	0.026	0.054	0.059	0.274	0.045	**1.2**	0.292	55
Hexaldehyde	66-25-1	0.020	0.015	0.078	0.081	0.060	0.321			0.006	96
Isovaleraldehyde	590-86-3	*0*	0	0	*0*	0	0			0.009	0
Methyl Ethyl Ketone	78-93-3	0.104	0.099	0.368	0.308	0.291	1.084	*5000*	0.0001	0.110	98
Methyl Isobutyl Ketone	108-10-1	0.025	0.023	0.065	0.102	0.095	0.267	*3000*	0.00003	0.097	96
Methyl Methacrylate	80-62-6	*0.001*	0	0.017	*0.005*	0	0.058	*700*	0.00001	0.352	18
Methyl tert-Butyl Ether	1634-04-4	*0.001*	0	0.010	*0.003*	0	0.037	3.8	0.001	0.037	11
n-Octane	111-65-9	0.020	0.019	0.045	0.093	0.090	0.209			0.151	100
Propionaldehyde	123-38-6	0.090	0.077	0.191	0.213	0.184	0.454	*8*	0.03	0.004	100
Propylene	115-07-1	0.201	0.182	0.650	0.346	0.312	1.119	*3000*	0.0001	0.110	100
Styrene	100-42-5	0.006	0.005	0.029	0.026	0.020	0.123	1.8	0.01	0.155	52
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.010	*0.006*	0	0.070	0.017	0.3	0.143	13
Tetrachloroethylene	127-18-4	0.011	0.010	0.027	0.073	0.070	0.186	0.16	0.5	0.099	91
Tolualdehydes		0.028	0.023	0.075	0.138	0.115	0.370			0.014	93
Toluene	108-88-3	0.135	0.131	0.324	0.509	0.494	1.221	*3760*	0.0001	0.490	100
1,2,4-Trichlorobenzene	120-82-1	*0.004*	0	0.024	*0.028*	0	0.180	*2*	0.01	1.848	23
1,1,1-Trichloroethane	71-55-6	*0.002*	0	0.013	*0.013*	0	0.070	*1000*	0.00001	0.075	39
1,1,2-Trichloroethane	79-00-5	*0.0005*	0	0.016	*0.003*	0	0.086	0.063	0.04	0.104	4
Trichloroethylene	79-01-6	*0.002*	0	0.013	*0.008*	0	0.068	0.2	0.04	0.081	18
Trichlorofluoromethane	75-69-4	0.221	0.219	0.270	1.241	1.231	1.517	*700*	0.002	0.065	100
Trichlorotrifluoroethane	76-13-1	0.079	0.079	0.094	0.605	0.602	0.723	*30000*	0.00002	0.075	100
1,2,4-Trimethylbenzene	95-63-6	0.014	0.013	0.039	0.071	0.066	0.189	*60*	0.001	0.132	98
1,3,5-Trimethylbenzene	108-67-8	0.007	0.005	0.023	0.033	0.026	0.113	*60*	0.001	0.167	86
Valeraldehyde	110-62-3	0.009	0.009	0.034	0.033	0.031	0.120			0.006	80
Vinyl chloride	75-01-4	*0.002*	0	0.014	*0.004*	0	0.036	0.11	0.04	0.033	20
m,p-Xylene	108-38-3, 106-42-3	0.045	0.039	0.273	0.196	0.168	1.185	*100*	0.002	0.156	100
o-Xylene	95-47-6	0.024	0.022	0.083	0.106	0.096	0.361	*100*	0.001	0.116	100

[a] See page 10-26 for footnotes.

Table 10-7

ELIZABETH LAB - 2018 NJ Toxic VOCs Monitoring Data[a]

Analyte	CAS No.	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[c]	24-Hour Maximum (ppbv)	Annual Mean (µg/m³)[b,c]	Annual Median (µg/m³)[c]	24-Hour Maximum (µg/m³)	Health Bench-mark (µg/m³)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m³)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	1.259	1.120	3.520	2.268	2.018	6.342	0.45	**5**	0.031	100
Acetone	67-64-1	1.193	1.010	5.180	2.834	2.399	12.305	*31000*	0.0001	0.328	100
Acetonitrile	75-05-8	0.491	0.206	9.250	0.824	0.345	15.530	*60*	0.01	0.027	100
Acetylene	74-86-2	0.818	0.673	2.310	0.871	0.716	2.458			0.042	100
Acrolein[g]	107-02-8	0.396	0.364	0.946	0.908	0.835	2.169	*0.02*	**45**	0.516	100
Acrylonitrile	107-13-1	*0.0004*	0	0.023	*0.001*	0	0.049	0.015	0.1	0.023	3
tert-Amyl Methyl Ether	994-05-8	*0.0004*	0	0.010	*0.002*	0	0.040			0.052	7
Benzaldehyde	100-52-7	0.027	0.025	0.106	0.119	0.109	0.460			0.008	98
Benzene	71-43-2	0.222	0.197	0.501	0.709	0.628	1.601	0.13	**5**	0.046	100
Bromochloromethane	74-97-5	*0.0004*	0	0.015	*0.002*	0	0.077	*40*	0.0001	0.070	5
Bromodichloromethane	75-27-4	*0.001*	0	0.019	*0.005*	0	0.129	0.027	0.2	0.111	8
Bromoform	75-25-2	*0.001*	0	0.019	*0.008*	0	0.200	0.91	0.01	0.183	10
Bromomethane	74-83-9	0.011	0.011	0.044	0.044	0.041	0.170	*5*	0.01	0.045	90
1,3-Butadiene	106-99-0	0.041	0.037	0.103	0.092	0.082	0.228	0.033	**3**	0.043	100
Butyraldehyde	123-72-8	0.103	0.093	0.279	0.304	0.273	0.823			0.047	100
Carbon Disulfide	75-15-0	0.019	0.016	0.052	0.060	0.049	0.162	*700*	0.00009	0.239	98
Carbon Tetrachloride	56-23-5	0.089	0.090	0.127	0.557	0.566	0.799	0.17	**3**	0.084	100
Chlorobenzene	108-90-7	*0.001*	0	0.011	*0.006*	0	0.052	*1000*	0.00001	0.088	20
Chloroethane	75-00-3	0.012	0.013	0.043	0.032	0.035	0.113	*10000*	0.000003	0.066	61
Chloroform	67-66-3	0.032	0.027	0.079	0.154	0.133	0.385	0.043	**4**	0.063	100
Chloromethane	74-87-3	0.565	0.571	0.692	1.167	1.178	1.429	0.56	**2**	0.096	100
Chloroprene	126-99-8	*0.0003*	0	0.013	*0.001*	0	0.046	0.002	0.6	0.047	5
Crotonaldehyde	123-73-9	0.109	0.045	0.783	0.311	0.128	2.245			0.007	100
Dibromochloromethane	124-48-1	*0.001*	0	0.014	*0.014*	0	0.143	0.037	0.4	0.153	30
1,2-Dibromoethane	106-93-4	*0.0005*	0	0.012	*0.003*	0	0.089	0.0017	**2**	0.145	7
m-Dichlorobenzene	541-73-1	*0.001*	0	0.014	*0.005*	0	0.083			0.109	11
o-Dichlorobenzene	95-50-1	*0.001*	0	0.013	*0.005*	0	0.080	200	0.00003	0.124	11
p-Dichlorobenzene	106-46-7	0.009	0.009	0.038	0.053	0.057	0.227	*0.091*	0.6	0.120	61
Dichlorodifluoromethane	75-71-8	0.501	0.504	0.559	2.480	2.490	2.765	*100*	0.02	0.135	100
1,1-Dichloroethane	75-34-3	*0.001*	0	0.013	*0.004*	0	0.054	0.63	0.01	0.058	13
1,2-Dichloroethane	107-06-2	0.022	0.021	0.033	0.088	0.086	0.132	0.038	**2**	0.056	100
1,1-Dichloroethene	75-35-4	*0.001*	0	0.011	*0.004*	0	0.044	*200*	0.00002	0.047	15
cis-1,2-Dichloroethylene	156-59-2	*0*	0	0	*0*	0	0			0.074	0
trans-1,2-Dichloroethylene	156-60-5	*0.002*	0	0.018	*0.007*	0	0.073			0.053	20
Dichloromethane	75-09-2	0.155	0.134	0.682	0.537	0.466	2.369	77	0.01	0.050	100

[a] See page 10-26 for footnotes.

Table 10-7 (continued)
ELIZABETH LAB - 2018 NJ Toxic VOCs Monitoring Data[a]

Analyte	CAS No.	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[c]	24-Hour Maximum (ppbv)	Annual Mean (µg/m³)[b,c]	Annual Median (µg/m³)[c]	24-Hour Maximum (µg/m³)	Health Bench-mark (µg/m³)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m³)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	*0.0004*	0	0.016	*0.002*	0	0.072	0.1	0.02	0.094	5
cis-1,3-Dichloropropene	10061-01-5	*0.001*	0	0.014	*0.003*	0	0.061	0.25	0.01	0.089	7
trans-1,3-Dichloropropene	10061-02-6	*0.0002*	0	0.012	*0.001*	0	0.055	0.25	0.004	0.089	3
Dichlorotetrafluoroethane	76-14-2	0.018	0.018	0.025	0.127	0.122	0.178			0.094	100
2,5-Dimethylbenzaldehyde	5779-94-2	*0*	0	0	*0*	0	0			0.013	2
Ethyl Acrylate	140-88-5	*0*	0	0	*0*	0	0	*8*		0.096	2
Ethyl tert-Butyl Ether	100-41-4	0.069	0.060	0.204	0.301	0.262	0.886	0.40	0.8	0.112	100
Ethylbenzene	637-92-3	*0.001*	0	0.013	*0.006*	0	0.055			0.046	21
Formaldehyde	50-00-0	3.234	2.575	13.300	3.971	3.162	16.333	0.077	**52**	0.060	100
Hexachlorobutadiene	87-68-3	0.005	0.006	0.020	0.054	0.061	0.210	0.045	**1.2**	0.292	57
Hexaldehyde	66-25-1	0.038	0.035	0.099	0.155	0.143	0.407			0.006	98
Isovaleraldehyde	590-86-3	*0*	0	0	*0*	0	0			0.009	2
Methyl Ethyl Ketone	78-93-3	0.165	0.132	0.577	0.486	0.389	1.699	*5000*	0.0001	0.110	100
Methyl Isobutyl Ketone	108-10-1	0.045	0.039	0.145	0.183	0.161	0.594	*3000*	0.00006	0.097	95
Methyl Methacrylate	80-62-6	*0.007*	0	0.072	*0.024*	0	0.253	*700*	0.00003	0.352	38
Methyl tert-Butyl Ether	1634-04-4	*0.001*	0	0.023	*0.004*	0	0.084	3.8	0.001	0.037	13
n-Octane	111-65-9	0.071	0.055	0.211	0.331	0.259	0.986			0.151	100
Propionaldehyde	123-38-6	0.200	0.170	0.662	0.474	0.404	1.573	*8*	0.06	0.004	100
Propylene	115-07-1	1.747	0.742	11.800	3.007	1.276	20.309	*3000*	0.001	0.110	100
Styrene	100-42-5	0.018	0.016	0.054	0.077	0.067	0.229	1.8	0.04	0.155	95
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.012	*0.004*	0	0.082	0.017	0.2	0.143	8
Tetrachloroethylene	127-18-4	0.021	0.018	0.098	0.145	0.121	0.663	0.16	0.9	0.099	100
Tolualdehydes		0.043	0.036	0.083	0.212	0.178	0.410			0.014	100
Toluene	108-88-3	0.455	0.385	1.500	1.716	1.449	5.652	*3760*	0.0005	0.490	100
1,2,4-Trichlorobenzene	120-82-1	*0.003*	0	0.023	*0.025*	0	0.174	*2*	0.01	1.848	20
1,1,1-Trichloroethane	71-55-6	0.004	0.004	0.024	0.020	0.021	0.133	*1000*	0.00002	0.075	59
1,1,2-Trichloroethane	79-00-5	*0.0003*	0	0.012	*0.002*	0	0.063	0.063	0.03	0.104	5
Trichloroethylene	79-01-6	0.006	0.003	0.059	0.031	0.014	0.315	0.2	0.2	0.081	51
Trichlorofluoromethane	75-69-4	0.225	0.222	0.293	1.265	1.247	1.646	*700*	0.002	0.065	100
Trichlorotrifluoroethane	76-13-1	0.078	0.079	0.093	0.598	0.602	0.710	*30000*	0.00002	0.075	100
1,2,4-Trimethylbenzene	95-63-6	0.061	0.054	0.181	0.301	0.267	0.890	*60*	0.005	0.132	100
1,3,5-Trimethylbenzene	108-67-8	0.020	0.019	0.051	0.099	0.093	0.251	*60*	0.002	0.167	98
Valeraldehyde	110-62-3	0.026	0.020	0.075	0.091	0.070	0.265			0.006	97
Vinyl chloride	75-01-4	*0.002*	0	0.016	*0.005*	0	0.040	0.11	0.05	0.033	26
m,p-Xylene	108-38-3, 106-42-3	0.188	0.154	0.562	0.816	0.666	2.440	*100*	0.01	0.156	100
o-Xylene	95-47-6	0.083	0.068	0.228	0.361	0.297	0.990	*100*	0.004	0.116	100

[a] See page 10-26 for footnotes.

Table 10-8

RUTGERS UNIVERSITY - 2018 NJ Toxic VOCs Monitoring Data[a]

Analyte	CAS No.	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[c]	24-Hour Maximum (ppbv)	Annual Mean ($\mu g/m^3$)[b,c]	Annual Median ($\mu g/m^3$)[c]	24-Hour Maximum ($\mu g/m^3$)	Health Bench-mark ($\mu g/m^3$)[d]	Annual Mean Risk Ratio[e]	Detection Limit ($\mu g/m^3$)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	0.744	0.692	2.320	1.340	1.247	4.180	0.45	**3**	0.031	100
Acetone	67-64-1	0.906	0.932	3.250	2.152	2.214	7.720	*31000*	0.0001	0.328	100
Acetonitrile	75-05-8	0.683	0.194	14.900	1.147	0.326	25.016	*60*	0.02	0.027	100
Acetylene	74-86-2	0.555	0.443	1.620	0.591	0.471	1.724			0.042	100
Acrolein[g]	107-02-8	0.339	0.334	0.691	0.777	0.766	1.584	*0.02*	**39**	0.516	100
Acrylonitrile	107-13-1	*0*	0	0	*0*	0	0	0.015		0.023	0
tert-Amyl Methyl Ether	994-05-8	*0.0004*	0	0.011	*0.002*	0	0.044			0.052	7
Benzaldehyde	100-52-7	0.025	0.018	0.129	0.108	0.079	0.560			0.008	96
Benzene	71-43-2	0.137	0.126	0.295	0.437	0.403	0.942	0.13	**3**	0.046	100
Bromochloromethane	74-97-5	*0.0003*	0	0.015	*0.001*	0	0.077	*40*	0.00003	0.070	2
Bromodichloromethane	75-27-4	*0.001*	0	0.016	*0.008*	0	0.105	0.027	0.3	0.111	18
Bromoform	75-25-2	*0.001*	0	0.019	*0.008*	0	0.197	0.91	0.01	0.183	7
Bromomethane	74-83-9	0.011	0.010	0.053	0.041	0.039	0.207	*5*	0.01	0.045	85
1,3-Butadiene	106-99-0	0.019	0.017	0.054	0.041	0.037	0.119	0.033	**1.3**	0.043	91
Butyraldehyde	123-72-8	0.080	0.071	0.488	0.237	0.211	1.439			0.047	100
Carbon Disulfide	75-15-0	0.020	0.018	0.067	0.062	0.055	0.210	*700*	0.0001	0.239	100
Carbon Tetrachloride	56-23-5	0.087	0.092	0.124	0.549	0.580	0.780	0.17	**3**	0.084	100
Chlorobenzene	108-90-7	*0.002*	0	0.015	*0.007*	0	0.067	*1000*	0.00001	0.088	22
Chloroethane	75-00-3	0.027	0.014	0.288	0.072	0.038	0.760	*10000*	0.00001	0.066	62
Chloroform	67-66-3	0.030	0.026	0.063	0.149	0.129	0.308	0.043	**3**	0.063	100
Chloromethane	74-87-3	0.573	0.577	0.686	1.184	1.192	1.417	0.56	**2**	0.096	100
Chloroprene	126-99-8	*0.0002*	0	0.007	*0.001*	0	0.026	0.002	0.4	0.047	4
Crotonaldehyde	123-73-9	0.072	0.029	0.408	0.207	0.083	1.170			0.007	100
Dibromochloromethane	124-48-1	*0.001*	0	0.015	*0.011*	0	0.146	0.037	0.3	0.153	20
1,2-Dibromoethane	106-93-4	*0.0004*	0	0.016	*0.003*	0	0.124	0.0017	***2***	0.145	4
m-Dichlorobenzene	541-73-1	*0.001*	0	0.011	*0.003*	0	0.063			0.109	7
o-Dichlorobenzene	95-50-1	*0.001*	0	0.014	*0.006*	0	0.085	200	0.00003	0.124	11
p-Dichlorobenzene	106-46-7	0.006	0.006	0.028	0.034	0.033	0.166	*0.091*	0.4	0.120	51
Dichlorodifluoromethane	75-71-8	0.506	0.511	0.576	2.504	2.527	2.849	*100*	0.03	0.135	100
1,1-Dichloroethane	75-34-3	*0.001*	0	0.011	*0.004*	0	0.043	0.63	0.01	0.058	11
1,2-Dichloroethane	107-06-2	0.021	0.020	0.028	0.083	0.080	0.114	0.038	**2**	0.056	100
1,1-Dichloroethene	75-35-4	*0.001*	0	0.011	*0.004*	0	0.044	*200*	0.00002	0.047	15
cis-1,2-Dichloroethylene	156-59-2	*0*	0	0	*0*	0	0			0.074	0
trans-1,2-Dichloroethylene	156-60-5	*0.001*	0	0.014	*0.005*	0	0.054			0.053	13
Dichloromethane	75-09-2	0.139	0.121	0.689	0.482	0.420	2.394	77	0.01	0.050	100

[a] See page 10-26 for footnotes.

Table 10-8 (continued)
RUTGERS UNIVERSITY - 2018 NJ Toxic VOCs Monitoring Data[a]

Analyte	CAS No.	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[c]	24-Hour Maximum (ppbv)	Annual Mean (µg/m^3)[b,c]	Annual Median (µg/m^3)[c]	24-Hour Maximum (µg/m^3)	Health Benchmark (µg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m^3)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	*0.001*	0	0.014	*0.004*	0	0.063	0.1	0.04	0.094	7
cis-1,3-Dichloropropene	10061-01-5	*0.0004*	0	0.015	*0.002*	0	0.066	0.25	0.01	0.089	4
trans-1,3-Dichloropropene	10061-02-6	*0.0004*	0	0.019	*0.002*	0	0.088	0.25	0.006	0.089	2
Dichlorotetrafluoroethane	76-14-2	0.018	0.018	0.026	0.128	0.127	0.184			0.094	100
2,5-Dimethylbenzaldehyde	5779-94-2	*0*	0	0	*0*	0	0			0.013	0
Ethyl Acrylate	140-88-5	*0*	0	0	*0*	0	0	*8*		0.096	0
Ethyl tert-Butyl Ether	100-41-4	0.051	0.037	0.344	0.220	0.159	1.494	0.40	0.6	0.112	100
Ethylbenzene	637-92-3	0.007	0.009	0.020	0.031	0.039	0.084			0.046	71
Formaldehyde	50-00-0	1.977	1.330	8.360	2.427	1.633	10.267	0.077	**32**	0.060	100
Hexachlorobutadiene	87-68-3	0.004	0.005	0.025	0.047	0.051	0.270	0.045	**1.0**	0.292	51
Hexaldehyde	66-25-1	0.055	0.027	0.980	0.226	0.110	4.015			0.006	96
Isovaleraldehyde	590-86-3	*0*	0	0	*0*	0	0			0.009	0
Methyl Ethyl Ketone	78-93-3	0.181	0.130	2.150	0.533	0.383	6.331	*5000*	0.0001	0.110	98
Methyl Isobutyl Ketone	108-10-1	0.030	0.029	0.095	0.122	0.119	0.390	*3000*	0.00004	0.097	93
Methyl Methacrylate	80-62-6	*0.004*	0	0.036	*0.015*	0	0.125	*700*	0.0000	0.352	38
Methyl tert-Butyl Ether	1634-04-4	*0.002*	0	0.017	*0.008*	0	0.061	3.8	0.002	0.037	27
n-Octane	111-65-9	0.026	0.024	0.100	0.123	0.113	0.467			0.151	100
Propionaldehyde	123-38-6	0.117	0.114	0.369	0.277	0.271	0.877	*8*	0.03	0.004	98
Propylene	115-07-1	0.297	0.282	0.790	0.511	0.485	1.360	*3000*	0.0002	0.110	100
Styrene	100-42-5	0.016	0.014	0.118	0.067	0.059	0.503	1.8	0.04	0.155	85
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.013	*0.004*	0	0.087	0.017	0.2	0.143	7
Tetrachloroethylene	127-18-4	0.014	0.013	0.063	0.097	0.090	0.428	0.16	0.6	0.099	96
Tolualdehydes		0.033	0.028	0.094	0.163	0.138	0.463			0.014	97
Toluene	108-88-3	0.223	0.212	0.856	0.842	0.799	3.225	*3760*	0.0002	0.490	100
1,2,4-Trichlorobenzene	120-82-1	*0.003*	0	0.022	*0.021*	0	0.160	*2*	0.01	1.848	18
1,1,1-Trichloroethane	71-55-6	0.003	0.004	0.015	0.017	0.020	0.079	*1000*	0.00002	0.075	55
1,1,2-Trichloroethane	79-00-5	*0.0003*	0	0.015	*0.001*	0	0.080	0.063	0.02	0.104	2
Trichloroethylene	79-01-6	*0.003*	0	0.014	*0.014*	0	0.077	0.2	0.1	0.081	31
Trichlorofluoromethane	75-69-4	0.222	0.220	0.296	1.250	1.236	1.663	*700*	0.002	0.065	100
Trichlorotrifluoroethane	76-13-1	0.079	0.080	0.090	0.604	0.611	0.693	*30000*	0.00002	0.075	100
1,2,4-Trimethylbenzene	95-63-6	0.027	0.022	0.113	0.134	0.106	0.555	*60*	0.002	0.132	98
1,3,5-Trimethylbenzene	108-67-8	0.011	0.009	0.044	0.052	0.045	0.217	*60*	0.001	0.167	91
Valeraldehyde	110-62-3	0.022	0.014	0.238	0.077	0.048	0.838			0.006	93
Vinyl chloride	75-01-4	*0.002*	0	0.015	*0.005*	0	0.038	0.11	0.04	0.033	18
m,p-Xylene	108-38-3, 106-42-3	0.115	0.072	1.150	0.499	0.314	4.993	*100*	0.005	0.156	100
o-Xylene	95-47-6	0.054	0.037	0.514	0.232	0.161	2.232	*100*	0.002	0.116	100

[a] See page 10-26 for footnotes.

Footnotes for Tables 10-5 through 10-8

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

[c] 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.

[d] 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.

NOTE: Health benchmarks in italics are based on noncancer effects.

[e] 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.

Table 10-9
Analytes with 100% Non-Detects in 2018

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

In 2018, samples of the chemicals in Table 10-9 were never detected at the monitoring location specified. However, these pollutants may be present in the air at levels the lab cannot measure. Chemical-specific average detection limits can be found in Tables 10-5 through 10-8.

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