Chicago, IL NATTS Network Assessment Review

- Established 2003: Carbonyls and VOCs
  - Added PM_{10} Metals in 2005
  - Added Chromium VI in 2005, completed in 2013
  - Added PAHs in 2008
- For the NATTS Network Assessment (2003-2018):
  - 18 of 18 Method Quality Objective (MQO) Core HAPs were included in the national trends
  - 245 of 255 pollutant datasets were suitable for trends analysis
  - Annual Average and 3-Year Rolling Average Concentrations for select pollutants (benzene, beryllium (PM_{10}), cadmium (PM_{10}), lead (PM_{10}), and trichloroethylene) were generally decreasing over time.
  - 100% Reporting of Datasets
- Method Quality Objectives (MQO): 2003-2018
  - Completeness: Met 85% completeness in 238 of 255 pollutant datasets
  - Method Detection Limits: Met MDL Target Ratio of 1.00 in 244 of 265 pollutant datasets
  - Bias: Met ±25% for 209 of 223 pollutant datasets
  - Overall Method Precision: Met ≤15% CV for 70 of 128 pollutant datasets
  - Analytical Method Precision: Met ≤15% CV for 177 of 190 pollutant datasets
- Analytical Laboratories for 2018

VOC	Carbonyl	PM_{10} Metals	Chromium VI	PAHs
ERG	ERG	ERG	NA	ERG

- Equipment Year Deployed

Equipment Type	VOC	Carbonyl	PM_{10} Metals	Chromium VI	PAHs
Sampler	2015	2015	2009	2005	1998
Analytical	2010	2018	2015	2001	2015
Preconcentrator	2007	NA	NA	NA	NA
Standards Preparation	1985	NA	NA	NA	NA
Canister Cleaning	2011	NA	NA	NA	NA
Extraction	NA	NA	2014	2011	2004

National Summary: NATTS data were collected at 27 locations across the United States, with sites beginning in 2003 or later (Figure 1) for 19 core HAPs. Over 528,000 concentrations (primary, secondary, and replicate) were generated and analyzed for this assessment. Pollutant datasets were scored to assess whether they were suitable for trends analysis. Each pollutant dataset was evaluated against four MQOs: Completeness; Sensitivity; Bias; and Precision. Datasets that were suitable (A- or B-rated) for six consecutive years were used for national trends analysis (Table 1).

National trends were determined by comparing the most recent 3-year blocked averages (e.g., 2013-2015 vs. 2016-2018) to determine if the NATTS Trends DQO was being met:

To be able to detect a a15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error.

Of the 19 core HAPs. 18 were assessed for the NATTS Trends DQO. Due to sampling and analytical issues, acrolein was not considered for trends analysis (Table 2). This assessment showed that across the network, 15 of those 18 pollutants were decreasing between the 3-year blocks, while two of those pollutants were increasing between the 3-year blocks. One pollutant did not exhibit a trend.

Figure 1. NATTS Site and Year Established

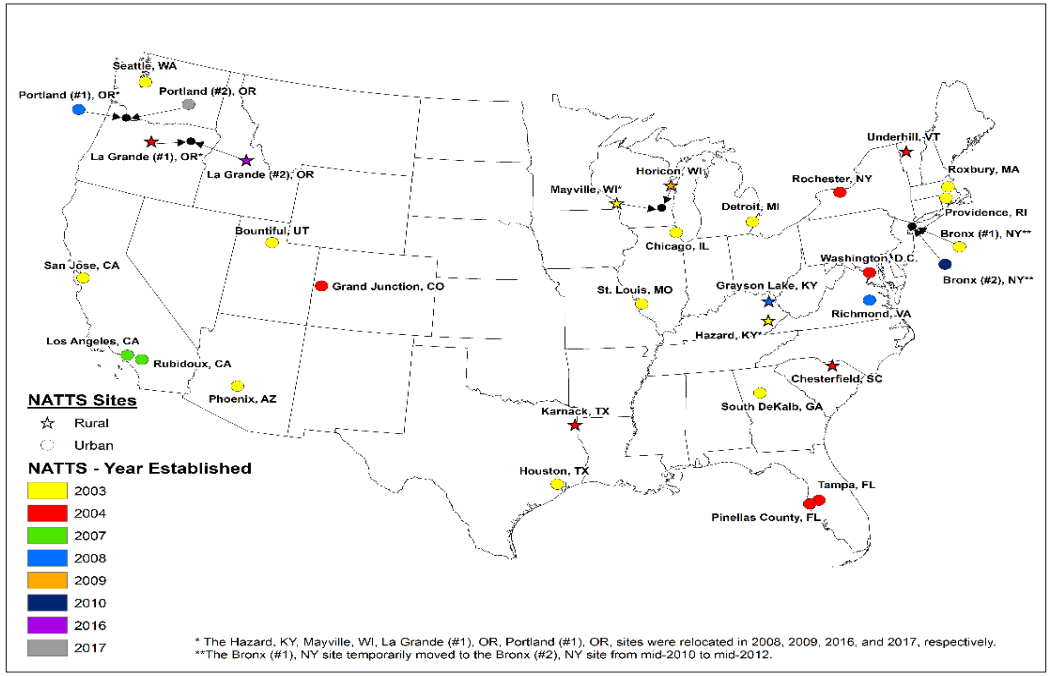


Table 1. NATTS Network Assessment: Count and Percentage of Suitable Datasets by Pollutant Group

Pollutant Group	A-rated		B-rated		Does Not Meet	
	#	%	#	%	#	%
VOCs	1,452	53%	737	27%	555	20%
Carbonyls	523	67%	193	25%	66	8%
PM_{10} Metals	1,418	61%	685	30%	213	9%
Chromium VI	159	74%	29	13%	27	13%
PAHs	410	74%	124	22%	18	3%
Total = 6,609	3,962	60%	1,768	27%	879	13%

Table 2. Three-Year Block Averages for National Trends

Pollutant	Units	# Sites	Block 1	Block 2	% Difference
Acetaldehyde	$\mu g/m^3$	19	1.51	1.39	-7.7%
Arsenic (PM_{10})	ng/m^3	21	0.71	0.68	-3.2%
Benzene	$\mu g/m^3$	19	0.65	0.59	-10.2%
Benzo(a)pyrene	ng/m^3	21	0.113	0.087	-23.2%
Beryllium (PM_{10})	ng/m^3	20	0.012	0.009	-26.4%
Butadiene, 1,3-	$\mu g/m^3$	19	0.071	0.063	-10.9%
Cadmium (PM_{10})	ng/m^3	21	0.170	0.097	-43.0%
Carbon Tetrachloride	$\mu g/m^3$	15	0.59	0.56	-4.7%
Chloroform	$\mu g/m^3$	20	0.256	0.255	-0.4%
Chromium VI	ng/m^3	18	0.029	0.026	-7.7%
Formaldehyde	$\mu g/m^3$	19	2.77	2.68	-3.3%
Lead (PM_{10})	ng/m^3	21	3.08	2.81	-8.9%
Manganese (PM_{10})	ng/m^3	20	8.06	7.93	-1.6%
Naphthalene	ng/m^3	20	66.70	51.08	-23.4%
Nickel (PM_{10})	ng/m^3	19	1.28	1.05	-18.0%
Tetrachloroethylene	$\mu g/m^3$	19	0.149	0.174	17.2%
Trichloroethylene	$\mu g/m^3$	19	0.020	0.022	10.7%
Vinyl Chloride	$\mu g/m^3$	17	0.0051	0.0048	-5.5%

Site Information

Region	5
NATTS Site Type	Urban
County	Cook
AQS Site Code	17-031-4201
NATTS Operating Agency	IL Enviromental Protection Agency
Latitude	42.139996
Longitude	-87.799227
AQS Land Use	Residential
AQS Location Setting	Suburban
10-Mile Population	5,240,700

Figure 2. NATTS Site Location

Pollutant Datasets Evaluation: Suitable for Trends (Y=yes; Y(T)=yes, and used for DQO Trends; N=No; "--"=not rated

Final Pollutant Name	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Acetaldehyde	N[a]	N[b]	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Arsenic (PM_{10})	--	N[c]	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Benzene	--	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Benzo(a)pyrene	--	--	--	--	--	--	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Beryllium (PM_{10})	--	N[c]	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Butadiene, 1,3-	--	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Cadmium (PM_{10})	--	N[c]	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Carbon tetrachloride	--	N[d]	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Chloroform	--	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Chromium VI	--	--	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	--	--	--	--	--	--
Formaldehyde	N[a]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Lead (PM_{10})	--	N[c]	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Manganese (PM_{10})	--	N[c]	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Naphthalene	--	--	--	--	--	--	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Nickel (PM_{10})	--	N[c]	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Tetrachloroethylene	--	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Trichloroethylene	--	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Vinyl chloride	--	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)

[a]: No MDL reported to EPA

[b]: Completeness was less than 75% based on 1-in-6 day sampling

[c]: Pollutant was expected, but not sampled at this site for this year.

[d]: Reported MDL to NATTS Target Ratio greater than 2.0

Table 3. NATTS Network Assessment Data (2003-2018) - National Distribution Statistics By Type[a]

Analyte	Units	Site Type	# Data Records	% Detections	Arithmetic Mean[b]	Percentile Value[c]						
						5th	10th	25th	50th	75th	90th	95th
Acetaldehyde	µg/m^3	Urban	15,704	100%	1.77 ± 0.02	0.50	0.66	0.97	1.45	2.19	3.24	4.04
	µg/m^3	Rural	4,930	100%	1.20 ± 0.04	0.36	0.46	0.65	0.93	1.38	2.02	2.76
	µg/m^3	All Sites	20,634	100%	1.63 ± 0.02	0.44	0.58	0.86	1.31	2.00	3.02	3.86
Arsenic (PM_{10})	ng/m^3	Urban	14,968	97%	0.89 ± 0.04	0.10	0.19	0.34	0.58	0.99	1.70	2.41
	ng/m^3	Rural	4,622	96%	0.49 ± 0.02	0.04	0.08	0.17	0.35	0.59	0.94	1.28
	ng/m^3	All Sites	19,590	97%	0.79 ± 0.03	0.06	0.14	0.29	0.52	0.89	1.54	2.19
Benzene	µg/m^3	Urban	15,984	99%	0.86 ± 0.01	0.25	0.30	0.43	0.66	1.05	1.64	2.21
	µg/m^3	Rural	2,494	95%	0.43 ± 0.02	0.04	0.13	0.21	0.33	0.52	0.78	1.01
	µg/m^3	All Sites	18,478	99%	0.81 ± 0.01	0.19	0.26	0.39	0.61	0.98	1.55	2.09
Benzo(a)pyrene	ng/m^3	Urban	12,336	70%	0.096 ± 0.004	ND	ND	ND	0.04	0.11	0.24	0.37
	ng/m^3	Rural	3,179	36%	0.067 ± 0.009	ND	ND	ND	ND	0.02	0.13	0.37
	ng/m^3	All Sites	15,515	63%	0.090 ± 0.004	ND	ND	ND	0.03	0.10	0.23	0.37
Beryllium (PM_{10})	ng/m^3	Urban	15,783	75%	0.051 ± 0.006	ND	ND	0.00003	0.005	0.018	0.050	0.101
	ng/m^3	Rural	4,687	49%	0.023 ± 0.003	ND	ND	ND	ND	0.005	0.017	0.072
	ng/m^3	All Sites	20,470	69%	0.045 ± 0.005	ND	ND	ND	0.003	0.012	0.049	0.100
Butadiene, 1,3-	µg/m^3	Urban	15,388	81%	0.092 ± 0.002	ND	ND	0.025	0.058	0.114	0.215	0.302
	µg/m^3	Rural	2,185	29%	0.012 ± 0.001	ND	ND	ND	ND	0.017	0.046	0.059
	µg/m^3	All Sites	17,573	75%	0.082 ± 0.002	ND	ND	ND	0.049	0.104	0.199	0.287
Cadmium (PM_{10})	ng/m^3	Urban	16,360	92%	0.21 ± 0.02	ND	0.01	0.05	0.09	0.17	0.42	0.63
	ng/m^3	Rural	4,684	87%	0.10 ± 0.01	ND	ND	0.03	0.06	0.11	0.20	0.29
	ng/m^3	All Sites	21,044	91%	0.18 ± 0.01	ND	0.01	0.04	0.08	0.16	0.35	0.56
Carbon Tetrachloride	µg/m^3	Urban	14,713	99%	0.569 ± 0.003	0.361	0.433	0.496	0.562	0.651	0.737	0.798
	µg/m^3	Rural	2,189	92%	0.534 ± 0.016	ND	0.180	0.402	0.537	0.633	0.727	0.798
	µg/m^3	All Sites	16,902	98%	0.565 ± 0.003	0.304	0.408	0.490	0.559	0.649	0.736	0.798
Chloroform	µg/m^3	Urban	16,068	87%	0.265 ± 0.022	ND	ND	0.093	0.132	0.217	0.420	0.668
	µg/m^3	Rural	3,802	43%	0.052 ± 0.003	ND	ND	ND	ND	0.095	0.144	0.230
	µg/m^3	All Sites	19,870	79%	0.224 ± 0.018	ND	ND	0.064	0.113	0.196	0.364	0.586
Chromium VI	ng/m^3	Urban	8,414	74%	0.036 ± 0.002	ND	ND	ND	0.020	0.042	0.081	0.120
	ng/m^3	Rural	2,586	41%	0.018 ± 0.004	ND	ND	ND	ND	0.017	0.031	0.051
	ng/m^3	All Sites	11,000	66%	0.032 ± 0.001	ND	ND	ND	0.016	0.036	0.073	0.114

Table 3. NATTS Network Assessment Data (2003-2018) - National Distribution Statistics By Type[a]

Analyte	Units	Site Type	# Data Records	% Detections	Arithmetic Mean[b]	Percentile Value[c]						
						5th	10th	25th	50th	75th	90th	95th
Formaldehyde	µg/m^3	Urban	16,118	100%	3.11 ± 0.04	0.66	0.99	1.60	2.47	3.84	5.63	7.25
	µg/m^3	Rural	5,002	100%	2.22 ± 0.05	0.53	0.68	1.06	1.69	2.74	4.19	5.45
	µg/m^3	All Sites	21,120	100%	2.90 ± 0.04	0.61	0.86	1.43	2.29	3.59	5.38	6.96
Lead (PM_{10})	ng/m^3	Urban	16,366	100%	4.21 ± 0.13	0.72	0.98	1.55	2.64	4.56	8.35	11.90
	ng/m^3	Rural	4,680	99%	2.10 ± 0.16	0.37	0.50	0.84	1.41	2.37	3.91	5.36
	ng/m^3	All Sites	21,046	99%	3.74 ± 0.11	0.55	0.80	1.31	2.31	4.04	7.41	10.56
Manganese (PM_{10})	ng/m^3	Urban	16,141	100%	9.80 ± 0.32	1.09	1.51	2.52	4.92	10.21	20.10	30.08
	ng/m^3	Rural	4,627	99%	3.96 ± 0.14	0.46	0.73	1.36	2.57	4.75	8.54	12.13
	ng/m^3	All Sites	20,768	100%	8.50 ± 0.25	0.85	1.23	2.15	4.18	8.89	17.98	26.70
Naphthalene	ng/m^3	Urban	12,332	100%	74.63 ± 1.14	15.62	21.27	33.55	55.89	94.64	150.05	196.16
	ng/m^3	Rural	3,301	100%	24.47 ± 1.38	3.74	4.73	7.74	13.86	26.25	50.88	79.17
	ng/m^3	All Sites	15,633	100%	64.04 ± 1.00	6.58	10.92	23.37	45.59	83.31	137.54	181.75
Nickel (PM_{10})	ng/m^3	Urban	16,125	97%	1.85 ± 0.05	0.25	0.41	0.67	1.11	2.00	3.52	5.27
	ng/m^3	Rural	4,623	85%	0.65 ± 0.08	ND	ND	0.10	0.28	0.64	1.15	1.89
	ng/m^3	All Sites	20,748	94%	1.58 ± 0.04	ND	0.15	0.47	0.92	1.73	3.14	4.74
Tetrachloroethylene	µg/m^3	Urban	15,612	86%	0.25 ± 0.01	ND	ND	0.06	0.13	0.25	0.48	0.74
	µg/m^3	Rural	2,272	36%	0.09 ± 0.04	ND	ND	ND	ND	0.04	0.08	0.16
	µg/m^3	All Sites	17,884	79%	0.23 ± 0.01	ND	ND	0.04	0.11	0.22	0.44	0.70
Trichloroethylene	µg/m^3	Urban	15,843	41%	0.040 ± 0.002	ND	ND	ND	ND	0.051	0.107	0.164
	µg/m^3	Rural	3,388	13%	0.021 ± 0.003	ND	ND	ND	ND	ND	0.017	0.250
	µg/m^3	All Sites	19,231	36%	0.037 ± 0.002	ND	ND	ND	ND	0.041	0.105	0.167
Vinyl Chloride	µg/m^3	Urban	14,778	19%	0.0044 ± 0.0003	ND	ND	ND	ND	ND	0.0137	0.0257
	µg/m^3	Rural	2,444	8%	0.0040 ± 0.0009	ND	ND	ND	ND	ND	ND	0.0156
	µg/m^3	All Sites	17,222	17%	0.0043 ± 0.0003	ND	ND	ND	ND	ND	0.0126	0.0254

[a] Statistics presented are from pollutant datasets which were suitable for trends.

[b] The arithmetic mean is the average of all samples results which include actual measured values. If no chemical was registered, then a value of zero is used when calculating the mean.

[c] ND: No results of this chemical were registered by the laboratory analytical equipment.

Table 4. Summary Statistics for Chicago, IL

Analyte	Units	# Data Records	% Detection	Arithmetic Mean[a]	Percentile Value[b]						
					5th	10th	25th	50th	75th	90th	95th
Acetaldehyde	µg/m^3	931	99%	1.32 ± 0.06	0.36	0.48	0.73	1.10	1.64	2.34	3.07
Arsenic (PM_{10})	ng/m^3	809	100%	0.77 ± 0.04	0.18	0.23	0.37	0.64	1.00	1.47	1.76
Benzene	µg/m^3	899	100%	0.62 ± 0.03	0.23	0.28	0.38	0.52	0.73	1.03	1.31
Benzo(a)pyrene	ng/m^3	622	95%	0.12 ± 0.01	0.02	0.03	0.05	0.09	0.15	0.26	0.34
Beryllium (PM_{10})	ng/m^3	809	97%	0.0057 ± 0.0004	0.001	0.001	0.002	0.004	0.008	0.012	0.015
Butadiene, 1,3-	µg/m^3	899	75%	0.05 ± 0.01	ND	ND	0.005	0.03	0.06	0.09	0.13
Cadmium (PM_{10})	ng/m^3	809	100%	0.14 ± 0.01	0.04	0.05	0.07	0.11	0.18	0.27	0.36
Carbon Tetrachloride	µg/m^3	899	99%	0.67 ± 0.01	0.44	0.51	0.58	0.65	0.75	0.87	0.97
Chloroform	µg/m^3	899	96%	1.68 ± 0.38	0.09	0.14	0.22	0.43	0.93	2.14	5.47
Chromium VI	ng/m^3	508	69%	0.020 ± 0.002	ND	ND	ND	0.016	0.027	0.046	0.063
Formaldehyde	µg/m^3	931	100%	2.06 ± 0.26	0.37	0.52	0.88	1.47	2.32	3.55	4.40
Lead (PM_{10})	ng/m^3	809	100%	3.76 ± 0.21	0.94	1.18	1.83	2.91	4.70	7.27	8.90
Manganese (PM_{10})	ng/m^3	809	100%	7.90 ± 0.48	1.80	2.44	3.47	5.77	9.27	15.91	22.13
Naphthalene	ng/m^3	622	100%	89.59 ± 7.61	16.05	21.32	32.38	56.98	107.06	196.96	270.85
Nickel (PM_{10})	ng/m^3	809	100%	1.18 ± 0.05	0.55	0.62	0.78	1.02	1.35	1.80	2.34
Tetrachloroethylene	µg/m^3	899	83%	0.34 ± 0.10	ND	ND	0.08	0.14	0.26	0.48	0.77
Trichloroethylene	µg/m^3	899	44%	0.19 ± 0.19	ND	ND	ND	ND	0.09	0.22	0.39
Vinyl Chloride	µg/m^3	899	10%	0.002 ± 0.001	ND	ND	ND	ND	ND	0.003	0.021

[a] :The arithmetic mean is the average of all samples results which included actual measured values. If no chemical was registered, then a value of zero is used.

[b] ND: No results of this chemical were registered by the laboratory analytical equipment.

Table 5. Analytical Labs Supporting this Site

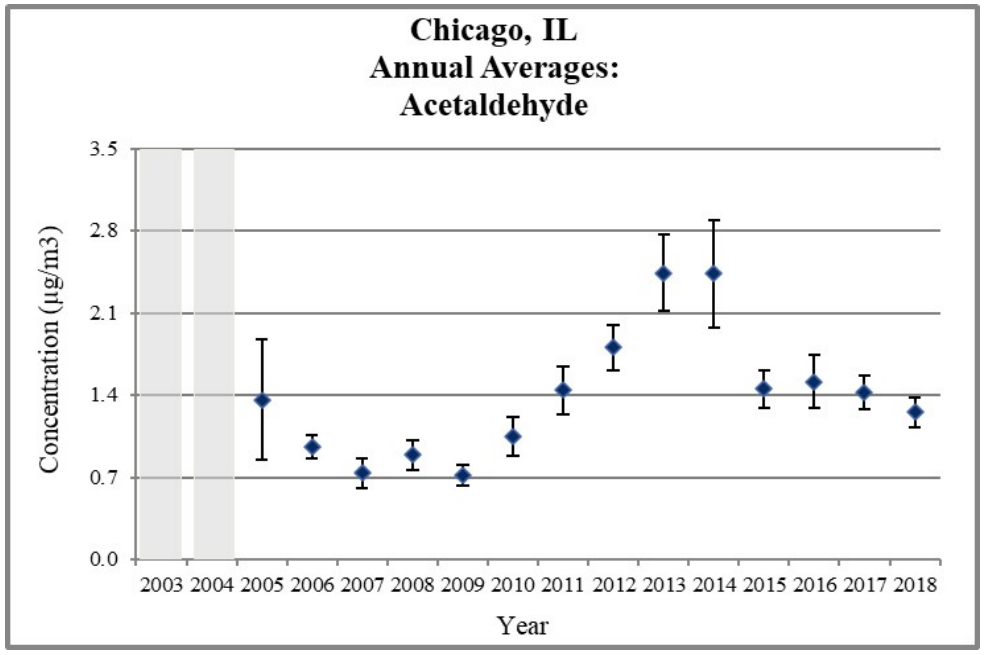
Pollutant Group	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
VOCs	ERG	ERG	ERG/IEPA	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Carbonyls	IEPA	IEPA	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PM_{10} Metals	--	NONE	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Chromium VI	--	--	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	--	--	--	--	--
PAHs	--	--	--	--	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG

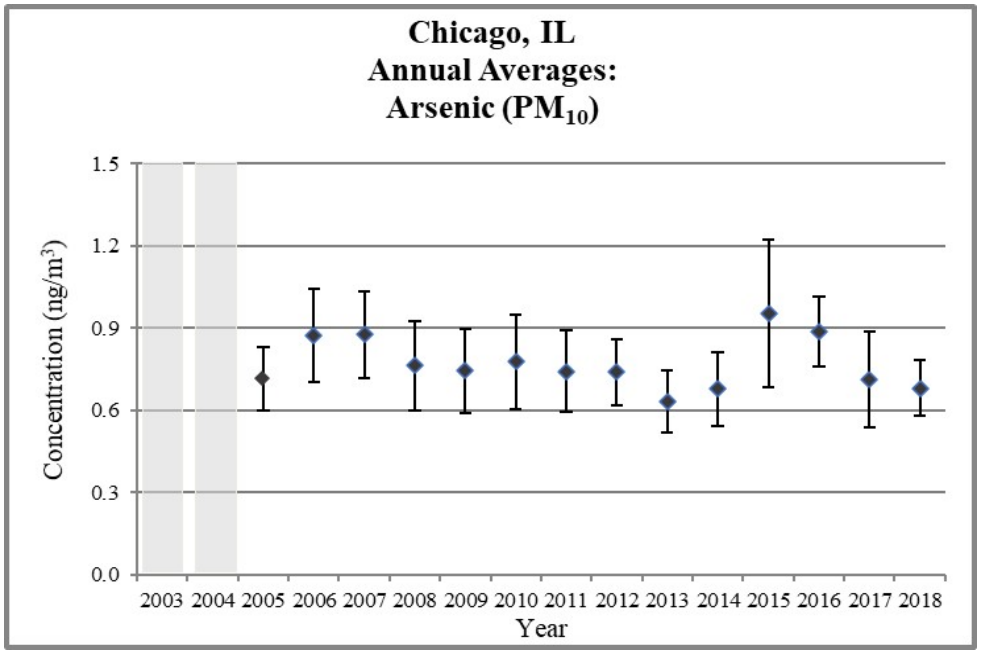
--: Not Applicable

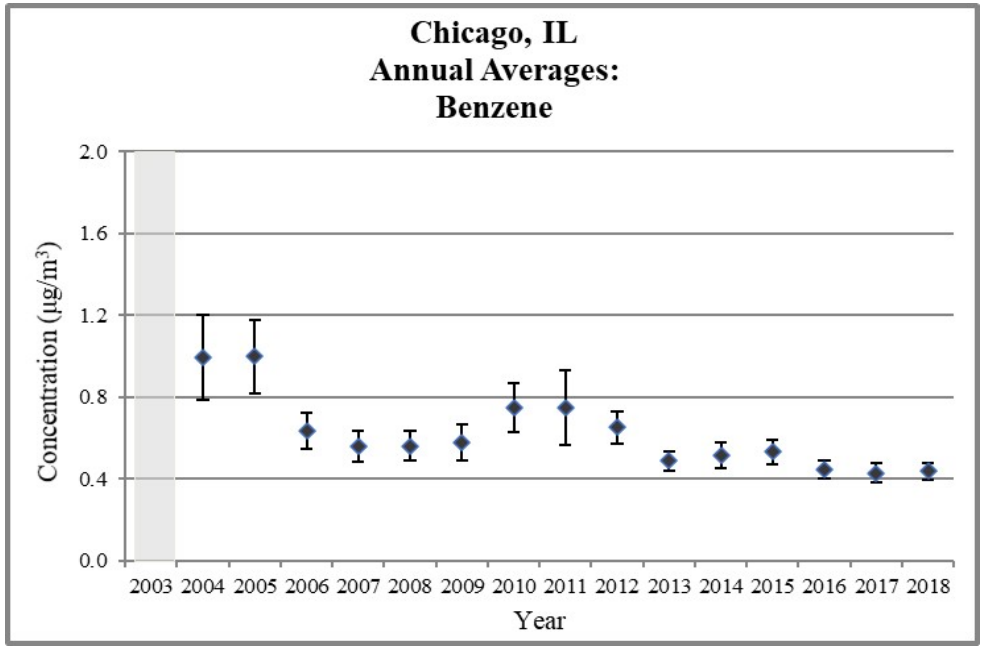
ERG: Eastern Research Group, Inc.

IPA: Illinois Environmental Protection Agency

Figure 3. Chicago, IL Annual Average Concentrations







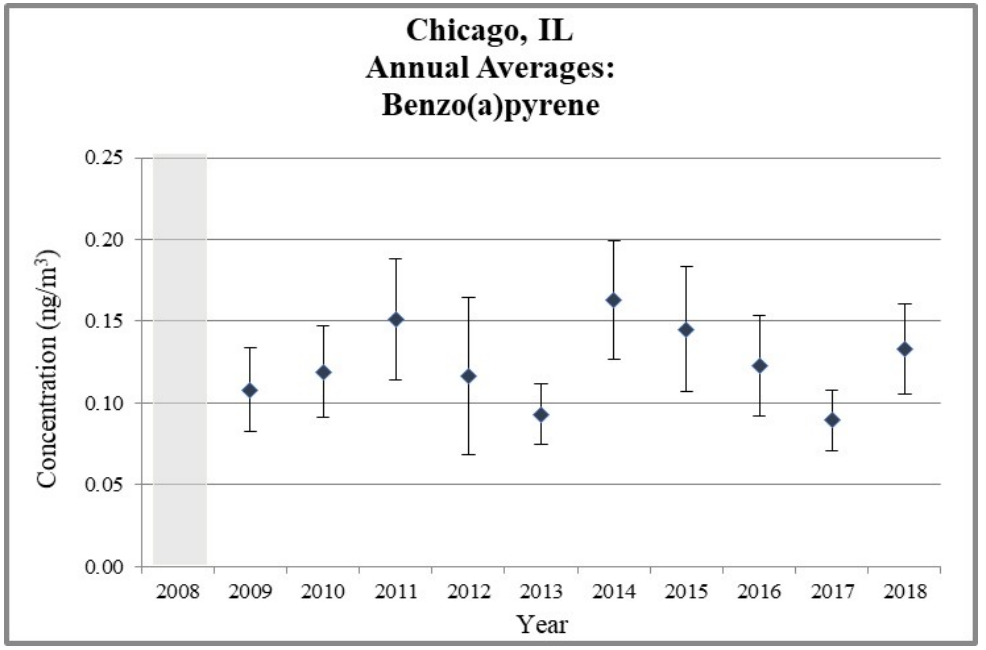
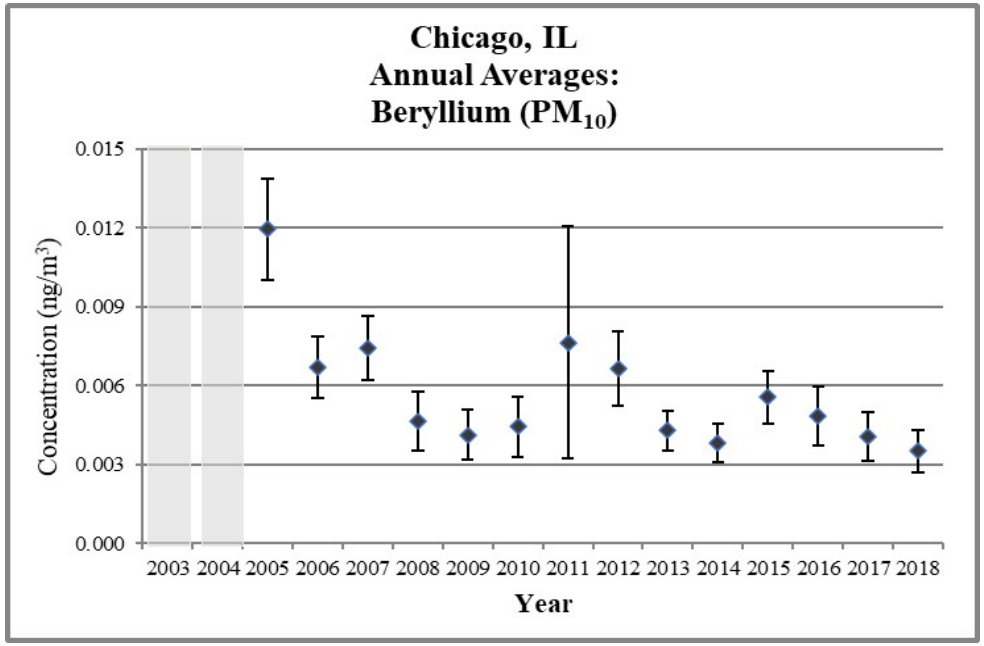
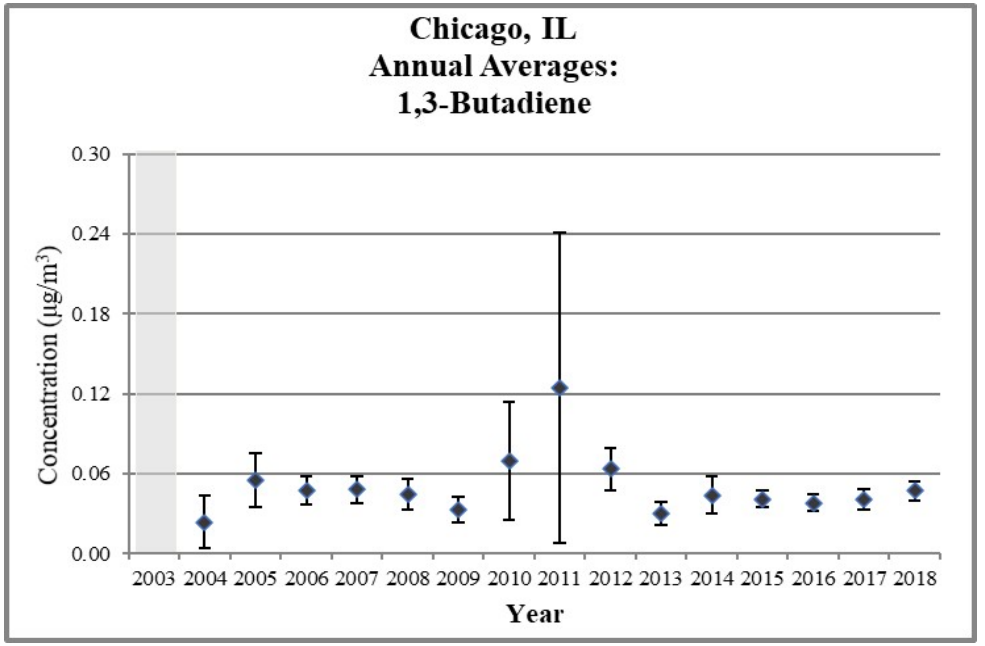
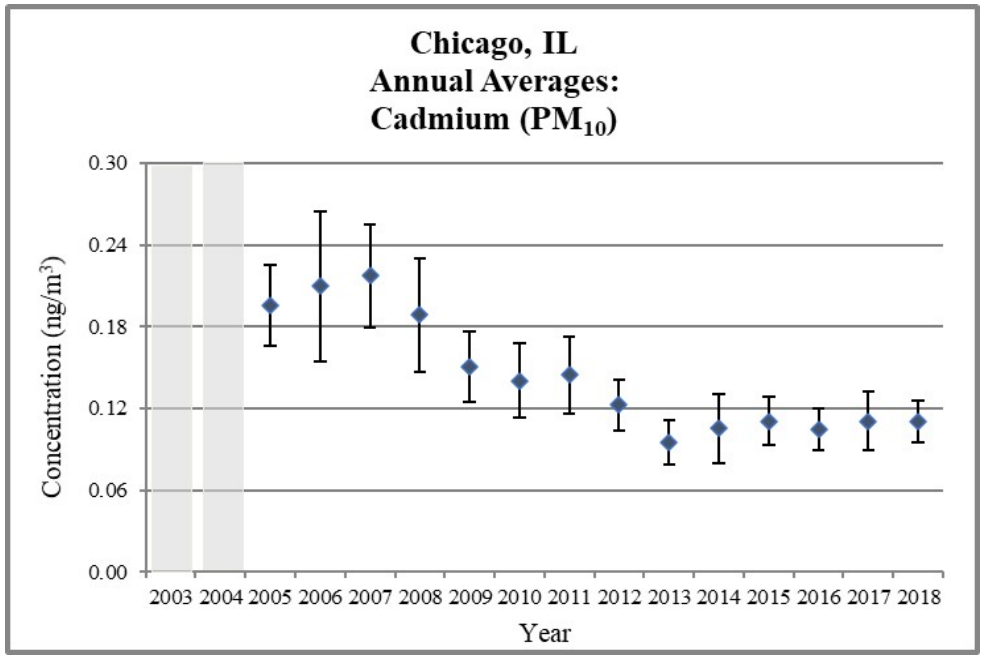


Figure 3. Chicago, IL Annual Average Concentrations







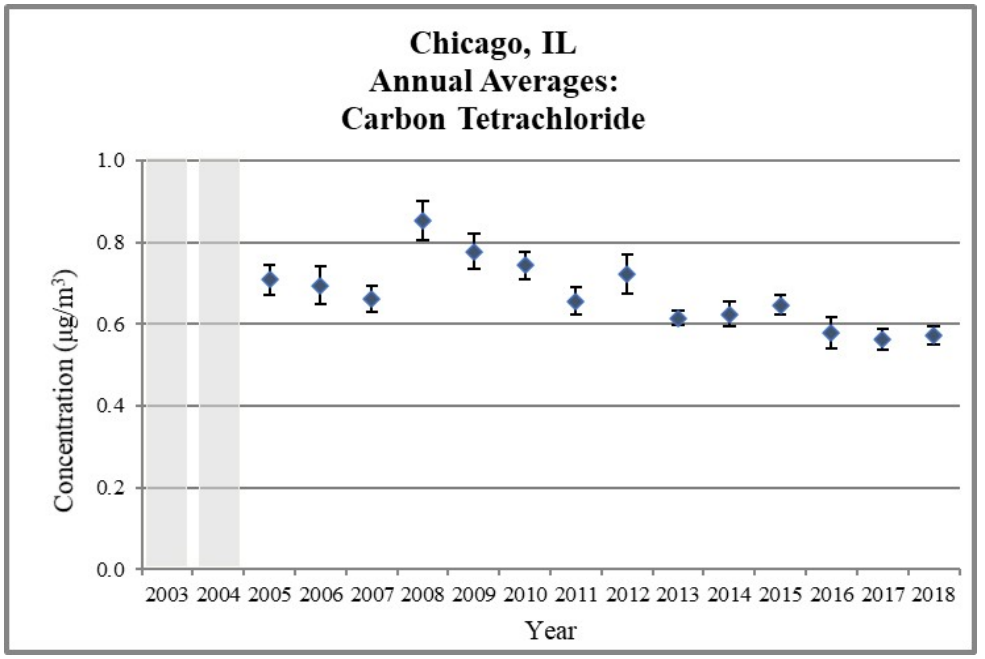
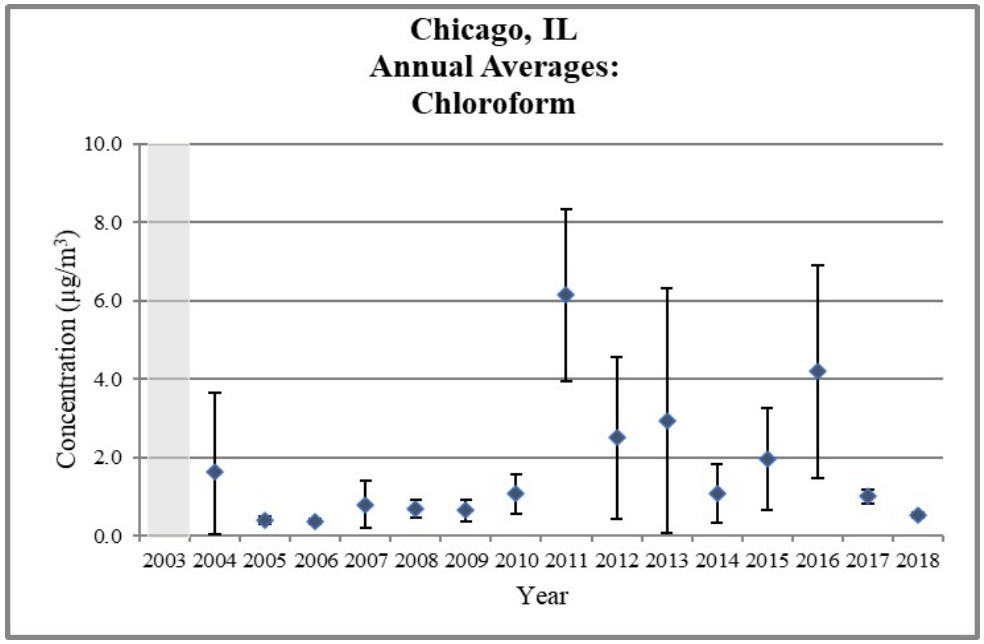
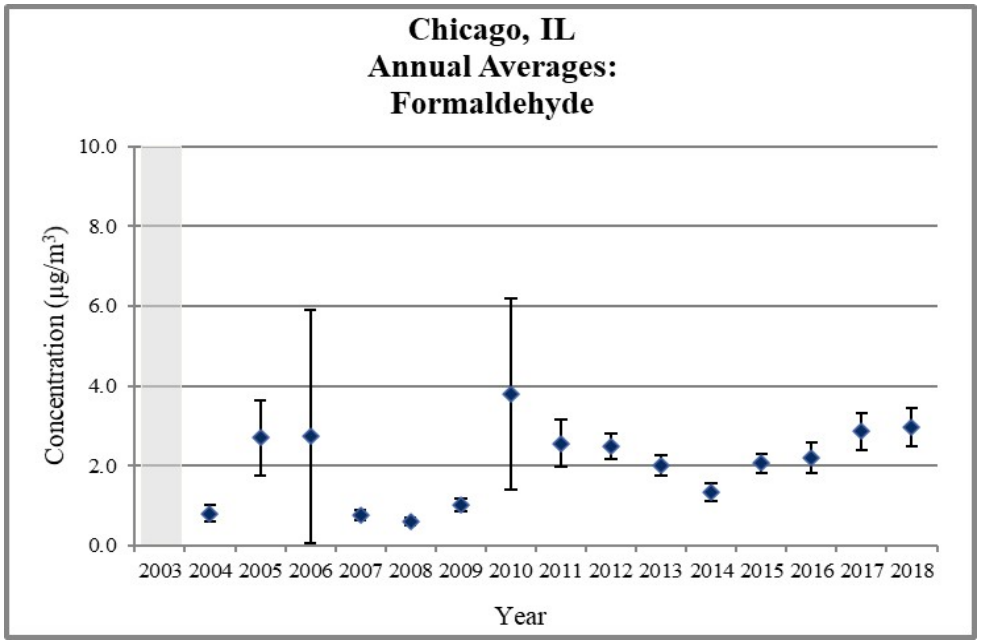
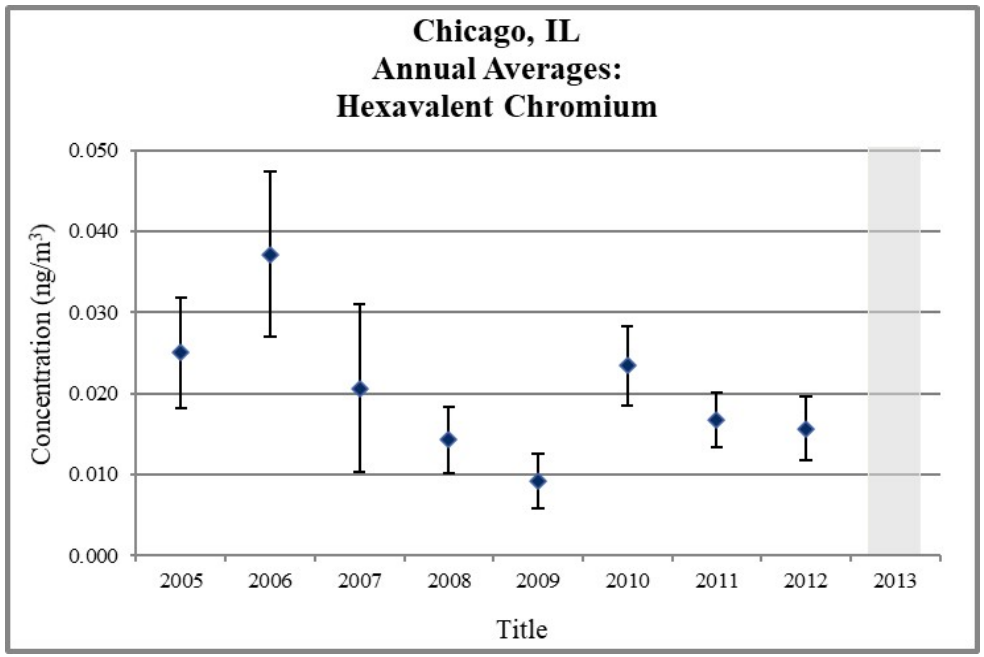


Figure 3. Chicago, IL Annual Average Concentrations







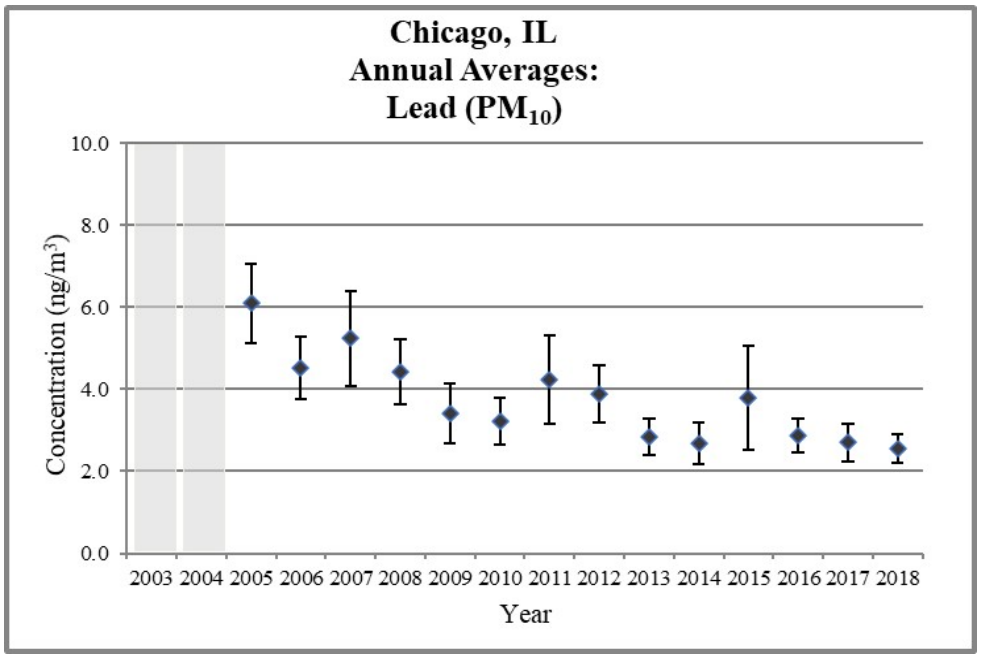
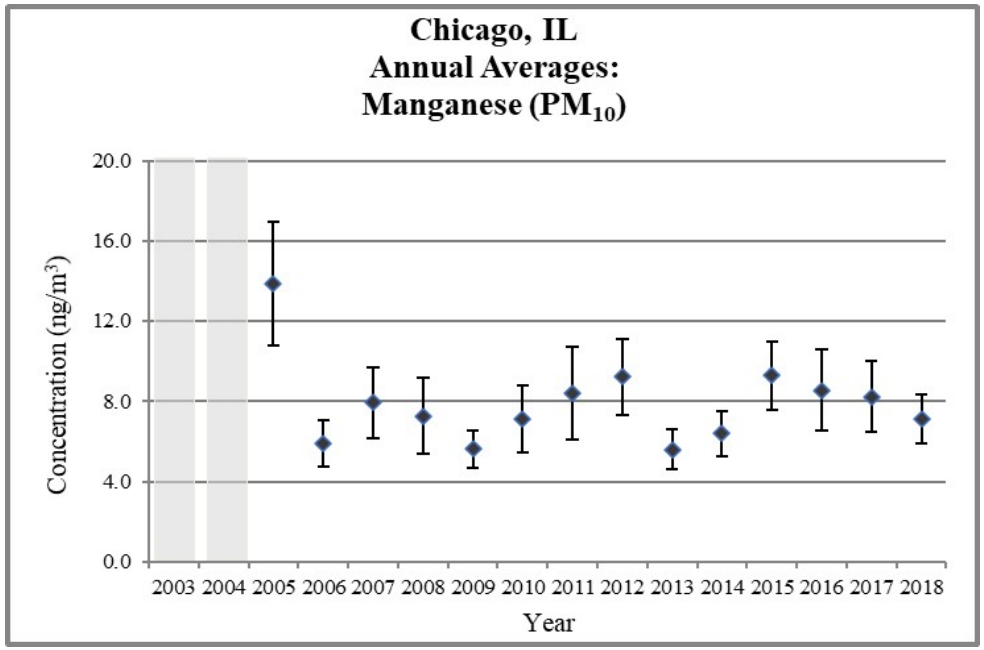
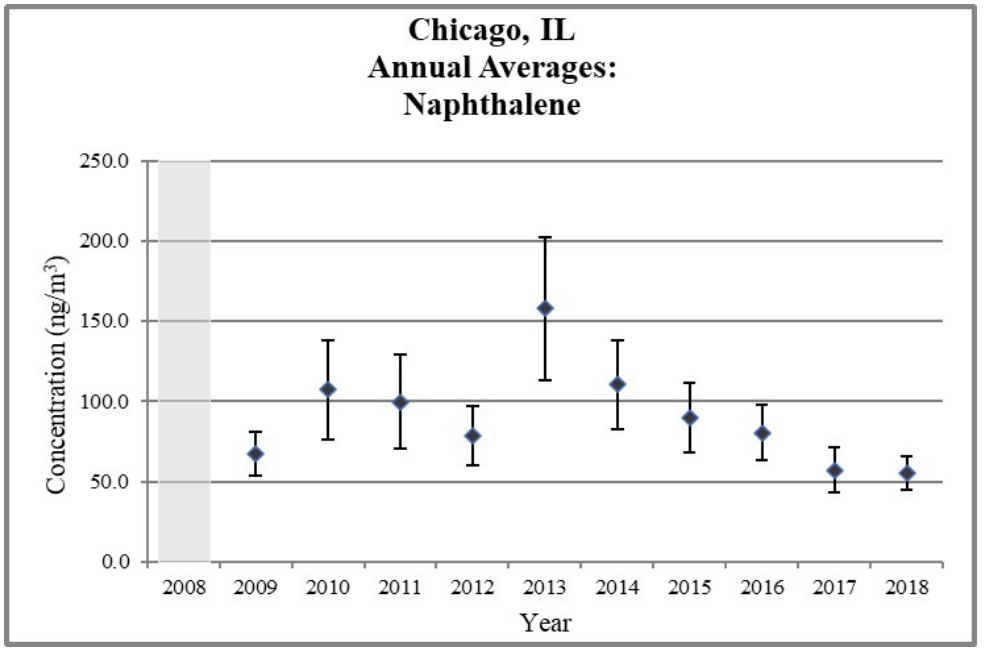
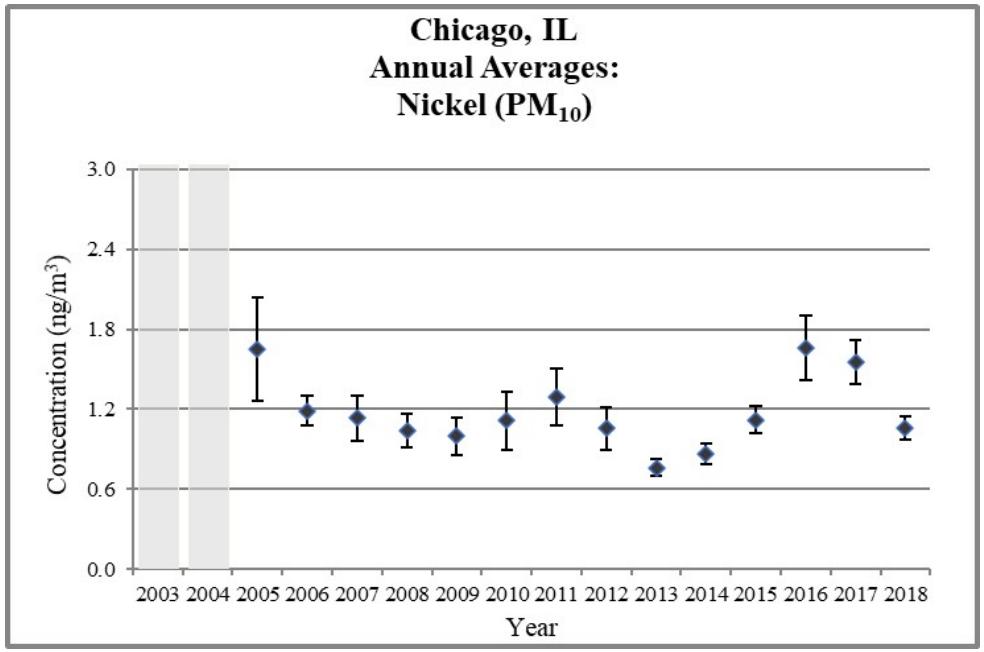


Figure 3. Chicago, IL Annual Average Concentrations







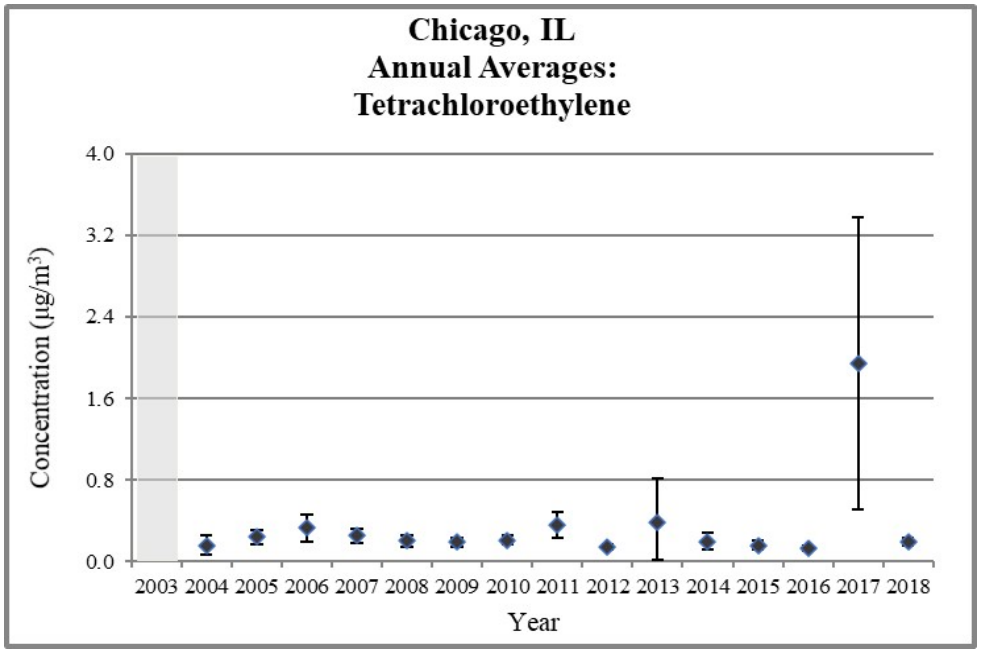
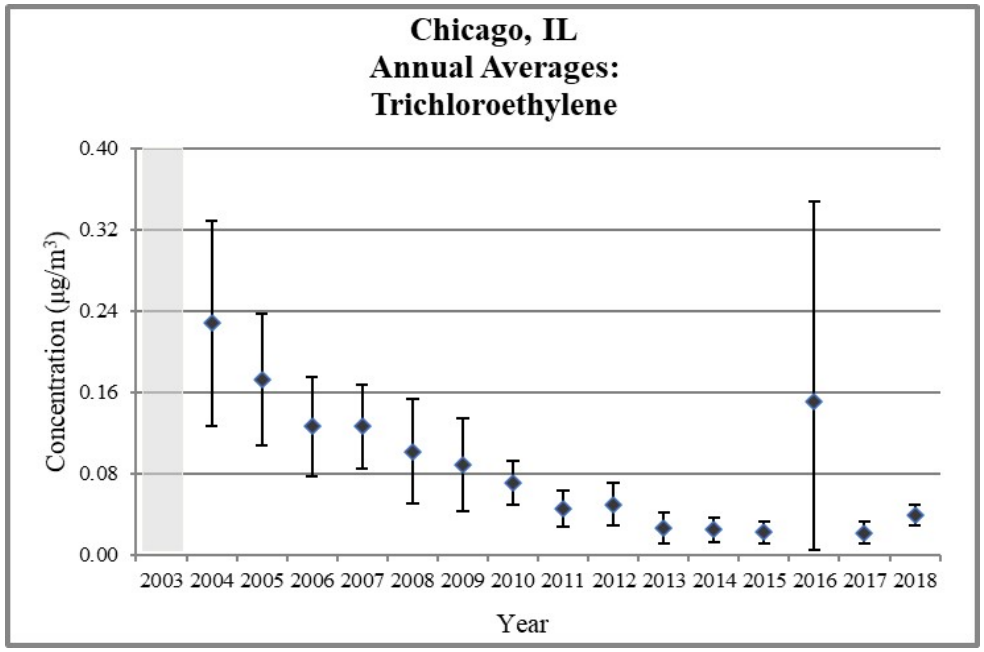
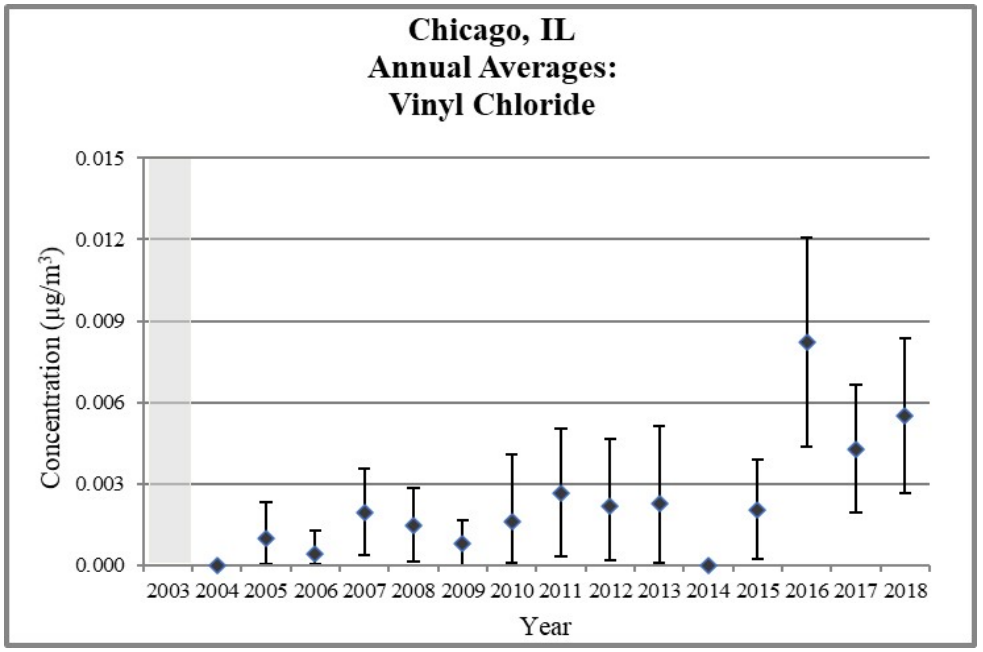


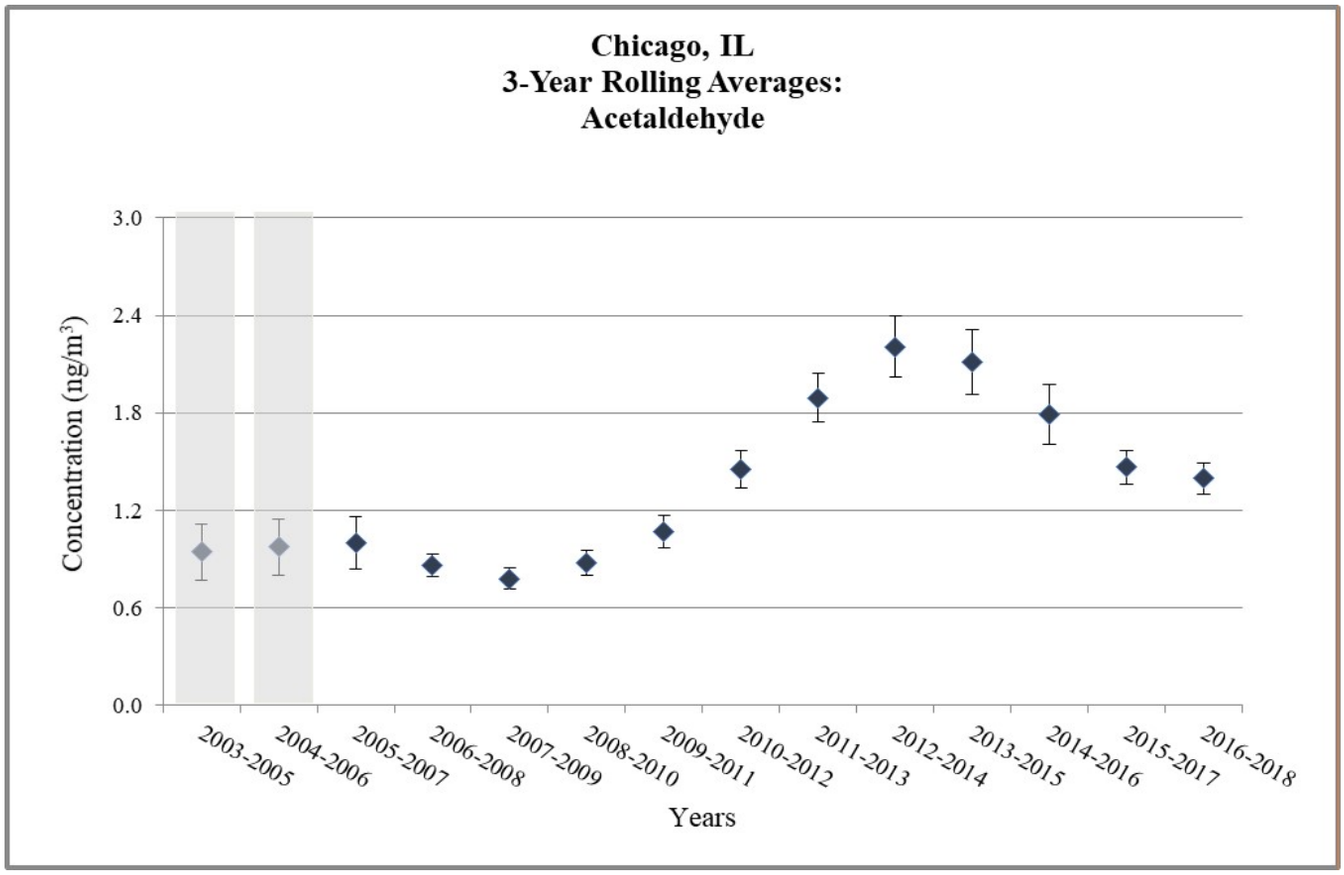
Figure 3. Chicago, IL Annual Average Concentrations





Does not meet MQO

Figure 4. Chicago, IL - 3-Year Rolling Average Concentrations



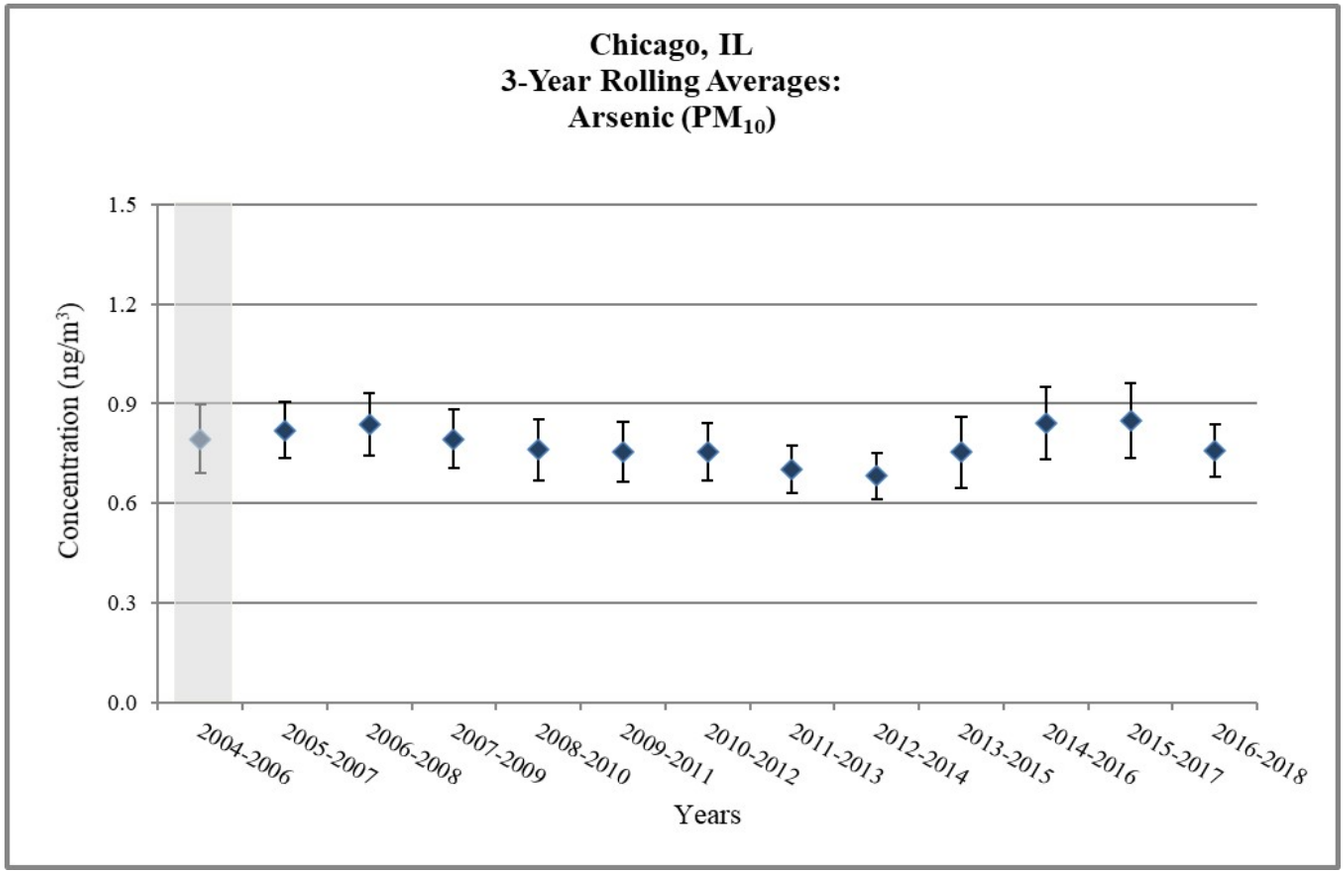
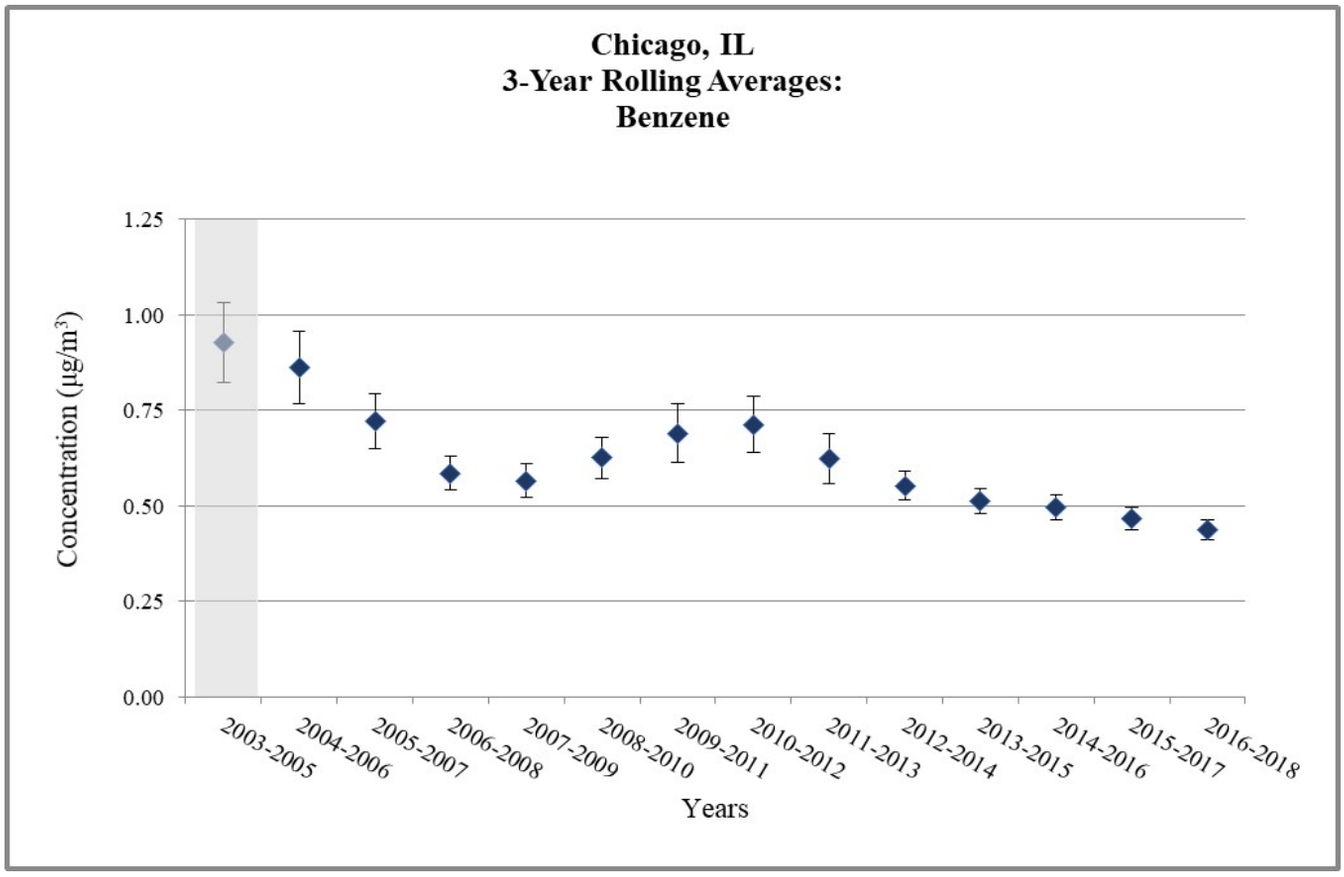


Figure 4. Chicago, IL - 3-Year Rolling Average Concentrations



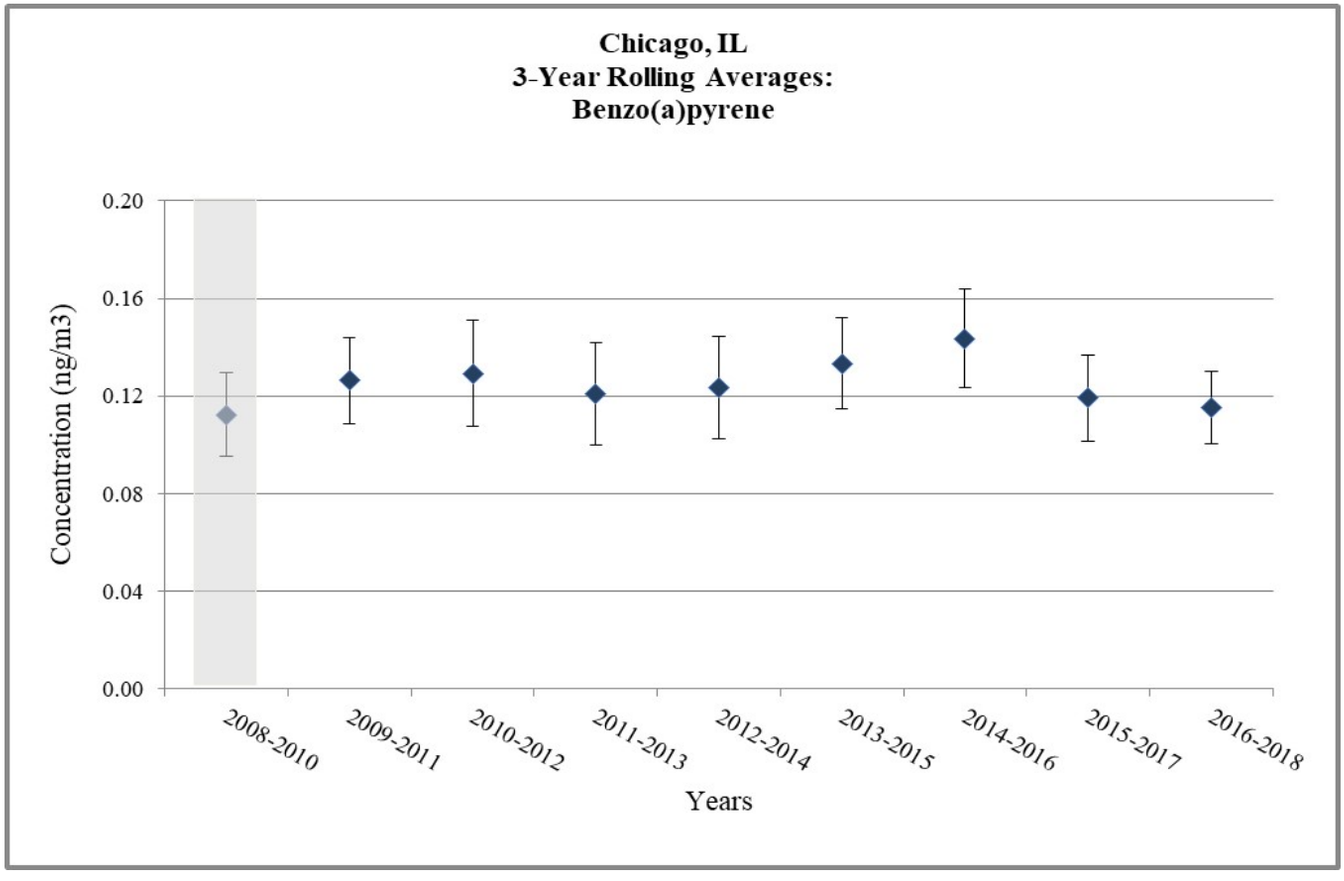
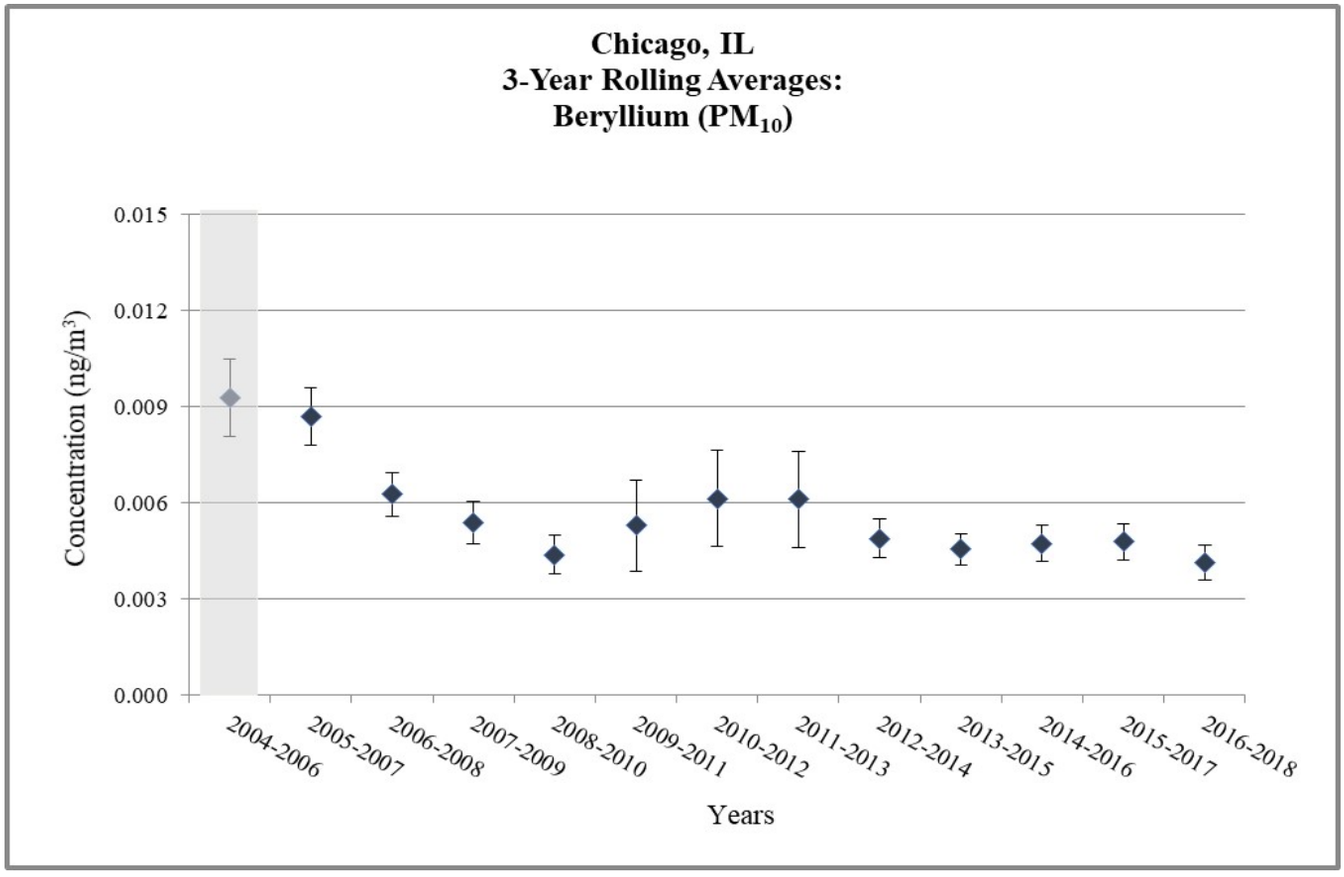


Figure 4. Chicago, IL - 3-Year Rolling Average Concentrations



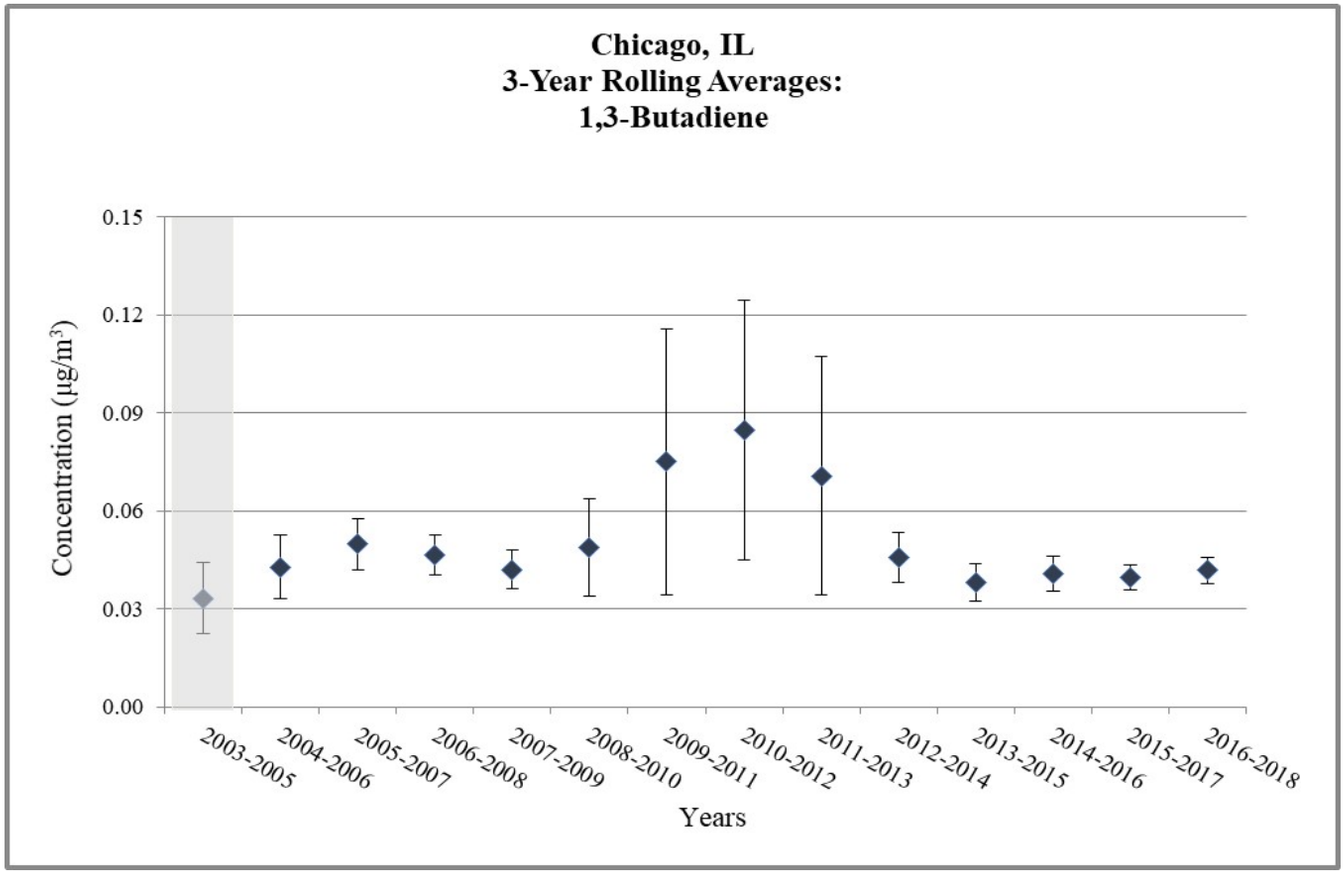
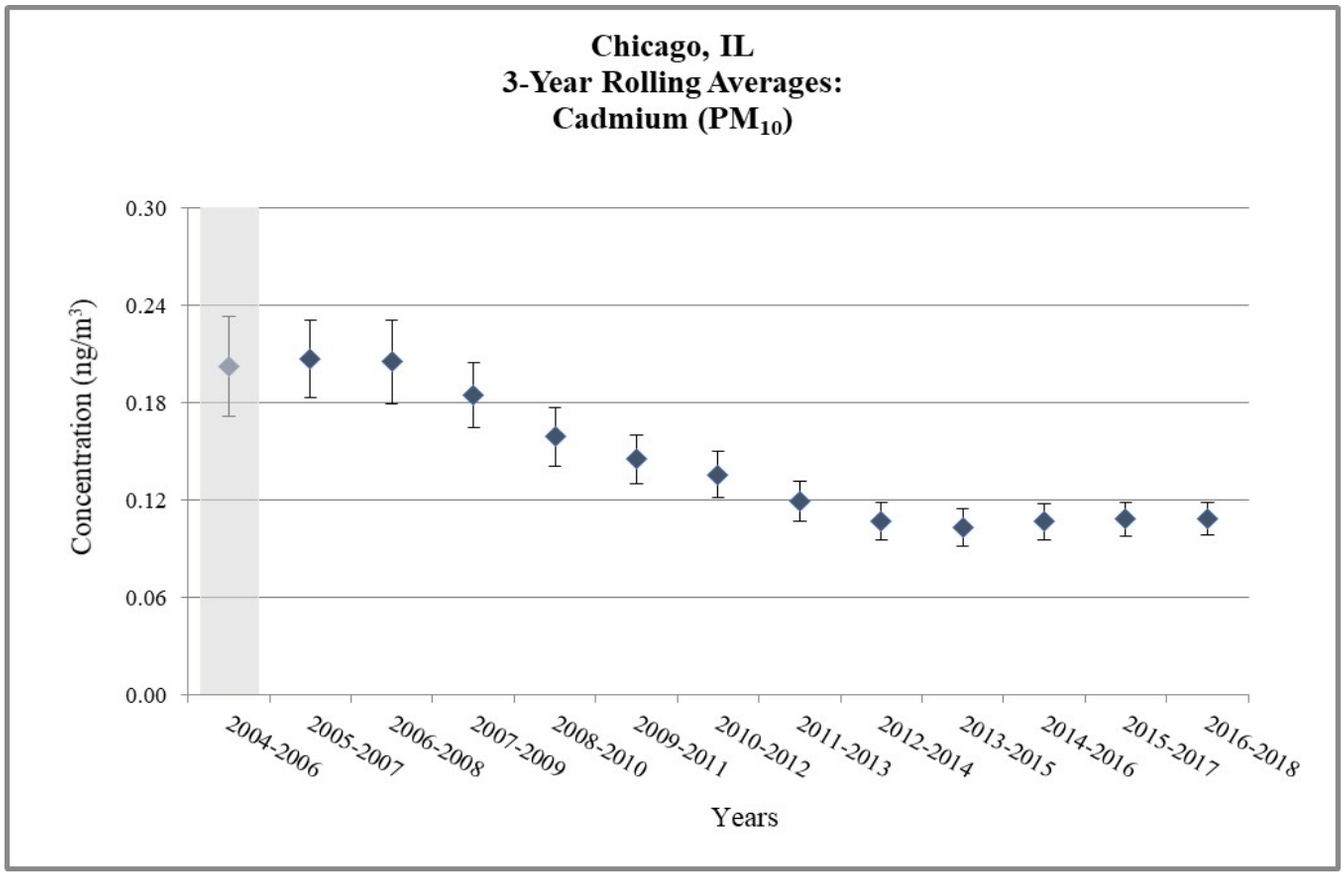


Figure 4. Chicago, IL - 3-Year Rolling Average Concentrations



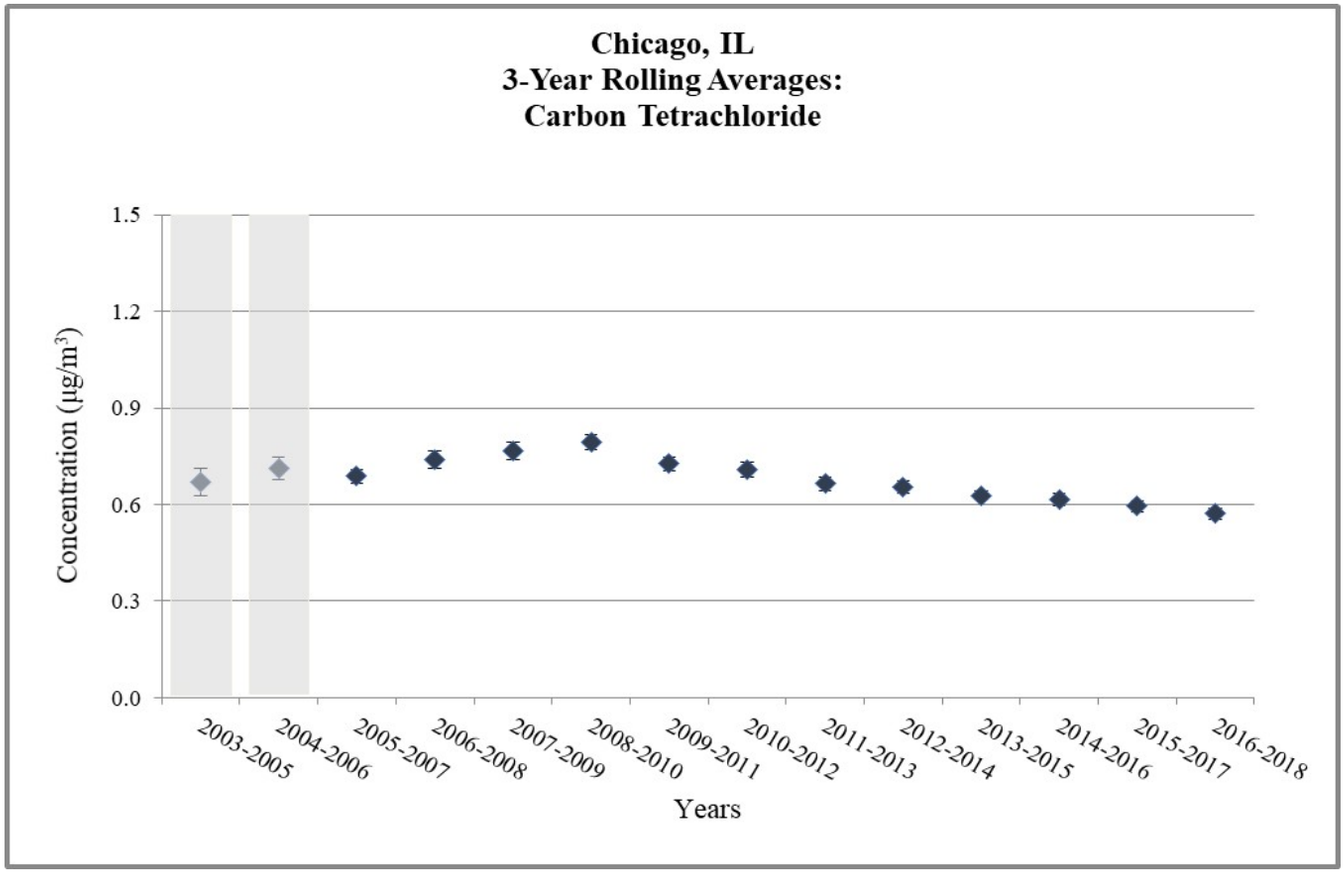
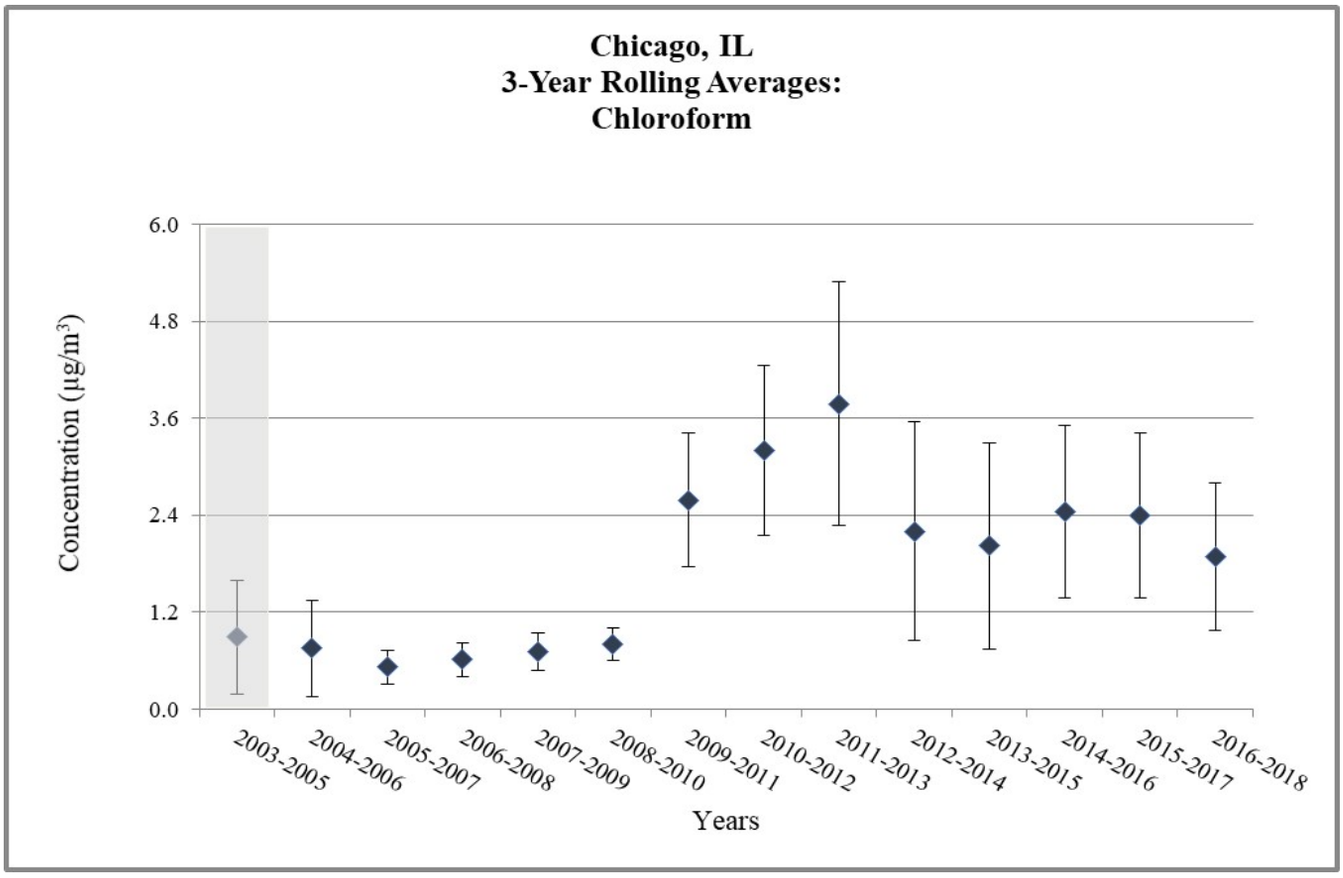


Figure 4. Chicago, IL - 3-Year Rolling Average Concentrations



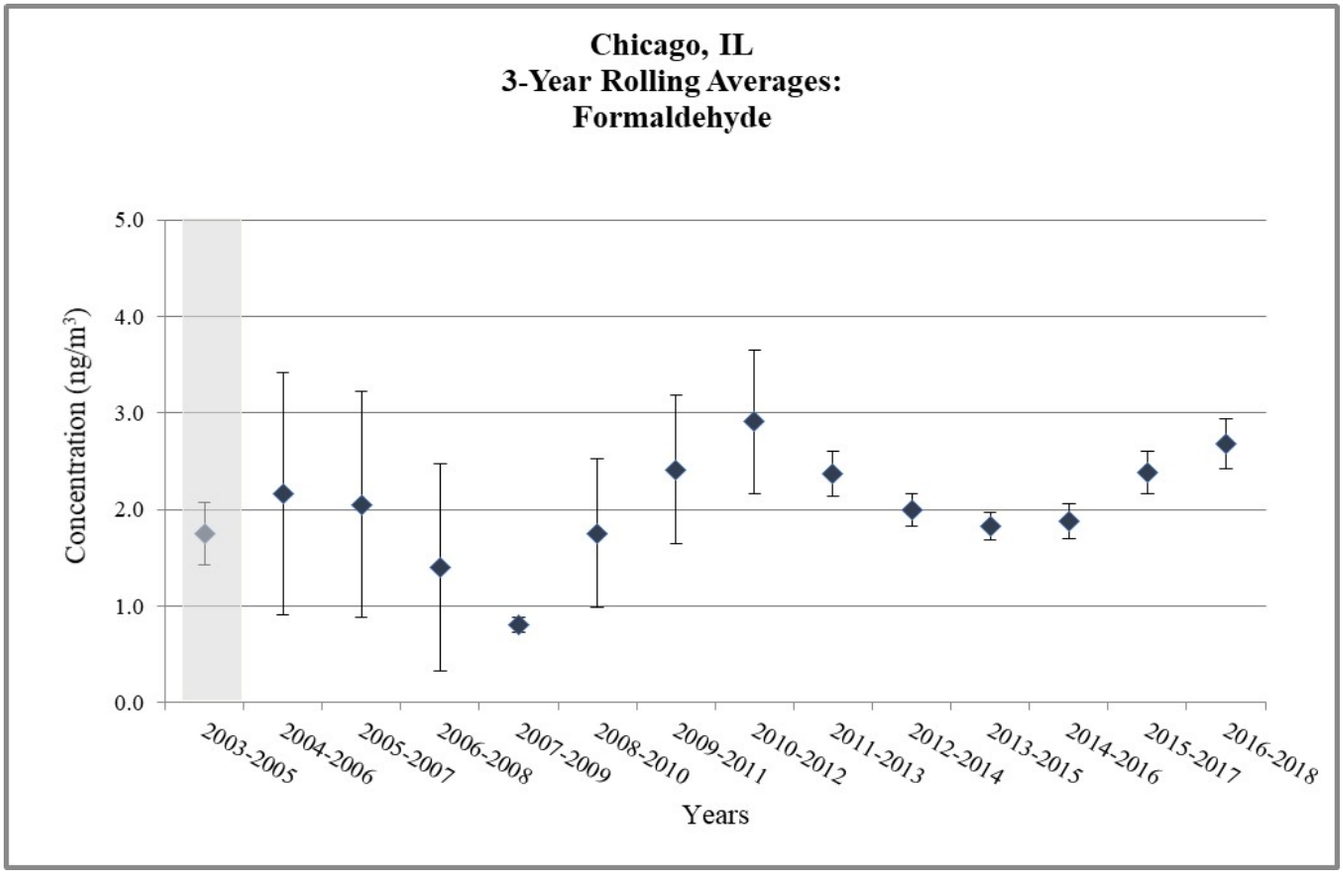
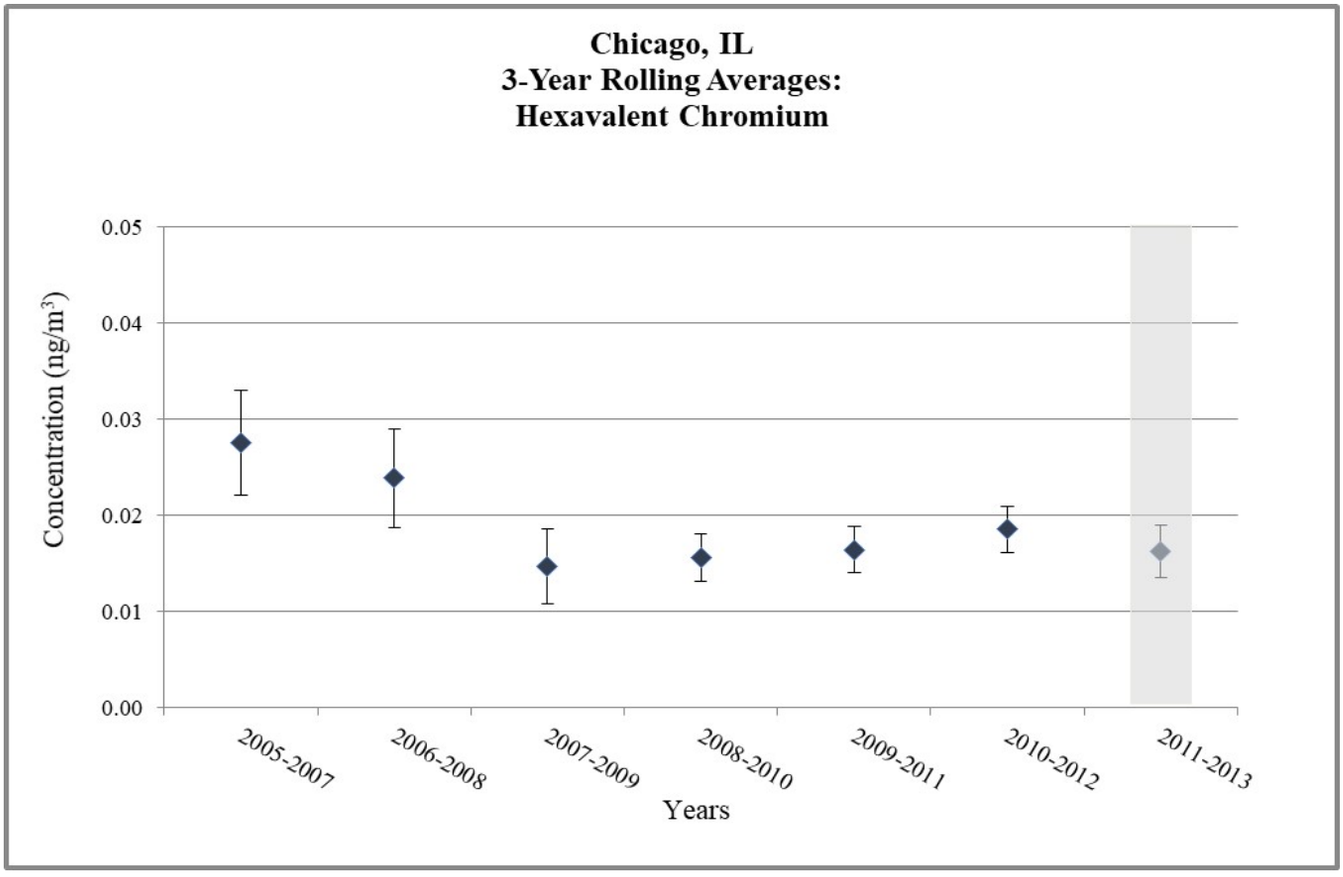


Figure 4. Chicago, IL - 3-Year Rolling Average Concentrations



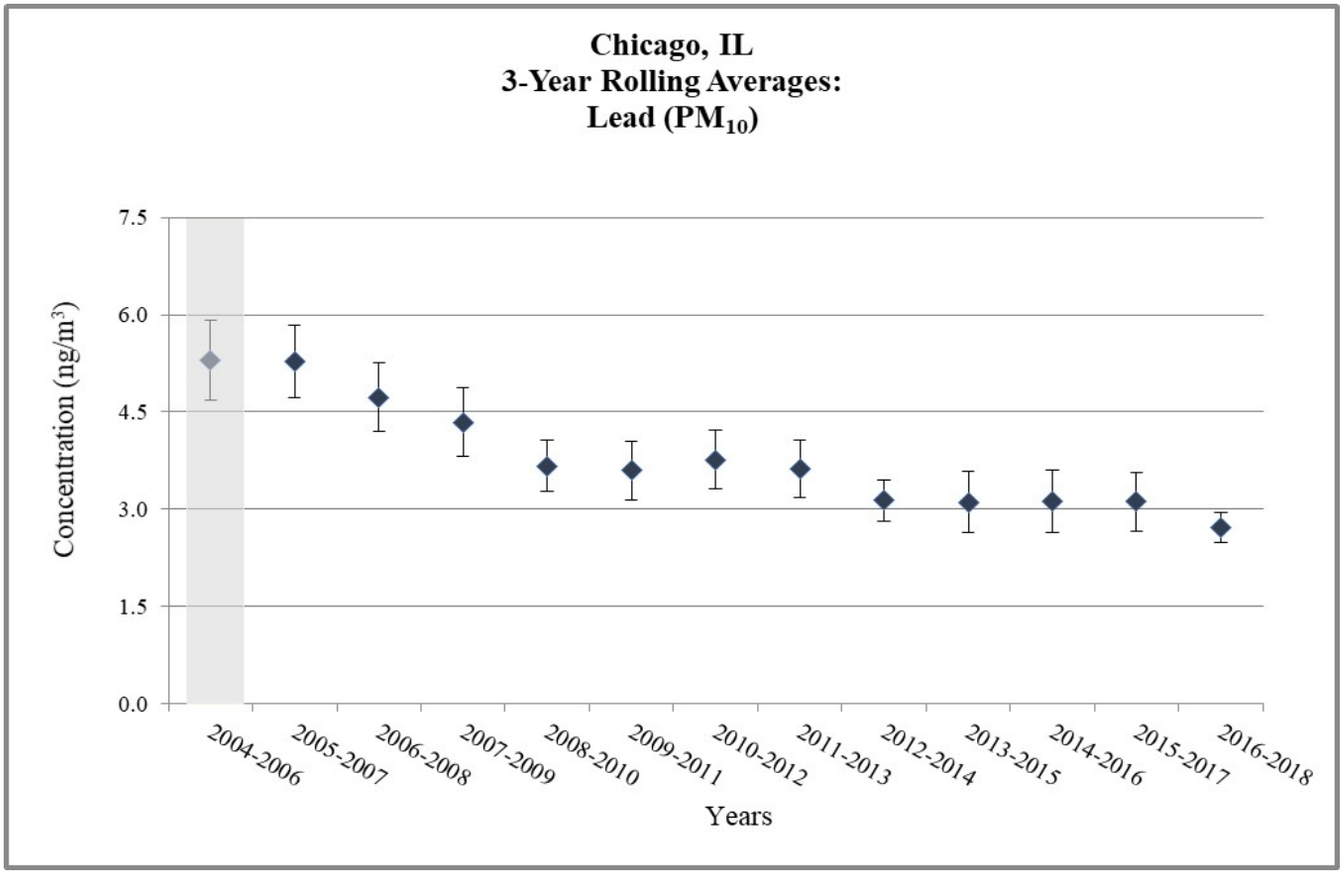
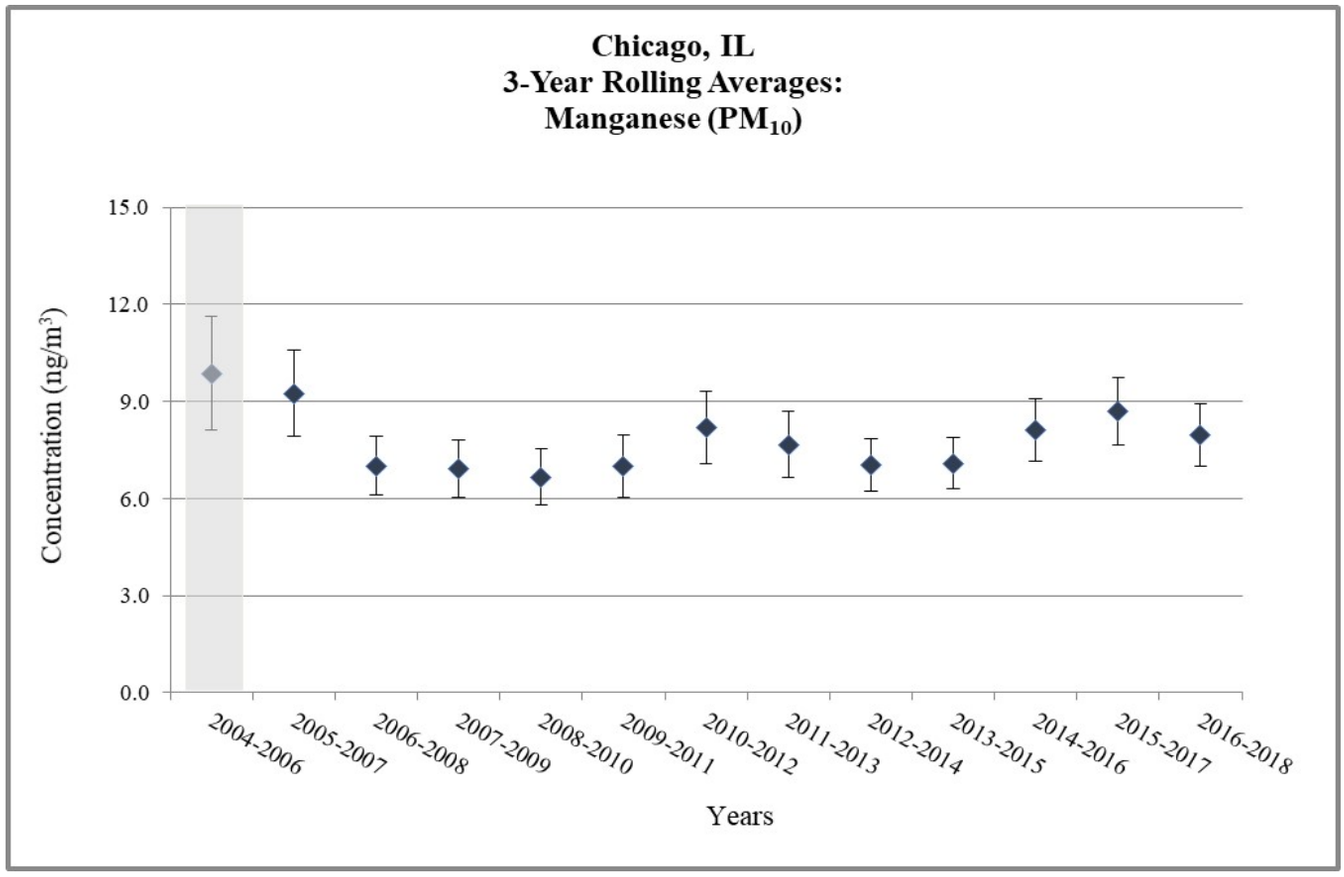


Figure 4. Chicago, IL - 3-Year Rolling Average Concentrations



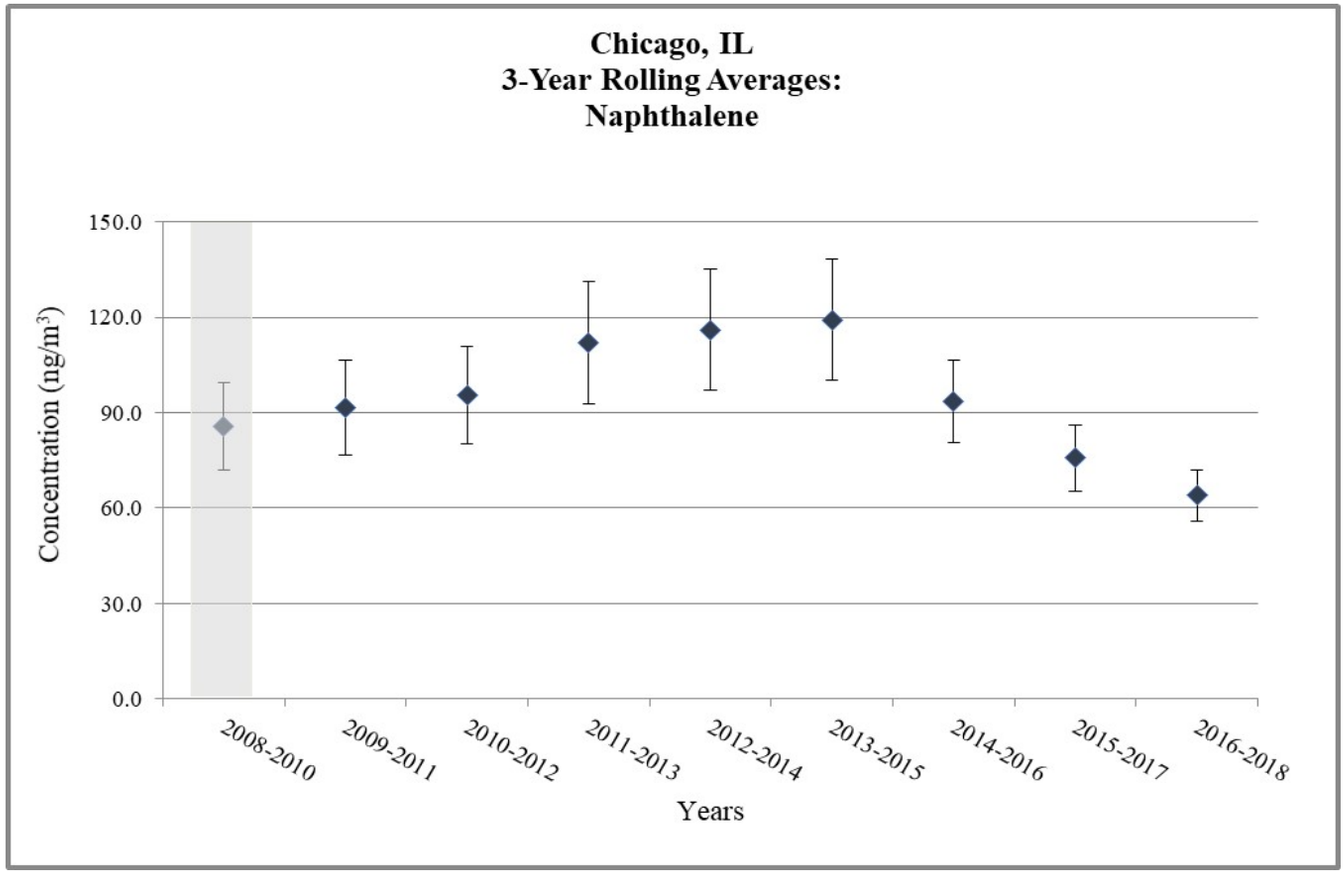
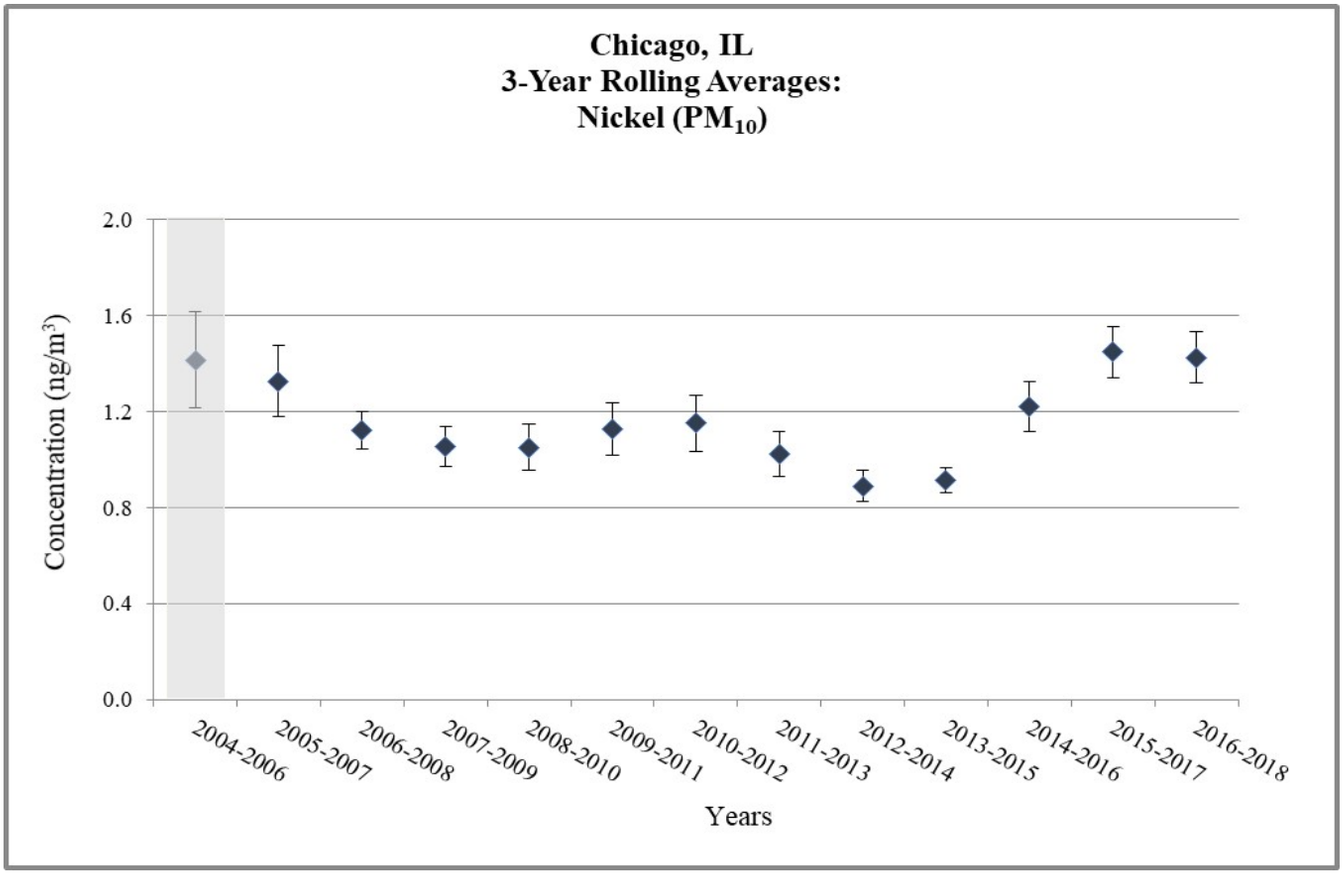


Figure 4. Chicago, IL - 3-Year Rolling Average Concentrations



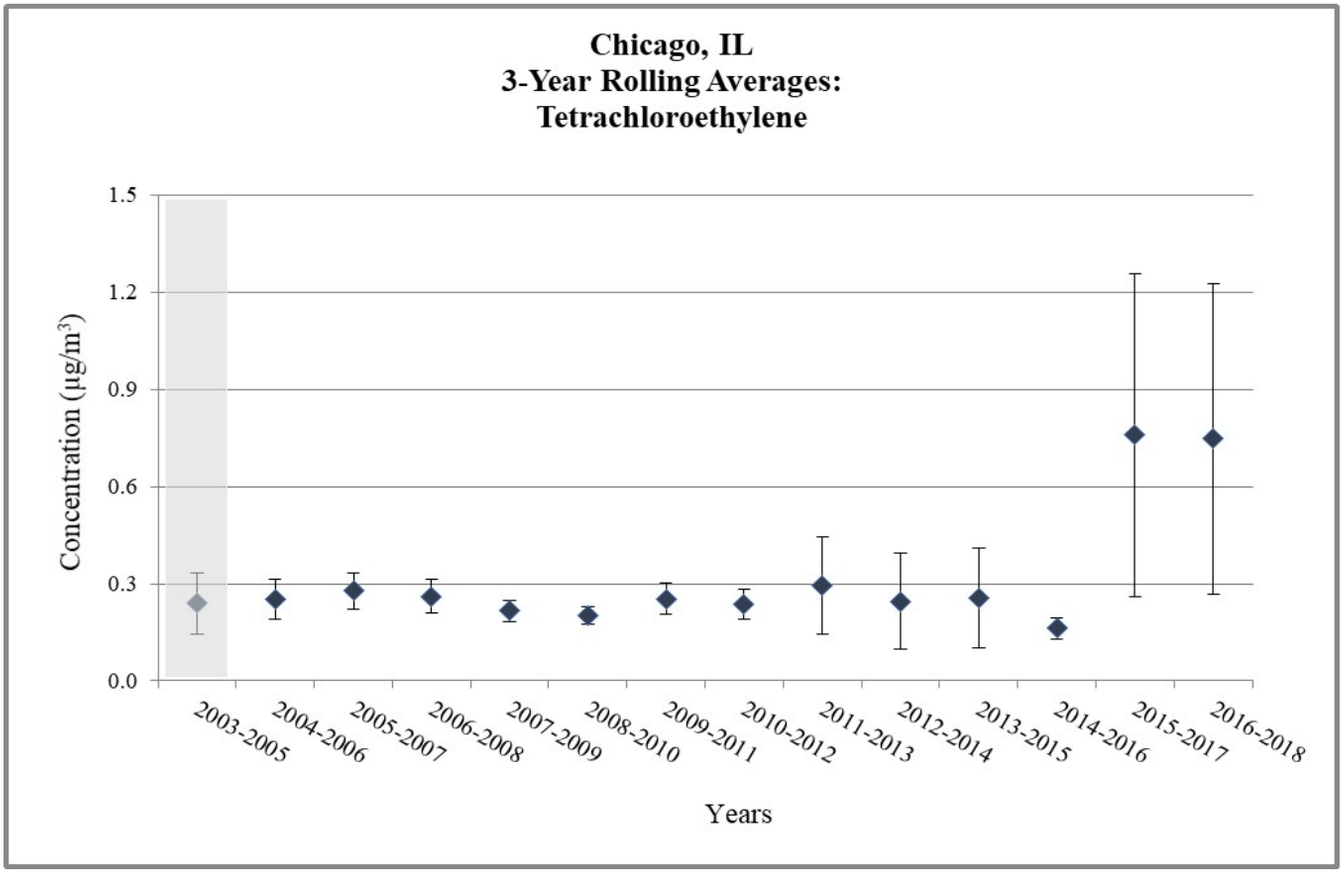
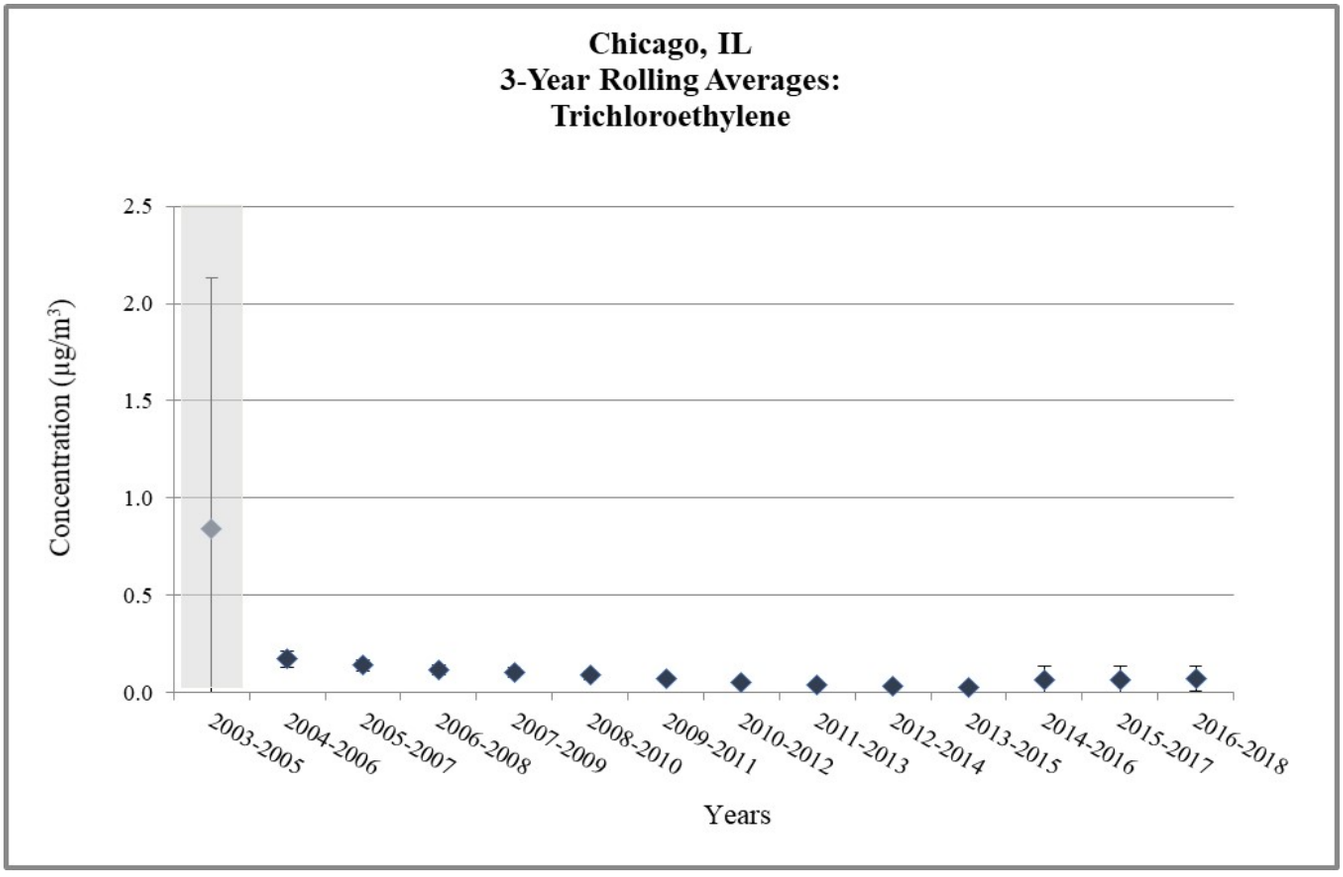
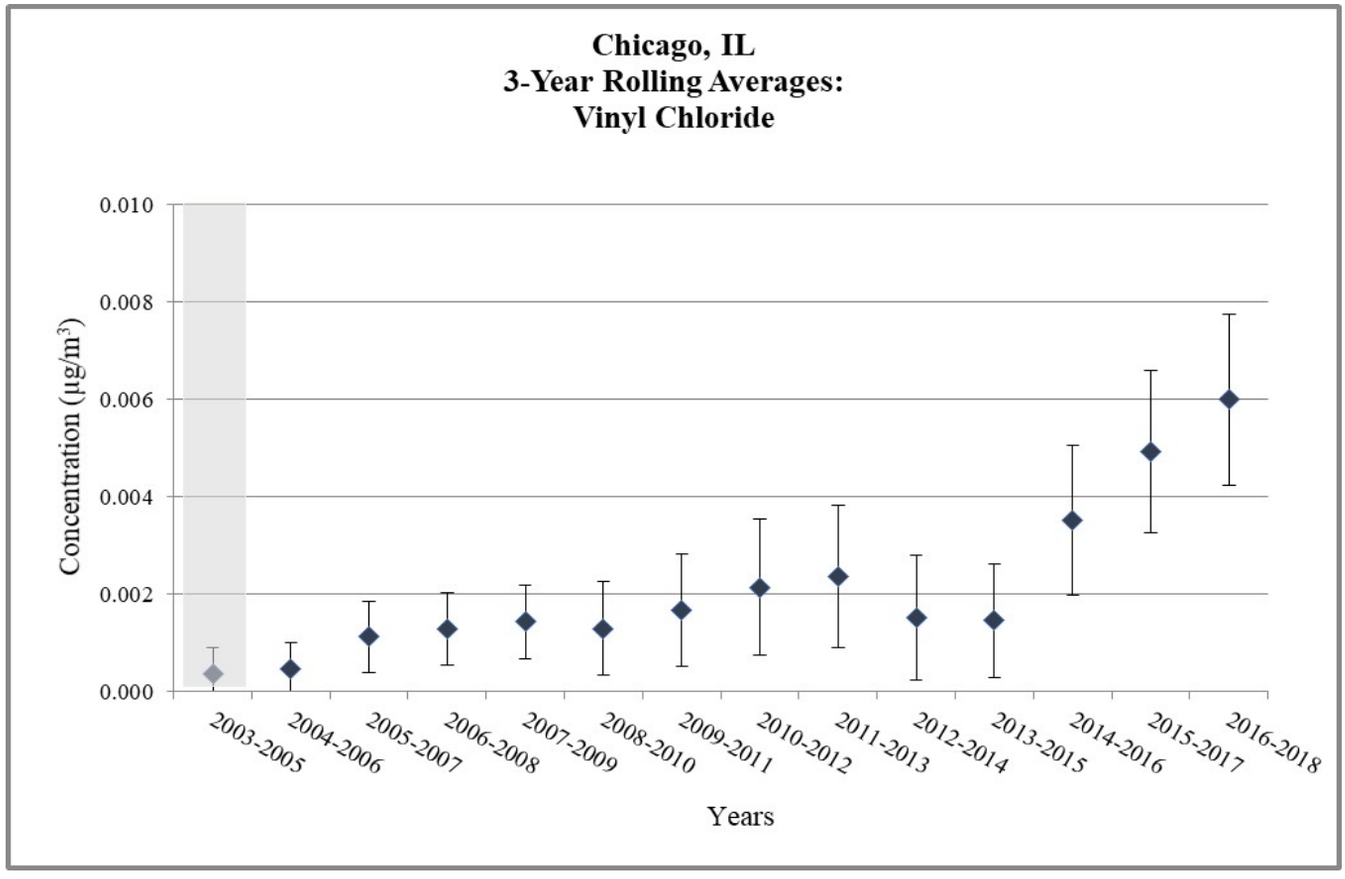


Figure 4. Chicago, IL - 3-Year Rolling Average Concentrations





Does not meet MQO or wasn't able to collect enough samples

Table 6. NATTS Network Assessment: MQO#1 - Completeness Percentage at Chicago, IL

Pollutant Group	Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Carbonyl	Acetaldehyde	98	74	80	100	97	97	100	90	102	108	102	90	95	97	100	100
Carbonyl	Formaldehyde	98	75	79	100	97	97	100	90	102	108	102	90	95	97	100	100
Chromium VI	Chromium VI	--	--	89	97	102	100	98	100	100	100	--	--	--	--	--	--
PAH	Benzo(a)pyrene	--	--	--	--	--	--	98	97	100	93	95	90	100	92	98	100
PAH	Naphthalene	--	--	--	--	--	--	98	97	100	93	95	90	100	92	98	100
PM_{10} Metals	Arsenic (PM_{10})	--	a	100	102	97	92	100	100	87	89	97	87	93	93	98	95
PM_{10} Metals	Beryllium (PM_{10})	--	a	100	102	97	92	100	100	87	89	97	87	93	93	98	95
PM_{10} Metals	Cadmium (PM_{10})	--	a	100	102	97	92	100	100	87	89	97	87	93	93	98	95
PM_{10} Metals	Lead (PM_{10})	--	a	100	102	97	92	100	100	87	89	97	87	93	93	98	95
PM_{10} Metals	Manganese (PM_{10})	--	a	100	102	97	92	100	100	87	89	97	87	93	93	98	95
PM_{10} Metals	Nickel (PM_{10})	--	a	100	102	97	92	100	100	87	89	97	87	93	93	98	95
VOC	Benzene	--	79	87	98	100	105	93	92	90	100	100	92	90	97	97	100
VOC	Butadiene, 1,3-	--	79	87	98	100	105	93	92	90	100	100	92	90	97	97	100
VOC	Carbon tetrachloride	--	79	87	98	100	105	93	92	90	100	100	92	90	97	97	100
VOC	Chloroform	--	79	87	98	100	105	93	92	90	100	100	92	90	97	97	100
VOC	Tetrachloroethylene	--	79	87	98	100	105	93	92	90	100	100	92	90	97	97	100
VOC	Trichloroethylene	--	79	87	98	100	105	93	92	90	100	100	92	90	97	97	100
VOC	Vinyl chloride	--	79	87	98	100	105	93	92	90	100	100	92	90	97	97	100

A-rated: ≥85%

B-rated: Between 75% to 85%

Does not meet: ≤75%

-- No data available

[a]: Pollutant was expected, but not sampled at this site for this year.

Table 7. NATTS Network Assessment: MQO#2 - Reported Method Detection Limits (MDLs) at Chicago, IL

Pollutant Group	Pollutant Name	Target MDL	Units	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Carbonyl	Acetaldehyde	0.45	µg/m^3	b	0.16	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.04	0.02	0.02	0.02	0.08	0.07
Carbonyl	Formaldehyde	0.98/0.08[a]	µg/m^3	b	0.08	0.01	0.003	0.003	0.01	0.01	0.003	0.01	0.01	0.23	0.12	0.17	0.12	0.68	0.72
Chromium VI	Chromium VI	0.08	ng/m^3	--	--	0.15	0.14	0.09	0.08	0.05	0.01	0.05	0.04	0.05	--	--	--	--	--
PAH	Benzo(a)pyrene	0.91	ng/m^3	--	--	--	--	--	0.07	0.05	0.04	0.05	0.05	0.05	0.03	0.12	0.05	0.02	0.01
PAH	Naphthalene	29.00	ng/m^3	--	--	--	--	--	0.01	0.01	0.01	0.003	0.004	0.006	0.011	0.005	0.02	0.05	0.05
PM_{10} Metals	Arsenic (PM_{10})	0.23	ng/m^3	--	c	0.09	0.04	0.04	0.04	0.04	0.21	0.23	0.28	0.36	0.29	0.03	0.03	0.04	0.04
PM_{10} Metals	Beryllium (PM_{10})	0.42	ng/m^3	--	c	0.05	0.05	0.03	0.03	0.005	0.002	0.010	0.012	0.010	0.005	0.001	0.001	0.001	0.004
PM_{10} Metals	Cadmium (PM_{10})	0.56	ng/m^3	--	c	0.03	0.014	0.01	0.01	0.05	0.13	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
PM_{10} Metals	Lead (PM_{10})	15.0	ng/m^3	--	c	0.005	0.001	0.001	0.007	0.004	0.050	0.006	0.008	0.010	0.006	0.007	0.007	0.006	0.006
PM_{10} Metals	Manganese (PM_{10})	5.0	ng/m^3	--	c	0.03	0.00	0.00	0.00	0.01	0.062	0.02	0.07	0.03	0.05	0.05	0.06	0.07	0.18
PM_{10} Metals	Nickel (PM_{10})	2.1	ng/m^3	--	c	0.09	0.04	0.04	0.05	0.06	0.733	0.17	0.22	0.70	0.39	0.25	0.26	0.25	0.23
VOC	Benzene	0.13	µg/m^3	1.23	1.23	0.49	0.12	0.59	0.25	0.15	0.47	0.71	1.50	0.47	0.37	0.96	0.52	0.64	0.36
VOC	Butadiene, 1,3-	0.10	µg/m^3	2.21	1.33	1.02	0.13	0.40	0.11	0.07	0.22	0.15	0.24	0.24	0.29	0.31	0.58	0.44	0.43
VOC	Carbon tetrachloride	0.17	µg/m^3	4.07	2.22	1.48	0.33	0.56	0.15	0.07	0.89	0.89	0.89	0.59	0.63	0.37	0.59	0.85	0.49
VOC	Chloroform	0.50	µg/m^3	0.59	0.39	0.27	0.04	0.17	0.07	0.02	0.17	0.09	0.14	0.15	0.14	0.16	0.12	0.19	0.13
VOC	Tetrachloroethylene	0.17	µg/m^3	3.59	1.99	0.80	0.44	0.44	0.24	0.12	0.44	0.72	0.80	0.56	0.52	0.56	0.64	1.24	0.58
VOC	Trichloroethylene	0.5/0.2[a]	µg/m^3	0.64	0.54	0.43	0.11	0.19	0.04	0.02	0.18	0.27	0.24	0.43	0.46	0.46	0.43	0.94	0.40
VOC	Vinyl chloride	0.11	µg/m^3	1.39	0.93	0.93	0.19	0.56	0.12	0.05	0.30	0.19	0.26	0.26	0.28	0.19	0.74	0.40	0.30

A-rated: MDL to Target MDL ratio ≤ 1

B-rated" MDL to Target MDL ratio between 1 and 2

Does Not Meet MDL to Target MDL ratio>2

-- No data available

[a]: For the 2012 sampling year, the Target MDL for this pollutant was reduced.

[b]: Pollutant was sampled, but no MDL data were reported to AQS.

[c]: Pollutant was expected, but not sampled at this site for this year.

Table 8. NATTS Network Assessment: MQO#3 - Bias Percent Difference at Chicago, IL

Pollutant Group	Pollutant Name	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Carbonyls	Acetaldehyde	1.0	8.9	-0.8	-1.9	24.6	-10.1	0.7	3.0	a	0.1	-4.3	a	-5.4	3.6	-8.7
Carbonyls	Formaldehyde	-0.9	0.8	-13.2	-3.2	14.4	-7.8	-2.8	-3.4	a	-0.5	-2.2	a	-19.1	-5.3	-3.7
Chromium VI	Chromium VI	--	a	a	a	a	-5.6[b]	10.5[b]	a	19.5	-6.5	--	--	--	--	--
PAH	Benzo(a)pyrene	--	--	--	--	e	-1.7	-2.3	-2.1	25.2	-5.7	-16.3	-14.2	-10.5	-22.4	-14.8
PAH	Naphthalene	--	--	--	--	e	-7.7	-17.1	-13.9	21.4	25.5	0.7	-11.4	-9.5	-11.6	-20.7
PM_{10} Metals	Arsenic (PM_{10})	c	8.1	5.2	11.5	8.4	-14.8	7.3	1.4	15.7	-3.0	1.9	a	-2.3	-1.4	-3.4
PM_{10} Metals	Beryllium (PM_{10})	c	13.6	6.4	18.9	4.8	-5.5	11.2	-8.2	17.5	-2.0	d	a	-0.4	3.7	0.5
PM_{10} Metals	Cadmium (PM_{10})	c	-1.1	-0.2	5.3	5.1	-16.2	4.9	-5.7	16.6	1.4	d	a	3.9	2.8	3.0
PM_{10} Metals	Lead (PM_{10})	c	-1.9	-2.4	-1.5	4.7	-30.6	-3.5	-6.3	19.9	0.1	2.2	a	-1.6	-0.4	-1.9
PM_{10} Metals	Manganese (PM_{10})	c	-2.8	-10.2	-13.8	-25.3	-37.7	0.6	-3.8	21.5	-6.2	13.2	a	3.9	1.3	2.6
PM_{10} Metals	Nickel (PM_{10})	c	-12.9	-6.3	-8.5	8.6	-28.9	4.7	-6.8	11.4	-1.2	e	a	26.5	21.2	10.6
VOC	Benzene	-5.6	23.6	-12.9	-5.8	-1.5	6.2	-13.2	10.2	a	-3.3	18.1	-5.3	5.2	14.6	-11.8
VOC	Butadiene, 1,3-	10.4	4.4	5.9	2.5	7.8	-0.5	-3.7	10.9	a	0.6	-8.1	-22.0	-10.1	3.9	-6.6
VOC	Carbon tetrachloride	32.2	26.5	-5.0	10.4	16.5	1.9	31.6	25.4	a	13.3	24.2	40.2	53.5	26.5	0.0
VOC	Chloroform	-6.4	15.5	3.9	9.1	4.3	5.4	1.0	-9.7	a	-2.4	8.5	10.3	8.1	9.2	-7.5
VOC	Tetrachloroethylene	-2.1	11.5	-14.3	-3.7	0.0	1.1	-16.1	0.8	a	-9.5	-1.8	-14.6	-5.5	13.0	-3.8
VOC	Trichloroethylene	10.7	13.5	16.6	5.5	5.3	2.7	-6.4	-8.3	a	3.0	-0.3	-10.0	-9.5	9.6	-14.6
VOC	Vinyl chloride	-5.4	2.0	-11.0	1.1	-14.1	-0.1	-14.1	0.3	a	-8.1	10.0	-7.1	1.5	-3.3	-2.7

	A-rated:±25%
	B-rated: Between 25% to 35% or between -25% to -35%
	Does not meet:>35% or <35%
--	No data available

[a]: No Proficiency Test samples were sent for this pollutant and year.

[b]: Proficiency Test results are from the National Contract Lab for EPA's School Air Toxics Monitoring Program. The %Difference was -5.55% in 2009 and 10.53% in 2010.

[c]: Pollutant was expected, but not sampled at this site for this year.

[d]: The Proficiency Test sample for this pollutant was 0; the site reported a concentration as "< MDL", rather than 0. EPA accepted this result.

[e]: Although a Proficiency Test sample was sent to the lab supporting this site and year, the results were nullified by EPA due to QA issues.

Table 9. NATTS Network Assessment: MQO#4 - Overall Method Precision %CV at Chicago, IL

Pollutant Group	Pollutant Name	Overall Method precision % CV															
		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Carbonyls	Acetaldehyde	--	--	18.5	37.4	78.3	26.8	2.5	6.9	2.2	2.6	1.4	1.8	--	--	5.0	2.1
Carbonyls	Formaldehyde	--	--	22.9	71.0	75.7	20.8	4.9	7.7	2.9	3.9	1.8	1.1	--	--	5.1	2.0
Chromium VI	Chromium VI	--	--	14.7	16.4	17.8	16.1	35.0	19.5	18.2	25.7	2.1	--	--	--	--	--
PAH	Benzo(a)pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PAH	Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PM_{10} Metals	Arsenic (PM_{10})	--	--	--	--	--	--	17.3	18.3	--	3.6	6.3	--	--	--	--	--
PM_{10} Metals	Beryllium (PM_{10})	--	--	--	--	--	--	12.4	27.6	--	9.4	28.3	--	--	--	--	--
PM_{10} Metals	Cadmium (PM_{10})	--	--	--	--	--	--	24.2	28.8	--	5.0	4.9	--	--	--	--	--
PM_{10} Metals	Lead (PM_{10})	--	--	--	--	--	--	19.0	25.9	--	0.3	12.3	--	--	--	--	--
PM_{10} Metals	Manganese (PM_{10})	--	--	--	--	--	--	10.7	22.1	--	0.1	7.2	--	--	--	--	--
PM_{10} Metals	Nickel (PM_{10})	--	--	--	--	--	--	23.8	14.3	--	16.5	a	--	--	--	--	--
VOC	Benzene	16.5	32.1	13.6	46.9	18.5	9.9	25.8	5.5	15.0	10.9	6.8	8.4	--	--	6.5	3.6
VOC	Butadiene, 1,3-	a	a	a	33.6	50.5	30.4	a	22.5	6.2	9.0	7.2	3.3	--	--	2.2	6.6
VOC	Carbon tetrachloride	6.1	72.3	10.3	4.7	18.8	8.8	9.1	3.2	20.7	9.3	6.3	6.3	--	--	6.7	9.9
VOC	Chloroform	25.7	138.5	18.7	36.4	92.2	33.0	23.6	66.1	34.5	20.8	28.7	9.8	--	--	6.4	4.6
VOC	Tetrachloroethylene	a	0	0	36.0	30.6	36.6	34.4	11.4	5.2	6.4	22.6	8.5	--	--	2.8	3.5
VOC	Trichloroethylene	a	a	a	47.8	a	30.8	31.4	2.0	a	10.5	--	a	--	--	a	a
VOC	Vinyl chloride	--	a	a	a	a	a	a	6.1	--	--	4.0	a	--	a	a	a

	A-rated:≤ 15% CV
	B-rated: Between 15%CV to25% CV
	Does Not Meet: >25% CV or did not report Precision (required in the NATTS Workplan Template since 2012)
--	No data available

[a]: Although both primary and secondary data were reported, both sets of values were less than the MDL. Thus no %CV was calculated.

Table 10. NATTS Network Assessment: MQO#4 - Analytical Precision %CV at Chicago, IL

Pollutant Group	Pollutant Name	Analytical Method precision % CV															
		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Carbonyls	Acetaldehyde	--	--	0.4	0.3	0.4	1.1	0.5	0.6	1.3	1.4	0.9	0.3	2.8	2.9	0.5	0.9
Carbonyls	Formaldehyde	--	--	0.2	0.4	1.1	0.9	0.4	1.0	0.4	2.4	0.9	0.6	4.0	3.3	0.4	1.0
Chromium VI	Chromium VI	--	--	--	6.2	6.9	10.3	8.7	3.9	7.2	4.9	3.4	--	--	--	--	--
PAH	Benzo(a)pyrene	--	--	--	--	--	--	--	--	--	a	2.5	6.0	1.7	1.2	1.5	2.0
PAH	Naphthalene	--	--	--	--	--	--	--	--	--	a	3.5	6.0	0.8	2.5	1.1	1.1
PM_{10} Metals	Arsenic (PM_{10})	--	--	--	--	--	--	1.2	1.4	--	1.6	4.4	4.8	1.2	2.6	4.1	3.3
PM_{10} Metals	Beryllium (PM_{10})	--	--	--	--	--	--	12.2	15.8	--	7.8	8.3	15.2	11.9	24.2	18.5	5.5
PM_{10} Metals	Cadmium (PM_{10})	--	--	--	--	--	--	8.0	7.6	--	1.6	2.9	18.2	4.9	3.8	5.7	10.6
PM_{10} Metals	Lead (PM_{10})	--	--	--	--	--	--	1.2	5.4	--	2.5	2.1	3.8	1.6	3.0	5.1	2.7
PM_{10} Metals	Manganese (PM_{10})	--	--	--	--	--	--	1.2	4.9	--	1.4	1.5	4.8	1.3	2.7	1.8	2.8
PM_{10} Metals	Nickel (PM_{10})	--	--	--	--	--	--	1.9	2.4	--	0.8	b	0.9	16.5	5.0	10.8	9.4
VOC	Benzene	9.5	7.5	3.5	7.7	2.3	6.6	1.4	5.9	4.2	4.0	5.4	1.4	2.0	18.9	3.5	3.2
VOC	Butadiene, 1,3-	b	--	b	10.2	3.0	14.0	13.2	13.9	9.4	11.0	10.1	16.2	13.7	b	b	5.1
VOC	Carbon tetrachloride	10.9	4.2	3.0	6.7	5.6	6.5	3.2	5.4	12.8	7.8	5.9	2.6	8.6	6.6	3.9	3.1
VOC	Chloroform	6.5	4.2	4.3	4.8	5.3	7.2	3.3	3.6	3.1	4.8	4.2	3.4	17.2	20.4	7.1	4.2
VOC	Tetrachloroethylene	b	12.9	0.0	5.3	3.1	13.5	6.6	3.7	4.7	9.2	7.3	6.3	6.4	7.7	3.0	4.2
VOC	Trichloroethylene	b	--	b	9.0	8.9	8.1	13.9	4.8	b	14.7	b	b	b	12.3	b	b
VOC	Vinyl chloride	--	--	--	--	b	40.4	--	2.9	--	b	0	b	7.1	0	b	2.1

A-rated:≤ 15% CV

B-rated: Between 15%CV to25% CV

Does Not Meet: >25% CV or did not report Precision (required in the NATTS Workplan Template since 2012)

-- No data available

[a]: Per the NATTS Workplan template, analytical replicates were required to be reported to AQS for this sampling year.

[b]: Although both primary and secondary data were reported, both sets of values were less than the MDL. Thus no %CV was calculated..

Appendix A. Equipment Inventory

Pollutant Type	Year(s)	Manufacturer/Model, Extraction Type, and Year
Sampling Equipment		
Carbonyls	2003-2008	Custom-built C-24 (Year Deployed: 2003)
	2009-2009	Custom-built C-2 (Year Deployed: 2009)
	2010-2011	Custom-built C-24 (Year Deployed: 2010)
	2012-2014	ERG AT/C-5 (Year Deployed: 2010)
	2015-2018	ERG AT/C-11 (Year Deployed: 2015)
Chormium VI	2005-2013	ERG Chromium VI sampler (Year Deployed: 2005)
PAHs	2008-2018	General Metal Works PS-1 Sampler (Year Deployed: <1998)
PM_{10} Metals	2005-2008	General Metal Works Hi-Volume Sampler (Year Deployed: <1995)
	2009-2018	Andersen Hi-Volume PM10 Sampler (Year Deployed: 2009)
VOCs	2003-2008	VR-24 custom built (Year Deployed: unknown)
	2009-2009	VR-24 custom built (Year Deployed: 2008)
	2010-2014	ERG AT/C (Year Deployed: 2010)
	2015-2018	ERG AT/C-11 (Year Deployed: 2015)
Analytical Equipment		
Carbonyls	2003-2004	Unknown
	2005-2017	Waters Alliance 2695 HPLC /model 2487 Dual Absorbance (Year Deployed: 2003)
	2018	Waters Alliance e2695 HPLC /model 2489 Dual Absorbance (Year Deployed: 2018)
Chromium VI	2005-2013	Dionex 300 ion chromatography system (Year Deployed: 2001)
PAHs	2008-2014	HP/Agilent 5890/5971 GC/MS (Year Deployed: 2008)
	2015-2018	HP/Agilent 7890B/5975C GC/MS (Year Deployed: 2015)
PM_{10} Metals	2005-2014	PE ELAN 9000 ICP-MS (Year Deployed: 2003)
	2015-2018	Thermo iCAP Q ICP-MS (Year Deployed: 2015)
VOCs	2003	HP/Agilent 5890/5971 GC/MS, HP/Agilent model 6890/5973 GC/MS (Year Deployed: 1990)
	2004-2005	HP/Agilent 5890/5971 GC/MS (Year Deployed: 1990)
	2006-2009	HP/Agilent 6890/5973 GC/MS (Year Deployed: 2005)
	2010	HP/Agilent 5890/5971 GC/MS (Year Deployed: 2008)
	2011-2018	HP/Agilent 6890/5975 GC/MS (Year Deployed: 2010)
Preconcentrator Equipment		
VOCs	2003	Entech 7000 (Year Deployed: 2003)
	2004-2006	Entech 7100 (Dynamic Dilution) (Year Deployed: 2003)
	2007-2018	Entech 7100A (Year Deployed: 2007)
Standards Preparation Equipment		
VOCs	2003-2018	Custom-built (dynamic dilution) (Year Deployed: 1985)

Appendix A. Equipment Inventory

Pollutant Type	Year(s)	Manufacturer/Model, Extraction Type, and Year
Canister Cleaning Equipment		
VOCs	2003-2010	Custom-built (Cold) (Year Deployed: 2003)
	2011-2018	Wasson-ECE TO Clean (Hot) (Year Deployed: 2010)
PM_{10} Extraction Equipment		
PM_{10} Metals	2005-2013	Branson 8510 (Sonicator) (Year Deployed: 2004)
	2014-2018	Environmental Express (Hotblock) (Year Deployed: 2014)
Chromium VI Extraction Equipment		
Chromium VI	2005-2010	Branson 8510 (Sonicator) (Year Deployed: 2001)
	2011	Branson 8510 Sonicator/ Branson Shaker (Year Deployed: 2001/2011)
	2012-2014	Branson Shaker (Year Deployed: 2011)
PAHs Extraction Equipment		
PAHs	2008-2018	Dionex -300 (ASE) (Year Deployed: 2004)