

Karnack, TX NATTS Network Assessment Review

- Established 2004: Carbonyls, PM₁₀ Metals, and VOCs
 - Chromium VI added in 2006; ended in in 2013
 - PAHs added in 2008
- For the NATTS Network Assessment (2004-2018):
 - 0 of 18 Method Quality Objective (MQO) Core HAPs were included in the national trends
 - All HAPs: Sampling ended mid-year for 2018.
 - Arsenic (PM₁₀): Analytical precision not reported and percent bias outside ±35% in 2014
 - Benzene: Reported MDL to NATTS Target MDL ratio greater than 2.0
 - 1,3-Butadiene, Chloroform, Tetrachloroethylene, Trichloroethylene, and Vinyl Chloride: Reported MDL to NATTS Target MDL ratio greater than 2.0 from 2013-2018 and Analytical precision data not reported from 2013-2018.
 - Carbon Tetrachloride: Reported MDL to NATTS Target MDL ratio greater than 2.0 from 2013-2018, Analytical precision data not reported from 2013-2018, and Bias % Difference was outside of ±35% in 2015
 - Formaldehyde: Reported MDL to NATTS Target MDL ratio greater than 2.0 and Analytical precision data not reported in 2015.
 - 135 of 238 pollutant datasets were suitable for trends analysis.
 - Annual Average and 3-Year Rolling Average Concentrations were generally flat over time, with the exception of some pollutants (acetaldehyde, formaldehyde, naphthalene, and nickel (PM₁₀)).
 - 100% Reporting of Datasets
- Method Quality Objectives (MQO): 2004-2018
 - Completeness: Met 85% completeness in 206 of 238 pollutant datasets
 - Method Detection Limits: Met MDL Target Ratio of 1.00 in 102 of 251 pollutant datasets
 - Bias: Met ±25% for 191 of 206 pollutant datasets
 - Overall Method Precision: Met ≤15% CV for 0 pollutant datasets
 - Analytical Method Precision: Met ≤15% CV for 2 of 125 pollutant datasets
- Analytical Laboratories for 2018

VOC	Carbonyl	PM ₁₀ Metals	Chromium VI	PAHs
TCEQ	TCEQ	TCEQ	NA	TCEQ

- Equipment Year Deployed (Through 2014)^a

Equipment Type	VOC	Carbonyl	PM ₁₀ Metals	Chromium VI	PAHs
Sampler	2004	2013	2013	2006	2007
Analytical	2014	2012	2010	2001	2011
Preconcentrator	2013	NA	NA	NA	NA
Standards Preparation	Unknown	NA	NA	NA	NA
Canister Cleaning	2007	NA	NA	NA	NA
Extraction	NA	NA	2010	2011	2011

^a: Survey results from 2015-2018 were not returned to EPA

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 15 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.

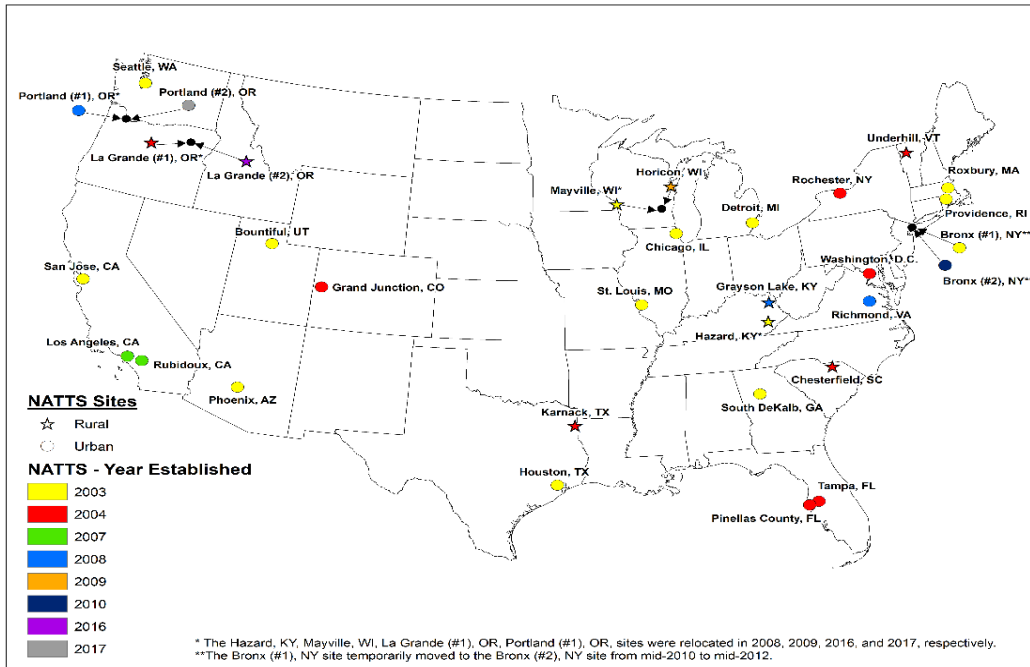
Table 1. NATTS Network Assessment: Count and Percentage of Suitable Datasets by Pollutant Group

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	µg/m ³	19	1.51	1.39	-7.7%
Arsenic (PM ₁₀)	ng/m ³	21	0.71	0.68	-3.2%
Benzene	µg/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-	µg/m ³	19	0.071	0.063	-10.9%
Cadmium (PM ₁₀)	ng/m ³	21	0.170	0.097	-43.0%
Carbon Tetrachloride	µg/m ³	15	0.59	0.56	-4.7%
Chloroform	µg/m ³	20	0.256	0.255	-0.4%
Chromium VI	ng/m ³	18	0.029	0.026	-7.7%
Formaldehyde	µg/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	µg/m ³	19	0.149	0.174	17.2%
Trichloroethylene	µg/m ³	19	0.020	0.022	10.7%
Vinyl Chloride	µg/m ³	17	0.0051	0.0048	-5.5%

Figure 1. NATTS Site and Year Established



NATTS Monitoring Site Report: Karnack, TX

Site Information

Region	6
NATTS Site Type	Rural
County	Harrison
AQS Site Code	48-203-0002
NATTS Operating Agency	TX Commission on Env. Quality
Latitude	36.669004
Longitude	-94.16744
AQS Land Use	Agricultural
AQS Location Setting	Rural
10-Mile Population	66,886

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

^a: Reported MDL to NATTS Target Ratio greater than 2.0.

^d: Pollutant was expected, but not sampled at this site for this year.

^b: Analytical precision data not reported.

^c: Completeness was less than 75% based on 1-in-6 day sampling.

^e: Percent Bias outside of ±35%.

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 Karnack, TX

Analyte	Units	# Data Records	% Detection	Arithmetic Mean ^a	Percentile Value ^b						
					5th	10th	25th	50th	75th	90th	95th
Acetaldehyde	µg/m ³	837	100%	0.93 ± 0.04	0.41	0.49	0.65	0.82	1.09	1.48	1.72
Arsenic (PM ₁₀)	ng/m ³	807	100%	0.57 ± 0.02	0.20	0.28	0.44	0.55	0.59	0.78	1.03
Benzene	µg/m ³	892	96%	1.14 ± 0.05	0.36	0.47	0.66	0.96	1.44	2.04	2.53
Benzo(a)pyrene	ng/m ³	585	39%	0.04 ± 0.01	ND	ND	ND	ND	0.02	0.06	0.17
Beryllium (PM ₁₀)	ng/m ³	471	35%	0.016 ± 0.003	ND	ND	ND	ND	0.011	0.071	0.073
Butadiene, 1,3-	µg/m ³	892	32%	0.009 ± 0.003	ND	ND	ND	ND	0.011	0.012	0.050
Cadmium (PM ₁₀)	ng/m ³	471	59%	0.04 ± 0.00	ND	ND	ND	0.02	0.07	0.08	0.13
Carbon Tetrachloride	µg/m ³	892	97%	0.60 ± 0.01	0.43	0.50	0.56	0.61	0.67	0.73	0.77
Chloroform	µg/m ³	892	88%	0.066 ± 0.003	ND	ND	0.025	0.053	0.100	0.105	0.121
Chromium VI	ng/m ³	392	75%	0.115 ± 0.024	ND	ND	ND	0.034	0.161	0.275	0.338
Formaldehyde	µg/m ³	838	100%	2.07 ± 0.11	0.55	0.70	1.04	1.58	2.67	3.99	5.12
Lead (PM ₁₀)	ng/m ³	471	100%	1.57 ± 0.09	0.57	0.68	0.96	1.38	1.92	2.58	3.11
Manganese (PM ₁₀)	ng/m ³	471	100%	4.41 ± 0.42	0.99	1.34	1.96	3.25	4.97	8.28	11.17
Naphthalene	ng/m ³	585	100%	54.02 ± 5.51	10.85	13.40	21.67	35.23	65.13	105.25	144.95
Nickel (PM ₁₀)	ng/m ³	471	89%	0.44 ± 0.04	ND	ND	0.11	0.37	0.70	0.78	0.96
Tetrachloroethylene	µg/m ³	892	45%	0.03 ± 0.01	ND	ND	ND	ND	0.04	0.07	0.07
Trichloroethylene	µg/m ³	892	33%	0.014 ± 0.002	ND	ND	ND	ND	0.027	0.029	0.055
Vinyl Chloride	µg/m ³	892	32%	0.007 ± 0.001	ND	ND	ND	ND	0.013	0.013	0.026

^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	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
VOCs	--	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ
Carbonyls	--	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ
PM ₁₀ Metals	--	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ
Chromium VI	--	--	NONE	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ/ERG	ERG	ERG	ERG	--	--	--	--	--
PAHs	--	--	--	--	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ

--: Not Applicable

TCEQ: Texas Commission on Environmental Quality

ERG: Eastern Research Group, Inc.

Figure 3. Karnack, TX Annual Average Concentrations

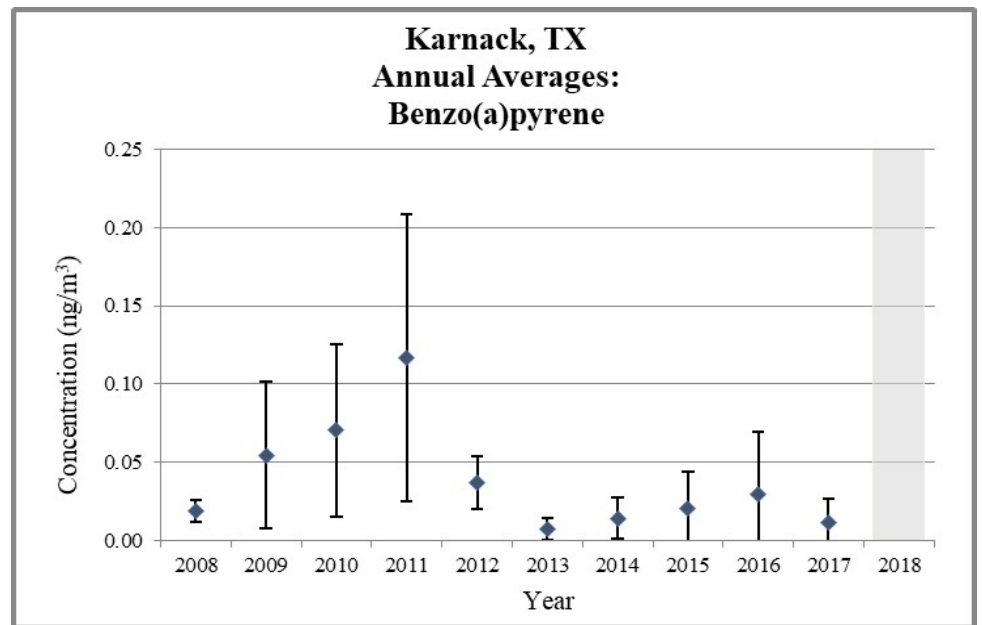
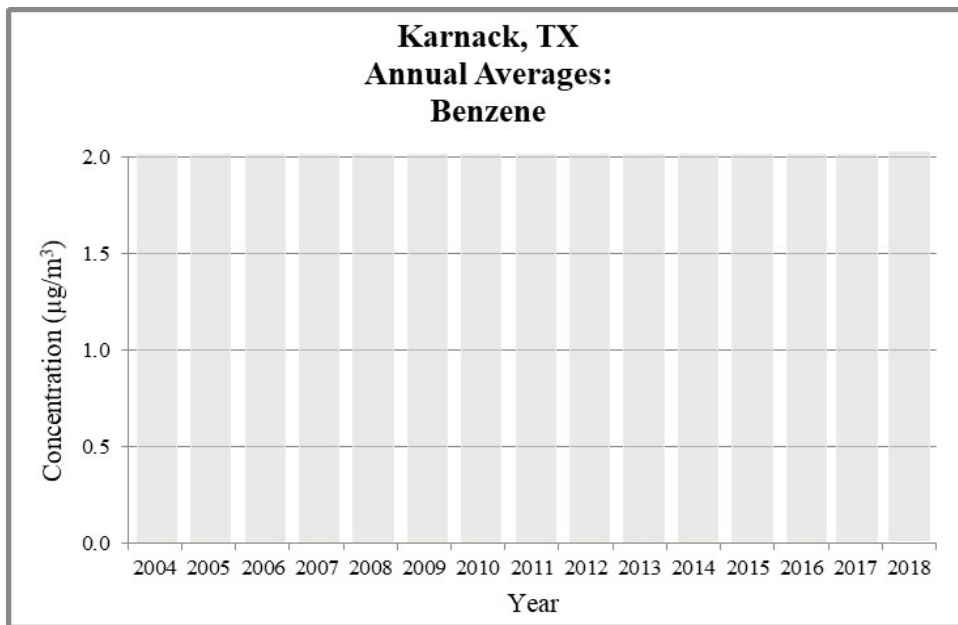
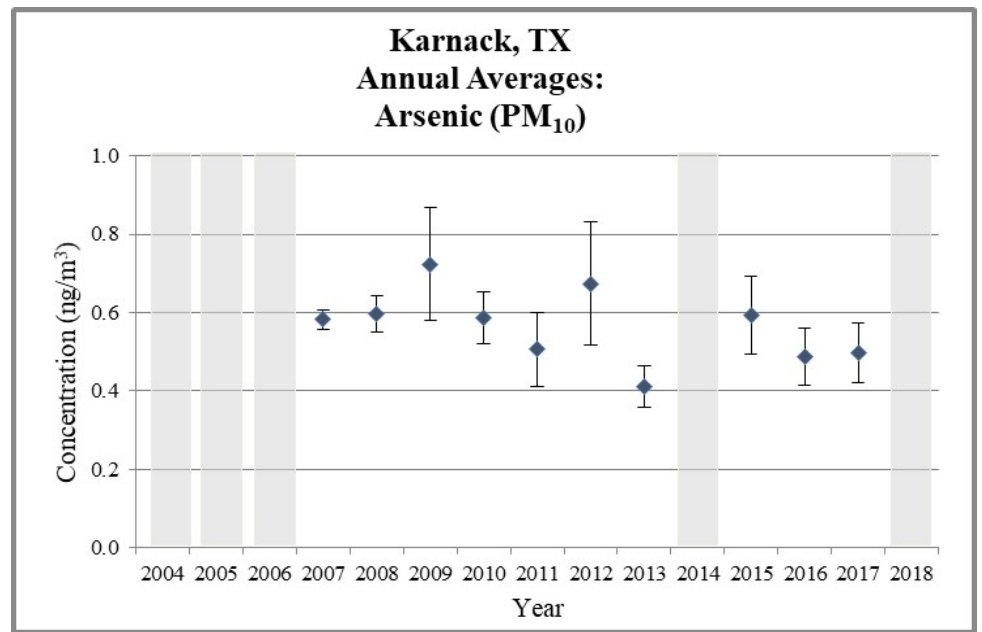
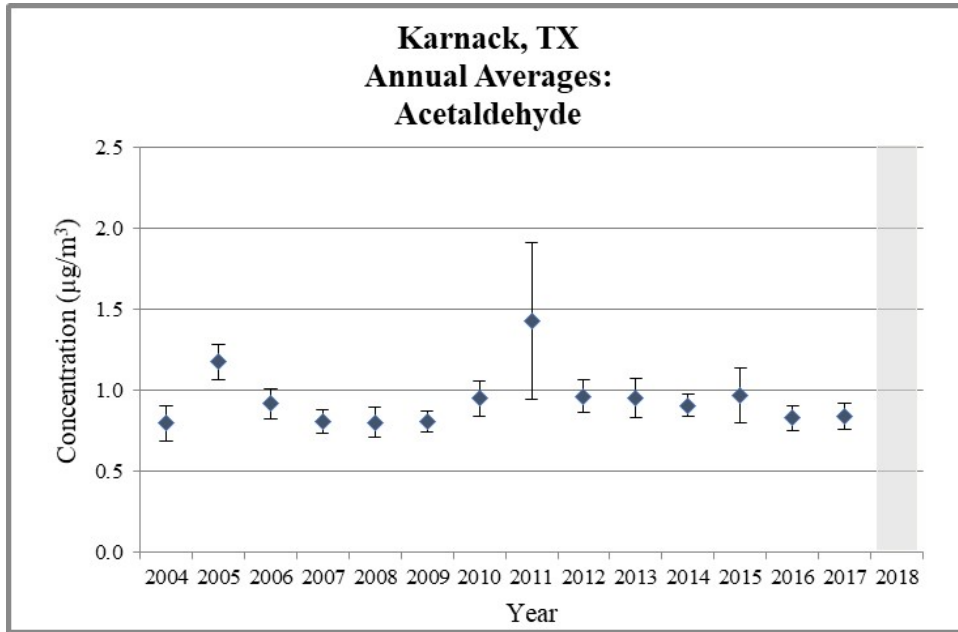


Figure 3. Karnack, TX Annual Average Concentrations

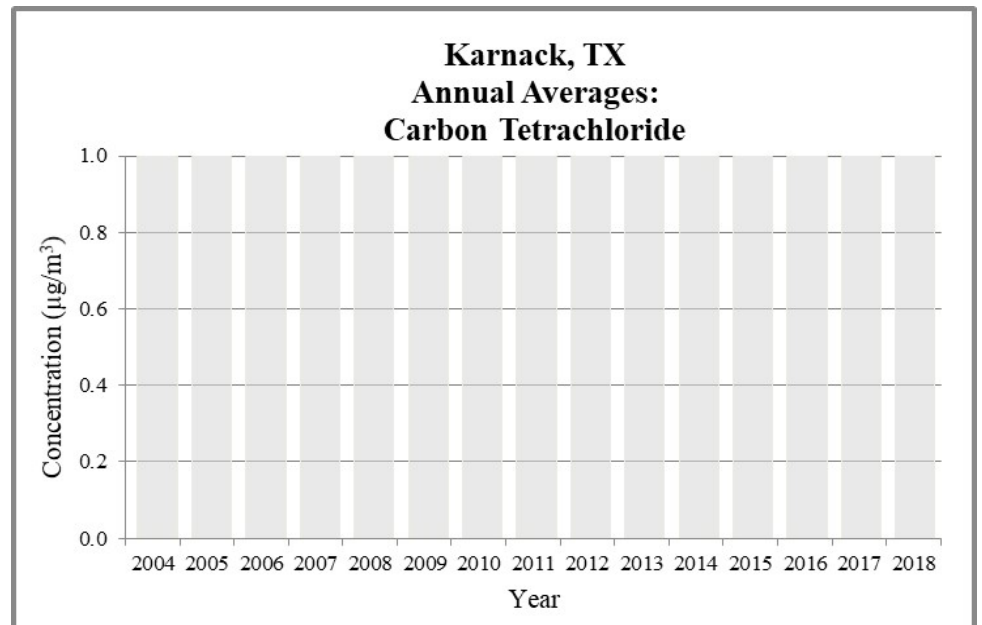
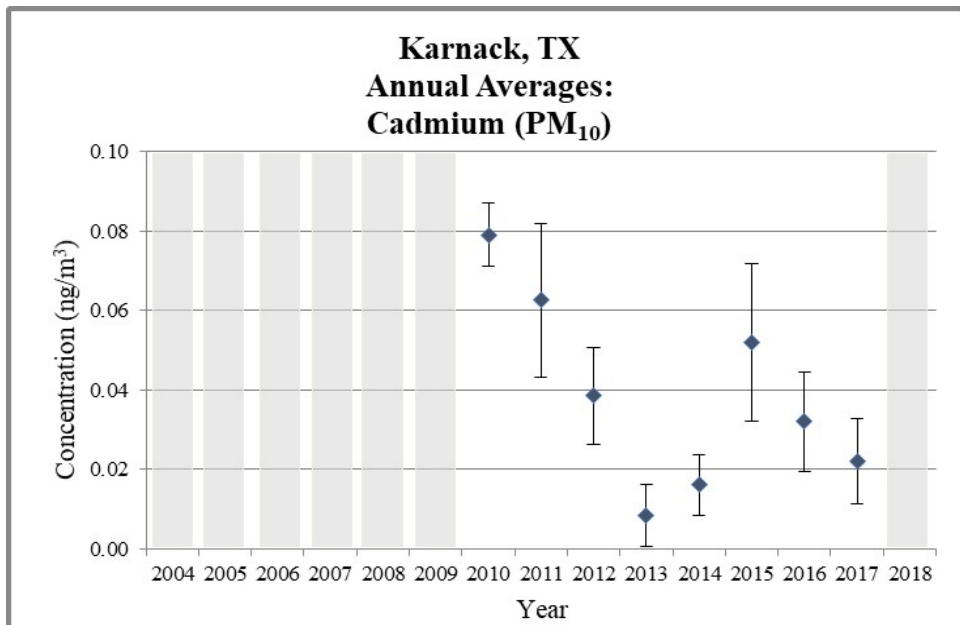
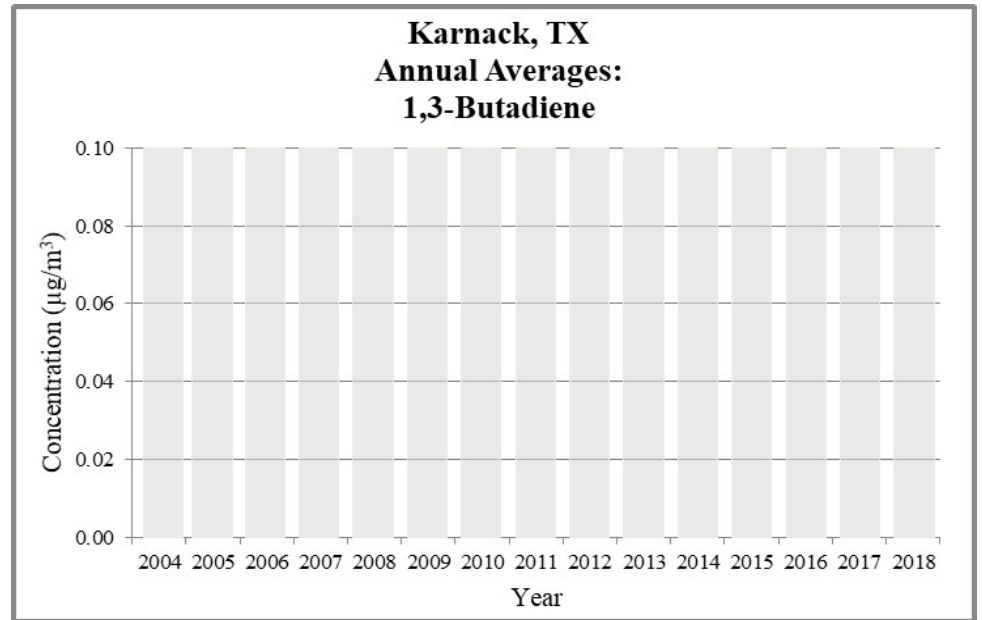
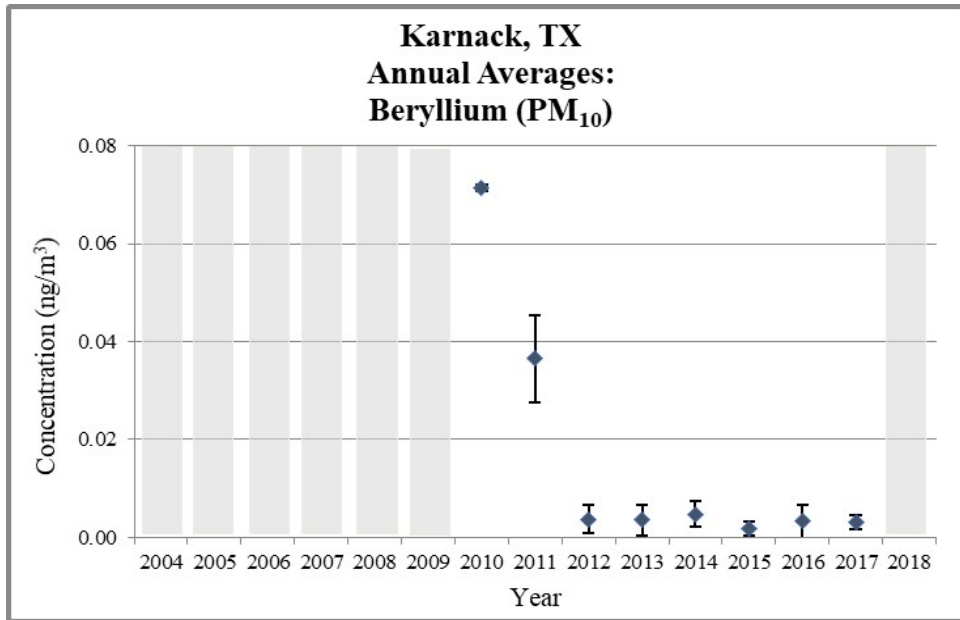


Figure 3. Karnack, TX Annual Average Concentrations

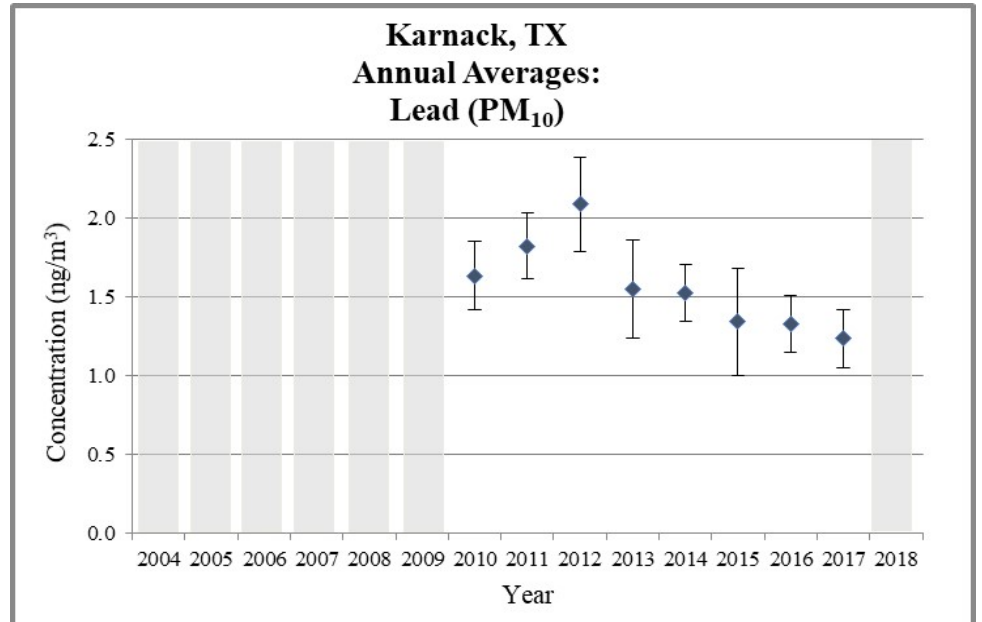
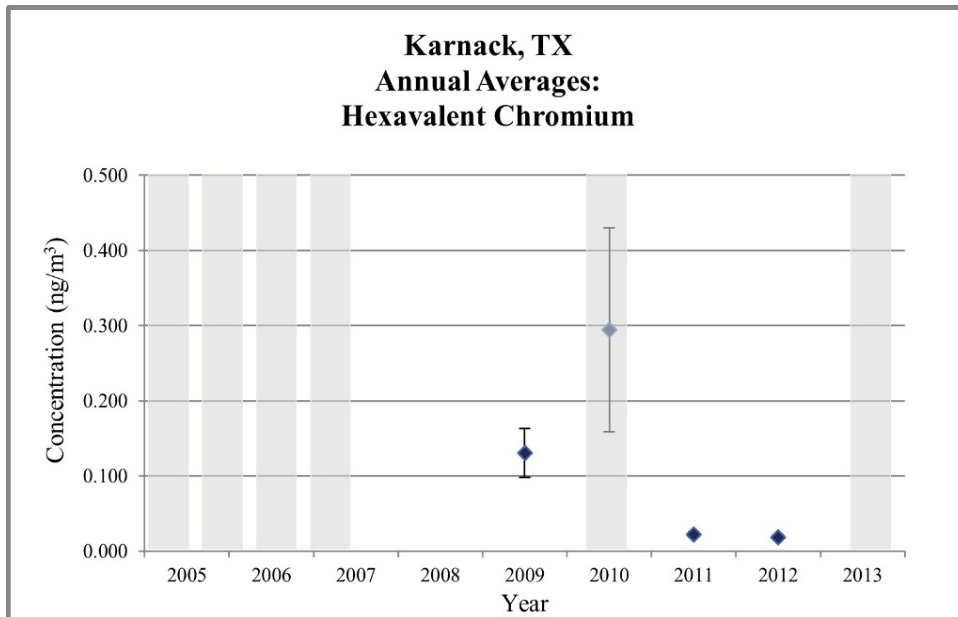
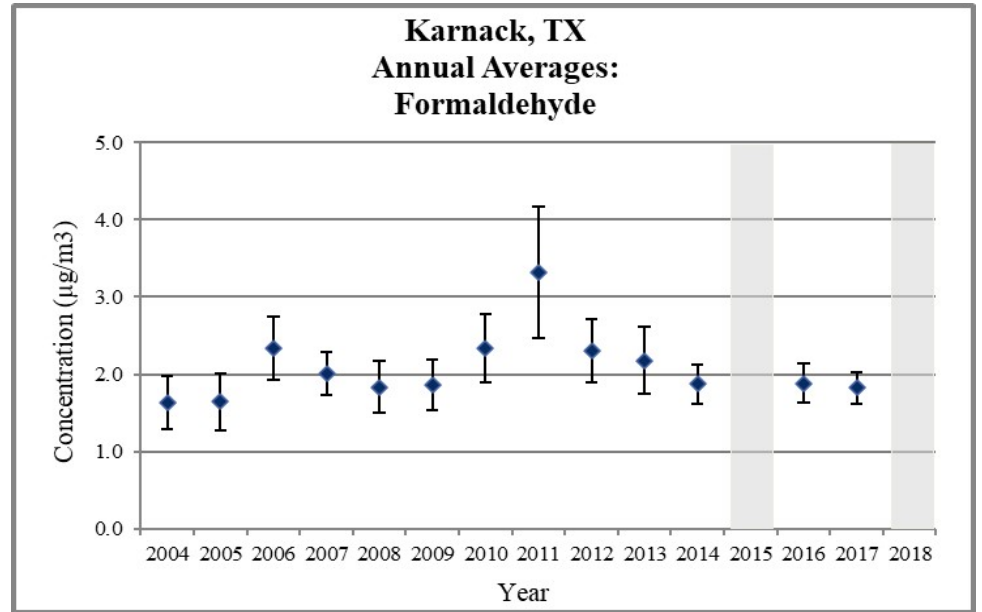
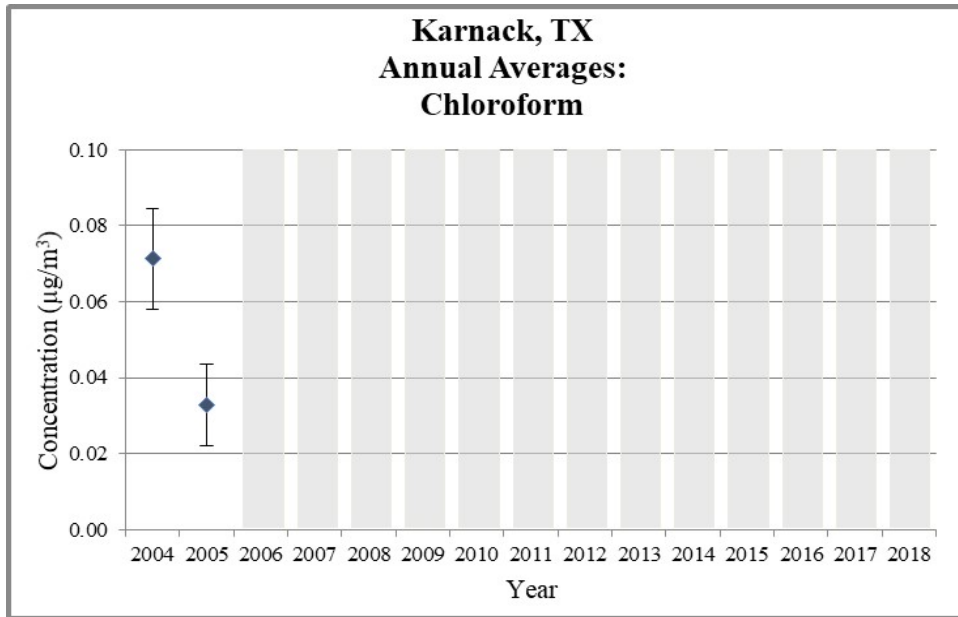


Figure 3. Karnack, TX Annual Average Concentrations

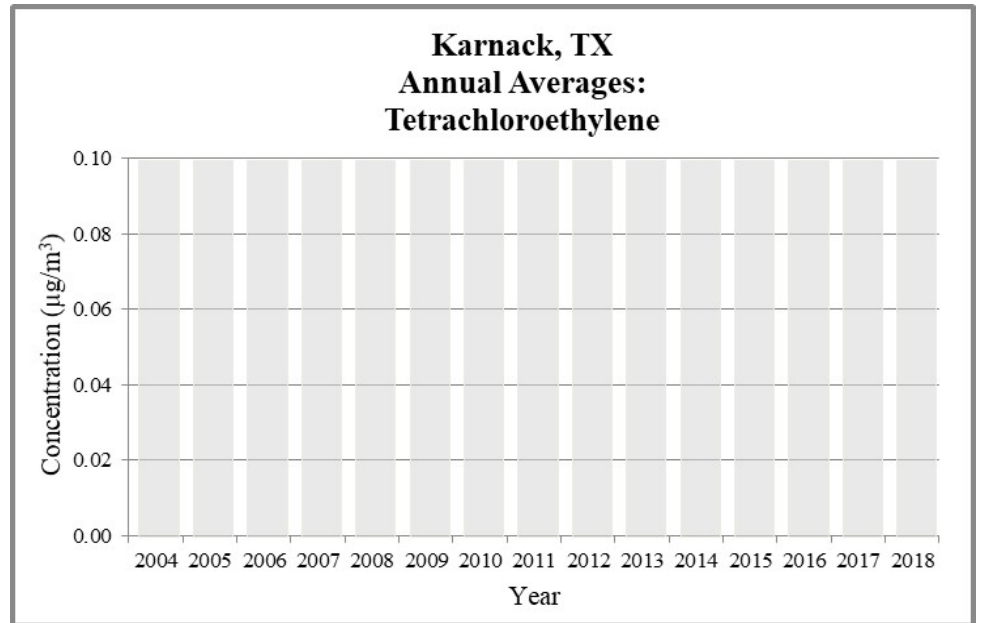
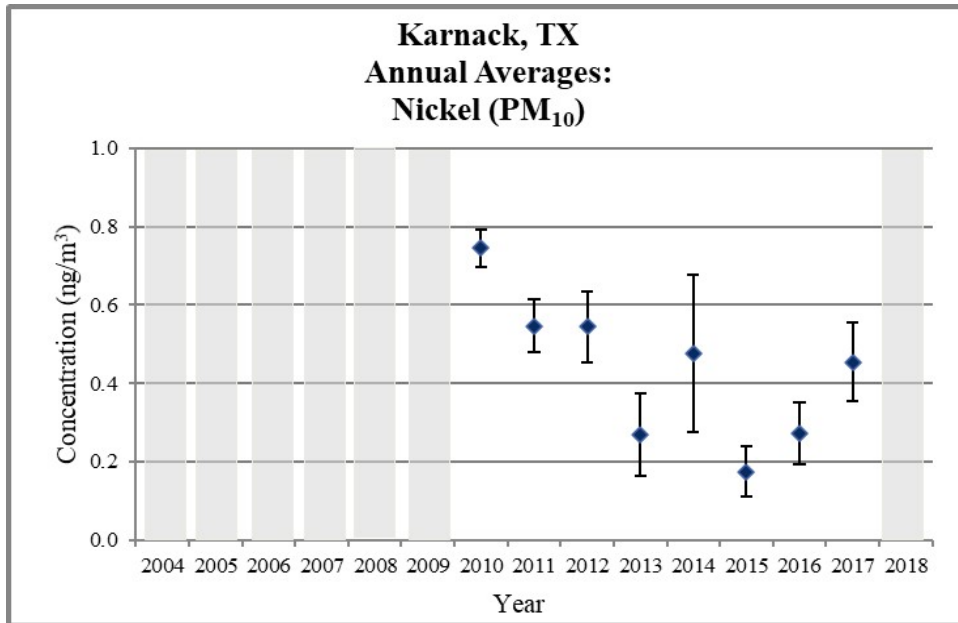
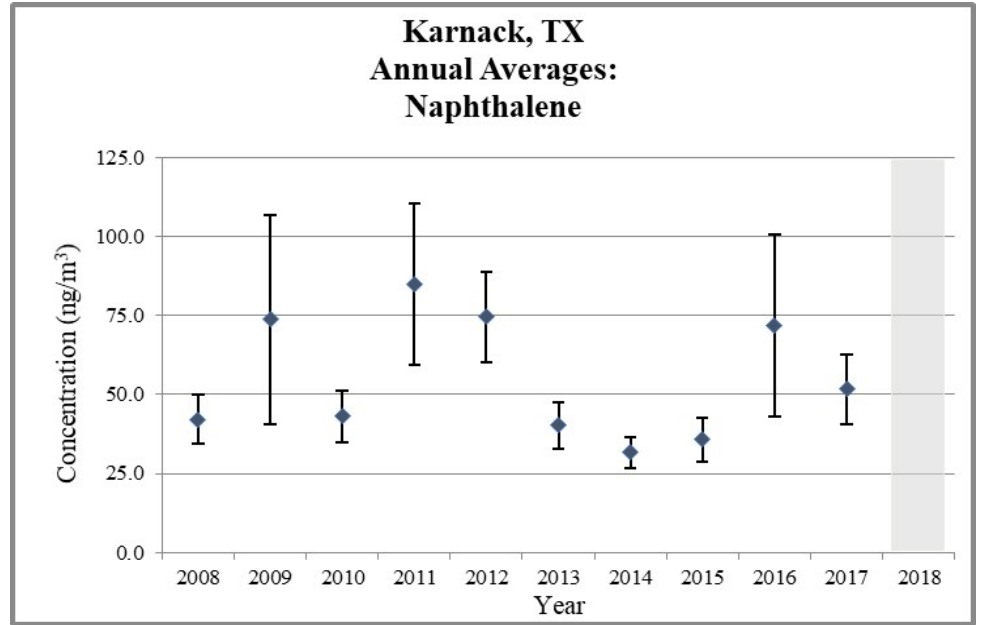
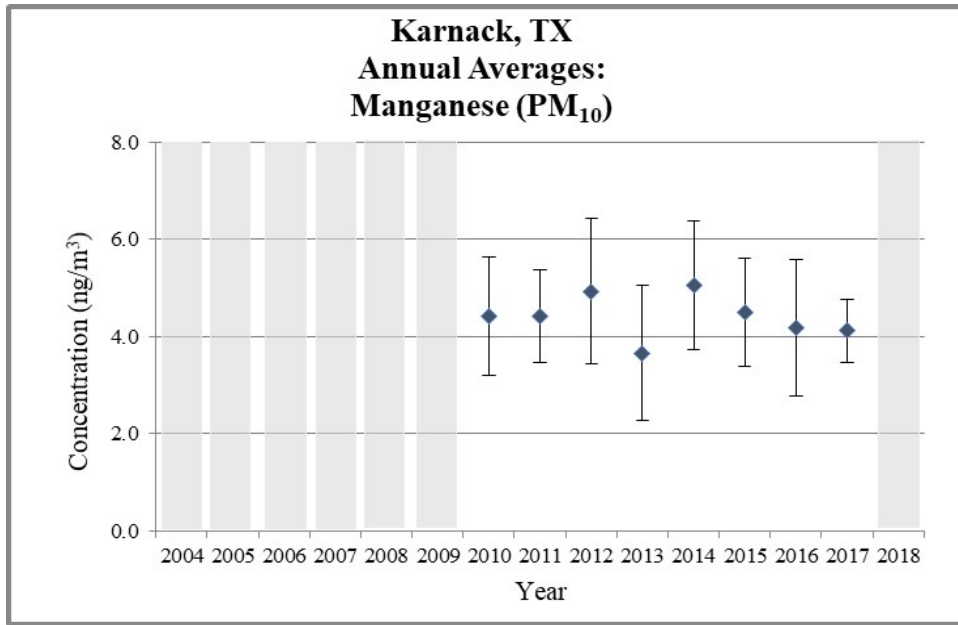
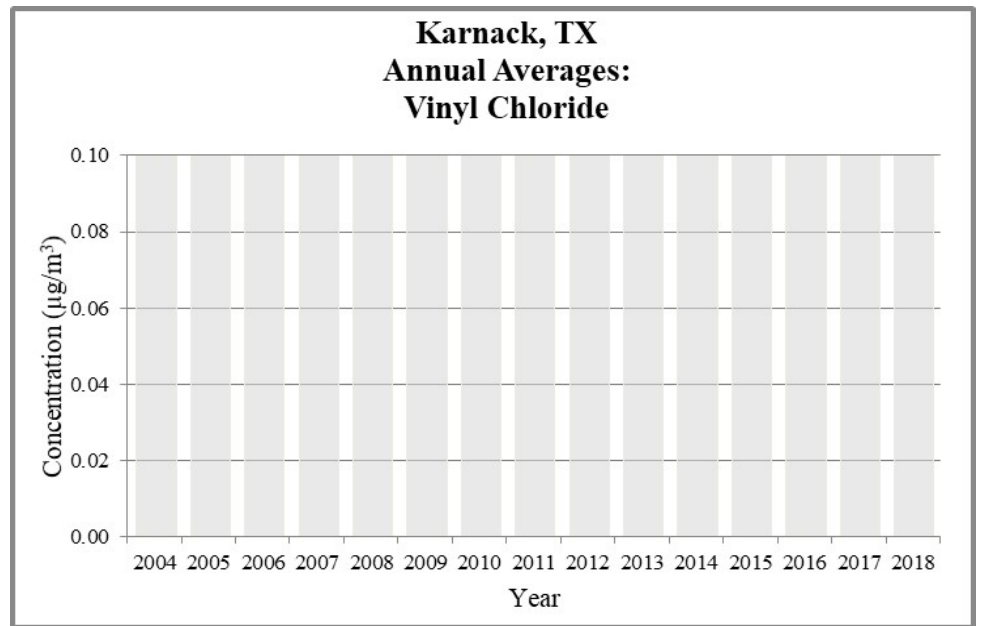
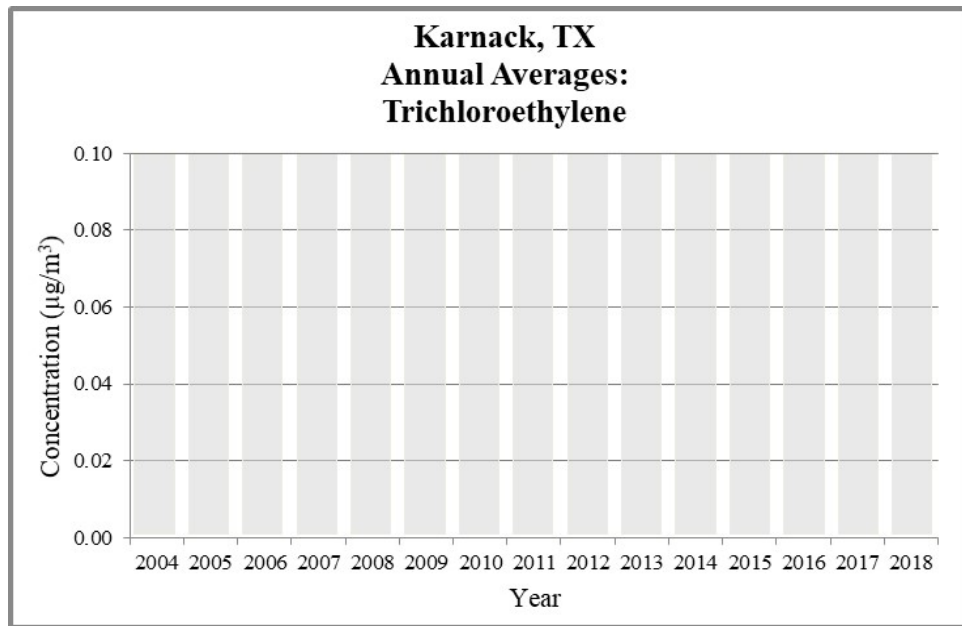


Figure 3. Karnack, TX Annual Average Concentrations



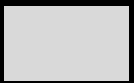
 Does not meet MQO

Figure 4. Karnack, TX - 3-Year Rolling Average Concentrations

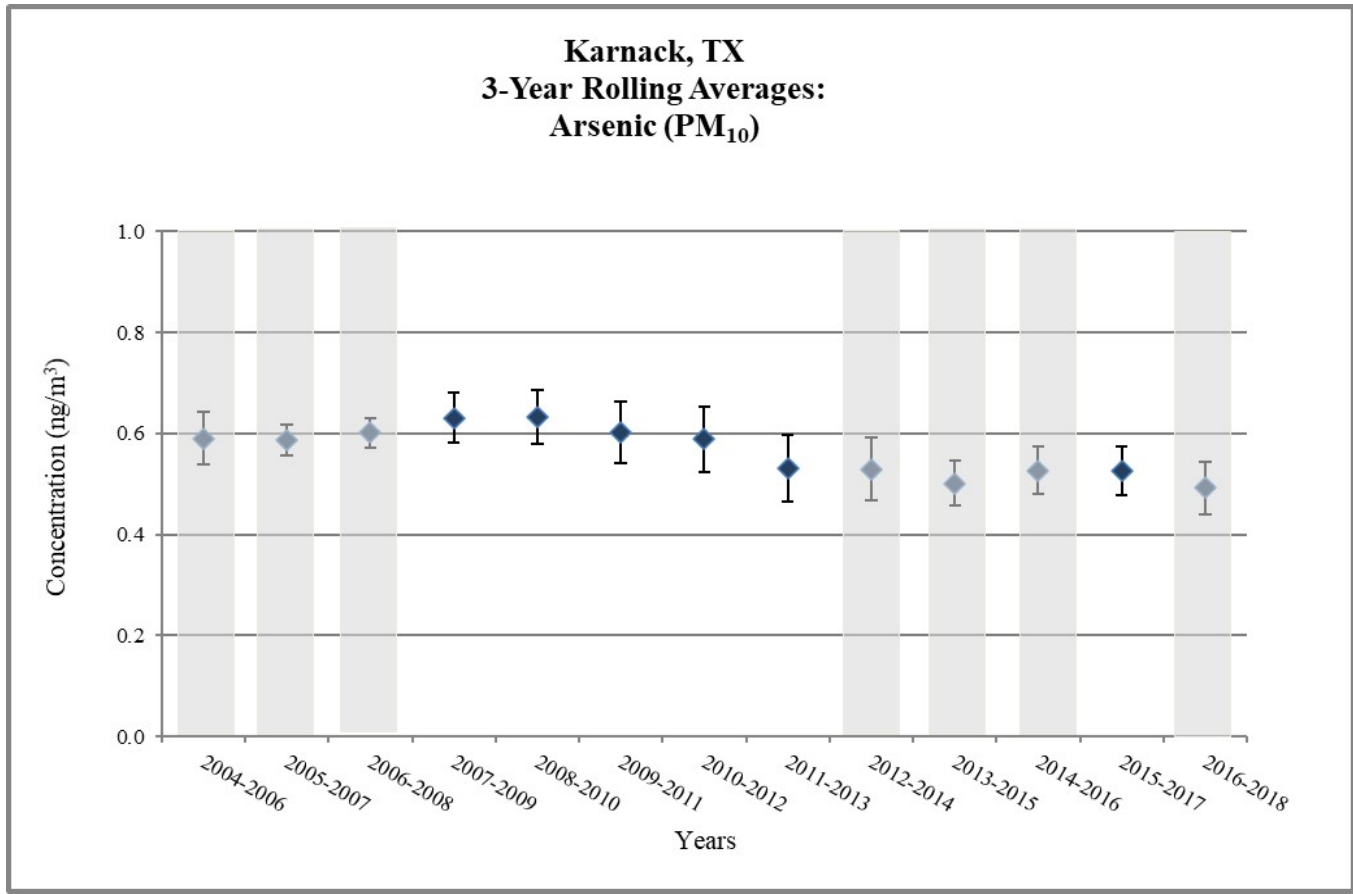
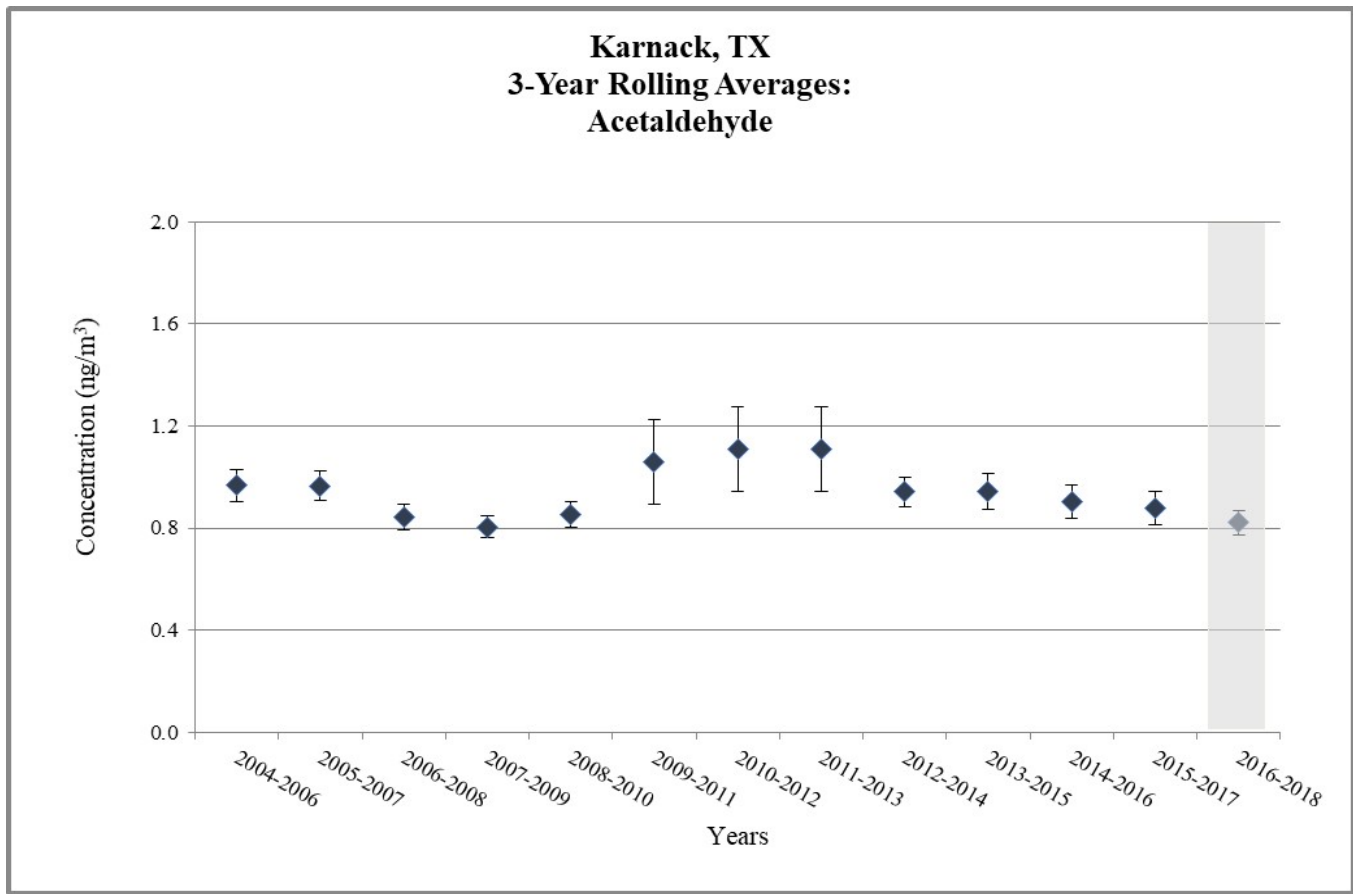


Figure 4. Karnack, TX - 3-Year Rolling Average Concentrations

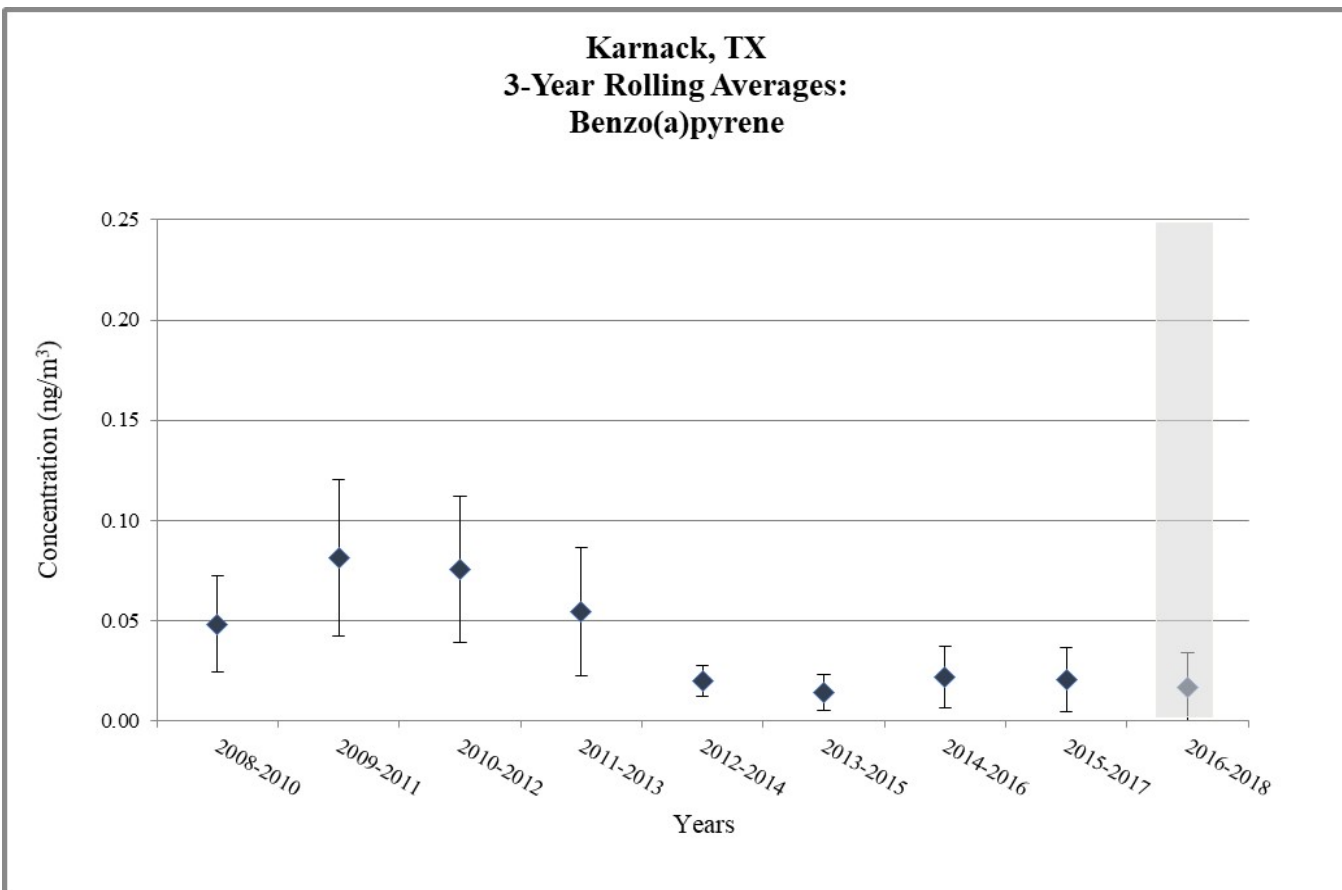
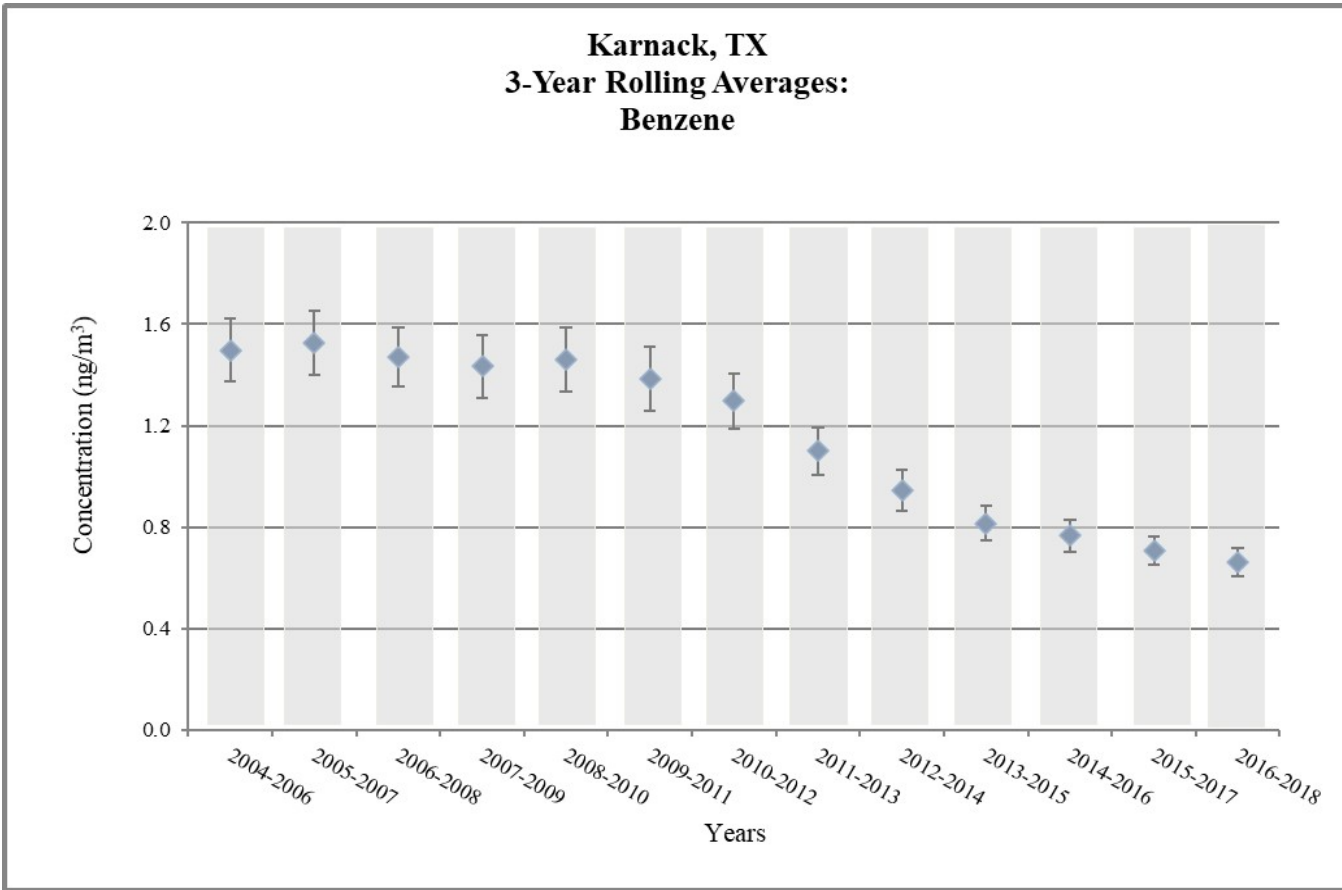


Figure 4. Karnack, TX - 3-Year Rolling Average Concentrations

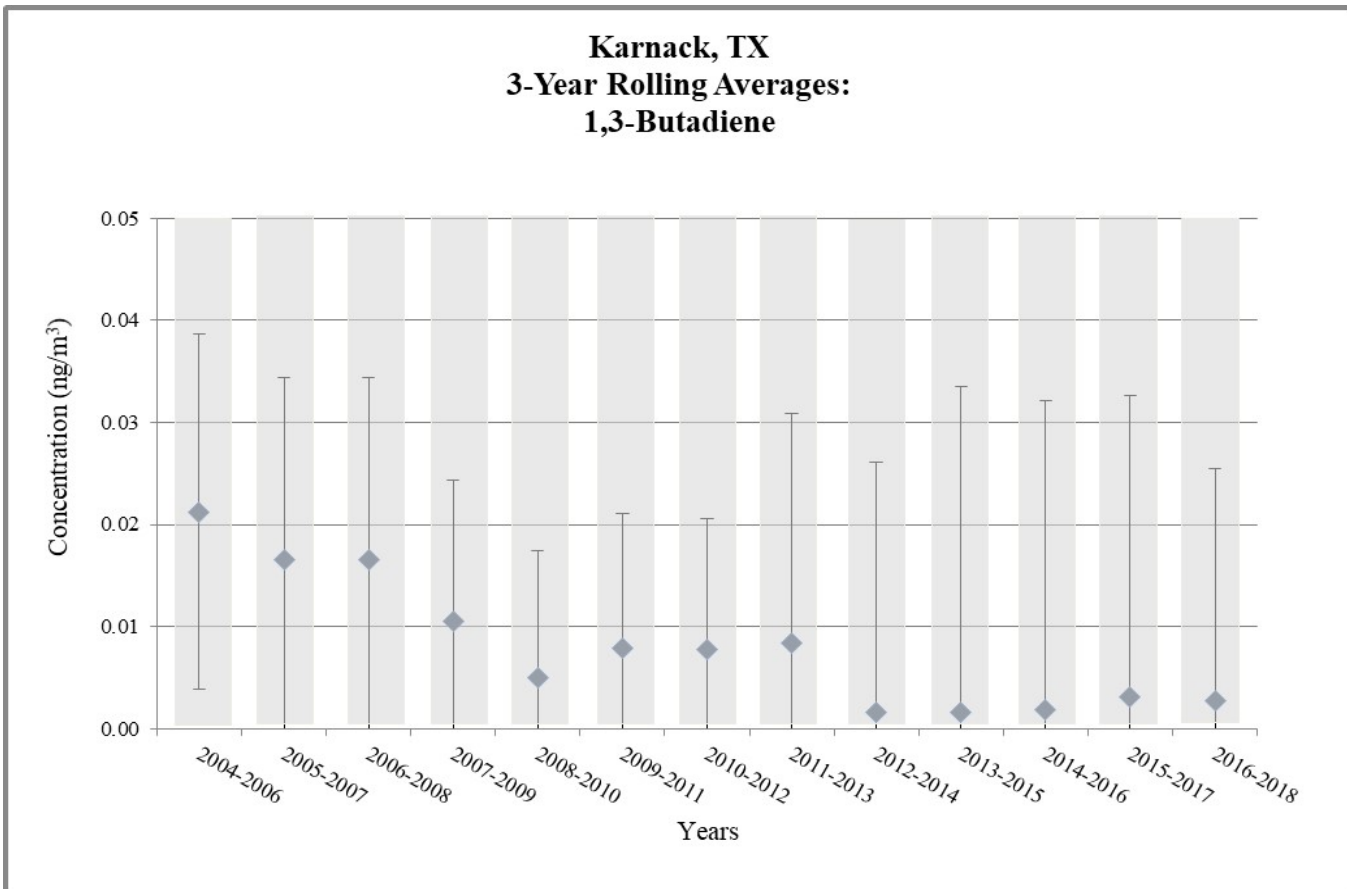
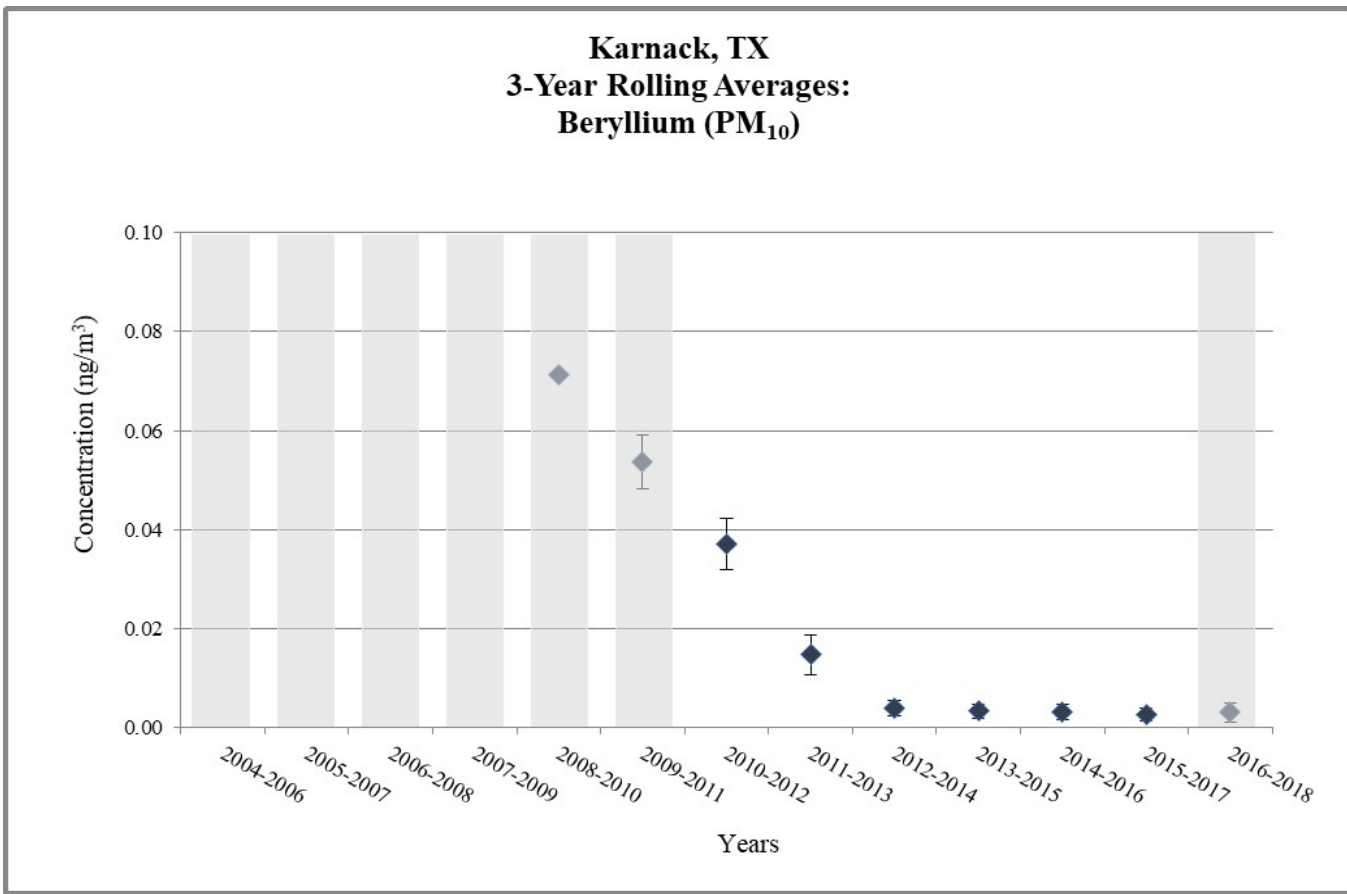


Figure 4. Karnack, TX - 3-Year Rolling Average Concentrations

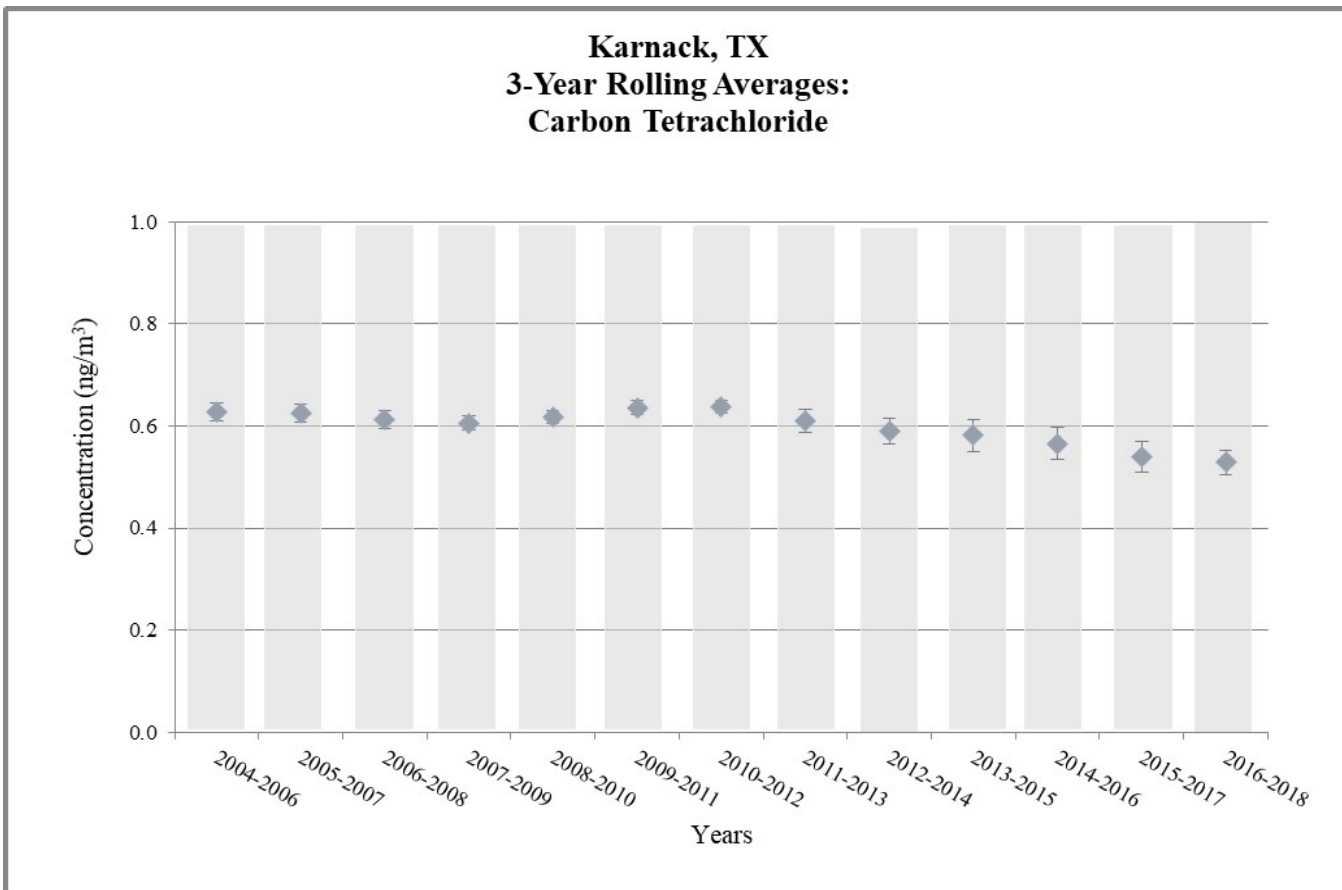
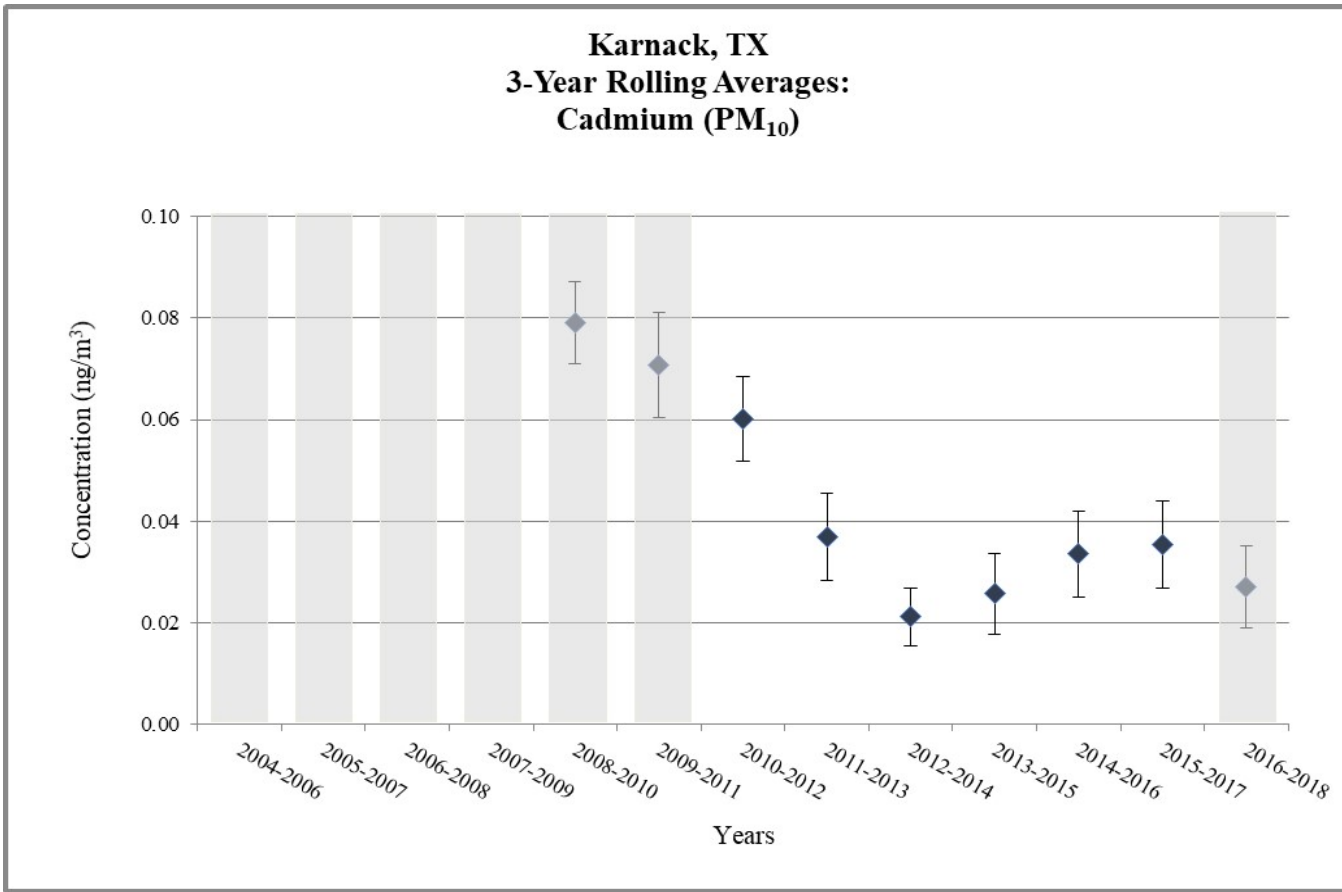


Figure 4. Karnack, TX - 3-Year Rolling Average Concentrations

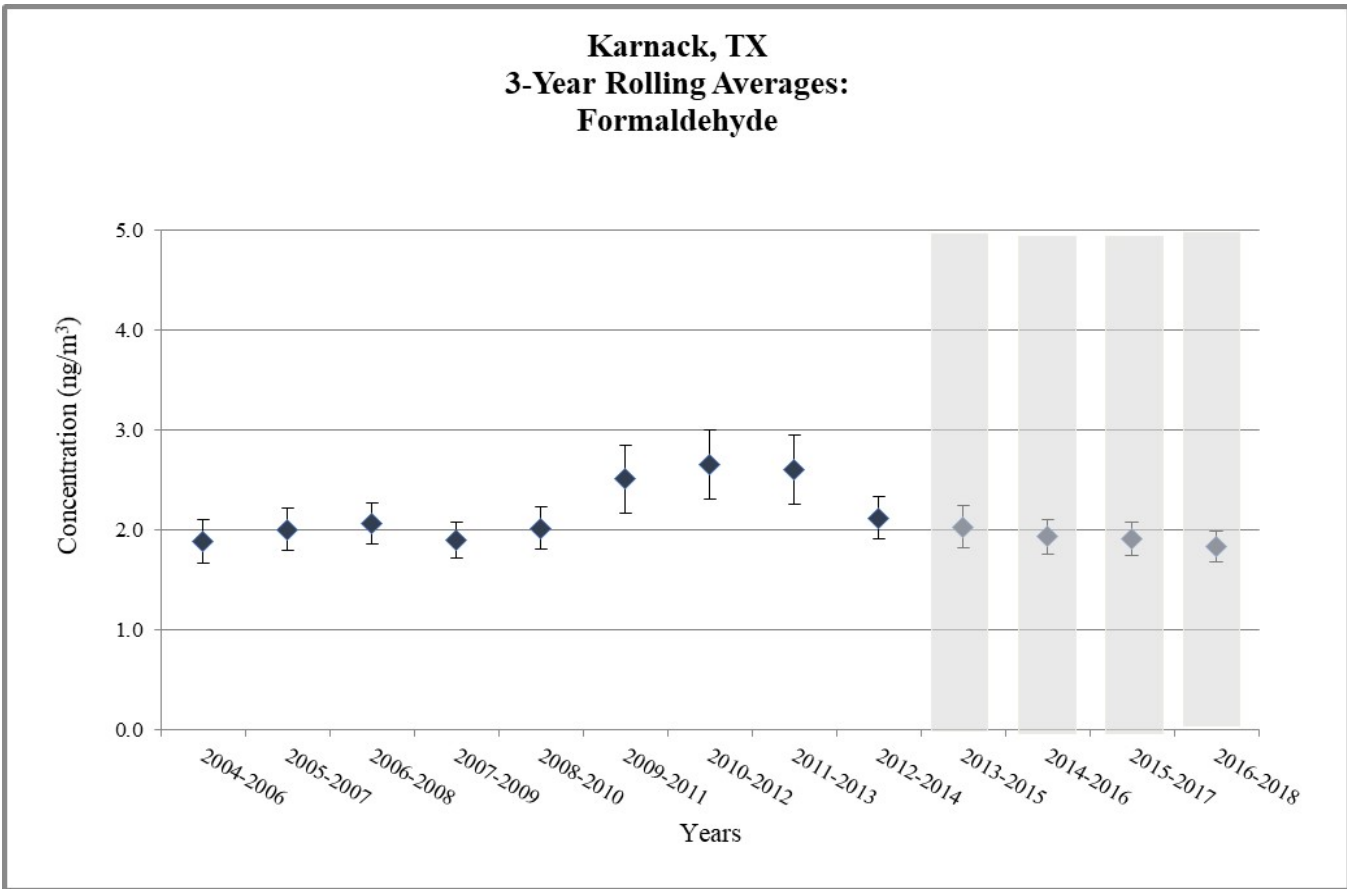
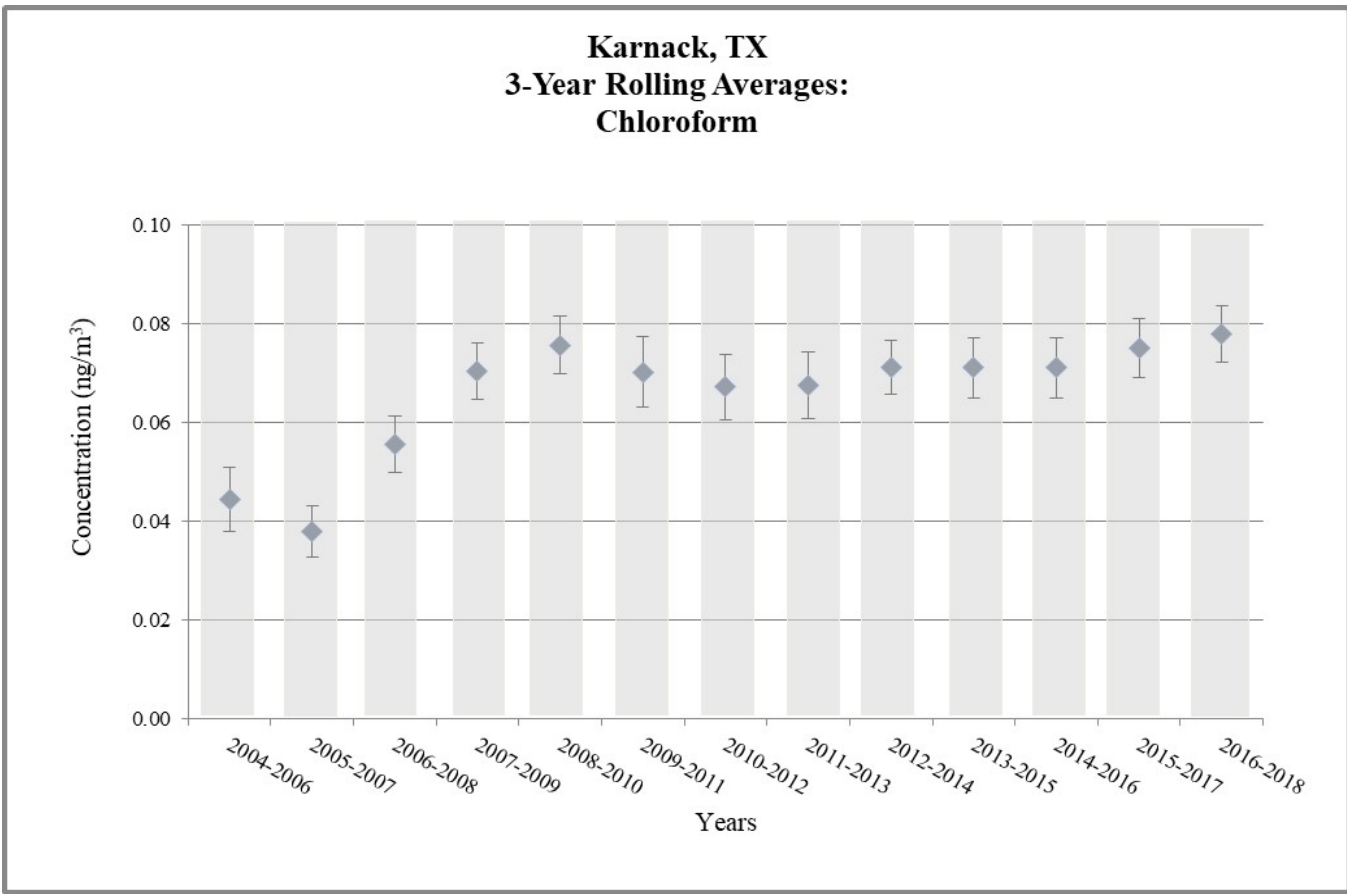


Figure 4. Karnack, TX - 3-Year Rolling Average Concentrations

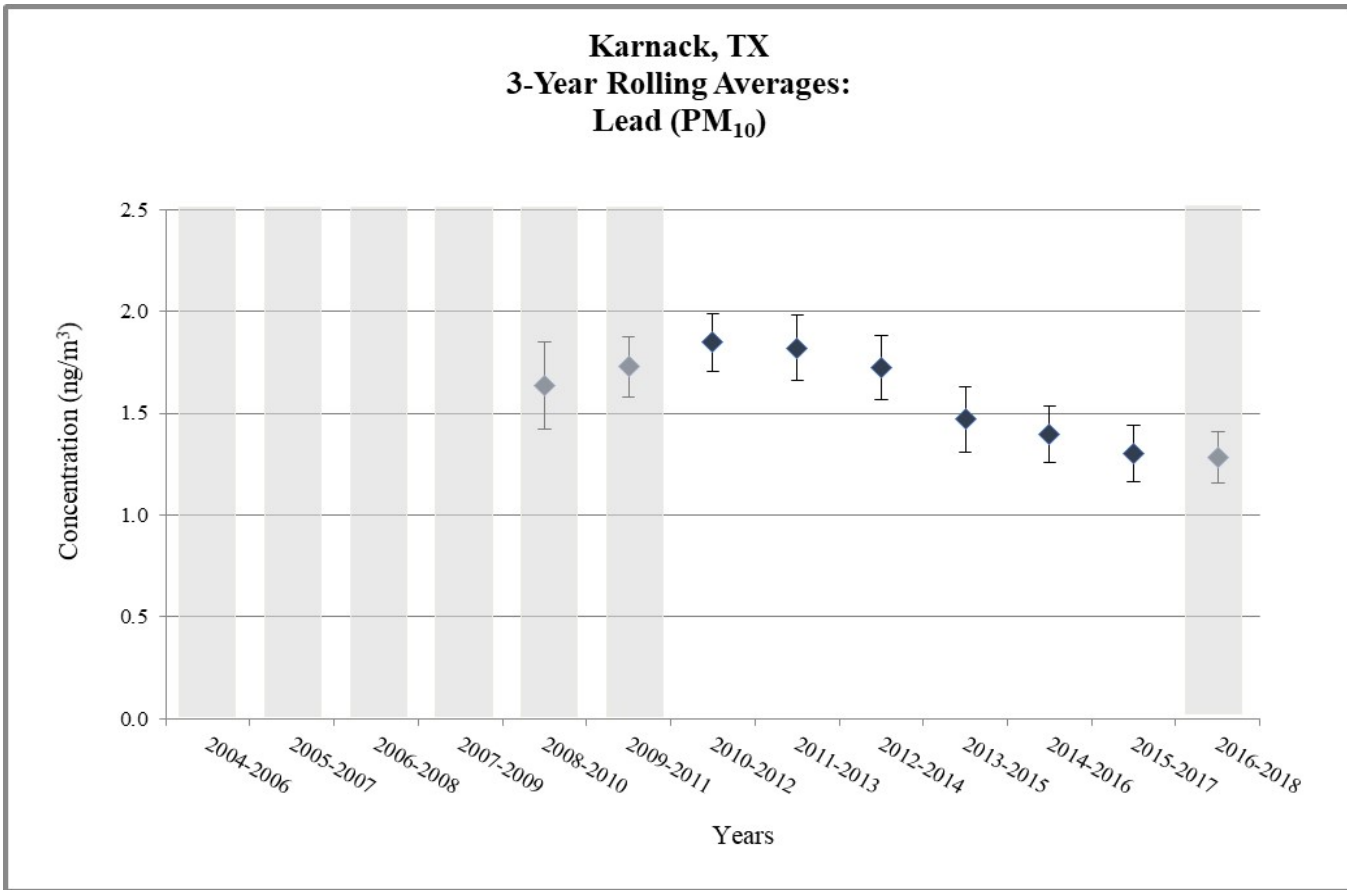
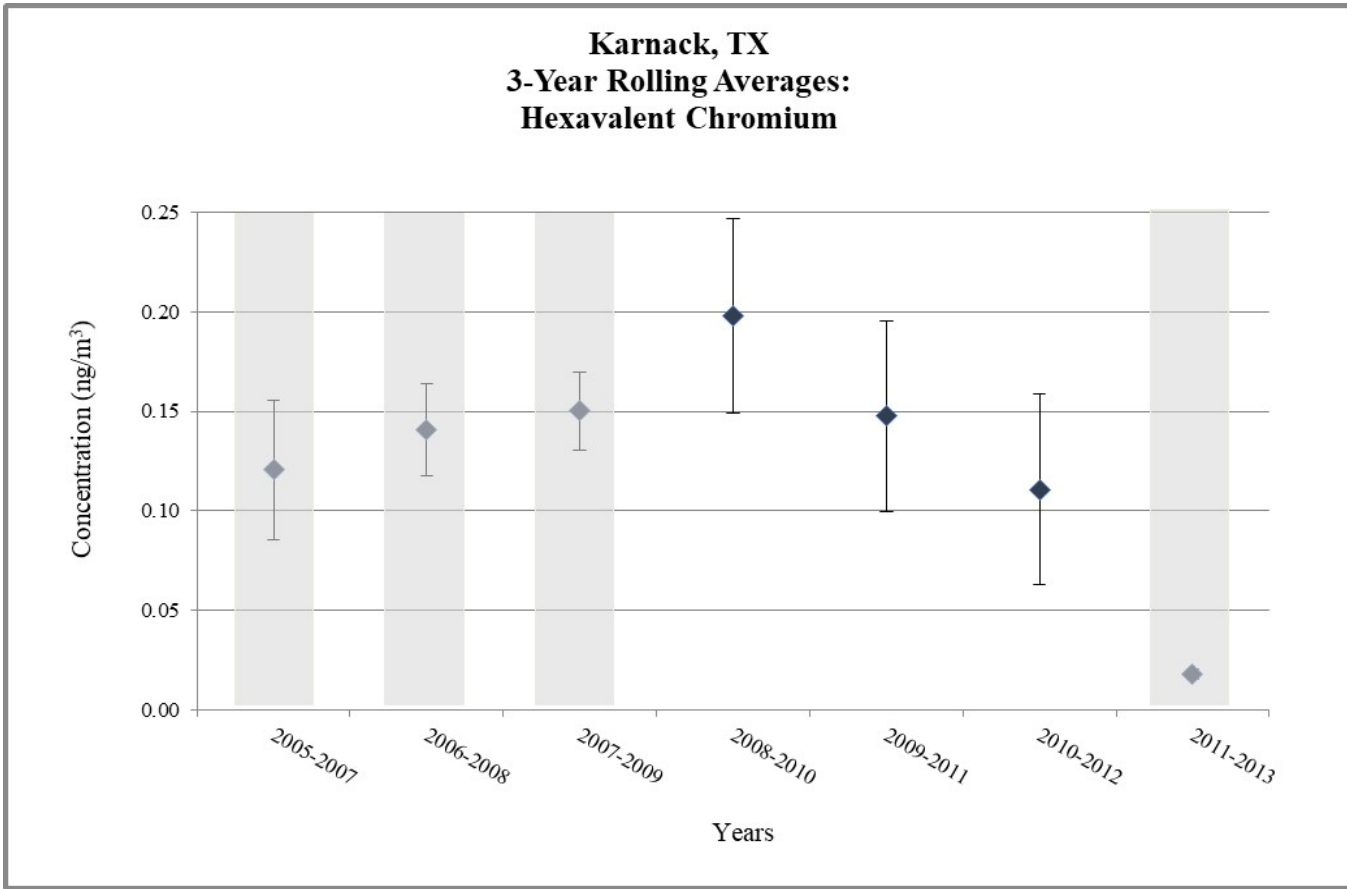


Figure 4. Karnack, TX - 3-Year Rolling Average Concentrations

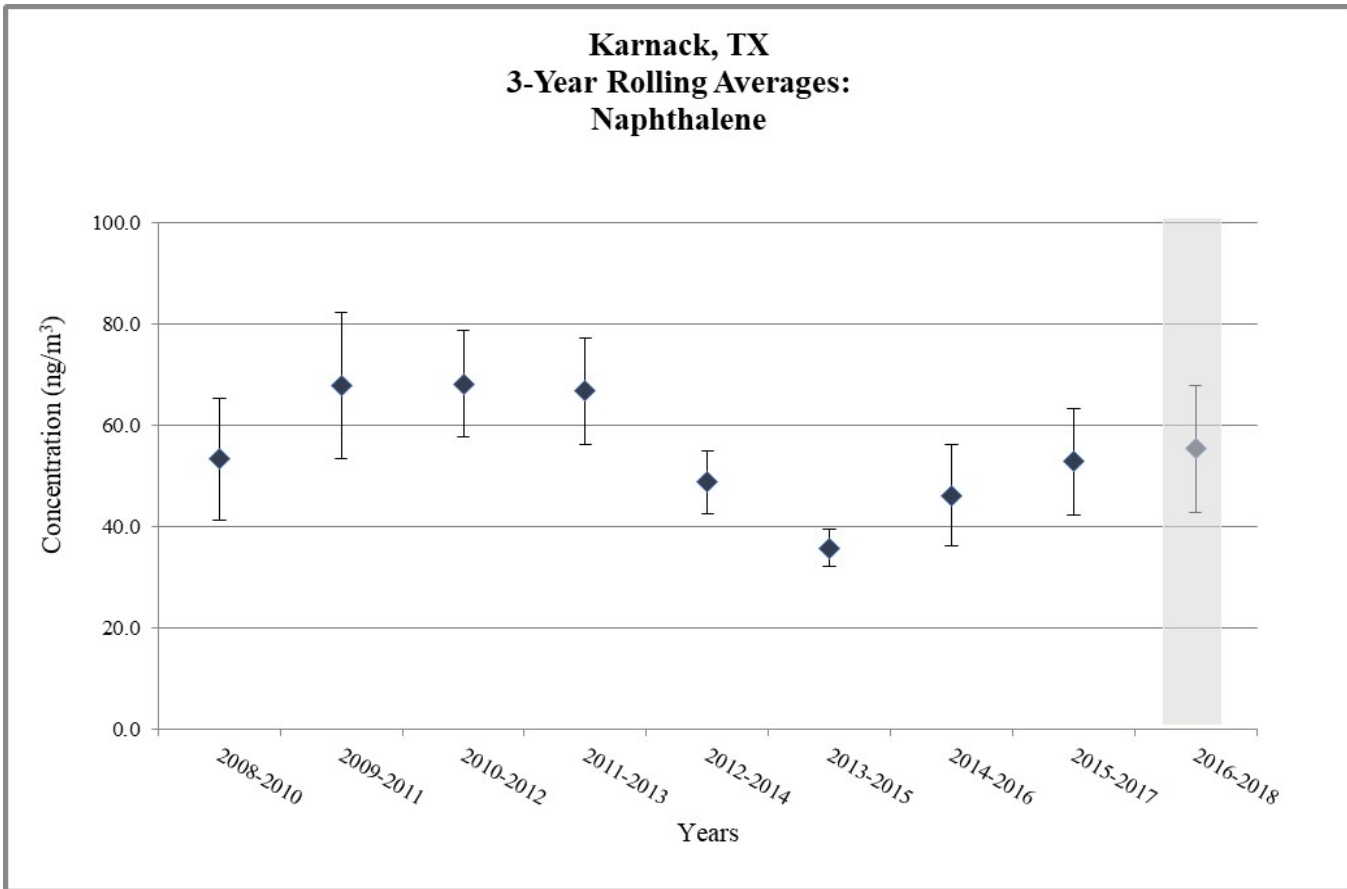
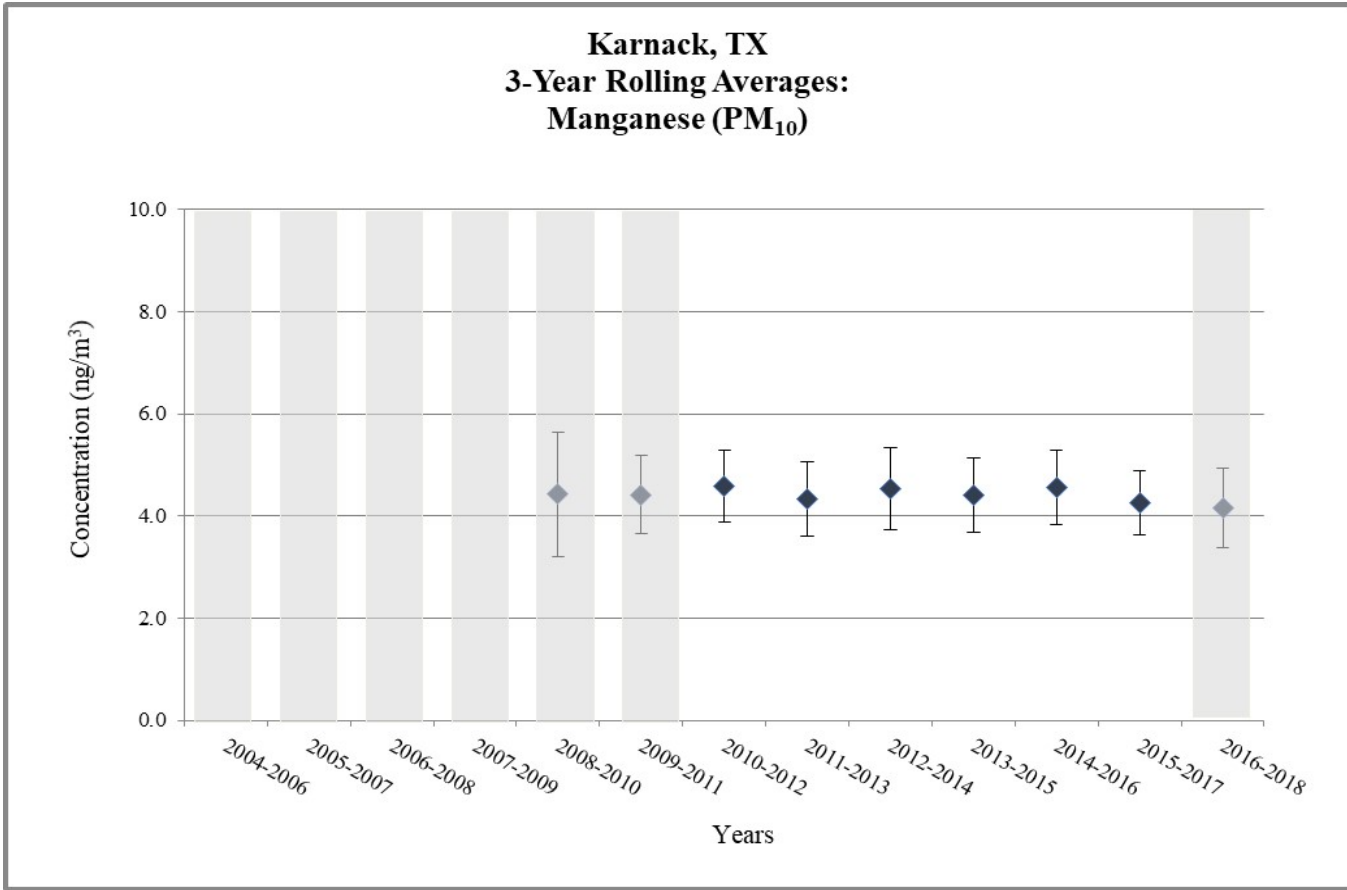


Figure 4. Karnack, TX - 3-Year Rolling Average Concentrations

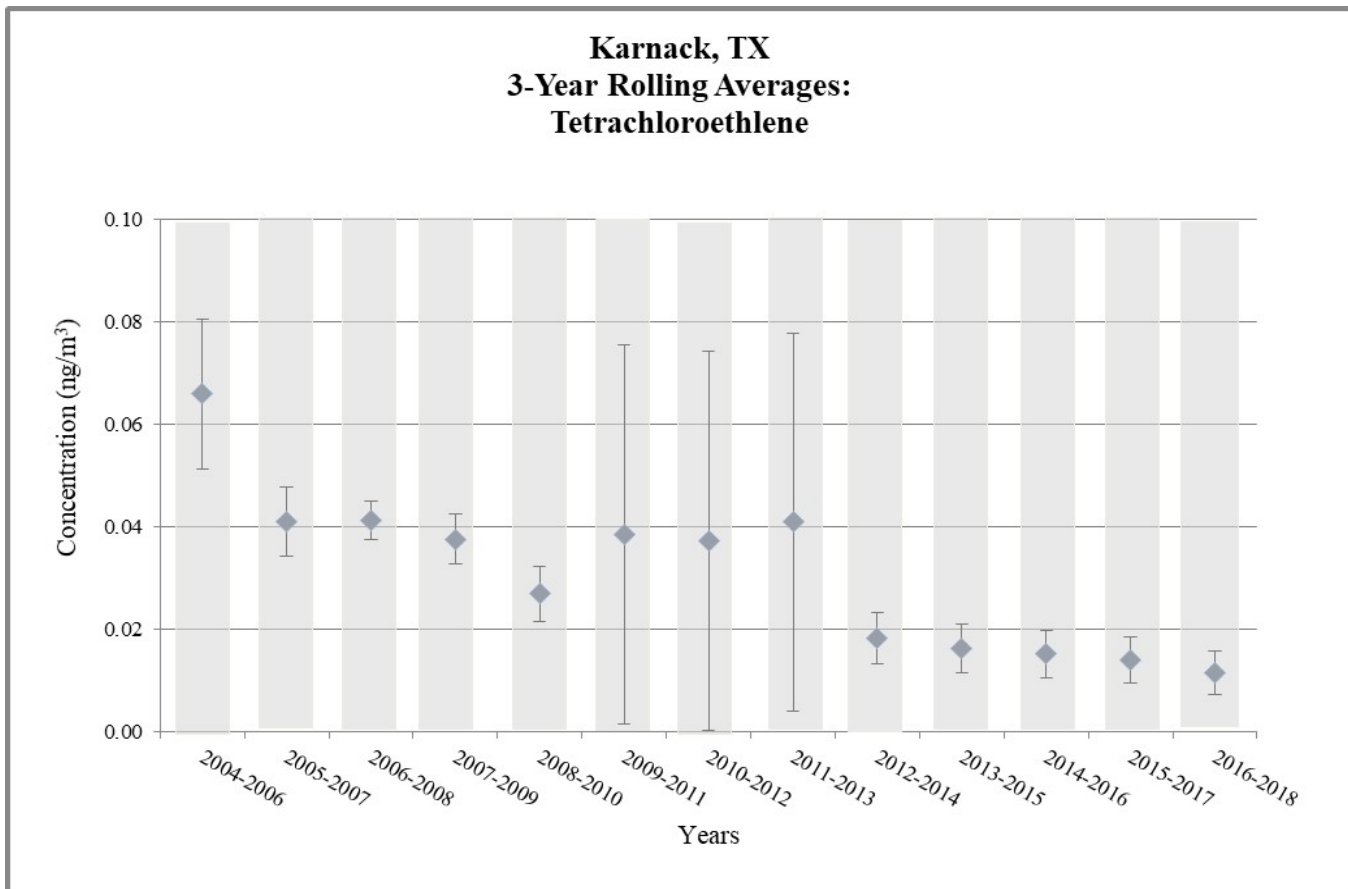
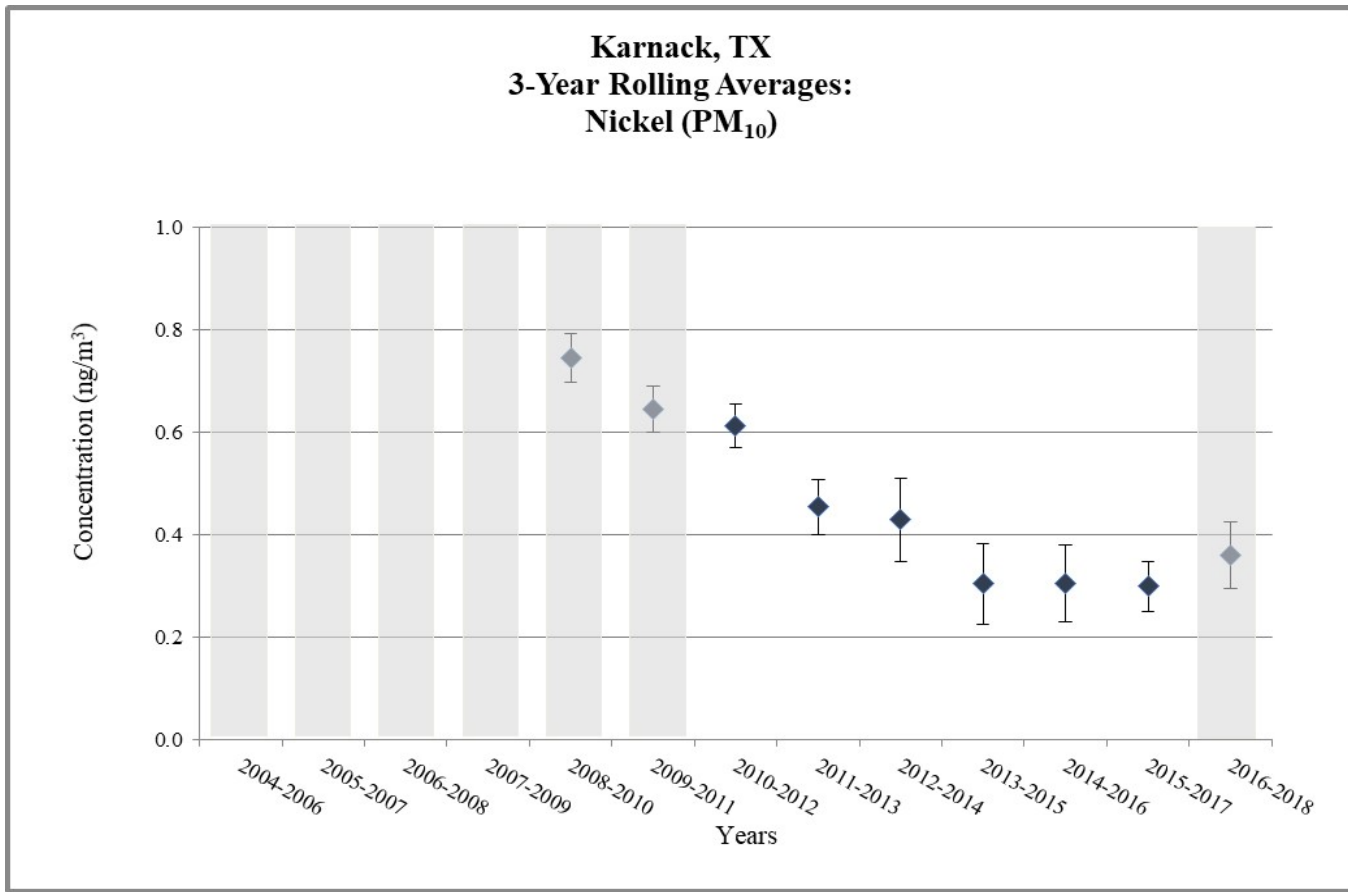
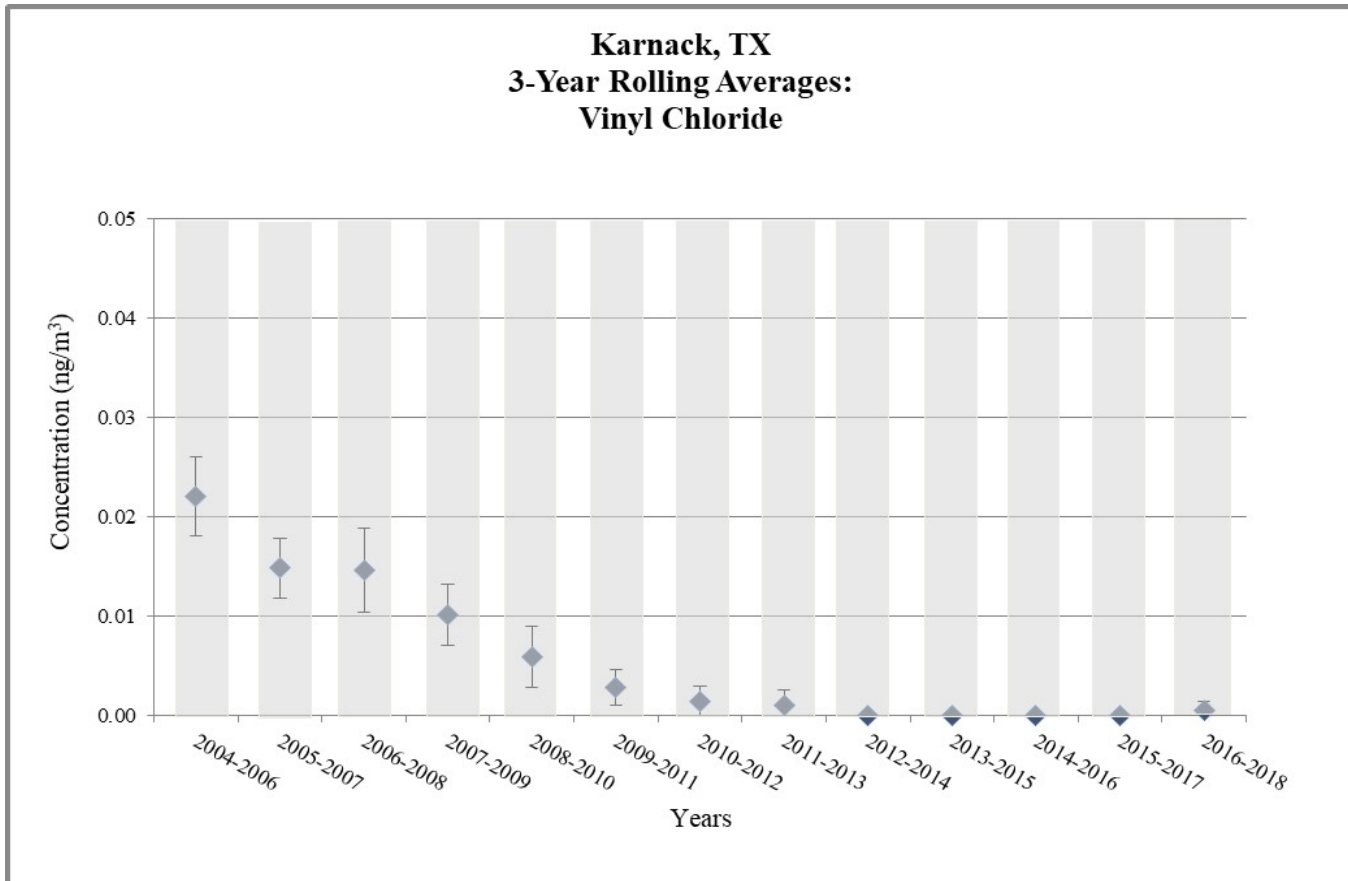
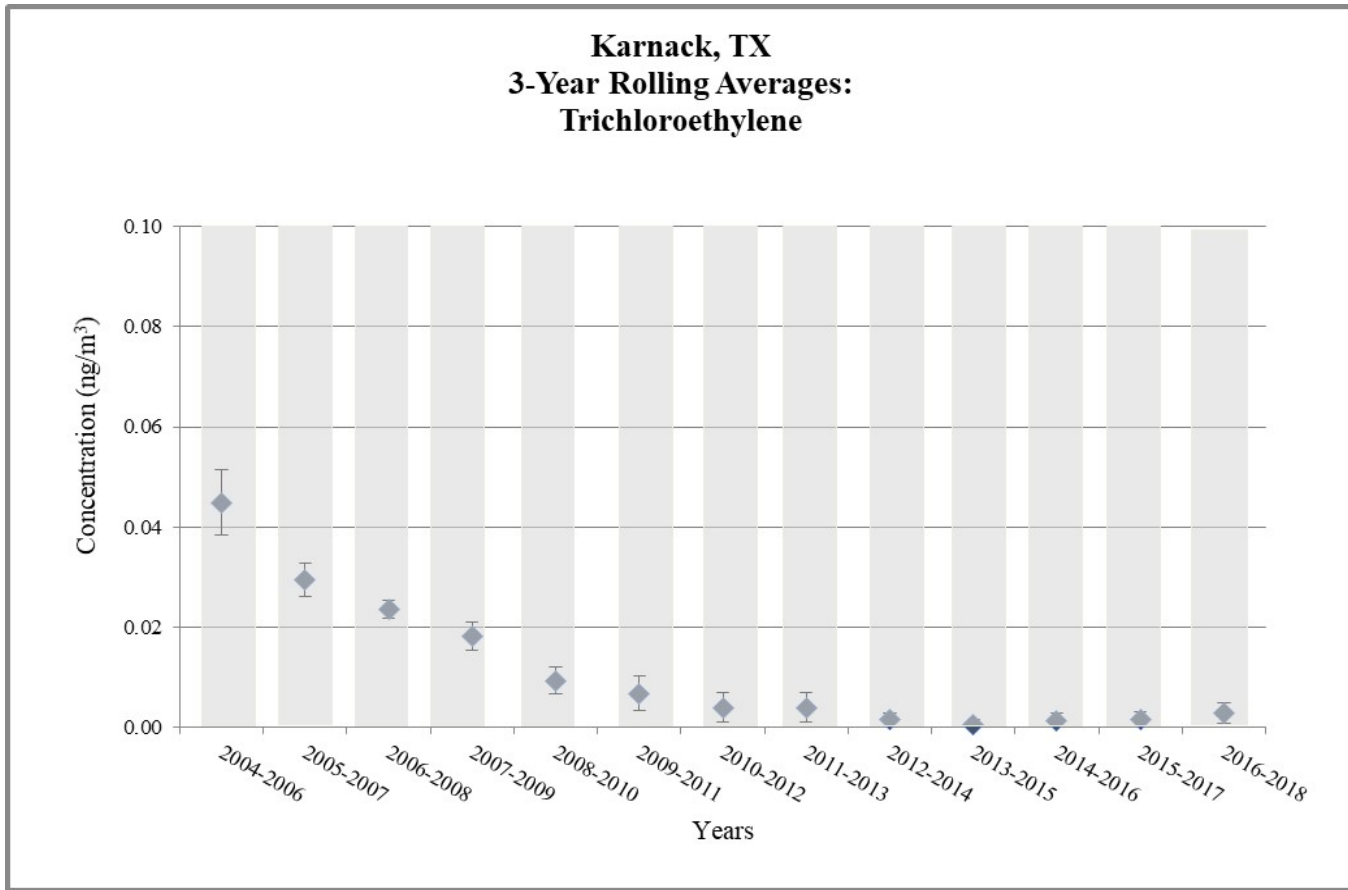


Figure 4. Karnack, TX - 3-Year Rolling Average Concentrations



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

Table 6. NATTS Network Assessment: MQO#1 - Completeness Percentage at Karnack, TX

Pollutant Group	Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Carbonyl	Acetaldehyde	89	92	97	92	95	95	97	93	97	97	95	97	97	100	--
Carbonyl	Formaldehyde	89	92	97	92	95	95	97	95	97	97	95	97	97	100	--
Chromium VI	Chromium VI	--	-- ^a	30	87	87	98	97	100	97	--	--	--	--	--	--
PAH	Benzo(a)pyrene	--	--	--	--	89	93	89	97	92	93	90	95	90	89	--
PAH	Naphthalene	--	--	--	--	89	93	89	97	92	93	90	95	90	89	--
PM ₁₀ Metals	Arsenic (PM ₁₀)	85	93	98	98	97	89	97	98	97	95	93	98	100	95	--
PM ₁₀ Metals	Beryllium (PM ₁₀)	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	97	98	97	95	93	98	100	95	--
PM ₁₀ Metals	Cadmium (PM ₁₀)	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	97	98	97	95	93	98	100	95	--
PM ₁₀ Metals	Lead (PM ₁₀)	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	97	98	97	95	93	98	100	95	--
PM ₁₀ Metals	Manganese (PM ₁₀)	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	97	98	97	95	93	98	100	95	--
PM ₁₀ Metals	Nickel (PM ₁₀)	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	97	98	97	95	93	98	100	95	--
VOC	Benzene	100	102	100	93	98	98	95	98	98	97	100	95	98	98	--
VOC	Butadiene, 1,3-	100	102	100	93	98	98	95	98	98	97	100	95	98	98	--
VOC	Carbon tetrachloride	100	102	100	93	98	98	95	98	98	97	100	95	98	98	--
VOC	Chloroform	100	102	100	93	98	98	95	98	98	97	100	95	98	98	--
VOC	Tetrachloroethylene	100	102	100	93	98	98	95	98	98	97	100	95	98	98	--
VOC	Trichloroethylene	100	102	100	93	98	98	95	98	98	97	100	95	98	98	--
VOC	Vinyl chloride	100	102	100	93	98	98	95	98	98	97	100	95	98	98	--

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 Karnack, TX

Pollutant Group	Pollutant Name	Target MDL	Units	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Carbonyl	Acetaldehyde	0.45	µg/m ³	0.31	0.33	0.33	0.32	0.32	0.32	0.32	0.33	0.16	0.16	0.16	0.22	0.27	0.27	0.27
Carbonyl	Formaldehyde	0.98/0.08 ^a	µg/m ³	0.08	0.08	0.08	0.08	0.08	0.10	0.10	0.11	0.13	1.54	1.54	2.11	1.34	1.34	1.34
Chromium VI	Chromium VI	0.08	ng/m ³	--	-- ^b	2.33	2.33	2.33	0.16	0.04	0.06	0.05	0.06	--	--	--	--	--
PAH	Benzo(a)pyrene	0.91	ng/m ³	--	--	--	--	0.10	0.09	0.06	0.07	0.07	0.60	0.60	0.60	0.60	0.60	0.60
PAH	Naphthalene	29.00	ng/m ³	--	--	--	--	0.02	0.01	0.06	0.004	0.006	0.02	0.02	0.02	0.02	0.02	0.02
PM ₁₀ Metals	Arsenic (PM ₁₀)	0.23	ng/m ³	3.74	5.65	9.57	0.06	0.06	0.07	0.58	0.26	0.26	0.35	0.30	0.13	0.22	0.22	-- ^b
PM ₁₀ Metals	Beryllium (PM ₁₀)	0.42	ng/m ³	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	0.07	0.14	0.07	0.07	0.07	0.07	0.07	0.07	0.07
PM ₁₀ Metals	Cadmium (PM ₁₀)	0.56	ng/m ³	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	0.05	0.07	0.054	0.05	0.05	0.05	0.04	0.04	-- ^b
PM ₁₀ Metals	Lead (PM ₁₀)	15.0	ng/m ³	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	0.01	0.001	0.001	0.01	0.01	0.002	0.002	0.01	-- ^b
PM ₁₀ Metals	Manganese (PM ₁₀)	5.0	ng/m ³	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	0.02	0.05	0.020	0.02	0.02	0.02	0.08	0.09	-- ^b
PM ₁₀ Metals	Nickel (PM ₁₀)	2.1	ng/m ³	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	-- ^b	0.12	0.08	0.019	0.11	0.11	0.10	0.06	0.06	-- ^b
VOC	Benzene	0.13	µg/m ³	7.62	7.62	7.62	6.64	6.65	6.65	6.65	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64
VOC	Butadiene, 1,3-	0.10	µg/m ³	6.00	6.00	5.97	5.97	5.99	5.99	5.99	5.97	5.97	5.97	5.97	5.97	5.97	5.97	5.97
VOC	Carbon tetrachloride	0.17	µg/m ³	14.71	14.71	14.80	9.99	10.01	10.01	10.01	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99
VOC	Chloroform	0.50	µg/m ³	2.00	2.00	2.05	2.05	2.06	2.06	2.06	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05
VOC	Tetrachloroethylene	0.17	µg/m ³	9.41	9.41	9.58	9.58	9.59	9.59	9.59	9.58	9.58	9.58	9.58	9.58	9.58	9.58	9.58
VOC	Trichloroethylene	0.5/0.2 ^a	µg/m ³	3.20	3.20	3.12	3.12	3.12	3.12	3.12	3.12	3.12	7.79	7.79	7.79	7.79	7.79	7.79
VOC	Vinyl chloride	0.11	µg/m ³	3.91	3.91	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95

	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 expected, but not sampled at this site for this year.

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

Pollutant Group	Pollutant Name	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Carbonyls	Acetaldehyde	8.7	7.4	2.0	-4.7	2.3	-17.4	-0.4	-7.6	-- ^a	-0.4	1.0	-- ^a	-3.5	1.5	-18.8
Carbonyls	Formaldehyde	6.5	6.7	-7.0	-2.8	8.0	-12.3	1.2	-5.8	-- ^a	-5.8	-5.6	-- ^a	-15.1	-7.9	-9.0
Chromium VI	Chromium VI	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	10.5 ^b	-- ^a	19.5	-6.5	--	--	--	--	--
PAH	Benzo(a)pyrene	--	--	--	-- ^c	-- ^c	-5.5	-41.3	-11.2	14.6	-- ^c	-19.4	-- ^c	-- ^c	-- ^c	-- ^c
PAH	Naphthalene	--	--	--	-- ^c	-- ^c	-9.2	-49.6	-23.7	32.8	-- ^c	-2.1	-- ^c	-- ^c	-- ^c	-- ^c
PM ₁₀ Metals	Arsenic (PM ₁₀)	-- ^c	10.5	4.5	8.1	27.8	4.8	15.7	2.7	13.5	4.1	-49.8	-- ^a	-5.0	15.6	-- ^a
PM ₁₀ Metals	Beryllium (PM ₁₀)	-- ^c	24.8	7.1	18.9	11.8	10.6	16.8	10.7	17.1	0.8	-- ^d	-- ^a	-12.2	-5.8	-5.1
PM ₁₀ Metals	Cadmium (PM ₁₀)	-- ^c	-5.1	-3.8	3.6	24.4	6.6	10.0	5.7	9.0	2.2	-- ^d	-- ^a	-12.5	-0.5	-9.4
PM ₁₀ Metals	Lead (PM ₁₀)	-- ^c	-0.8	1.3	-1.4	4.4	-15.8	-2.5	3.3	12.8	3.1	9.7	-- ^a	-8.9	-4.5	-11.4
PM ₁₀ Metals	Manganese (PM ₁₀)	-- ^c	12.2	-10.0	-14.1	-17.3	-26.2	10.4	4.3	11.0	-7.7	9.3	-- ^a	-8.2	1.5	-8.3
PM ₁₀ Metals	Nickel (PM ₁₀)	-- ^c	5.8	-0.1	-10.1	-0.8	-6.2	9.2	11.4	3.4	2.2	-- ^e	-- ^a	20.9	20.8	-0.6
VOC	Benzene	-- ^f	3.8	4.5	-6.2	21.5	-3.4	-5.5	13.2	-- ^a	4.5	8.9	-1.4	0.7	-13.5	-0.1
VOC	Butadiene, 1,3-	-5.6	-26.4	3.3	1.3	-0.6	-1.4	34.1	5.3	-- ^a	4.8	10.4	-10.3	1.2	-11.9	-1.3
VOC	Carbon tetrachloride	10.1	19.2	10.4	3.5	33.0	4.4	5.1	15.3	-- ^a	10.6	18.0	61.7	27.9	18.4	21.0
VOC	Chloroform	-- ^f	0.2	-12.4	-14.7	-1.4	-17.9	-17.5	-9.1	-- ^a	2.8	14.7	-11.2	-4.3	-7.9	-0.3
VOC	Tetrachloroethylene	-- ^f	-19.8	-24.3	-22.1	-39.4	-21.9	-39.8	5.7	-- ^a	1.0	-4.9	-29.0	-21.0	-30.4	-22.9
VOC	Trichloroethylene	-18.7	-14.3	-6.7	-16.3	6.3	-13.4	-23.9	0.0	-- ^a	-0.1	6.6	-15.2	-12.2	-14.9	-5.4
VOC	Vinyl chloride	-- ^f	-14.0	-3.4	-6.2	-4.2	-3.9	-4.7	-8.2	-- ^a	-0.9	22.7	-3.7	-2.8	-7.9	-- ^a

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 10.53% in 2010.

^c: Pollutant was sampled at this site and year, but no bias data were reported.

^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.

^f: Pollutant not included in the PT sample sent to the lab supporting this site.

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

Pollutant Group	Pollutant Name	Overall Method precision % CV														
		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Carbonyls	Acetaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbonyls	Formaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium VI	Chromium VI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PAH	Benzo(a)pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PAH	Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PM ₁₀ Metals	Arsenic (PM ₁₀)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PM ₁₀ Metals	Beryllium (PM ₁₀)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PM ₁₀ Metals	Cadmium (PM ₁₀)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PM ₁₀ Metals	Lead (PM ₁₀)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PM ₁₀ Metals	Manganese (PM ₁₀)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PM ₁₀ Metals	Nickel (PM ₁₀)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOC	Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOC	Butadiene, 1,3-	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOC	Carbon tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOC	Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOC	Tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOC	Trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOC	Vinyl chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

	A-rated: ≤ 15% CV
	B-rated: Between 15%CV to 25% CV
	Does Not Meet: >25% CV or did not report Precision
--	No data available

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

Pollutant Group	Pollutant Name	Analytical Method precision % CV															
		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Carbonyls	Acetaldehyde	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
Carbonyls	Formaldehyde	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
Chromium VI	Chromium VI	--	--	--	--	--	--	--	--	--	4.3	--	--	--	--	--	--
PAH	Benzo(a)pyrene	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
PAH	Naphthalene	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
PM ₁₀ Metals	Arsenic (PM ₁₀)	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
PM ₁₀ Metals	Beryllium (PM ₁₀)	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
PM ₁₀ Metals	Cadmium (PM ₁₀)	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
PM ₁₀ Metals	Lead (PM ₁₀)	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
PM ₁₀ Metals	Manganese (PM ₁₀)	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
PM ₁₀ Metals	Nickel (PM ₁₀)	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
VOC	Benzene	--	--	--	3.4	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
VOC	Butadiene, 1,3-	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
VOC	Carbon tetrachloride	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
VOC	Chloroform	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
VOC	Tetrachloroethylene	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
VOC	Trichloroethylene	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
VOC	Vinyl chloride	--	--	--	--	--	--	--	--	--	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a

	A-rated: ≤ 15% CV
	B-rated: Between 15%CV to 25% 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

Appendix A. Equipment Inventory

Pollutant Type	Year(s)	Manufacturer/Model, Extraction Type, and Year
<i>Sampling Equipment</i>		
Carbonyls	2004-2009	ATEC 8000 Cartridge Sampler (Year Deployed: 2004)
	2010-2014	Custom-built (Year Deployed: 2013)
Chormium VI	2005	NONE
	2006-2013	RM Environmental Systems 924 Toxic Air Sampler (Year Deployed: <2006)
PAHs	2008-2014	Tisch Environmental TE-1000 PUF Sampler (Year Deployed: 2007)
PM ₁₀ Metals	2004-2008	Wedding RFPS-1087-066 Hi_Vol Sampler (Year Deployed: <2004)
	2009-2012	Wedding & Associates 600 Hi-Vol Sampler/Tisch Sampler (Year Deployed: 2009)
	2013	Wedding & Associates 600 Hi-Vol Sampler/Tisch Sampler (Year Deployed: 2013)
	2014	Tisch PM10 Sampler (Year Deployed: 2013)
VOCs	2004-2014	Entech 1800 Dual Channel Field Sampler (Year Deployed: 2004)
<i>Analytical Equipment</i>		
Carbonyls	2004-2011	Waters Alliance 2695/996 PDA detection, HP/Agilent 1050 HPLC (Year Deployed: <2003)
	2012-2014	WatersAcquity/PDA detection UPLC (Year Deployed: 2012)
Chormium VI	2005-2005	NONE
	2006-2009	Metrohm-Peak IC (Year Deployed: unknown)
	2010-2013	Dionex 300 IC (Year Deployed: 2001)
PAHs	2008-2010	HP/Agilent 6890/5973 GC/MS (Year Deployed: 1999)
	2011-2014	HP/Agilent 7890/5970C GC/MS (Year Deployed: 2011)
PM ₁₀ Metals	2004-2010	Thermo/VG Elemental PQ 3 ICP-MS (Year Deployed: unknown)
	2011-2014	GC/Bruker 820-MS (Year Deployed: 2010)
VOCs	2004-2009	HP/Agilent 6890/5973 GC/MS (Year Deployed: 2002)
	2010-2013	HP/Agilent 7890/5975D GC/MS (Year Deployed: 2010)
	2014	HP/Agilent 7890/5975D GC/MS (1); HP/Agilent 7890/5977A (2) (Year Deployed: 2010 (1); 2014 (2))
<i>Preconcentrator Equipment</i>		
VOCs	2004-2009	Entech 7100A (Year Deployed: 2002)
	2010	Entech 7150 (Year Deployed: 2010)
	2011	Entech 7100A (2 units) (Year Deployed: 2002, 2010)
	2012	Entech 7100A (Year Deployed: 2010)
	2013-2014	Entech 7100A (1); Entech 7200 (2) (Year Deployed: 2010 (1); 2013 (2))
<i>Standards Preparation Equipment</i>		
VOCs	2004-2009	(1) Custom-built, (2) Druck pressure gauge, (3) SGE syringe ((1) Dynamic Dilution, (2) Pressure Dilution, (3) Syringe Dilution) (Year Deployed: unknown)
	2007-2009	Entech 3100 (1); Entech 3100A (2) (Hot) (Year Deployed: 1999 (1); 2007 (2))
	2010-2014	certified Druck DPI 600 pressure calibrator (Year Deployed: unknown)

Appendix A. Equipment Inventory

Pollutant Type	Year(s)	Manufacturer/Model, Extraction Type, and Year
<i>Canister Cleaning Equipment</i>		
VOCs	2004-2006	Entech 3100 (Hot) (Year Deployed: 1999)
	2007-2010	Entech 3100 (1); Entech model 3100A (2) (hot) (Year Deployed: 1999 (1); 2007 (2))
	2011-2014	Entech Model 3100A (Hot) (Year Deployed: 2007)
<i>PM₁₀ Extraction Equipment</i>		
PM ₁₀ Metals	2004-2009	Unknown (Microwave) (Year Deployed: unknown)
	2010-2014	Environmental Express (Hotblock) (Year Deployed: 2010)
<i>Chromium VI Extraction Equipment</i>		
Chromium VI	2005	NONE
	2006-2009	unknown (Year Deployed: unknown)
	2010-2010	Branson 8510 (Sonicator) (Year Deployed: 2001)
	2011-2011	Branson 8510 Sonicator/ Branson Shaker (Year Deployed: 2001/2011)
	2012-2013	Branson Shaker (Year Deployed: 2011)
<i>PAHs Extraction Equipment</i>		
PAHs	2008	Dionex -300 (ASE) (Year Deployed: 2003)
	2009-2014	Dionex -350 (ASE) (Year Deployed: 2011)