Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: Michael Honeycutt, Ph.D. **Date:** March 5, 2009
Director, Toxicology Division

From: Tracie Phillips, Ph.D. TP
Toxicology Division, Chief Engineer's Office

Subject: Toxicological Evaluation of the Midlothian, Texas Ambient Air Collection and Analytical Chemical Analysis Contract First Quarter Sampling Data

Background

On May 9, 2008, the Texas Commission on Environmental Quality (TCEQ) Toxicology Division (TD) issued a Request for Proposals (RFP) for the collection and analytical chemical analysis of ambient air samples in Midlothian, Texas. The contract was awarded to URS Corporation on August 22, 2008. The purpose of collecting these samples is to attempt to answer citizen questions and concerns with regard to air quality in their city, as well as potentially fill data gaps noted in the Texas Department of State Health Services (TDSHS) draft health consultation entitled, *Midlothian Area Air Quality Part 1: Volatile Organic Compounds (VOCs) and Metals* (hereafter referred to as the Draft Midlothian Health Consultation).

Identified citizen questions include:

- How are industries in Midlothian, TX affecting air quality?
- Is the TCEQ every 6th day monitoring site an accurate representation of daily air concentrations in Midlothian, TX?
- What is the air quality near schools and parks in Midlothian, TX?
- What percentage of total chromium does chromium VI represent in Midlothian, TX?

Sampling for this project will consist of four separate events (quarters) over a one-year time span. For each sampling quarter, 24-hour samples will be collected for five consecutive days at five different sampling locations. One sampling day each quarter will coincide with the current every 6th day TCEQ sampling schedule at the TCEQ CAMS 52 sampling location in Midlothian, TX. There are two types of sampling locations for this project; stationary and mobile. Stationary sites will be sampled each of the four quarters while only one mobile site will be sampled each quarter.

Stationary sites include:

- Collocation with CAMS 52 (2725 Old Fort Worth Rd)
- Downwind of Gerdau Ameristeel (1291 E Wyatt Rd)
- Jaycee Park (1711 Meadow Ln)
- North of Ash Grove (Water Treatment Plant; 440 Tayman Dr)

Mobile sites include:

- Triangle Park (200 E Ave F)
- Midlothian High School (923 S 9th St)
- J.A. Vitovsky Elementary School (333 Church St)
- Mountain Peak Elementary School (5201 FM 663)

The first sampling quarter was completed December 6 – 10, 2008. This quarter sampled each of the four stationary sites as well as Triangle Park for the mobile sites. The TD received the *Data Report for the First Sampling Round: December 6 – 10, 2008* from URS Corporation on January 29, 2009. This memorandum will highlight the TD evaluation of that data.

Evaluation

Ambient air concentrations of volatile organic compounds (VOCs), aldehydes, and carbonyls (hereafter referred to collectively as VOCs) were measured at four of the five 1st quarter sampling sites, as decided by the citizen advisory committee: CAMS 52 collocation, Jaycee Park, Water Treatment Plant, and Triangle Park. Ambient air concentrations of metals were measured at all five of the 1st quarter sampling sites: Wyatt Rd, CAMS 52 collocation, Jaycee Park, Water Treatment Plant, and Triangle Park. This 1st quarter data was compared to historical data collected by the TCEQ at the CAMS 52 (Old Fort Worth Rd) monitoring site and the CAMS 302 (Wyatt Rd) monitoring site. VOC concentrations were compared to historical levels at the TCEQ CAMS 52 site, while PM_{10} metals will be compared to past levels at the TCEQ CAMS 302 site as there are not historical PM_{10} metals data for CAMS 52. Data evaluations include:

- Screening Value Comparisons
- Historical Data Comparisons
- Wind Rose, Day, and Site Comparisons
- Percent Hexavalent Chromium of Total Chromium
- Collocated monitor comparisons

For the purposes of this evaluation only five compounds will be highlighted below: aluminum, total chromium, hexavalent chromium, manganese, and benzene. These four metals represent the ones which citizens appear to be the most concerned about, while benzene is a good benchmark chemical for all VOCs. For non-detected compounds, half the detection limit (DL) was used as a proxy value instead of zero (i.e., TD replaced all non-detects in the raw data with ½ their respective DL). It is important to note that field blanks, field duplicates, and laboratory blanks indicate some level of metals are inherently present on the filters, which may bias all metals results high. However, all metals results are well below TCEQ health-based comparison values; therefore, any bias this may introduce is not relevant to this evaluation.

VOCs

Screening Value Comparison

The TCEQ TD required a target compound list of 13 chemicals. However, the lab which URS contracted with analyzed a full suite of 60 VOCs; therefore, the TD evaluated all 60 compounds. The full target analyte list can be found in Table 1 below. Ambient air concentrations of these 60 VOCs were measured at four of the five 1st quarter sampling sites, as decided by the citizen advisory committee: CAMS 52 collocation, Jaycee Park, Water Treatment Plant, and Triangle Park. All measured concentrations of VOCs were well below their respective appropriate short-term comparison levels (i.e., short-term ESLs or, where available, acute Reference Values (ReVs)). Therefore, we would not expect short-term exposures to these concentrations to be of a health concern. As 5-day VOC data are not representative of long-term concentrations (i.e., annual averages at a minimum), these data cannot be appropriately evaluated using long-term comparison levels.

Table 1. Analyte list for VOCs and PM_{10} Metals.

VOCs			
1,1,1-Trichloroethane	Acrylonitrile	cis-1,3-Dichloropropene	n-Octane
1,1,2,2-Tetrachloroethane	Benzene	Dibromochloromethane	o-Dichlorobenzene
1,1,2-Trichloroethane	Bromochloromethane	Dichlorodifluoromethane	o-Xylene
1,1-Dichloroethane	Bromodichloromethane	Dichloromethane	p-Dichlorobenzene
1,1-Dichloroethene	Bromoform	Dichlorotetrafluoroethane	Propylene
1,2,4-Trichlorobenzene	Bromomethane	Ethyl Acrylate	Styrene
1,2,4-Trimethylbenzene	Carbon Disulfide	Ethyl tert-Butyl Ether	tert-Amyl Methyl Ether
1,2-Dibromoethane	Carbon Tetrachloride	Ethylbenzene	Tetrachloroethylene
1,2-Dichloroethane	Chlorobenzene	Hexachloro-1,3-butadiene	Toluene
1,2-Dichloropropane	Chloroethane	m,p-Xylene	trans-1,2-Dichloroethylene
1,3,5-Trimethylbenzene	Chloroform	m-Dichlorobenzene	trans-1,3-Dichloropropene
1,3-Butadiene	Chloromethane	Methyl Ethyl Ketone	Trichloroethylene
Acetonitrile	Chloromethylbenzene	Methyl Isobutyl Ketone	Trichlorofluoromethane
Acetylene	Chloroprene	Methyl Methacrylate	Trichlorotrifluoroethane
Acrolein	cis-1,2-Dichloroethylene	Methyl tert-Butyl Ether	Vinyl chloride
PM_{10} Metals			
Aluminum	Chromium	Molybdenum	Uranium
Antimony	Cobalt	Nickel	Vanadium
Arsenic	Copper	Selenium	Zinc
Barium	Lead	Silver	--
Beryllium	Manganese	Thallium	--
Cadmium	Mercury	Thorium	--

Historical Data Comparisons
The TD also compared VOC levels to historical 24-hour every 6th-day VOC canister data from CAMS 52. Validated 24-hour canister data are currently available for March 29, 1997 to July 29, 2008. As more data become available and are validated the TD will continue the comparison.

In this section, benzene is highlighted as it is a good benchmark chemical for VOCs; it is the national risk driver according to the USEPA National-Scale Air Toxics Assessment (NATA) as well as a multi-source chemical (i.e., mobile, industrial, natural). The TD compared the 1st quarter data to all historical data for benzene at the TCEQ CAMS 52 monitor. The CAMS 52 collocated site and the Jaycee Park site values for the 1st quarter are within the range of the 50th to the 75th percentile of the historical data (Tables 2 & 3). Therefore, these data values are within the range of expected levels. The Triangle Park and the Water Treatment Plant sites are around the 50th percentile and the 25th percentile, respectively, of the historical data (Tables 2 & 3). Based on the historical data, these values are within the typical range of TCEQ's measurements in this area.

Historical benzene data (all months and December alone) were graphed along with the 1st quarter data (Figures 1 & 2). These graphs allow for an easy visual comparison of 1st quarter data as compared to historical benzene data. While there have been a few benzene peaks in the past, the historical data (all

months) and the 1st quarter data appear to be fairly consistent (Figure 1). The December data appear to be similar to the 1st quarter data, which indicate these values are typical of this time of year (Figure 2). The short-term health comparison value for benzene is 180 ppb_v, and all values (historical and 1st quarter data) are well below this value. The long-term health comparison value for benzene is 1.4 ppb_v. An appropriate comparison to long-term health-protective values requires data for at least one year (a conservative approach as the value is developed to protect for a lifetime of exposure), or for multiple years if available. Multiple exceedances of the long-term value on a short-term basis throughout the year would be a cause for concern if such exceedances lead to the yearly average exceeding the long-term comparison value. However, based on the consistency of the 1st quarter data with the historical data, the TD can infer that as long as these values stay somewhat consistent, benzene is not of a health concern in this area for long-term exposure.

Table 2. Percentile ranges for the historical benzene data (all months).

Benzene (ppb_v)	
95th Percentile	0.4485
75th Percentile	0.27
50th Percentile	0.21
25th Percentile	0.1475
5th Percentile	0.08

Table 3. 1st Quarter benzene data compared to historical (all months) percentiles.

Site	Date	Benzene (ppb_v)	
CAMS52	12/6/2008	0.225	Within the Range of 50 - 75% Percentile
	12/7/2008	0.237	
	12/8/2008	0.37	
	12/9/2008	0.194	
	12/10/2008	0.202	
JPTX	12/6/2008	0.194	Within the Range of 50 - 75% Percentile
	12/7/2008	0.239	
	12/8/2008	0.245	
	12/9/2008	0.231	
	12/10/2008	0.22	
TPTX	12/6/2008	0.209	Around the 50% Percentile
	12/7/2008	0.211	
	12/8/2008	0.214	
	12/9/2008	0.151	
	12/10/2008	0.171	
WTPTX	12/6/2008	0.154	Around the 25% Percentile
	12/7/2008	0.151	
	12/8/2008	0.145	
	12/9/2008	0.15	
	12/10/2008	0.148	

CAMS52 = CAMS 52 Collocated Site
JPTX = Jaycee Park Site
TPTX = Triangle Park Site
WTPTX = Water Treatment Plant Site

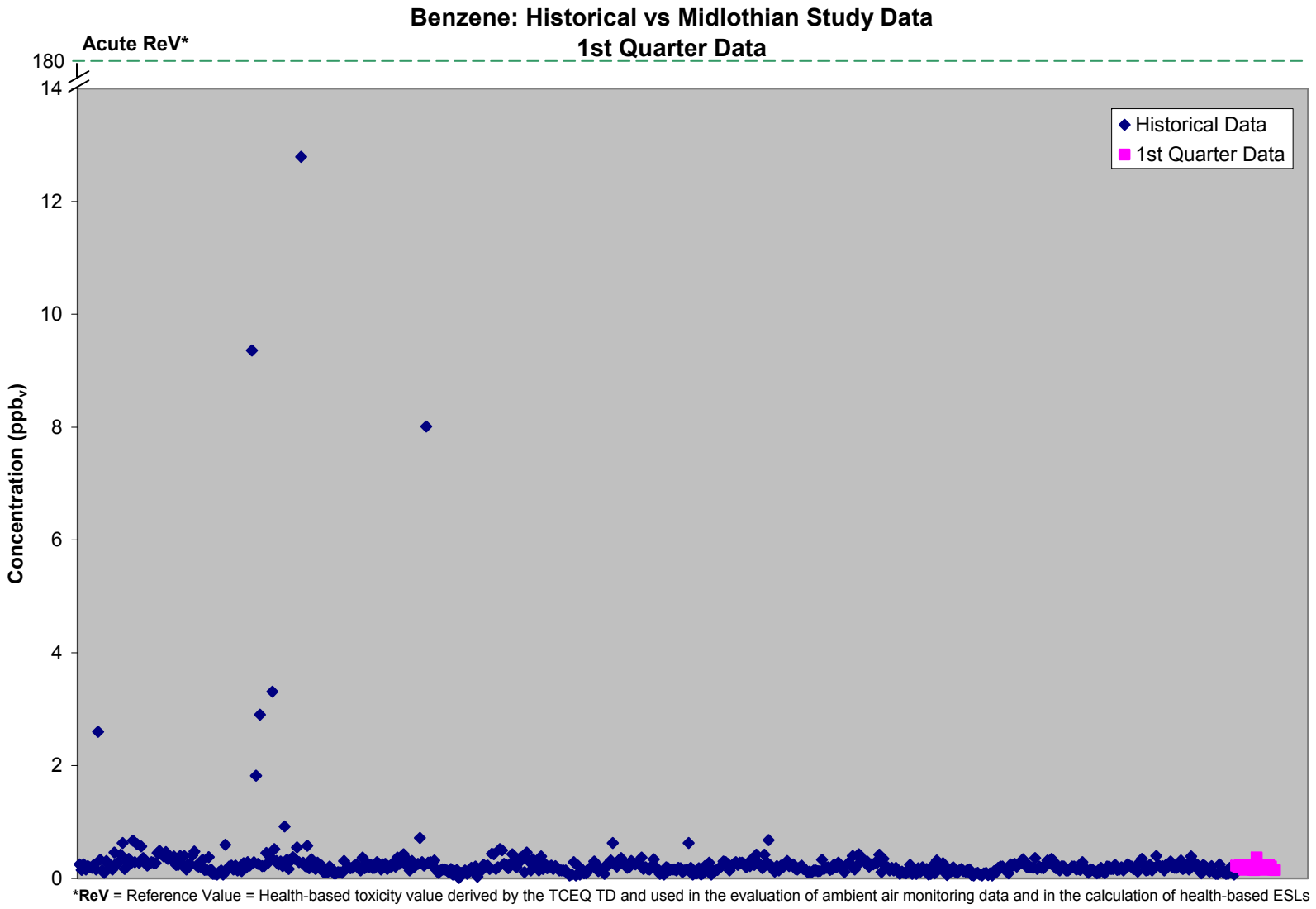


Figure 1. Historical and 1st Quarter Benzene Data.

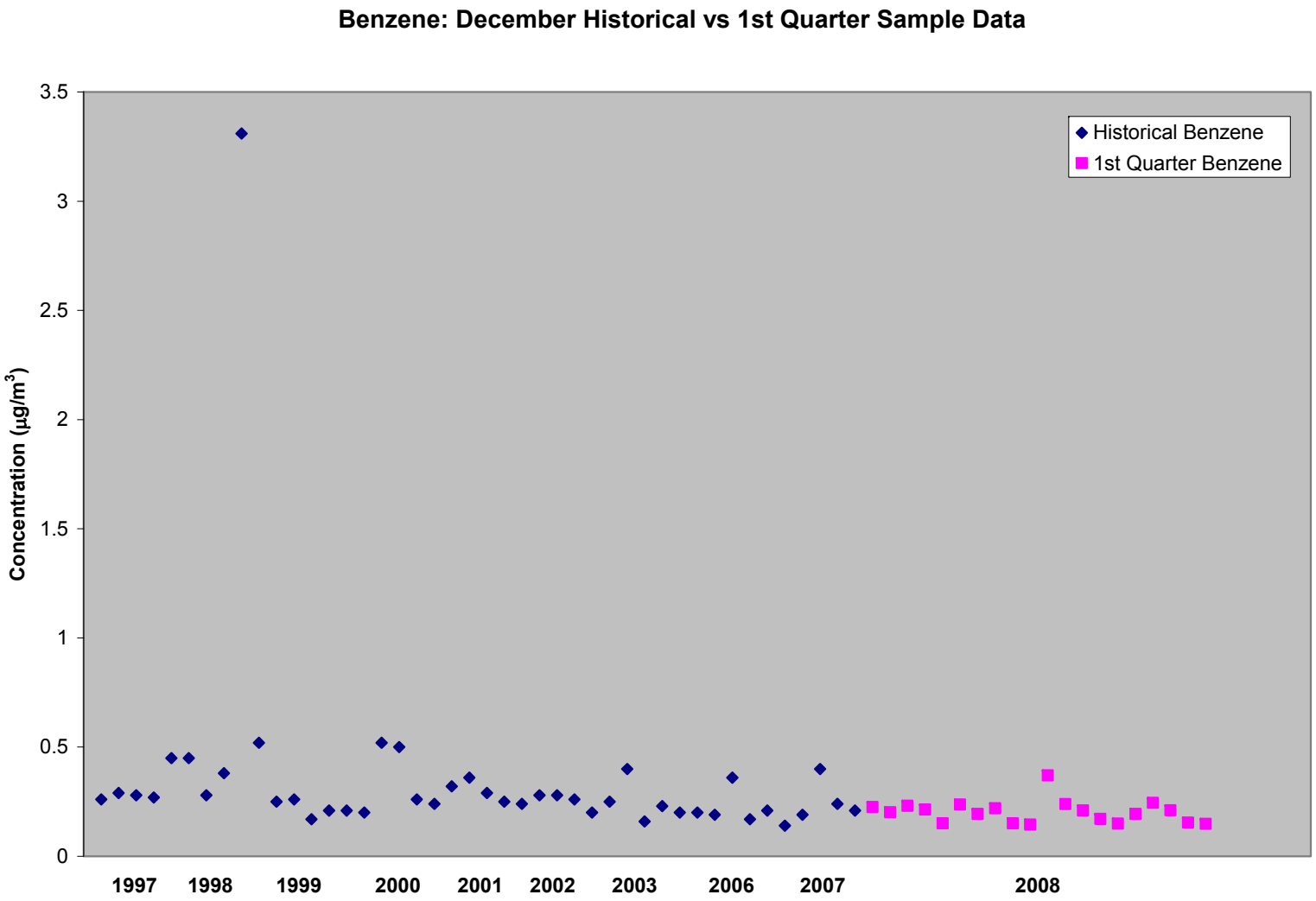


Figure 2. Historical December and 1st Quarter Benzene Data.

Day, Site, and Wind Rose Comparisons
The TD compared the 24-hour 1st quarter data between days and sampling sites, and evaluated the potential for wind direction to affect the measured concentrations. Benzene concentrations were fairly consistent and similar for all five days of sampling, at the four sites in which VOCs were measured, with no indication that wind direction affected the measured concentrations (see the benzene data in Figures 9 – 13 and Tables 6 – 10). Mobile sources (e.g., cars) would be expected to be the major contributor to VOC emissions in this area.

Collocated Monitor Comparison
One of the sampling sites is a monitor collocated with the TCEQ CAMS 52 monitor. As the TCEQ lab currently has a backlog for VOC data of 3 – 4 months with data validation requiring an additional 1 – 2 months, data from the collocated monitor are not currently available for comparison. Once the data from the TCEQ every 6th day sampling date of December 8, 2008 are received and validated, the TD will compare data from these two sites.

Metals
Screening Value Comparison
Ambient air concentrations of PM_{10} metals were measured at each of the five 1st quarter sampling sites on December 6 – 10, 2008. An analyte list of the metals measured can be found in Table 1. All measured concentrations of metals were well below their respective short-term ESLs. Therefore, we would not expect short-term exposures to these concentrations to be of a health concern. As 5-day metals data are not representative of long-term concentrations (i.e., annual averages at a minimum), these data cannot be appropriately evaluated using long-term comparison levels.

Historical Data Comparisons
The TD compared the reported PM_{10} metals concentrations to historical 24-hour every 6th-day PM_{10} metals data from the old TCEQ CAMS 302 monitoring site. The old CAMS 302 site data was used because only $PM_{2.5}$ data has been collected at CAMS 52. It is not appropriate to compare PM_{10} data to $PM_{2.5}$ as they measure different size fractions of particulate matter; therefore, data collected at CAMS 302 was used. CAMS 302 collected PM_{10} metals data from January 1, 2001 to June 26, 2004.

In this section, aluminum, total chromium, and manganese PM_{10} data are highlighted. The TD compared the 1st quarter data to all historical data for these PM_{10} metals at the TCEQ CAMS 302 monitor. The Wyatt Rd site values for the 1st quarter aluminum data are within the range of the 50th to the 95th percentile of the historical data (Tables 4 & 5). The Wyatt Rd site values for the 1st quarter chromium and manganese data are within the range of the 75th to the 95th percentile of the historical data (Tables 4 & 5). Therefore, these data values are within the range of expected levels. All other sites are within the range of the 50th percentile or lower than the 50th or 25th percentile of the historical data for aluminum, chromium, and manganese. Based on the historical data, these values are also within the typical range of the TCEQ's measurements in this area.

Historical aluminum, chromium, and manganese data (all months and December alone) were graphed along with the respective 1st quarter data (Figures 3 – 8). These graphs allow for an easy visual comparison of 1st quarter data as compared to historical data. The 1st quarter data for aluminum, chromium, and manganese all appear similar to historical data. The December data appear to be similar to the 1st quarter data, which indicate that these values are typical for this time of year. The short-term health

comparison values for aluminum, chromium, and manganese are 50, 0.1, and 2 µg/m^3, respectively. All values (historical and 1st quarter data) are well below these values. The long-term health comparison values for aluminum, chromium, and manganese are 5, 0.01, and 0.2 µg/m^3, respectively. An appropriate comparison to long-term health-protective values requires data for at least one year (a conservative approach as the value is developed to protect for a lifetime of exposure), or for multiple years if available. Multiple exceedances of the long-term value on a short-term basis throughout the year would be a cause for concern if such exceedances lead to the yearly average exceeding the long-term comparison value. However, based on the consistency of the 1st quarter data with the historical data, the TD can infer that as long as these values stay somewhat consistent, aluminum, chromium, and manganese are not of a health concern in this area for long-term exposure.

Table 4. Percentile ranges for the historical aluminum, chromium, and manganese data.

	Aluminum (µg/m^3)	**Chromium (µg/m^3)**	**Manganese (µg/m^3)**
95th Percentile	0.48	0.014	0.11725
75th Percentile	0.22525	0.007	0.05725
50th Percentile	0.137	0.004	0.03
25th Percentile	0.08475	0.003	0.017
5th Percentile	0.0445	0.001	0.005

Table 5. 1st Quarter aluminum, chromium, and manganese data compared to historical percentiles.

Site	Date	Aluminum		Chromium		Manganese	
WRTX	12/6/2008	0.653	Generally between the 95th and 50th Percentiles, higher than historical data	0.00973	Generally between the 95th and 75th Percentiles, higher than historical data	0.161	Generally between the 95th and 75th Percentiles, higher than historical data
	12/7/2008	0.39		0.00665		0.0924	
	12/8/2008	0.303		0.00796		0.12	
	12/9/2008	0.166		0.00362		0.0261	
	12/10/2008	0.0353		0.00179		0.00398	
	Duplicate12/12/2008	0.0139		0.00161		0.000576	
CAMS52	12/6/2008	0.182	Within the range of the 50th Percentile	0.00339	Within the range of the 25th Percentile	0.0344	Within the range of the 50th Percentile
	12/7/2008	0.187		0.00349		0.0329	
	12/8/2008	0.166		0.00395		0.036	
	12/9/2008	0.131		0.00223		0.0147	
	12/10/2008	0.046		0.00179		0.00478	
JPTX	12/6/2008	0.0699	Lower than the 50th Percentile	0.00187	Lower than the 50th Percentile	0.0107	Within the range of the 25th Percentile
	12/7/2008	0.0584		0.00141		0.00612	
	12/8/2008	0.0362		0.00148		0.00402	
	12/9/2008	0.0665		0.00187		0.00668	
	12/10/2008	0.0888		0.00376		0.0213	
TPTX	12/6/2008	0.0908	Lower than the 50th Percentile	0.00194	Lower than the 50th Percentile	0.0151	Within the range of the 25th Percentile
	12/7/2008	0.0423		0.00128		0.00351	
	12/8/2008	0.0414		0.00135		0.00432	
	12/9/2008	0.0601		0.00161		0.00693	
	12/10/2008	0.0503		0.00165		0.00486	
WTPTX	12/6/2008	0.0856	Lower than the 50th Percentile	0.00191	Lower than the 50th Percentile	0.014	Within the range of the 25th Percentile
	12/7/2008	0.148		0.002		0.0189	
	12/8/2008	0.0846		0.00164		0.011	
	12/9/2008	0.0479		0.00159		0.0038	
	12/10/2008	0.0765		0.00182		0.00986	

WRTX = Wyatt Rd Site
CAMS52 = CAMS 52 Collocated Site
JPTX = Jaycee Park Site
TPTX = Triangle Park Site
WTPTX = Water Treatment Plant Site

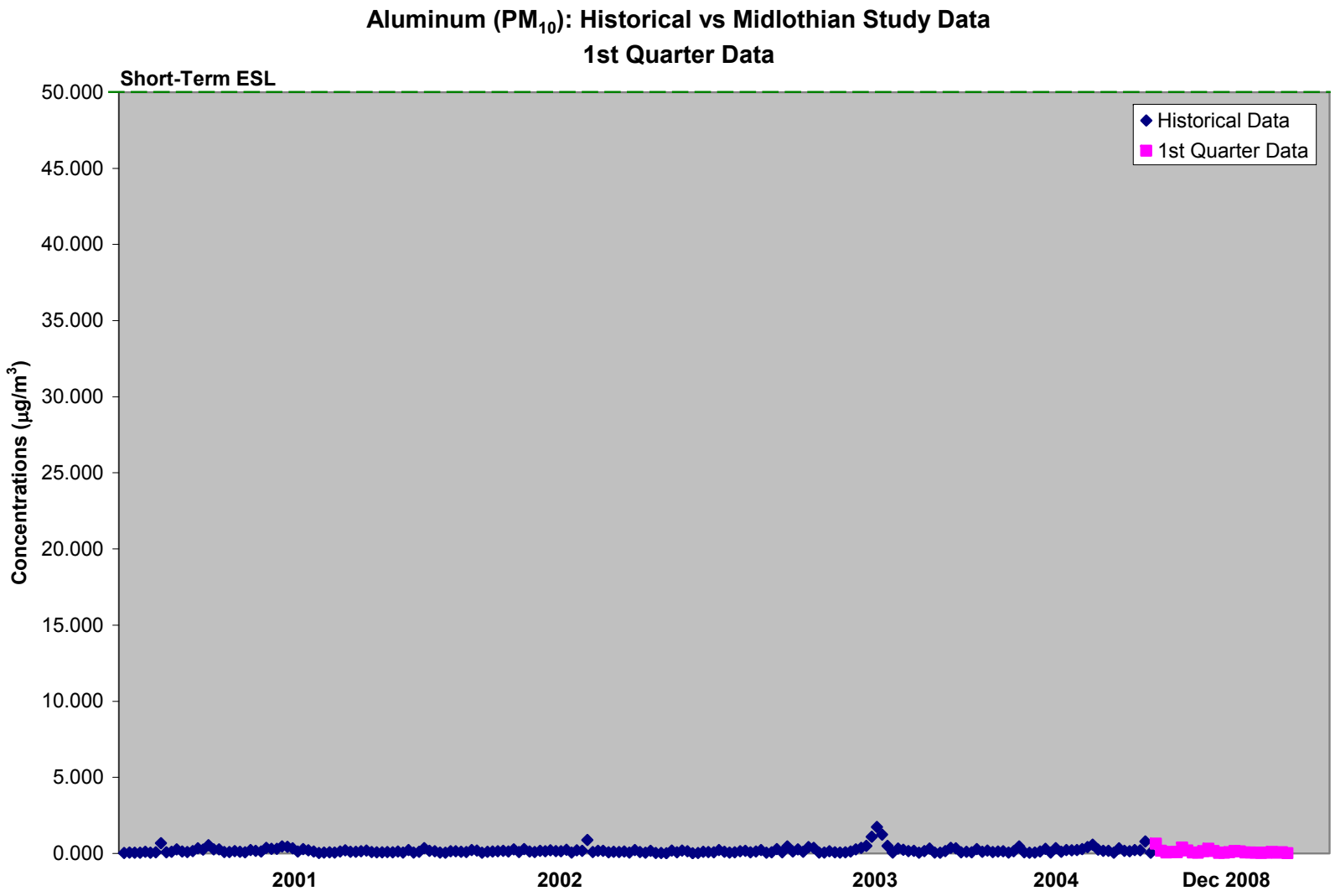


Figure 3. Historical and 1st Quarter Aluminum Data.

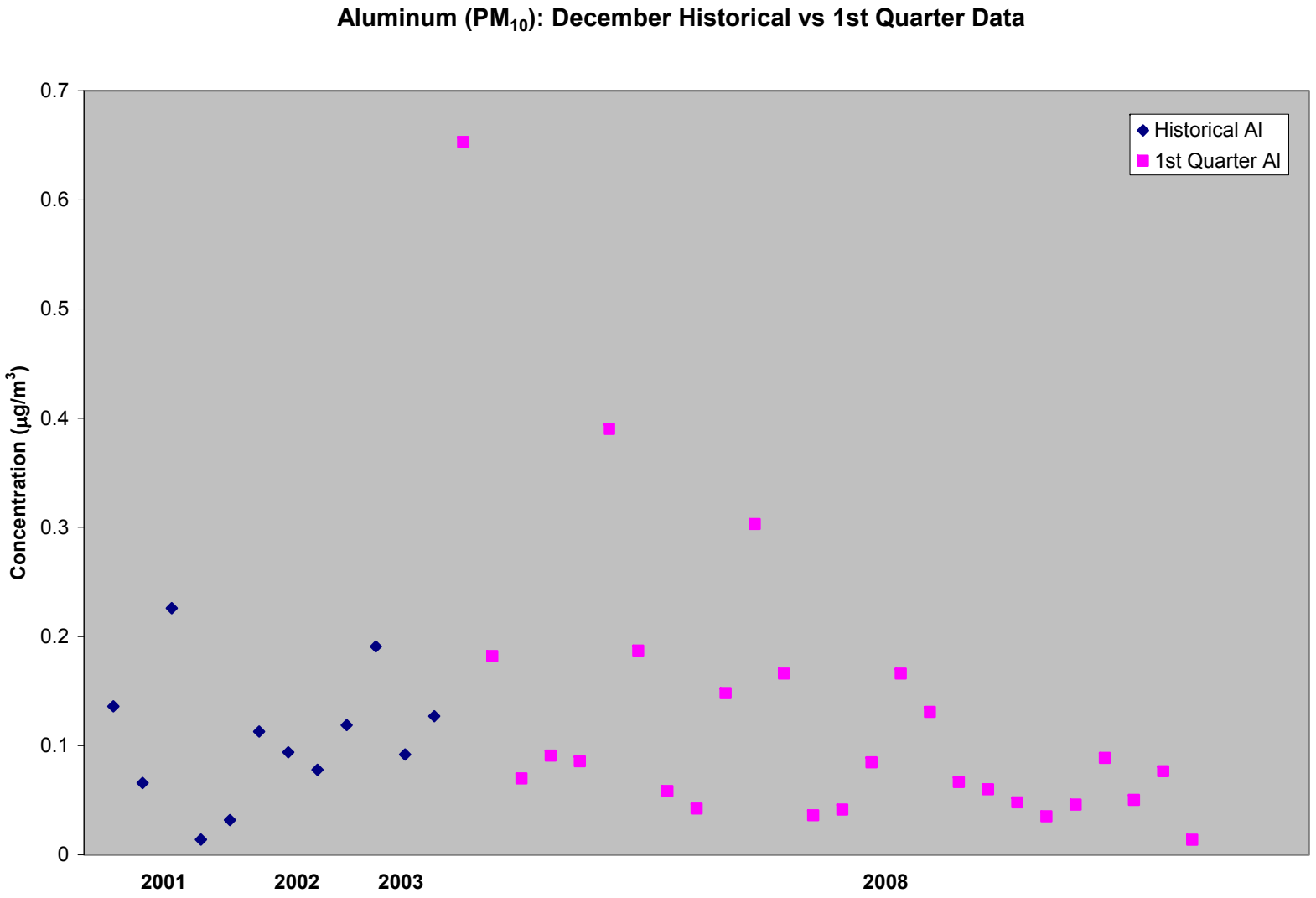


Figure 4. Historical December and 1st Quarter Benzene Data.

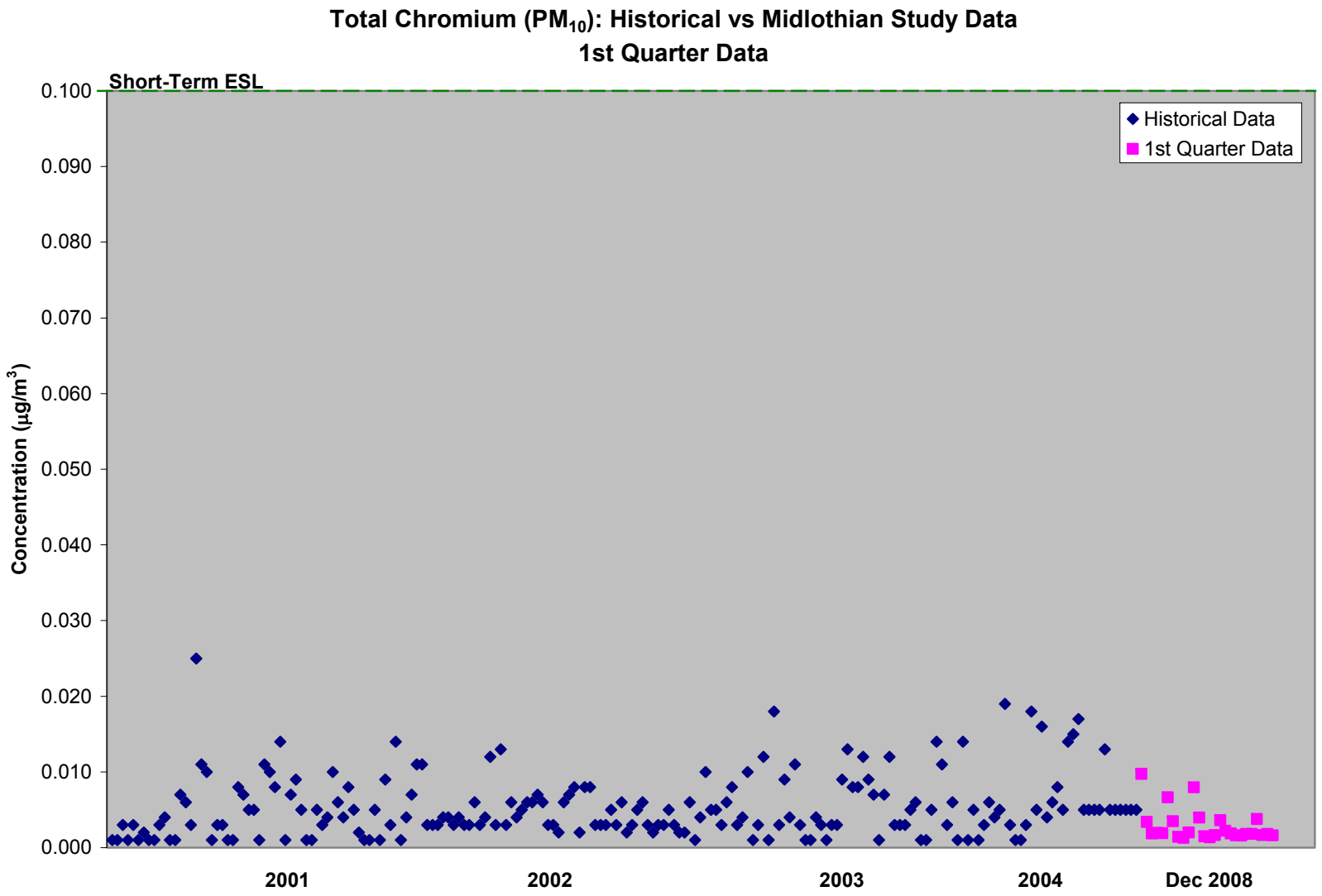


Figure 5. Historical and 1st Quarter Chromium Data.

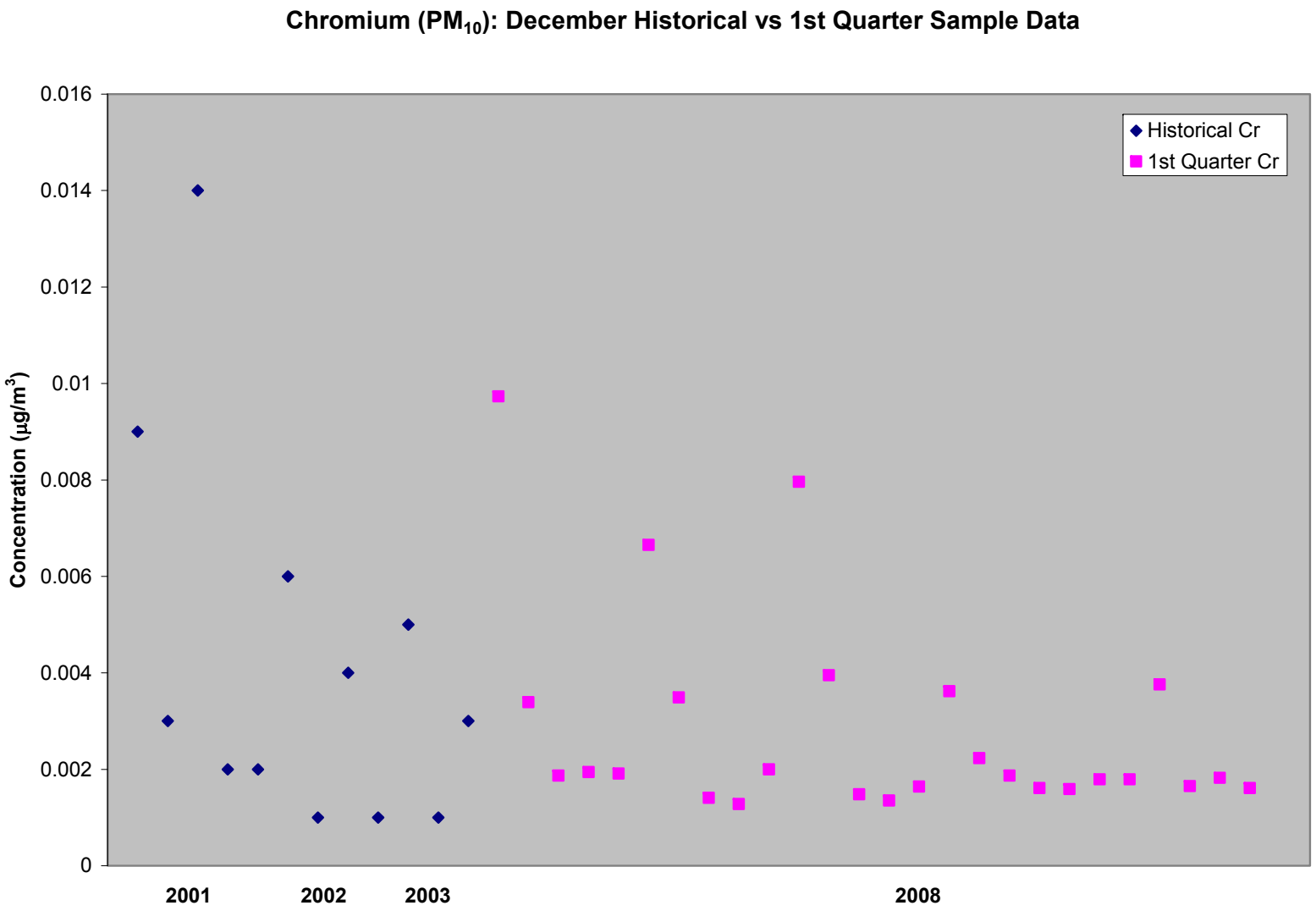


Figure 6. Historical December and 1st Quarter Benzene Data.

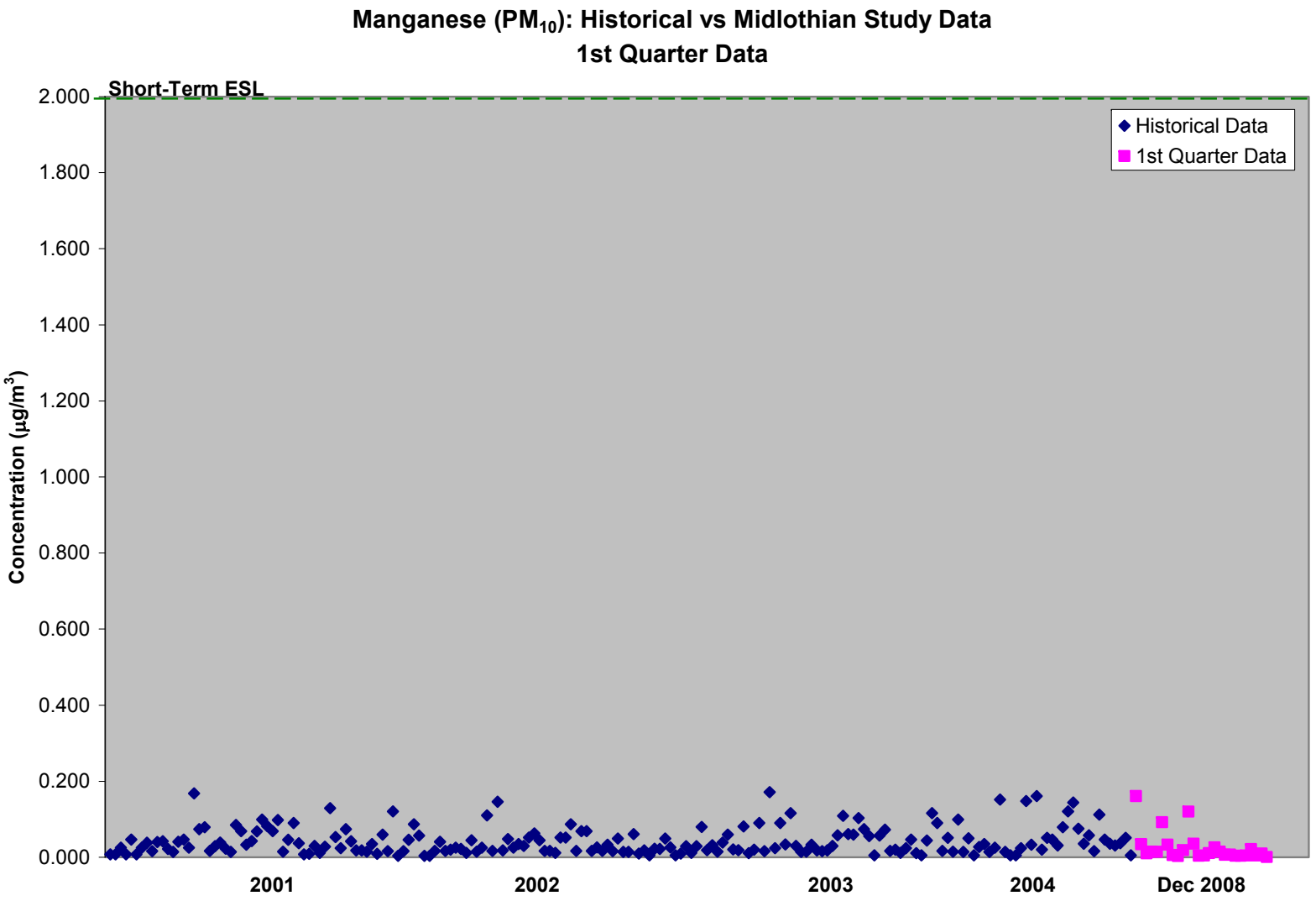


Figure 7. Historical and 1st Quarter Manganese Data.

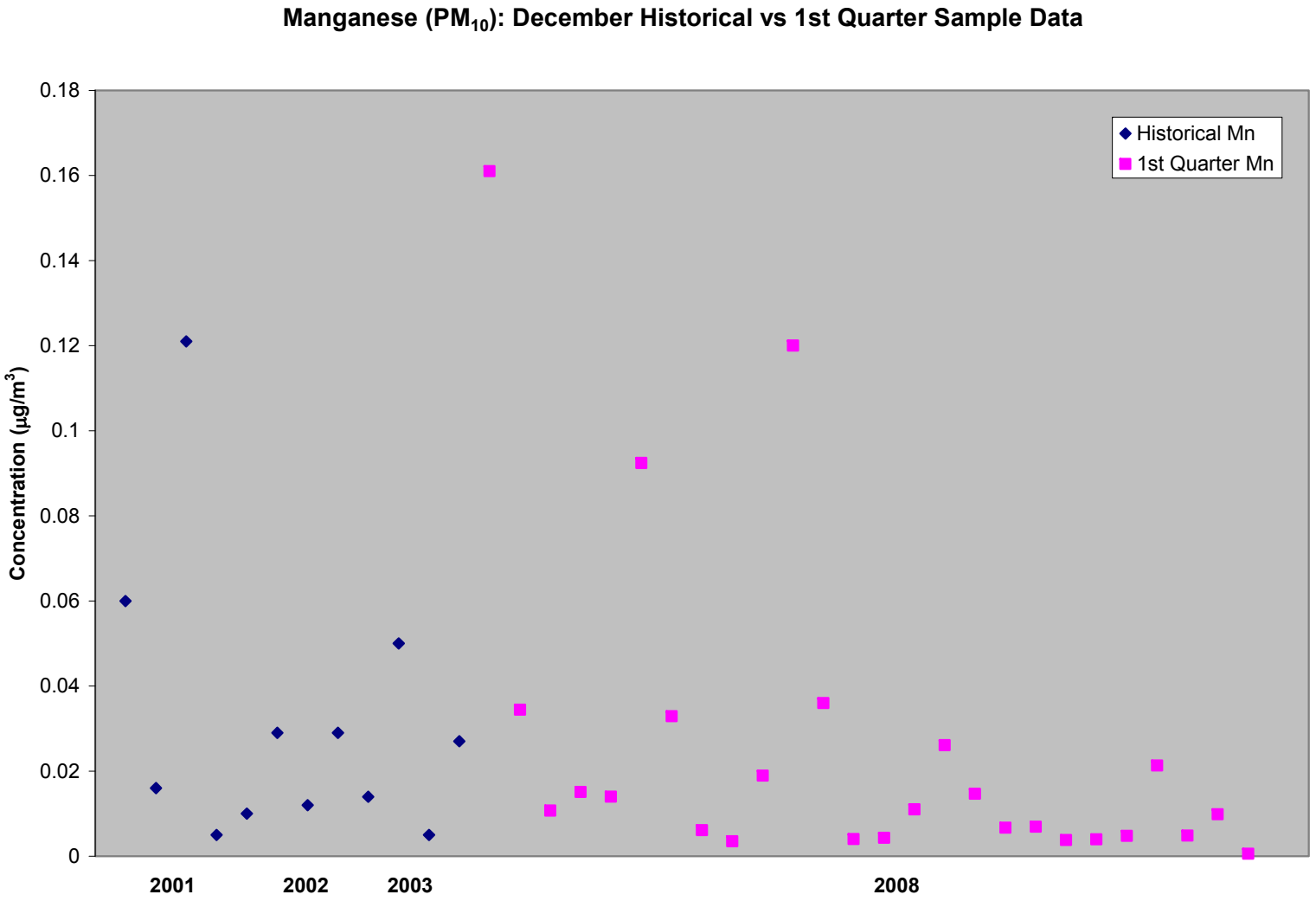


Figure 8. Historical December and 1st Quarter Benzene Data.

Wind Rose and Day Comparisons
The TD compared the 24-hour 1st quarter metals data between sampling days, and evaluated the potential for wind direction to affect the measured concentrations.

Sampling Day 1 (12/6/08)
Monitored values of PM_{10} metals (Figure 9) were highest at the Wyatt Rd site (aluminum (Al) = 0.653 $\mu g/m^3$; total chromium (Cr) = 0.00973 $\mu g/m^3$; hexavalent chromium (Cr^{6+}) = 0.000379 $\mu g/m^3$; and manganese (Mn) = 0.161 $\mu g/m^3$) and second highest at the CAMS 52 site (Al = 0.182 $\mu g/m^3$; Cr = 0.00339 $\mu g/m^3$; Cr^{6+} = 0.0000677 $\mu g/m^3$; and Mn = 0.0344 $\mu g/m^3$) on the first day of sampling (12/6/2008). Monitored values from the other three sites were much lower. The predominant wind direction on this day was mainly out of the southwest with some wind blowing from the southeast. Due to the wind direction, the Wyatt Rd, and CAMS 52 monitors were located downwind of industry on this day. Therefore, as a result of the wind direction, we would expect that those two monitors would measure potential contributions to air concentrations due to emissions from nearby industry.

Sampling Day 2 (12/7/08)
Monitored values of PM_{10} metals (Figure 10) were highest at the Wyatt Rd site (Al = 0.390 $\mu g/m^3$; Cr = 0.00665 $\mu g/m^3$; Cr^{6+} = 0.00016 $\mu g/m^3$; and Mn = 0.0924 $\mu g/m^3$), second highest at the CAMS 52 site (Al = 0.187 $\mu g/m^3$; Cr = 0.00349 $\mu g/m^3$; Cr^{6+} = 0.000257 $\mu g/m^3$; and Mn = 0.0329 $\mu g/m^3$), and third highest at the Water Treatment Plant site (Al = 0.148 $\mu g/m^3$; Cr = 0.002 $\mu g/m^3$; Cr^{6+} = 0.0000281 $\mu g/m^3$; and Mn = 0.0189 $\mu g/m^3$) on the second day of sampling (12/7/2008). Monitored values from the other two sites were much lower. The predominant wind direction on this day was mostly from the southeast and south. The Wyatt Rd, CAMS 52, and Water Treatment Plant monitors were all located downwind of industry on this day. Therefore, as a result of the wind direction, we would expect that those three monitors would measure potential contributions to air concentrations due to emissions from nearby industry.

Sampling Day 3 (12/8/08)
Monitored values of PM_{10} metals (Figure 11) were highest at the Wyatt Rd site (Al = 0.303 $\mu g/m^3$; Cr = 0.00796 $\mu g/m^3$; Cr^{6+} = 0.0000192 $\mu g/m^3$; and Mn = 0.120 $\mu g/m^3$), second highest at the CAMS 52 site (Al = 0.166 $\mu g/m^3$; Cr = 0.00395 $\mu g/m^3$; Cr^{6+} = 0.000152 $\mu g/m^3$; and Mn = 0.036 $\mu g/m^3$), and third highest at the Water Treatment Plant site (Al = 0.0846 $\mu g/m^3$; Cr = 0.00164 $\mu g/m^3$; Cr^{6+} = 0.0000038 $\mu g/m^3$; and Mn = 0.011 $\mu g/m^3$) on the third day of sampling (12/8/2008). Monitored values from the other two sites were lower and very similar. The predominant wind direction on this day was mainly out of the south. The Wyatt Rd, CAMS 52, and Water Treatment Plant monitors were located downwind of industry on this day. Therefore, as a result of the wind direction, we would expect that these three monitors would measure potential contributions to air concentrations due to emissions from nearby industry.

Sampling Day 4 (12/9/08)
Monitored values of PM_{10} metals (Figure 12) were highest at the Wyatt Rd site (Al = 0.166 $\mu g/m^3$; total Cr = 0.00362 $\mu g/m^3$; Cr^{6+} = 0.0000003 $\mu g/m^3$; and Mn = 0.0261 $\mu g/m^3$) and second highest at the CAMS 52 site (Al = 0.131 $\mu g/m^3$; Cr = 0.00223 $\mu g/m^3$; Cr^{6+} = 0.0000043 $\mu g/m^3$; and Mn = 0.0147 $\mu g/m^3$) on the fourth day of sampling (12/9/2008). Monitored values from the other three sites were much lower, with the lowest levels at the Water Treatment Plant. The predominant wind direction on this day was mainly out of the northwest, with some southwest winds during the day. Due to the wind direction, Wyatt Rd, CAMS 52, and the Water Treatment Plant monitors would be located predominantly upwind of industry and with some downwind time. Therefore, as a result of the wind direction, we would expect that these

monitors would measure potential contributions to air concentrations due to emissions from industry when the winds were from the southwest, but that the levels measured this day would not be heavily influenced by nearby industry.

Sampling Day 5 (12/10/08)
Monitored values of PM_{10} metals (Figure 13) were highest at the Jaycee Park site (Al = 0.0888 µg/m^3; total Cr = 0.00376 µg/m^3; Cr^{6+} = 0.0000638 µg/m^3; and Mn = 0.0213 µg/m^3) on the fifth day of sampling (12/10/2008). Monitored values from the other four sites were lower, with the lowest values at the Wyatt Rd and CAMS 52 sites. The predominant wind direction on this day was mainly out of the northwest. The Jaycee Park monitor was located downwind of industry on this day. Therefore, as a result of the wind direction, we would expect that that monitor would measure potential contributions to air concentrations due to emissions from nearby industry.

Day Comparison Summary
Overall, the highest concentrations were measured on sampling day one, with the highest concentrations measured at the Wyatt Rd site and the second highest concentrations at the CAMS 52 collocated site. Based on wind directional data, the TD concludes that the monitors are sited at locations which allow TCEQ to monitor potential emissions from nearby industry with favorable wind conditions. Overall, it appears that nearby industry does have an impact on the levels of PM_{10} metals detected in air in the Midlothian area. However, the levels detected are low, well below the TCEQ health-based screening values, and are not of health concern. Therefore, we would not expect to see a health impact from the observed levels of PM_{10} metals.

Wind Rose and Sampling Site Comparisons
The TD compared the 24-hour 1st quarter metals data between sampling sites, and evaluated the potential for wind direction to affect the measured concentrations.

Wyatt Rd
The highest measured concentrations of PM_{10} metals at this site were seen on sampling day one (Al = 0.653 µg/m^3; Cr = 0.00973 µg/m^3; Cr^{6+} = 0.000379 µg/m^3; and Mn = 0.161 µg/m^3), the second highest on day two (Al = 0.39 µg/m^3; Cr = 0.00665 µg/m^3; Cr^{6+} = 0.00016 µg/m^3; and Mn = 0.0924 µg/m^3), the third highest on day three (Al = 0.303 µg/m^3; Cr = 0.00796 µg/m^3; Cr^{6+} = 0.0000192 µg/m^3; and Mn = 0.12 µg/m^3), and the fourth highest on day four (Al = 0.166 µg/m^3; Cr = 0.00362 µg/m^3; Cr^{6+} = 0.0000003 µg/m^3; and Mn = 0.0261 µg/m^3) (Table 6). While this monitor does not have meteorological data available for sampling days one and two, the remainder of the sampling days averaged within 4% of the CAMS 52 collocated site readings, indicating those data may serve as reasonable surrogate data for the Wyatt Rd site. The predominant wind directions on those days were from the southwest, south-southeast, south, and northwest-southwest, respectively. These data indicate this monitor is positioned downwind of the nearby industry and measures potential contributions to air concentrations due to emissions when winds are out of the southwest, south, and southeast. All measured concentrations at this monitor were well below the TCEQ health-based comparison levels.

CAMS 52 Collocated
The highest measured concentrations of PM_{10} metals at this site were seen on sampling days one (Al = 0.182 µg/m^3; Cr = 0.00339 µg/m^3; Cr^{6+} = 0.0000677 µg/m^3; and Mn = 0.0344 µg/m^3) and two (Al = 0.187 µg/m^3; Cr = 0.00349 µg/m^3; Cr^{6+} = 0.000257 µg/m^3; and Mn = 0.0329 µg/m^3), the second highest on day three (Al = 0.166 µg/m^3; Cr = 0.00395 µg/m^3; Cr^{6+} = 0.000152 µg/m^3; and Mn = 0.036 µg/m^3), and the

third highest on day four (Al = 0.131 µg/m^3; Cr = 0.00223 µg/m^3; Cr^{6+} = 0.0000043 µg/m^3; and Mn = 0.0147 µg/m^3) (Table 7). The predominant wind directions those days were out of the southwest, south-southeast, the south, and the northwest-southwest, respectively. These data indicate this monitor is positioned downwind of the nearby industry and measures potential contributions to air concentrations due to emissions when winds are out of the southwest, south, and southeast. All measured concentrations at this monitor were well below the TCEQ health-based comparison levels.

Jaycee Park

The highest measured concentration of PM_{10} metals at this site was seen on sampling day five (Al = 0.0888 µg/m^3; Cr = 0.00376 µg/m^3; Cr^{6+} = 0.0000638 µg/m^3; and Mn = 0.0213 µg/m^3), with all other sampling days being fairly consistent (Table 8). The predominant wind direction on this day was from the north-northwest. This indicates the ambient air at this monitor may be impacted by nearby industry. However, the impact on the ambient air monitored concentrations at this site is very slight, as evidenced by only a slight increase in the ambient air concentrations when the winds shifted so the site was positioned downwind of nearby industry. All measured concentrations were well below the TCEQ health-based comparison levels.

Triangle Park

The highest measured concentration of PM_{10} metals at this site was seen on sampling day one (Al = 0.0908 µg/m^3; Cr = 0.00194 µg/m^3; Cr^{6+} = 0.0000305 µg/m^3; and Mn = 0.0151 µg/m^3), with all other sampling days being fairly consistent (Table 9). The predominant wind direction on this day was out of the southwest. This indicates the ambient air at this monitor may be impacted by nearby industry. However, the impact on the ambient air monitored concentrations at this site is slight, as evidenced by only a slight increase in the ambient air concentrations when the winds shifted so the site was positioned downwind of nearby industry. All measured concentrations were well below the TCEQ health-based comparison levels.

Water Treatment Plant

While the measured concentrations of PM_{10} metals are fairly consistent at this site, the highest measurement was seen on sampling day two (Al = 0.148 µg/m^3; Cr = 0.002 µg/m^3; Cr^{6+} = 0.0000281 µg/m^3; and Mn = 0.0189 µg/m^3) (Table 10). The predominant wind direction on this day was from the southeast. This indicates this monitor is positioned downwind of the nearby industry and measures potential contributions to air concentrations due to emissions when winds are out of the southeast. All measured concentrations at this monitor were well below the TCEQ health-based comparison levels.

Site Comparison Summary

Overall, the highest concentrations were measured at the Wyatt Rd site, with the CAMS 52 collocated site being the second highest when winds were such that those sites were positioned downwind of nearby industry. For these two sites the highest measurements were observed on sampling day one. As with the day comparisons, the TD concludes that the monitors are sited at locations which allow TCEQ to monitor potential emissions from nearby industry with favorable wind conditions. Overall, it appears that nearby industry does have an impact on the levels of PM_{10} metals detected in air in the Midlothian area. However, the levels detected are low, well below the TCEQ health-based screening values, and are not of health concern. Therefore, we would not expect to see a health impact from the observed levels of PM_{10} metals.

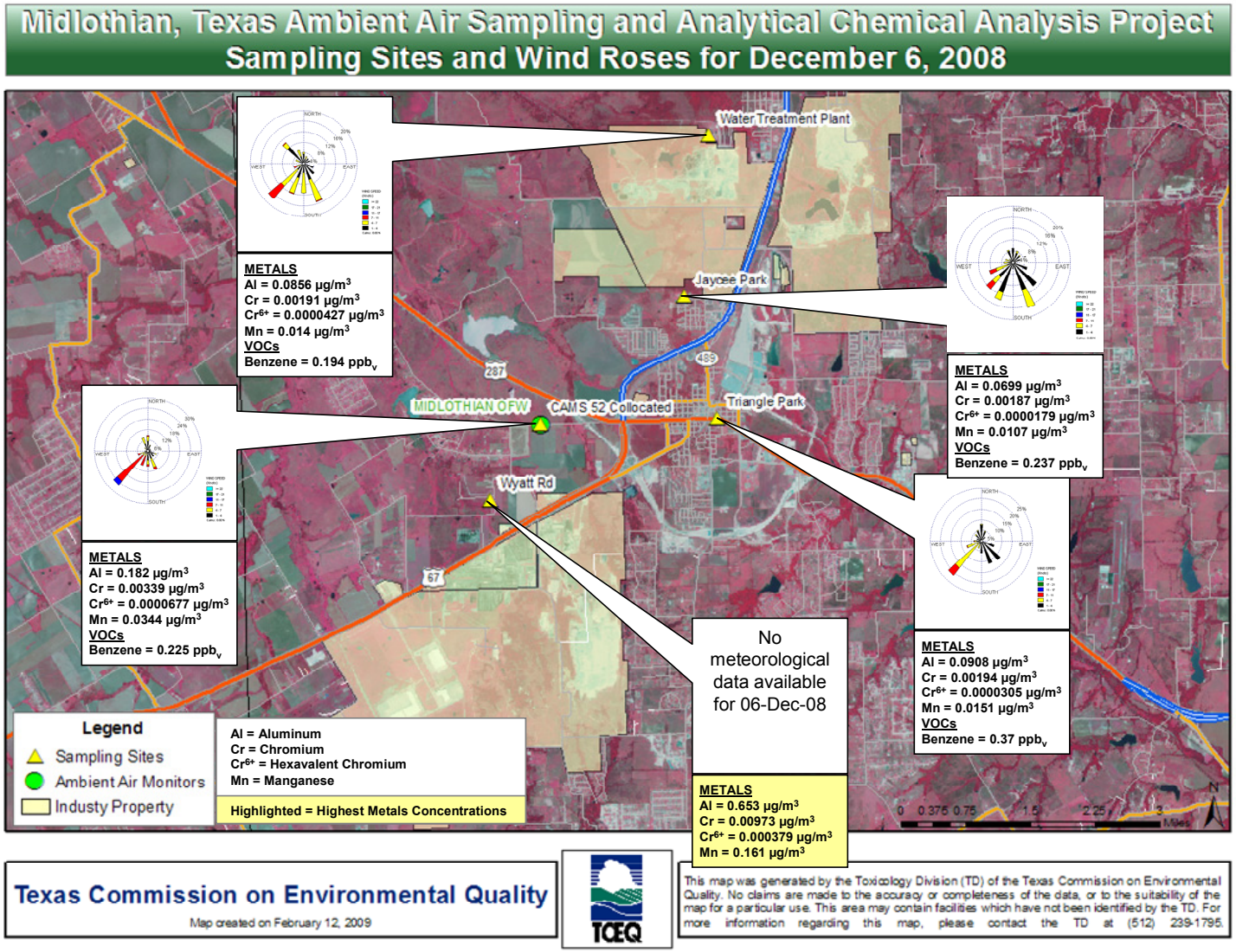


Figure 9. Site locations, wind directions, and chemical averages for 12/6/08.

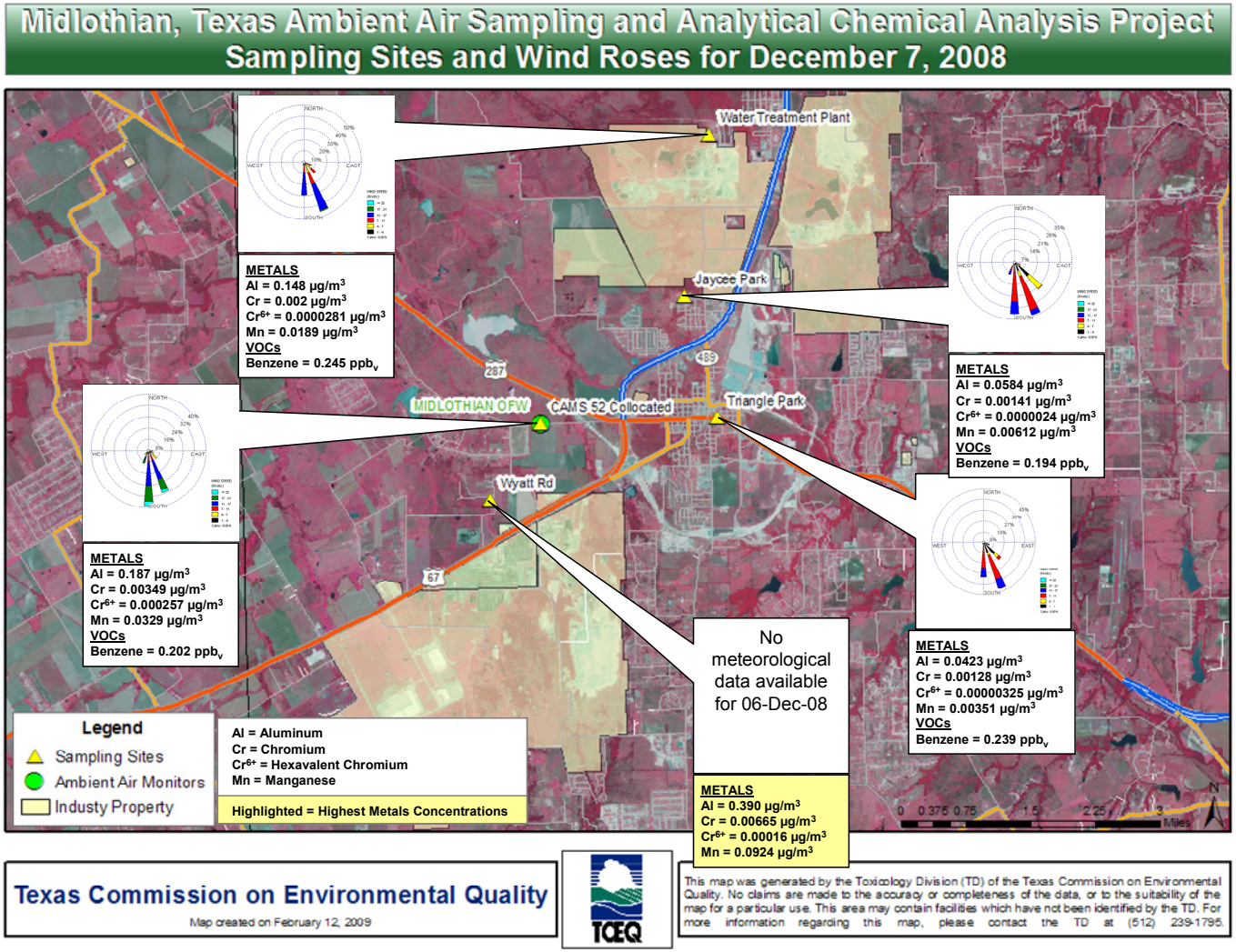


Figure 10. Site locations, wind directions, and chemical averages for 12/7/08.

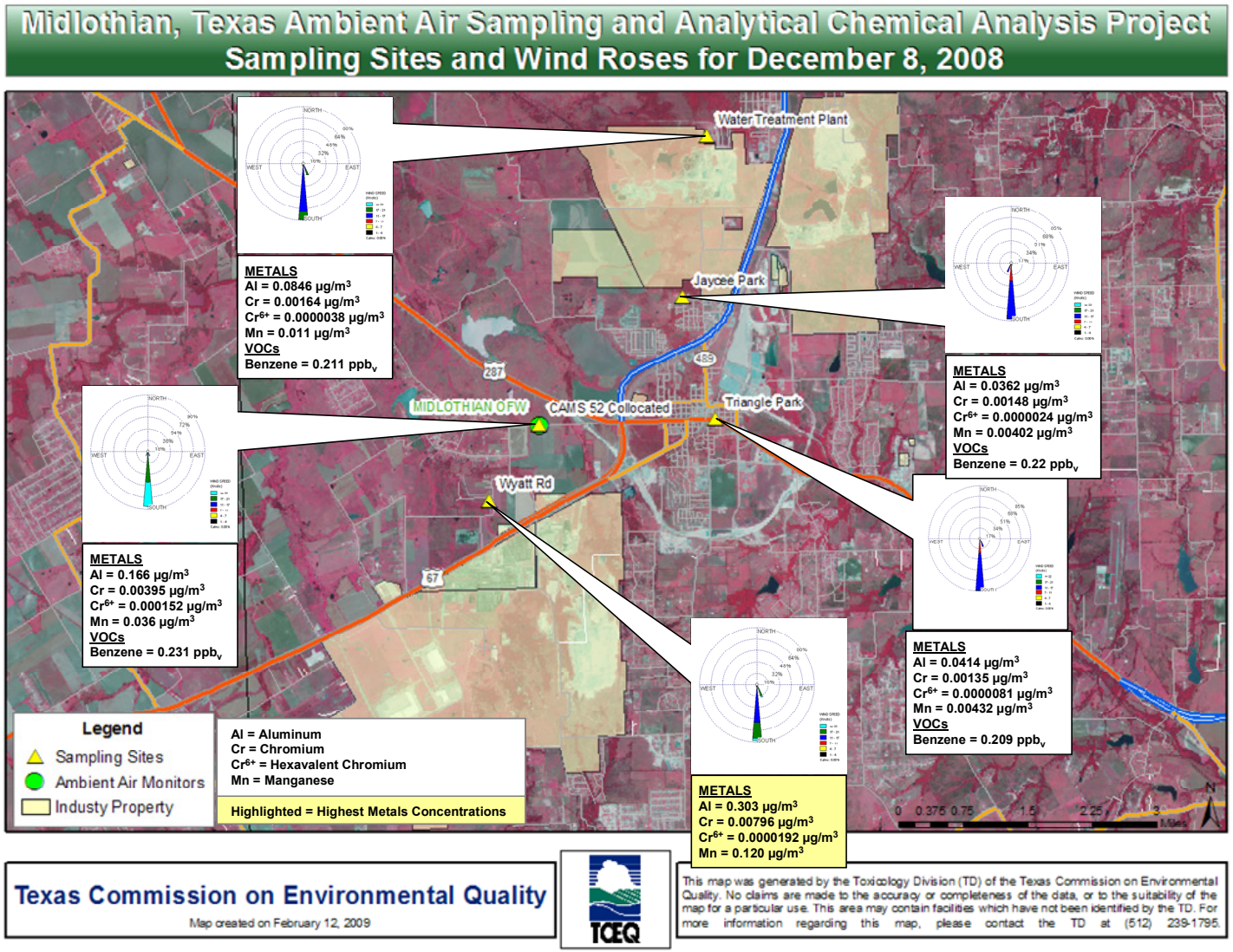


Figure 11. Site locations, wind directions, and chemical averages for 12/8/08.

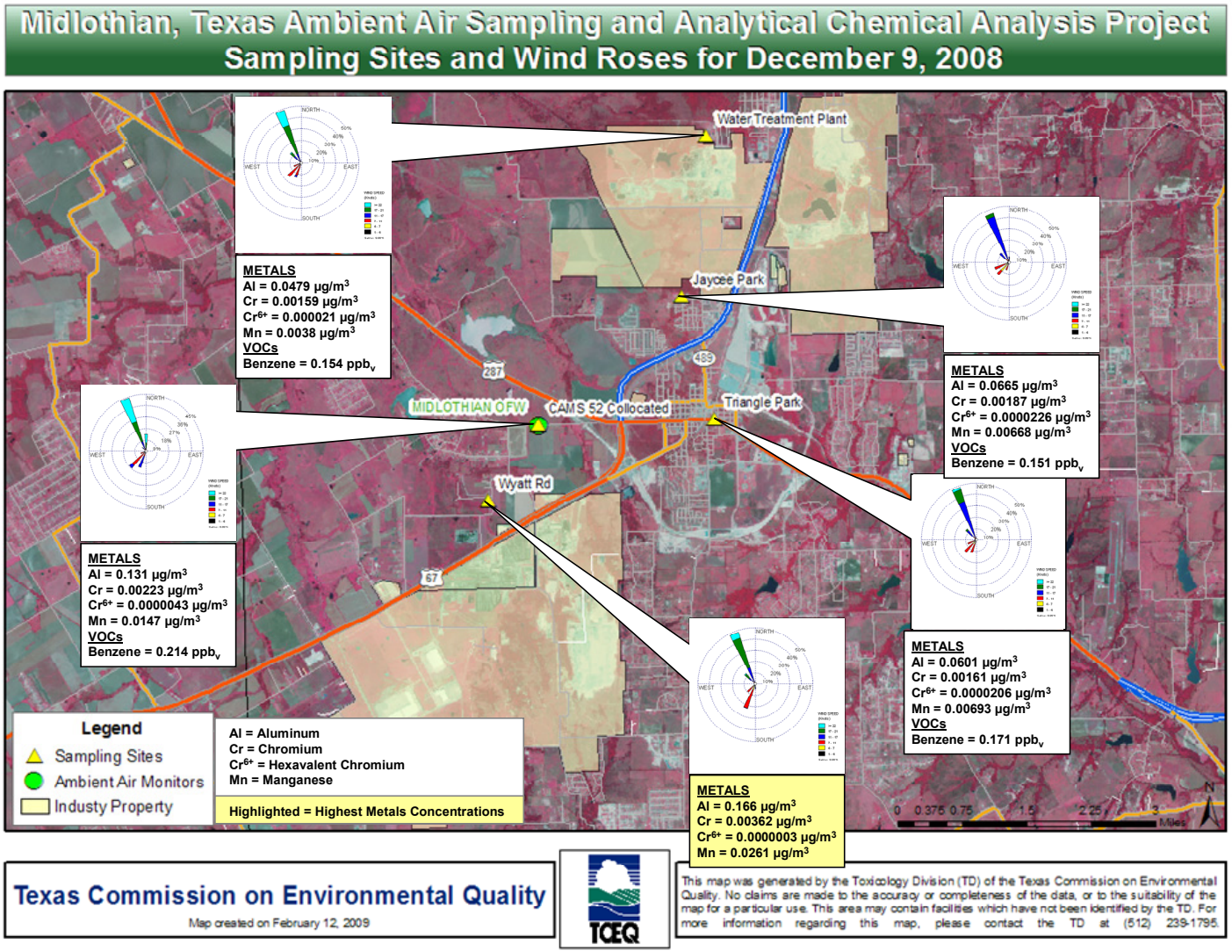


Figure 12. Site locations, wind directions, and chemical averages for 12/9/08.

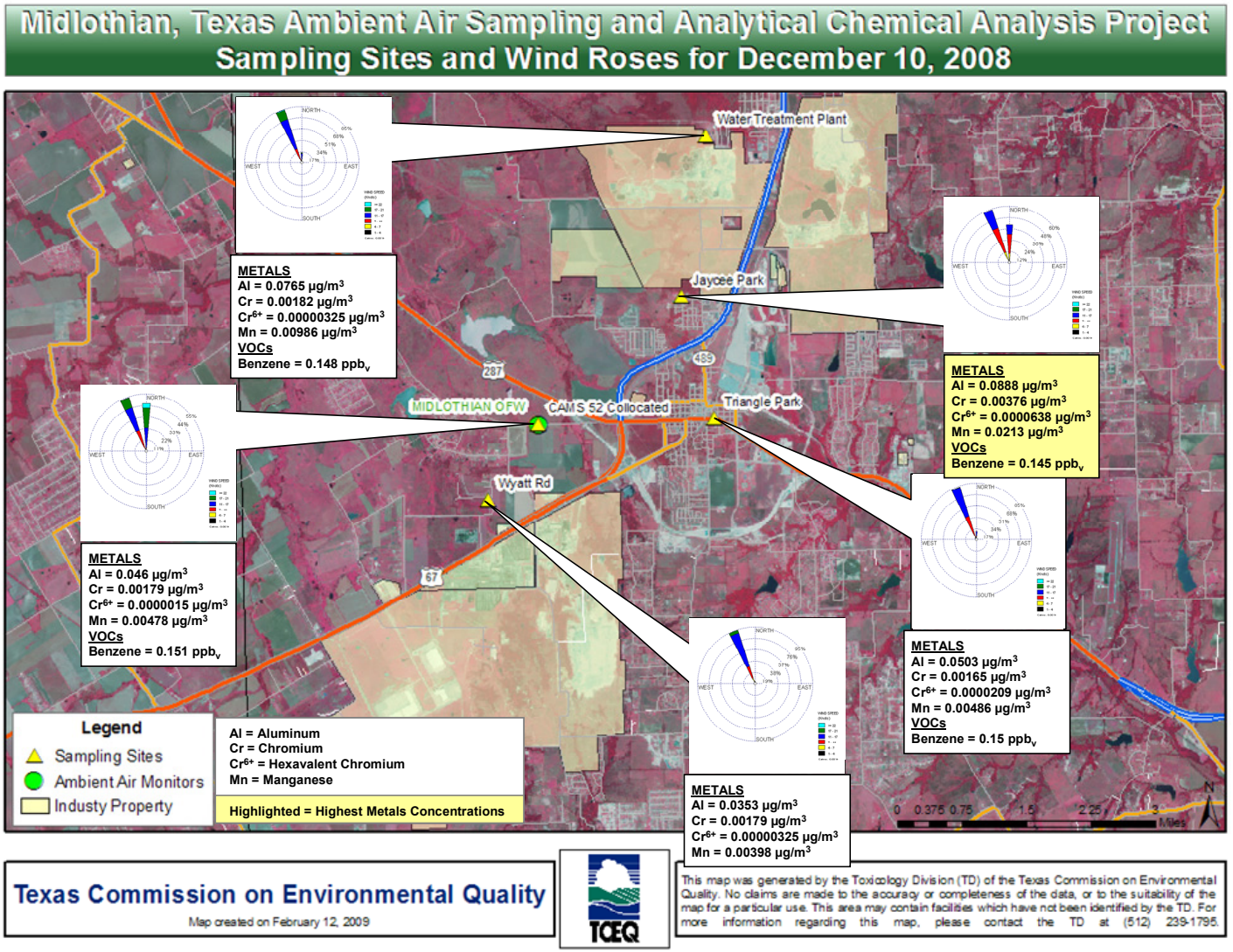


Figure 13. Site locations, wind directions, and chemical averages for 12/10/08.

Table 6. Wyatt Rd chemical concentrations and wind directions for all five 1st quarter sampling days.

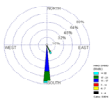
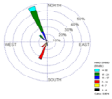
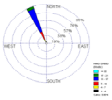
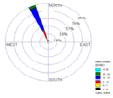
			Wyatt Road December 2008					
			No meteorological data available for 06-Dec-08	No meteorological data available for 07-Dec-08				
METALS	**CASRN**	**Short-Term # (ng/m3)**	**12/6/2008**	**12/7/2008**	**12/8/2008**	**12/9/2008**	**12/10/2008**	**Duplicate 12/10/08**
Aluminum	7429-90-5	50 µg/m^3	0.653	0.39	0.303	0.166	0.0353	0.0139
Chromium	7440-47-3	0.1 µg/m^3	0.00973	0.00665	0.00796	0.00362	0.00179	0.00161
Hexavalent Chromium	1854-02-99	0.1 µg/m^3	0.000379	0.00016	0.0000192	0.0000003	0.00000325	0.00000325
Manganese	7439-96-5	2 µg/m^3	0.161	0.0924	0.12	0.0261	0.00398	0.000576
VOCs								
Benzene	71-43-2	180 ppb$_v$	--	--	--	--	--	--

Table 7. CAMS 52 Collocated chemical concentrations and wind directions for all five 1st quarter sampling days.

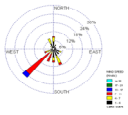
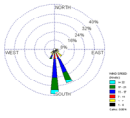
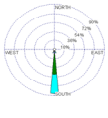
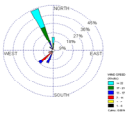
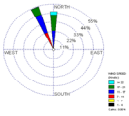
			CAMS 52 December 2008				
							
METALS	**CASRN**	**Short-Term # (ng/m3)**	**12/6/2008**	**12/7/2008**	**12/8/2008**	**12/9/2008**	**12/10/2008**
Aluminum	7429-90-5	50 µg/m^3	0.182	0.187	0.166	0.131	0.046
Chromium	7440-47-3	0.1 µg/m^3	0.00339	0.00349	0.00395	0.00223	0.00179
Hexavalent Chromium	1854-02-99	0.1 µg/m^3	0.0000677	0.000257	0.000152	0.0000043	0.0000015
Manganese	7439-96-5	2 µg/m^3	0.0344	0.0329	0.036	0.0147	0.00478
VOCs							
Benzene	71-43-2	180 ppb$_v$	0.225	0.202	0.231	0.214	0.151

Table 8. Jaycee Park chemical concentrations and wind directions for all five 1st quarter sampling days.

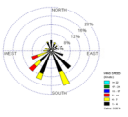
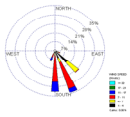
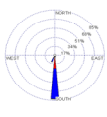
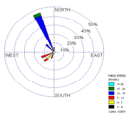
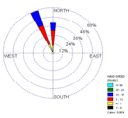
			Jaycee Park December 2008				
							
METALS	**CASRN**	**Short-Term # (ng/m3)**	**12/6/2008**	**12/7/2008**	**12/8/2008**	**12/9/2008**	**12/10/2008**
Aluminum	7429-90-5	50 µg/m^3	0.0699	0.0584	0.0362	0.0665	0.0888
Chromium	7440-47-3	0.1 µg/m^3	0.00187	0.00141	0.00148	0.00187	0.00376
Hexavalent Chromium	1854-02-99	0.1 µg/m^3	0.0000179	0.0000024	0.0000024	0.0000226	0.0000638
Manganese	7439-96-5	2 µg/m^3	0.0107	0.00612	0.00402	0.00668	0.0213
VOCs							
Benzene	71-43-2	180 ppb$_v$	0.237	0.194	0.22	0.151	0.145

Table 9. Triangle Park chemical concentrations and wind directions for all five 1st quarter sampling days.

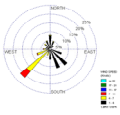
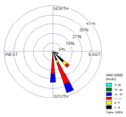
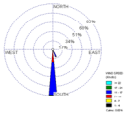
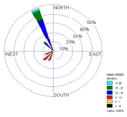
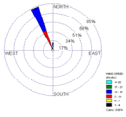
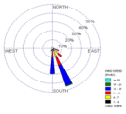
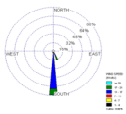
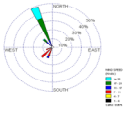
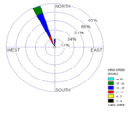
			Triangle Park December 2008				
							
METALS	**CASRN**	**Short-Term # (ng/m3)**	**12/6/2008**	**12/7/2008**	**12/8/2008**	**12/9/2008**	**12/10/2008**
Aluminum	7429-90-5	50 µg/m^3	0.0908	0.0423	0.0414	0.0601	0.0503
Chromium	7440-47-3	0.1 µg/m^3	0.00194	0.00128	0.00135	0.00161	0.00165
Hexavalent Chromium	1854-02-99	0.1 µg/m^3	0.0000305	0.00000325	0.0000081	0.0000206	0.0000209
Manganese	7439-96-5	2 µg/m^3	0.0151	0.00351	0.00432	0.00693	0.00486
VOCs							
Benzene	71-43-2	180 ppb$_v$	0.37	0.239	0.209	0.171	0.15

Table 10. Water Treatment Plant chemical concentrations and wind directions for all five 1st quarter sampling days.

			Water Treatment Plant December 2008				
							
METALS	**CASRN**	**Short-Term # (ng/m3)**	**12/6/2008**	**12/7/2008**	**12/8/2008**	**12/9/2008**	**12/10/2008**
Aluminum	7429-90-5	50 µg/m^3	0.0856	0.148	0.0846	0.0479	0.0765
Chromium	7440-47-3	0.1 µg/m^3	0.00191	0.002	0.00164	0.00159	0.00182
Hexavalent Chromium	1854-02-99	0.1 µg/m^3	0.0000472	0.0000281	0.0000038	0.000021	0.00000325
Manganese	7439-96-5	2 µg/m^3	0.014	0.0189	0.011	0.0038	0.00986
VOCs							
Benzene	71-43-2	180 ppb$_v$	0.194	0.245	0.211	0.154	0.148

Percent Hexavalent Chromium (Cr(VI) or Cr^{6+}) of Total Chromium

Ambient air concentrations of total chromium and Cr^{6+} associated with PM_{10} were measured at each of the five 1st quarter sampling sites December 6 – 10, 2008 (Table 11). The TCEQ short-term Effects Screening Level (ESL) for Cr^{6+} is 0.1 µg/m^3. All measured concentrations of Cr^{6+} were well below the short-term ESL. Although the most appropriate comparison to long-term health-protective values requires data for at least one year (or for multiple years if available), in this case valuable information is obtained from a comparison of these short-term measured values to the long-term health-protective value. All measured concentrations of Cr^{6+} were well below the TCEQ long-term ESL, which protects over a lifetime of exposure, of 0.01 µg/m^3. The USEPA has a long-term value of 0.0008 µg/m^3, which is based on a 1 in 100,000 excess risk level. To meet or exceed this long-term (i.e., chronic) level, the daily concentration of Cr^{6+} would have to consistently be at or above 0.0008 µg/m^3. All measured concentrations of Cr^{6+} are below the USEPA chronic value for Cr^{6+}. Therefore, these short-term Cr^{6+} data indicate that long-term comparison values are unlikely to be exceeded.

The TD also calculated the percentage of total chromium that Cr^{6+} comprised for the 1st quarter sampling data (Table 11). The highest percentage of total chromium that Cr^{6+} represented was 7.36% at the CAMS 52 collocated site on sampling day two. The highest average at any one site over the five monitored days was 2.70% at the CAMS 52 collocated site. The overall average for all five sampling days over all five sites is 1.43% Cr^{6+} of total chromium. These values are all well below the 100% Cr^{6+} proposed by TDSHS in their Draft Midlothian Health Consultation. They are also well below the suggested default

assumption of 34%, used by USEPA in their National-Scale Air Toxics Assessment (NATA). The Agency for Toxic Substances and Disease Registry (ATSDR) estimates cement production to be associated with 0.2% of chromium emissions as Cr^{6+} in their Toxicological Profile for chromium.

Table 11. Percentage hexavalent chromium PM_{10} represents of total chromium PM_{10} for the 1st quarter sampling.

		12/6/08		12/7/08	12/8/08	12/9/08	12/10/08		AVERAGE
WRTX[b] ($\mu g/m^3$)	Cr^{6+}	0.000379	0.000359*	0.00016	0.0000192	0.0000003	0.00000325	0.00000325*	--
	Cr_T[a]	0.00973	0.00973*	0.00665	0.00796	0.00362	0.00179	0.00161*	--
	$\%Cr^{6+}$	3.90 %	3.69 %	2.41 %	0.24 %	0.01 %	0.18 %	0.20 %	1.52 %
CAMS52[b] ($\mu g/m^3$)	Cr^{6+}	0.0000677	--	0.000257	0.000152	0.0000043	0.0000015	--	--
	Cr_T	0.00339	--	0.00349	0.00395	0.00223	0.00179	--	--
	$\%Cr^{6+}$	2.00 %	--	7.36 %	3.85 %	0.19 %	0.08 %	--	2.70 %
JPTX[d] ($\mu g/m^3$)	Cr^{6+}	0.0000179	--	0.0000024	0.0000024	0.0000226	0.0000638	--	--
	Cr_T	0.00187	--	0.00141	0.00148	0.00187	0.00376	--	--
	$\%Cr^{6+}$	0.96 %	--	0.17 %	0.16 %	1.21 %	1.70 %	--	0.84 %
TPTX[e] ($\mu g/m^3$)	Cr^{6+}	0.0000305	--	0.00000325	0.0000081	0.0000206	0.0000209	--	--
	Cr_T	0.00194	--	0.00128	0.00135	0.00161	0.00165	--	--
	$\%Cr^{6+}$	1.57 %	--	0.25 %	0.60 %	1.28 %	1.27 %	--	0.99 %
WTPTX[f] ($\mu g/m^3$)	Cr^{6+}	0.0000472	--	0.0000281	0.0000038	0.000021	0.00000325	--	--
	Cr_T	0.00191	--	0.002	0.00164	0.00159	0.00182	--	--
	$\%Cr^{6+}$	2.47 %	--	1.41 %	0.23 %	1.32 %	0.18 %	--	1.12 %
							Overall Average $\%Cr^{6+}$ 1st Quarter		1.43 %

* = Duplicate Sample
a = Total chromium
b = Wyatt Rd monitor
c = Collocated with TCEQ CAMS 52 monitor
d = Jaycee Park monitor
e = Triangle Park monitor – mobile site for 1st quarter sampling
f = Water Treatment Plant monitor

Collocated Monitor Comparison
One of the sampled sites is a monitor collocated with the TCEQ CAMS 52 monitor. However, the TCEQ CAMS 52 monitor collects $PM_{2.5}$ metals data. Therefore, the PM_{10} metals data collected for this study cannot be appropriately compared to the CAMS 52 $PM_{2.5}$ metals data.

If you have any questions concerning this evaluation, please e-mail me at tphillip@tceq.state.tx.us or call me at (512) 239-2269.