4.1 Mercury (Hg)

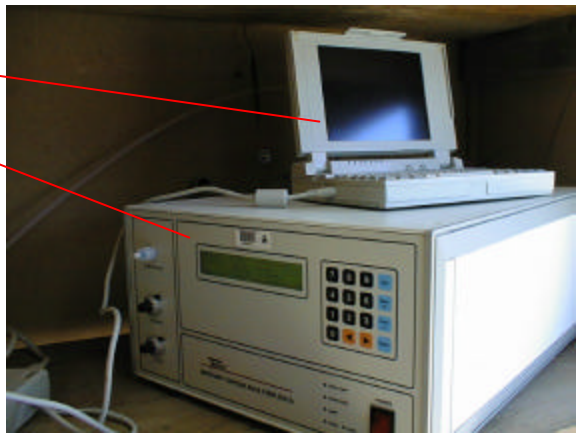
4.1.1 Method: Elemental mercury vapor (Hg^0) was monitored using a mobile mercury monitoring trailer from the NC DENR, DAQ, TPB equipped with a Tekran 2537A Hg Vapor Analyzer and its requisite support equipment. The Tekran Hg vapor analyzer operates on the following principles. The air sample is drawn into the instrument for a given sampling period and is passed through a gold trap. Hg^0 is collected on the trap by forming an amalgam. At the end of the sampling period the instrument switches to a second trap to begin collecting another sample. The first trap is then purged with argon gas and heated to "drive off" the Hg^0. The "released" mercury is then swept past a UV lamp and detected by fluorescence. The Hg^0 concentration in the air sample is automatically calculated by the instrument from the detector response for the given sample volume and is reported in ng/m^3.

4.1.2 Time Frame: The sampling time frame was continuous over a two-week period from April 18 to April 28, 1999. The Tekran Hg vapor analyzer collected 5-minute samples on a continuous basis. The number of data points that were collected were 2931 that corresponds to the number of "samples" taken.

4.1.3 Agency / Team Size: This team consisted of staff from the NC DAQ who were responsible for initial set up, operation, and data collection.

4.1.4 Field Equipment / Supplies:

Computer Data System
Tekran Hg vapor analyzer
Zero air generator
Calibration unit
Gas cylinders, nitrogen and argon
Meteorological station
(dedicated to Hg monitoring and independent of MC2 station)



4.1.5 Sampling Procedure: The equipment in the list above is contained in the TPB's mobile mercury monitoring trailer. The trailer was the base of operation for the mercury monitoring; and was located at Site MC2.

A "dedicated" meteorological station was co-located with the Tekran instrument and programmed to collect data over coinciding 5-minute intervals.

Once the trailer was positioned, the instrument and data collection systems were started and calibrated, the sample collection was begun. The sample inlet was set at a height of 4 meters. The system automatically performs a calibration check with an internal source every 25 hours and records that calibration data along with other system operational

parameters. The system operated within normal parameters for the duration of the sampling.

4.1.6 Sample Analysis and Data Reduction: At the end of the monitoring period, the data files were downloaded to floppy disks and the data returned to the DAQ lab for data reduction and analysis. The data file(s) from the dedicated meteorological station were also downloaded to a laptop computer and then transferred to floppy disks. The Hg^0 concentrations were then correlated to the meteorological data obtained at the site.

When the wind data was plotted (Figure 4.1.1) for the period of April 18 through April 28, 1999, it indicated that the wind was calm (< 1 mph) for 6.9% of the recorded values. The primary wind direction was from the southwest (~ 16%) and south-southwest (~ 14%) but not to a larger extent than other directions, most of which were between 3% and 9% of the data values. (Meteorological data was not collected from April 15 until April 18 due to a data logger malfunction that was corrected.)

When the observed Hg^0 concentration values were correlated with the 5 minute average wind direction (Figure 4.1.2), it can be seen that there are no values greater than 45 ng/m^3. The highest recorded values were in the range of 30-45 ng/m^3 and were observed simultaneously with winds from the west (<1%), north-northwest (<1%), and east-northeast (<1%). There were values below 2 ng/m^3 for 0.5% of the data set. The remaining data points are generally in the 2-5 ng/m^3 range with the remaining values generally in the 5-10 ng/m^3 range.

The average ambient level of elemental mercury vapor can range from 1.6-3.3 ng/m^3 depending on location and proximity to urban and/or industrial areas.[6]. The EPA's Reference Concentration (RfC) for elemental mercury is 300 ng/m^3. As stated in the introduction section of this report, EPA estimates

> *that inhalation of this [RfC] concentration or less, over a lifetime, would not likely result in the occurrence of chronic non-cancer effects. The RfC is not a direct estimator of risk but rather a reference point to gauge the potential effects. Exceedance of the RfC does not imply that an adverse health effect would necessarily occur. As the amount and frequency of exposures exceeding the RfC increase, the probability of adverse health effects also increases.*[2]

Although there were no concentration values that were near the RfC value, Figure 4.1.2 did indicate that there might be a directional component to concentration values above 10 ng/m^3. Therefore, Figure 4.1.3 was plotted and it does seem to indicate that there is a directional component to these values oriented to the northwest. There is also a smaller component to the northeast. The central area of the plot does not have any data points due there being no values below about 1.8 ng/m^3. The directional nature of these concentrations may be due to the proximity of the monitoring site to a major metropolitan area (Charlotte, NC). Hg^0 ambient air concentrations have been shown to be higher in metropolitan areas as compared to more rural or remote locations.[6]

Figure 4.1.1 - Matthews Mercury Site Wind Rose
Site MC2 - April 18 through April 28, 1999

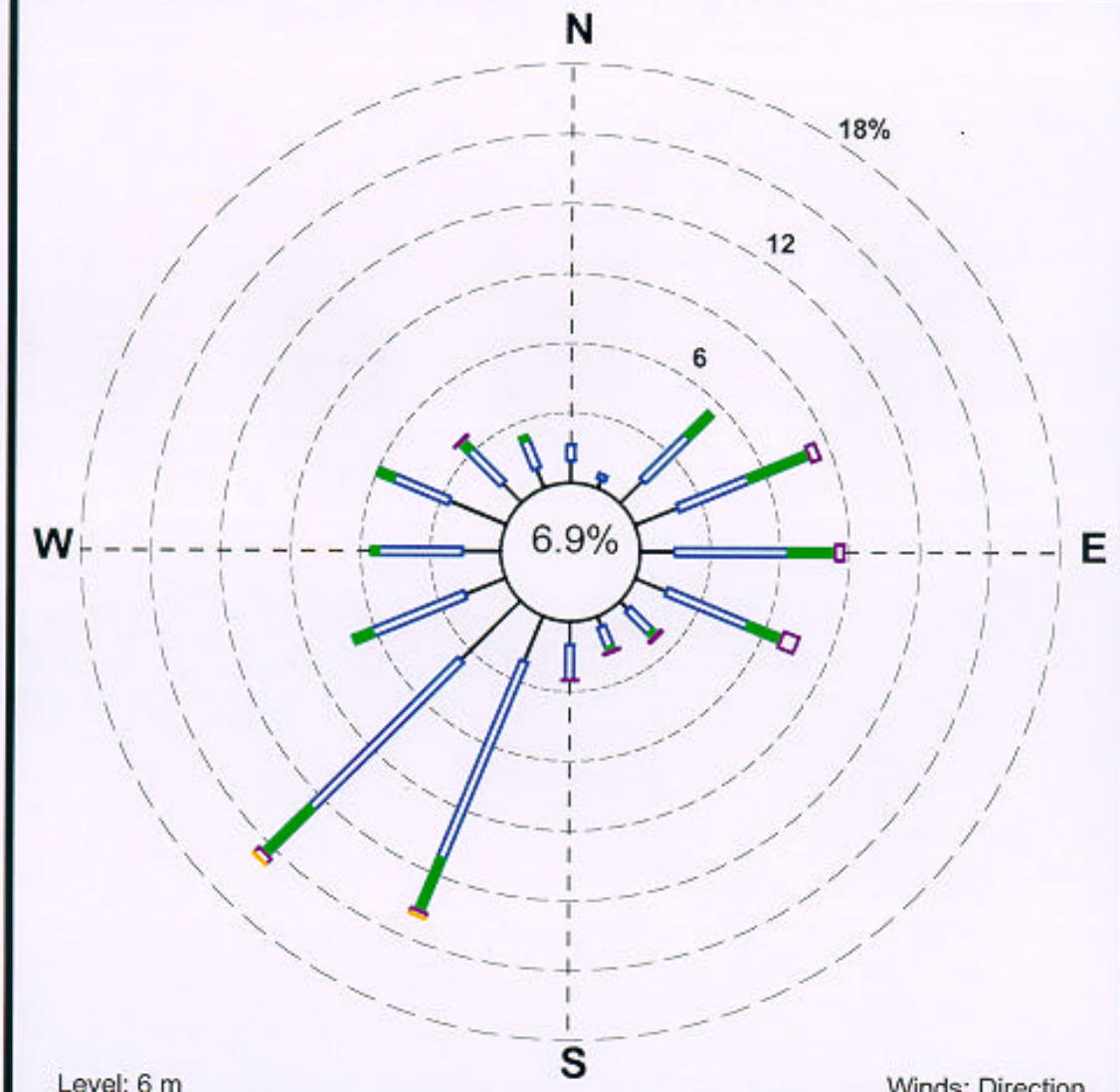


Figure 4.1.2 - Matthews Mercury Site Concentration Rose
Site MC2 - April 18 through April 28, 1999

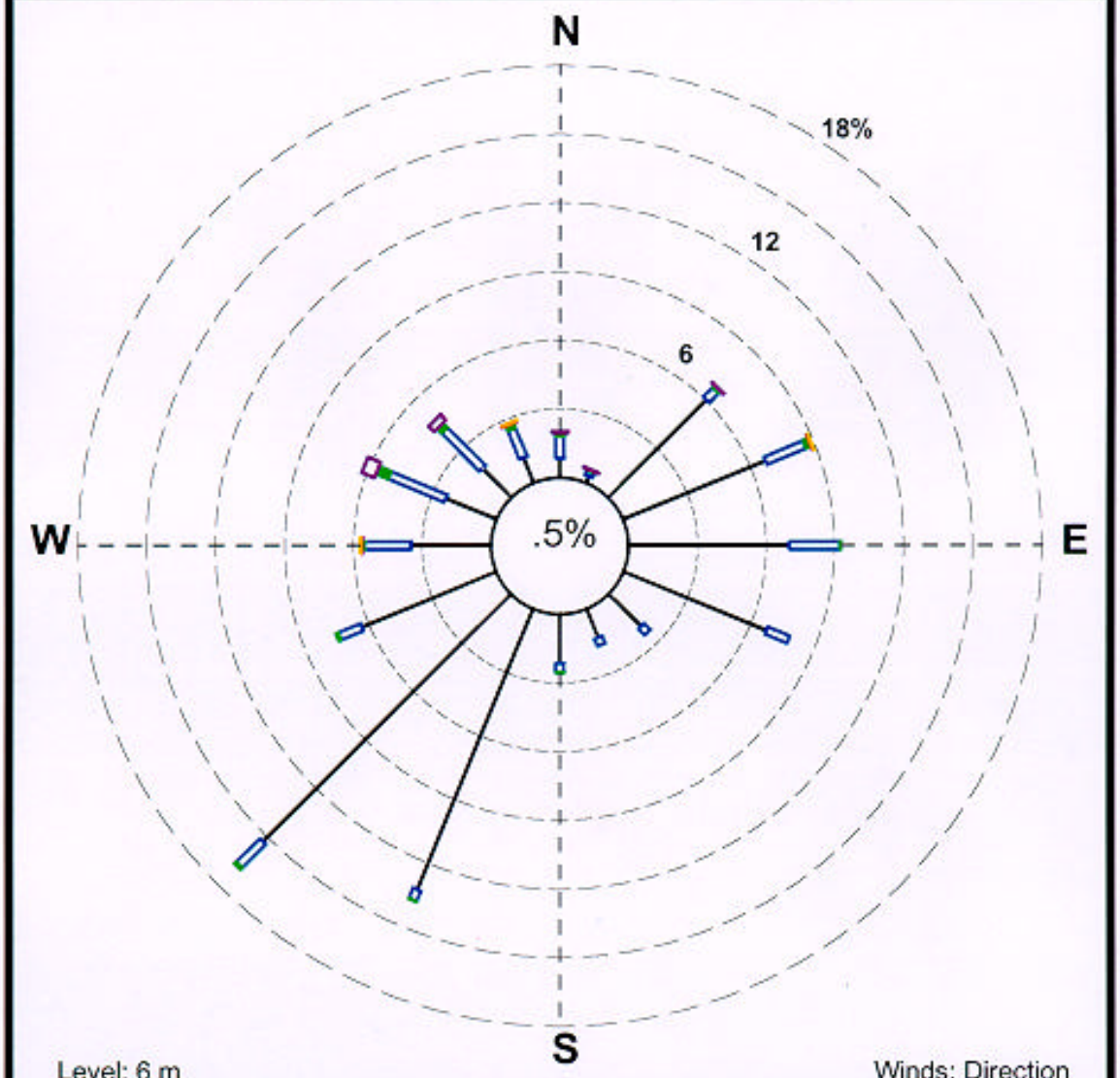


Figure 4.1.3 - Matthews Survey
Elemental Mercury Vapor Monitoring
Site MC2 - April 18 - 28, 1999