**APPENDIX M**

**CONVERSION EQUATIONS (mg/m$^3$ to ppm)**

**Equation M-1**

$$ppm_{NTP} = \frac{(mg/m^3)(24.46)}{MW}$$

Where:

24.46 = molar volume at 25°C (298K) and 760 mmHg
MW = molecular weight
NTP = Normal Temperature and Pressure (25°C and 760 mmHg)
mmHg = millimeters of mercury

CSHOs will not usually need to calculate the exposure concentration in ppm at the sampling site ($ppm_{PT}$) but, if necessary, it can be calculated from the SLTC's results reported in $ppm_{NTP}$ by using the following equation:

**Equation M-2**

$$ppm_{PT} = (ppm_{NTP})\left(\frac{760}{P}\right)\left(\frac{T}{298}\right)$$

Where:

P = sampling site pressure (mmHg)
T = sampling site temperature (K)
298 = normal temperature in degrees Kelvin (273 + 25)
760 = normal atmospheric pressure in mmHg

**Equation M-3**

$$\text{Because } ppm_{NTP} = \frac{(mg/m^3)(24.46)}{MW}$$

$$ppm_{PT} = (mg/m^3)\left(\frac{24.46}{MW}\right)\left(\frac{760}{P}\right)\left(\frac{T}{298}\right)$$

NOTE: When a contaminant concentration is converted from mg/m$^3$ and expressed as $ppm_{PT}$, that value cannot be compared directly to the PEL table without first converting it to its corresponding $ppm_{NTP}$ value.

NOTE: The **barometric pressure** for the time period sampled can sometimes be obtained from the NOAA website or by calling the local weather station or airport. If air pressures are obtained by this route, it is necessary to obtain the unadjusted barometric pressure (station pressure) for compliance applications. The barometric pressure information most readily available from weather and aviation

sources is the sea-level adjusted barometric pressure which tends to average about 760 mmHg and does not represent the actual air pressure of worksites much removed from sea level.
If the sources above are not readily available or cannot provide the actual station pressure, then the elevation (Elev) in feet of the worksite can be used to calculate the typical barometric pressure (P) in mmHg using the following equation:

**Equation M-4**

$$P = 760 \times \left[1 - \frac{Elev \times 1.6470 \times 10^{-3}}{295.20 \times (1 + Elev \times 4.9787 \times 10^{-8})}\right]^{6.3222}$$

Equation M-4 is an adaptation of the atmospheric model equation used in the *U.S. Standard Atmosphere* (1976) using a higher average effective sea-level screen temperature (295.2K) and lower temperature lapse rate (5.4K/km) typically observed over land surfaces within the northern latitudes of the U.S. (19ºN to 61ºN). For most of the U.S., the barometric pressures obtained with this equation are better estimates of observed station pressures than the 1976 model, and deviate from mean annual station pressures by about 0.24% RSD (percent relative standard deviation) for elevations below 4,300 feet and 0.52% RSD for elevations below 30,000 feet. These deviations are insignificant compared to the estimated 1.6% RSD for combined normal seasonal, storm, and diurnal station pressure variations observed at any elevation within the year. The 1.6% RSD may be assumed if the worksite elevation can be estimated to within 100 feet. A global positioning system (GPS) elevation measurement is typically within 100 feet of the actual elevation. GPS elevation measurements should be made outdoors and away from tall structures. Example calculations using the equation give 723.2 mmHg for an elevation of 1,400 feet above mean sea level and 569.5 mmHg for an elevation of 8,000 feet above mean sea level. Due to Alaska's high latitudes, Equation M-4 is biased high for significant elevations in Alaska; therefore, the station pressure of a nearby weather station is necessary to obtain accurate air pressures for most of Alaska.