

## Gas Chromatography/Mass Spectrometry<sup>1</sup>

Analytes	Media	Detection Limit <sup>2</sup>	Samples per day <sup>3</sup>	Interferences	Performance Tips and Limitations
Volatile Organics	Air	20 ppb to 5 ppm with no pre-concentration, ppt with pre-concentration	30-60	Spectral interferences can occur in the presence of excessive water vapor.  Various concentrations of petroleum-based fuels within the sample may result in the loss of chemicals of concern during the dilution process to bring the sample within linear range.	Field portable/transportable GC/MS equipment can be used to provide real time quantitation and speciation of unknowns in the field. The equipment can be designed for volatiles only (Inficon, Inc. HAPSITE, weight 35 lbs) or for full analysis of any chemical a fixed laboratory GC/MS can do (Bruker VIKING 573, weight 86 lbs). Ancillary equipment may be required (e.g., computer, carrier gas tank, marine battery, generator ).  Make sure the chemicals of concern are not affected by the method of sample introduction of the particular instrument. This can also affect detection limits.  Some instruments can use ambient air as a carrier gas. Operators must determine the appropriate column temperature for the chemicals of concern in order to determine the appropriate carrier gas.  Power requirements differ among instruments. Some can use batteries or AC current while others can use only AC current.  Higher oven temperature capabilities allow shorter run times and detection of less volatile compounds  Instruments that allow direct injection into the MS are useful for rapid analysis of samples without complex mixtures.
Volatile Organics	Soil	50 µg/kg to 50 mg/kg	12-48		
Volatile Organics	Water	0.1 to 100 µg/l	12-48		
Semi-volatile Organics	Soil	50 µg/kg to 50 mg/kg	12-48		

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## Gas Chromatography (Portable and Transportable) (Continued)

Detectors <sup>1</sup>	Media	Detection Limit (µg/L or µg/kg) <sup>2</sup>	Samples per day	Interferences	Performance Tips and Limitations <sup>3</sup>
<b>Volatile Organics Continued</b>					
Electron Capture Detector	Soil	0.01-3.4 <sup>4</sup> for halogenated compounds			This detector is extremely sensitive to halogenated chemicals and the detector of choice when the chemicals of concern are a mixture of halogenated alkanes and alkenes.
Electron Capture Detector	Water	0.01-3.4 <sup>4</sup> for halogenated compounds			
<b>Semi-Volatile Organics</b>					
Flame Ionization Detector	Soil	No published values. Diesel range organic compounds	12-35 depending upon the level of QA/QC required, the number of chemicals of concern, and the chemical family <sup>7</sup>	Chemical specific. Matrices contaminated with high concentrations of non-target compounds may pose co-elution problems.	Analysis of PAHs by FID is performed on a transportable GC. This analysis is limited by the co-elution of four pairs of compounds. However, PAHs, PCBs and pesticides can be analyzed in the field using transportable GCs, and a small scale extraction, such as that devised by the EPA Region 1 laboratory (Spittler).
Flame Ionization Detector	Water	100-1600 for phenols. 13-2300 for PAHs. <sup>6</sup>			
Flame Photometric Detector	Soil	2.0-40 for organophosphates			This detector is based on the principle that organosulfur and organophosphorus compounds produce chemiluminescent species when burned in a hydrogen flame. It is very sensitive and very selective for these compounds. Interchangeable optical filters permit selection of either sulfur or phosphorus containing compounds.
Flame Photometric Detector	Water	0.04-0.8 for organophosphates			

## Gas Chromatography/Mass Spectrometry<sup>1</sup> (Continued)

Analytes	Media	Detection Limit <sup>2</sup>	Samples per day <sup>3</sup>	Interferences	Performance Tips and Limitations
Semi-Volatile Organics	Water	0.1 to 100 µg/l	12-48		<p>Increasing the column length is often helpful for the resolution of complex mixtures.</p> <p>Some instruments can provide better detection limits for specific chemicals if they support selective ion monitoring.</p> <p>Requires highly trained operator.</p>

<sup>1</sup> Based on technical specifications from ETV program.

<sup>2</sup> Chemical, matrix, sample preparation/introduction, and instrument dependent.

<sup>3</sup> Depends on the instrument, preparation method, sample introduction method, and chemicals being analyzed. May require two analysts to achieve maximum throughput.