Field-Based Methods Available for Specific Classes of Environmental Contaminants [1]

Contaminant Class	Field Analytical Technique	Environmental/Waste Media		
		W	S	G
Halogenated solvents	Colorimetric test kits	X	X[2]	
	Detector tubes			X
	Fiber optic chemical sensors (FOCS)	X	X	X
	Fourier transform infrared spectroscopy (FTIR)			X
	Gas chromatography (GC)	X[2]	X[2]	X
	Gas chromatography/mass spectrometry (GC/MS)	X[2]	X[2]	X
	Membrane interface probe (MIP)[3]	(X)[4]	(X)[4]	X
	Surface acoustic wave sensors (SAWS)	(X)[4]	(X)[4]	X
BTEX	Biosensors	X		X
	Detector tubes			X
	FOCS	X	X	X
	GC	X[2]	X[2]	X
	GC/MS	X[2]	X[2]	X
	Immunoassay test kits[5]	X	X[2]	
	MIP[3]	(X)[4]	(X)[4]	X
	Ultraviolet fluorescence (UVF) test kits	X	X[2]	
MTBE and oxygenates	GC	X[2]	X[2]	X
	GC/MS	X[2]	X[2]	X
Pesticides and herbicides	Biosensors	X		X
	Colorimetric test kits	X	X[2]	
	GC	X[2]	X[2]	X[2]
	GC/MS	X[2]	X[2]	X[2]
	Immunoassay test kits[5]	X	X[2]	
Polychlorinated biphenyls (PCBs)	Biosensors	X		X
	Colorimetric test kits	X	X[2]	
	GC	X[2]	X[2]	X[2]
	GC/MS	X[2]	X[2]	X[2]
	Immunoassay test kits[5]	X	X[2]	
	UVF test kits	X	X[2]	
Pentachlorophenol (PCP), other phenols	Colorimetric test kits	X	X[2]	
	GC	X[2]	X[2]	X[2]
	GC/MS	X[2]	X[2]	X[2]
	Immunoassay test kits[5]	X	X[2]	
Chlorinated dioxins and furans	GC	(X)[2, 6]	(X)[2, 6]	(X)[2, 6]
	GC/MS	X[2, 6]	X[2, 6]	X[2, 6]
	Immunoassay test kits[5]	X	X[2]	

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Contaminant Class	Field Analytical Technique	Environmental/Waste Media		
		W	S	G
Petroleum hydrocarbons	Colorimetric test kits	X	X[2]	
	FOCS	X	X	X
	FTIR	X	X	X
	Fuel Fluorescence detector (FFD)	X	X	
	GC	X[2]	X[2]	X
	GC/MS	X[2]	X[2]	X
	Immunoassay test kits[5]	X	X[2]	
	Laser-induced fluorescence (LIF)		X	
	MIP[3]	(X)[4]	(X)[4]	X
	UVF test kits	X	X[2]	
Polycyclic aromatic hydrocarbons (PAHs)	Biosensors	X		X
	Colorimetric test kits	X	X[2]	
	FFD	X	X	
	GC	X[2]	X[2]	X[2]
	GC/MS	X[2]	X[2]	X[2]
	Immunoassay test kits[5]	X	X[2]	
	LIF		X	
	Liquid chromatography[7] (LC)	X[2]	X[2]	X[2]
	UVF test kits	X	X[2]	
Explosives	Biosensors	X		X
	Colorimetric test kits	X	X[2]	
	Downhole pyrolysis explosives sensor		X	
	Electro-optical sensors	X		
	GC	X[2]	X[2]	X[2]
	GC- ion mobility spectrometry (IMS)	X[2]	X[2]	
	GC/MS	X[2]	X[2]	X[2]
	Immunoassay test kits[5]	X	X[2]	
	LC[7]	X	X[2]	X[2]
Metals	Anodic stripping voltammetry (ASV)	X		
	Biosensors	X		X
	Colorimetric test kits	X	X[2]	X[2, 8]
	Graphite furnace atomic absorption Spectrophotometry (GFAA)	X	X[2]	X[2]
	Immunoassay test kits[5, 9]	X	X[2]	X[2]
	Inductively coupled plasma spectrophotometry (ICP) [7]	X	X[2]	X[2]
	Ion selective electrodes (ISE)	X	X[2]	
	Laser-induced breakdown spectroscopy (LIBS)		X	
	Mercury vapor analyzers	(X)[4]	(X)[4]	X
	X-ray fluorescence (XRF)		X	
Bulk metal objects	Electromagnetic induction (EM)		X	
	Ground penetrating radar (GPR)		X	
	Magnetometry		X	
			X	

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Contaminant Class	Field Analytical Technique	Environmental/Waste Media		
		W	S	G
General chemistry parameters [10]	Colorimetric test kits	X	X[2]	X
	Direct reading probes	X	X	
	ISE	X	X[2]	
Radionuclides	Gross counters	(X)[11]	(X)[11]	(X)[11]
	XRF		X	
Non-aqueous phase liquids	LIF		X	
	Seismic reflection/refraction		X	
	MIP[3]	(X)[4]	(X)[4]	

Abbreviations and Notes:

W – Water matrixes
S – Soil/Sediment/Solid
G – Gas/Air/Vapor

1 This table provides a general cross-reference only. Although the listed techniques can be used for the indicated analytical parameters and environmental media, potential users should investigate and weigh carefully whether a given technique is appropriate for their specific project. The performance of candidate technologies (e.g., sensitivity, bias, and precision) should be assessed through reference data or preferably, through pilot testing, relative to project data quality and decision quality objectives. Additional information on analytical technologies can be found at http://www.frtr.gov, http://www.epareachit.org.
2 Appropriate sample collection and preparation steps, such as extraction, concentration, and/or clean-up steps, are generally required before the technique can be used for this analytical parameter and sample medium.
3 The MIP is a downhole platform that can be paired with a variety of detection systems, including photoionization detectors (PIDs) for BTEX and TPH, electron capture detectors (ECDs) for halocarbons, or flame ionization detectors (FIDs) or a direct sampling ion trap mass spectrometer (DSITMS) for general characterization. Other downhole platforms can be paired with these detection systems for the detection of volatile contaminants, such as the hydrosparge and thermal desorption platforms.
4 Because they measure in situ concentrations in the vapor phase, MIPs and SAWS provide only indirect measurements of soil and groundwater concentrations.
5 IA kits generally detect classes of target analytes, and may not be compound-specific.
6 At best, field-based GCs and GC/MSs can provide only “screening” quality data for dioxins and furans that is not congener-specific. Project teams requiring low-level, congener-specific data for risk assessment purposes will probably require high resolution GC/MS analysis at a fixed laboratory.
7 This analytical technique is not very field portable, usually requiring a mobile or fixed on-site laboratory.
8 Mercury only.
9 IA kits are currently available only for mercury. Results can be affected by high concentrations of other metals or the presence of radionuclides.
10 Includes water quality parameters, anions, and other non-metal inorganics.
11 Gross counters are non-specific, reporting total activity rather than activity for specific radionuclides.