HALOGENATED AND AROMATIC VOLATILE ORGANIC COMPOUNDS (VOCs) BY GAS CHROMATOGRAPHY

SW-846 MethodS 8010A and 8020A or Method 8021A

Table 1A. Summary of Holding Times and Preservation for Halogenated and Aromatic Volatile Organic Compounds by Gas Chromatography

Analytical Parameter [a]	**Technical and Contract Holding Times**	**Preservation**
Volatile Organic Compounds (VOCs) in Water	Technical: 7 days from collection; Contract: 5 days from receipt at laboratory	Cool to 4EC ±2EC;
VOCs in Water	Technical: 14 days from collection; Contract: 10 days from receipt at laboratory	HCl to pH <2; Cool to 4EC ±2EC
VOCs in Soil	Technical: 48 hours Contract: 48 hours	Cool to 4EC ±2EC; sealed zero headspace containers; freezing can extend the holding time [b]
VOCs in Soil	Technical: 14 days from collection; Contract: 10 days from receipt at laboratory	Preserved samples: in methanol [c] or sodium bisulfate [d]

[a] Individual target compounds are listed in Tables 1B and 1C.
[b] Freezing the sample can extend the holding time; however, 48 hours unfrozen holding time will be considered cumulative.
[c] Use Method 5030 for purge and trap.
[d] Use Method 5035 for purge and trap.

pH of each sample must be recorded and reported with sample results.

Data Calculations and Reporting Units:

Calculate the calibration factors (CFs) and the concentration of individual analytes according to the equations specified in Sections 7.4.2 and 7.10.1, respectively, of Method 8000B. Report water sample results in concentration units of micrograms per liter (Fg/L). Report soil sample results on a dry-weight basis in micrograms per kilogram (Fg/kg). Report percent solid and percent moisture to the nearest whole percentage point.

For rounding results, adhere to the following rules:
a)If the number following those to be retained is less than 5, round down;
b)If the number following those to be retained is greater than 5, round up; or
c)If the number following the last digit to be retained is equal to 5, round down if the digit is even, or round up if the digit is odd.

All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example calculation in the data package.

Table 1B. Target Compound List, CAS Numbers, and Contract Required Quantitation Limits for *Halogenated Volatile Organic Compounds by Gas Chromatography*

SW-846 Method 8010A or 8021A

Compound	**CAS Number**	**CRQL (Fg/L or Fg/kg)**
Benzyl chloride	100-44-7	1
Bromobenzene	108-86-1	1
Bromodichloromethane	75-27-4	1
Bromoform	75-25-2	1
Bromomethane	74-83-9	1
Carbon tetrachloride	56-23-5	1
Chloroethane	75-00-3	1
2-Chloroethylvinylether	110-75-8	1
Chloroform	67-66-3	1
Chloromethane	74-87-3	1
Dibromochloromethane	124-48-1	1
Dibromomethane	74-95-3	1
Dichlorodifluoromethane	75-71-8	1
1,1-Dichloroethane	75-34-3	1
1,2-Dichloroethane	107-06-2	1
1,1-Dichloroethene	75-35-4	1
trans-1,2-Dichloroethene	156-60-5	1
1,2-Dichloropropane	78-87-5	1
cis-1,3-Dichloropropene	10061-01-5	1
trans-1,3-Dichloropropene	10061-02-6	1
Methylene chloride	75-09-2	5
1,1,2,2-Tetrachloroethane	79-34-5	1
1,1,1,2-Tetrachloroethane	630-20-6	1
Tetrachloroethene	127-18-4	1
1,1,1-Trichloroethane	71-55-6	1
1,1,2-Trichloroethane	79-00-5	1
Trichloroethene	79-01-6	1

Trichlorofluoromethane	75-69-4	1
1,2,3-Trichloropropane	96-18-4	1
Vinyl chloride	75-01-4	1
Additional Compounds:		
1,2-Dibromo-3-chloropropane	96-12-8	1
1,2-Dibromoethane	106-93-4	1
1,3-Dichloropropane	142-28-9	1
Dichlorofluoromethane	75-43-4	1

Table 1C. Target Compound List, CAS Numbers, and Contract Required Quantitation Limits for *Aromatic Volatile Organic Compounds by Gas Chromatography*

SW-846 Method 8020A or 8021A

Compound	**CAS Number**	**CRQL (Fg/L or Fg/kg)**
Benzene	71-43-2	1
Chlorobenzene	108-90-7	1
1,2-Dichlorobenzene	95-50-1	1
1,3-Dichlorobenzene	541-73-1	1
1,4-Dichlorobenzene	106-46-7	1
Ethylbenzene	100-41-4	1
Toluene	108-88-3	1
Xylenes (Total)	1330-20-7	1

Table 2. Summary of Calibration Procedures for Halogenated and Aromatic Volatile Organic Compounds by Gas Chromatography

Calibration Element	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration (minimum blank + 5 points for each analyte) (ICAL)[a, b, c]	Initially; whenever required, due to failure of CCV	RSD for CFs #30%; or, correlation coefficient (r) of linear regression $0.99	1. Terminate analysis 2. Recalibrate and verify before sample analysis
Continuing Calibration Verification (CCV)	Daily, every 12-hour, every ten samples, and end of run	%D between CF of CCV and avg CFs from ICAL <±25%	1. Recalibrate and verify 2. Reanalyze samples back to last good CCV
Retention time evaluation of CCV standards	Each analysis of CCV standard	±3 x the SD of the avg ICAL RT for each analyte	1. Re-calibrate and verify 2. Re-analyze samples back to last good CCV

[a] The ICAL low standard must be above but near the CRQL. The low ICAL standard must have a signal to noise ratio $5:1. If this requirement cannot be met, the laboratory must submit a MDL study as part of the data package.

[b] ICAL and continuing CAL standards must contain all target analytes listed in Table 1B.

[c] Report the retention time window for each analyte. Determine retention time windows as ±3 x the standard deviation of the average initial calibration retention time for each analyte.

Table 3. Summary of Internal Quality Control Procedures for Halogenated and Aromatic Volatile Organic Compounds by Gas Chromatography

QC Element	Frequency	Acceptance Criteria	Corrective Action
Method Blank (MB)	Each 12-hour time period, minimum of one per SDG [a]	< CRQL for each compound	1. Investigate the source of contamination and document. 2. Reanalyze all samples processed with a blank that is out of control.
Instrument Blank	After any sample which contains a target compound concentration >50 ppb	< CRQL for each compound	1. Investigate the source of the problem and document. 2. Acceptance criterion must be met before proceeding with further analysis, in order to demonstrate that there is no analyte carryover.
Surrogate Spikes [b]	Every sample, standard and method blank	Water Sample: 75-125% of expected value Soil Sample: 65-135% of expected value	1. Reanalyze all samples with non-compliant surrogate recoveries
Matrix Spike and Matrix Spike Duplicate (MS/MSD) [c]	One MS/MSD set per batch or SDG (1 MS/MSD set per 20 samples minimum)	Water Sample: 75-125% of expected value; Soil Sample: 65-135% of expected value; #30% RPD between MS and MSD	1. Report in case narrative

[a] SDG - Sample Delivery Group - each case of field samples received; or each 20 field samples within a case; or each 14 calendar day period during which field samples in a case are received.
[b] Surrogates: Halogenated compounds - 50 ng of one of the following three compounds: bromochlormethane, 2-bromo-1-chloropropane, or 1,4-dichlorobutane.
Aromatic compounds - 50 ng of one of the following two compounds: 1,1,1-trifluorotoluene and 4-bromofluorobenzene (BFB).

[c] Spike MS/MSD with 10 ppb of the following halogenated and aromatic VOCs: 1,1-dichloroethene, trichloroethene, chlorobenzene, toluene, and benzene.

Dilute and reanalyze samples which contain one or more target analytes at concentrations above the initial calibration range. Results for such reanalyses should fall within the mid-range of the calibration curve. Report results and submit documentation for both analyses.

Second column confirmation is required for all positive results. Confirmation must be performed on a column of a phase different from that used for quantitation. Confirmation analyses must meet all calibration criteria specified in Table 2 and blank acceptance criteria specified in Table 3.