SCREENING PROCEDURE FOR TOTAL VOLATILE ORGANIC HALIDES IN WATER

SW-846 is not intended to be an analytical training manual. Therefore, method procedures are written based on the assumption that they will be performed by analysts who are formally trained in at least the basic principles of chemical analysis and in the use of the subject technology.

In addition, SW-846 methods, with the exception of required method use for the analysis of method-defined parameters, are intended to be guidance methods which contain general information on how to perform an analytical procedure or technique which a laboratory can use as a basic starting point for generating its own detailed Standard Operating Procedure (SOP), either for its own general use or for a specific project application. The performance data included in this method are for guidance purposes only, and are not intended to be and must not be used as absolute QC acceptance criteria for purposes of laboratory accreditation.

1.0 SCOPE AND APPLICATION

1.1 This method is a colorimetric *screening* procedure that may be used to analyze water samples for total volatile organic halides (volatile halogenated organic compounds) including:

Analyte	Abbreviation	CAS Number*
Trichloroethylene	TCE	79-01-6
Perchloroethylene (Tetrachloroethene)	PCE	127-18-4
Carbon tetrachloride	--	56-23-5
Trihalomethanes	THMs	--

*Chemical Abstracts Service Registry Number

The method is based on a commercially-available testing product and is primarily intended for on-site use. This method is not specific to any one halogenated hydrocarbon compound. The sensitivity of the method is related to the number and position of the halide functional groups on the hydrocarbon. The testing product is based on a photochemical reaction involving UV light and therefore, it should be used in a location that is protected from direct sunlight, such as in a vehicle, a trailer, or under a covering.

1.2 For routine screening analysis, the calibration curve is generated using TCE. The testing product uses a three-point calibration covering the range of 5 - 190 µg/L of TCE and the total concentration of the volatile organic halides is reported as a concentration of TCE. An LOQ of 4 µg/L of TCE has been calculated by the manufacturer. The manufacturer provides standards of TCE, PCE, chloroform, and carbon tetrachloride, so that if one of these compounds is the predominant contaminant at a given site, a site-specific calibration can be generated, using the predominant contaminant.

1.3 Using the testing product from which this method was developed, 0% of spiked water samples containing 2.2 µg/L of TCE produced a false positive result and 0% of spiked

water samples containing 8.8 µg/L of TCE produced a false negative result. Tables 1 and 2 contain the results of the false positive and false negative evaluations, respectively. These data are for guidance purposes only.

1.4 Prior to employing this method, analysts are advised to consult the manufacturer's instructions for additional information on quality control procedures, development of QC acceptance criteria, calculations, and general guidance. Analysts also should consult the disclaimer statement at the front of the manual and the information in Chapter Two for guidance on the intended flexibility in the choice of methods, apparatus, materials, reagents, and supplies, and on the responsibilities of the analyst for demonstrating that the techniques employed are appropriate for the analytes of interest, in the matrix of interest, and at the levels of concern.

In addition, analysts and data users are advised that, except where explicitly specified in a regulation, the use of SW-846 methods is *not* mandatory in response to Federal testing requirements. The information contained in this method is provided by EPA as guidance to be used by the analyst and the regulated community in making judgments necessary to generate results that meet the data quality objectives for the intended application.

1.5 This method is restricted to use by, or under the supervision of, appropriately trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method.

2.0 SUMMARY OF METHOD

This screening method consists of two steps: (1) Extraction of the water sample and (2) the reaction of the sample extract under UV light to produce a colored product, the absorbance of which is measured by a dedicated colorimeter.

2.1 Extraction

2.1.1 A 290-mL water sample is mixed for 3 minutes with the extraction solvent (octane) and a length of Teflon® tape. The solvent, the tape, and the extraction container are provided with testing product. The extraction solvent and analytes will partition onto the Teflon® tape.

2.1.2 The tape is removed from the water sample and placed into a syringe barrel provided with the testing product. The syringe plunger is used to force the octane and the analytes of interest from the tape into the receiving vial provided with the testing product.

2.1.3 The extracted solution contains the solvent, analytes, and water, so two layers form in the receiving vial, which contains cobalt chloride. Cobalt chloride is used to facilitate separation of the aqueous phase (pink) from the solvent phase (colorless). The colorless solvent layer is pipetted off into a vial containing the drying agent, sodium sulfate.

2.1.4 The solution is transferred to the liquid/liquid transfer vial provided with the testing product. A liquid-liquid (octane/acetonitrile) extraction is then performed. The volatile organic halides will partition into the acetonitrile layer.

2.2 Reaction and readout

2.2.1 The upper octane layer is removed and discarded and 0.6 mL of the acetonitrile layer is transferred into the vial containing the reagent.

2.2.2 The sample is exposed to UV light (the UV exposure time is controlled by the instrument so that each sample is reacted using an equal number of photons) and the absorbance at the appropriate wavelength for the selected analyte is measured. The absorbance reading is converted to concentration using the calibration curve generated at the start of the analysis batch. The colorimeter readout displays the sample results in units of µg/L of total volatile organic halides.

3.0 DEFINITIONS

3.1 Total volatile organic halides -- An operationally-defined term that represents the sum of the responses generated from all of the volatile organic halide constituents (volatile halogenated organic compounds) present in a water sample using this test. That will include the responses of the three specific compounds listed in Sec. 1.1, as well as the responses from any of the trihalomethanes that are present.

3.2 Trihalomethane -- Any compound containing only one carbon atom, one hydrogen atom, and three halogen atoms. The three halogen atoms may all be the same, or may occur in any other combination of halogens.

3.3 Refer to Chapter One and the manufacturer's instructions for other definitions that may be relevant to this procedure.

4.0 INTERFERENCES

4.1 The use of this field test should be limited to the determination of volatile organic halides in water. It is not intended for use in different media or for other contaminants. This method is not specific to any one halogenated hydrocarbon compound. Sensitivity of the method is related to the number and positioning of the halide functional groups on the hydrocarbon. Table 3 provides a summary of the sensitivity of compounds tested relative to TCE, PCE, carbon tetrachloride, and chloroform. These data are provided for guidance purposes only.

4.2 Table 4 provides a summary of the compounds tested as possible interferants for the analysis of TCE at a concentration of 20 µg/L. No significant interference was observed for the compounds tested. 2,2,2-Trichloroethanol had an interference effect at 2,000 µg/L (100-fold higher concentration than the test level for TCE) but no significant interference at 200 µg/L (10-fold). These data are provided for guidance purposes only.

4.3 The suggested storage temperature for this testing product is 25 °C. The testing product should not be stored at temperatures below 5 °C or above 30 °C. Follow the manufacturer's instructions regarding shelf life and storage.

NOTE: Testing by the manufacturer indicates that the testing product may be stored for up to 8 months at ≤25 °C. However, if the storage temperature is 40 °C, the shelf life is reduced to 2 weeks.

4.4 The reagents used in the testing product are highly sensitive to UV light. Therefore, use and store the testing product in a location protected from direct or indirect sunlight.

NOTE: There are no indicators of instability or deterioration included with the testing product.

4.5 The photochemical reaction which produces the color used for quantitation is carried out in the instrument automatically. The color that is produced from the reaction is not stable and will decay after exposure. Since the instrument measures the color immediately after exposure, the decay of the color is not a concern for routine analysis. However, it is not possible to re-measure the sample color with the instrument.

5.0 SAFETY

5.1 This method does not address all safety issues associated with its use. The user is responsible for maintaining a safe work environment and a current awareness file of OSHA regulations regarding the safe handling of the chemicals listed in this method. A reference file of material safety data sheets (MSDSs) should be available to all personnel involved in these analyses.

5.2 The commercially-available testing product contains the following hazardous materials and proper precautions should be taken during use: TCE solutions in acetonitrile that are used as standards and calibrations checks, the Quick Test® reagent, octane, and acetonitrile. Material safety data sheets for all solvents and reagents are provided by the manufacturer and should be reviewed prior to use of the testing product.

6.0 EQUIPMENT AND SUPPLIES

6.1 The Quick Test for Volatile Organic Halides® (Strategic Diagnostics, Inc.) or equivalent. Each commercially-available testing product will supply reagents and materials necessary for completion of 10 tests, as well as solutions for calibration and calibration verification.

6.2 Instrumentation

6.2.1 A portable instrument, the Envirometer®, is required for use in this method. The Envirometer® serves two functions. First, it exposes each sample to a controlled amount of UV light. Second, the Envirometer® functions as a colorimeter to determine the concentration of the photo-product, which absorbs light in the visible region of 420 to 680 nm. The Envirometer® also performs the necessary calculations to convert the sample absorbance into a concentration, which is displayed in µg/L of total volatile organic halides, based on the calibrator employed (i.e., TCE, PCE, carbon tetrachloride, or chloroform). If available, equivalent instrumentation capable of carrying out both of these functions may be employed.

6.2.2 An adjustable (200 - 1000 µL) pipettor (Wheaton Model 851268, or equivalent) is necessary to measure and transfer solutions.

7.0 REAGENTS AND STANDARDS

7.1 Each commercially-available testing product will supply the reagents and standards necessary for successful completion of the test. Testing product reagents are labeled with appropriate expiration dates.

NOTE: The Quick Test® reagent is very sensitive to UV light and it is compromised almost immediately when exposed to strong UV sources such as sunlight. The thermal and reactive stability (aside from photoreactivity) of the reagent was tested over a period of 8 months at room temperature and for 2 weeks at 40 °C. The Quick Test® reagent was stable at these temperatures and times. The evaporation of organic solvents is an important factor in the shelf life of the testing product. The recommended storage times and temperatures are given in Sec. 4.3.

7.2 Organic-free reagent water -- Needed for the preparation of various quality control samples. All references to reagent water in this method refer to organic-free reagent water, as defined in Chapter One.

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 See the introductory material in Chapter Four, "Organic Analytes."

8.2 A 290-mL aliquot is required for each sample to be screened using this method. This volume exceeds that of the typical septum-sealed vial used for samples for volatile analysis (e.g., 40 mL). Therefore, collect each water sample in a sufficiently large container and fill it with no headspace.

8.3 Given the potential loss of volatile constituents from a container without a septum seal, samples should generally be analyzed as soon as practical after collection, and always within 1 hr.

9.0 QUALITY CONTROL

9.1 Follow the manufacturer's instructions for the quality control procedures specific to use of the testing product. Also, refer to Chapter One for additional guidance on quality assurance (QA) and quality control (QC) protocols that may be applicable. Any effort involving the collection of analytical data should include development of a structured and systematic planning document, such as a Quality Assurance Project Plan (QAPP) or a Sampling and Analysis Plan (SAP), which translates project objectives and specifications into directions for those that will implement the project and assess the results. Each laboratory should maintain a formal quality assurance program. The laboratory should also maintain records to document the quality of the data generated. All data sheets and quality control data should be maintained for reference or inspection.

9.2 Procedures to verify testing product performance

This method is intended for either on-site- or fixed-laboratory use. The appropriate level of quality control should accompany the application of this method to document data quality.

9.2.1 The 3-point calibration should be performed at the beginning of each analysis period, when large temperature variations (of greater than 20 °F or 10 °C) occur,

or when the calibration verification sample is out of the acceptance limits established by the manufacturer (see Sec. 9.2.2).

9.2.2 The calibration verification samples provided with each testing product contain 90 µg/L of TCE and are analyzed periodically (the manufacturer suggests after every 10 samples) to verify the calibration of the Envirometer®. The manufacturer established the calibration verification acceptance criteria as ±20% of the true value of this standard, e.g., 72 to 108 µg/L. Other concentrations may be employed for the calibration verification, if appropriate for a specific project. However, the analyst may have to prepare standards for this purpose from materials not provided with the testing product. In addition, it may be necessary to develop acceptance criteria specific to such other concentrations. Typical performance for calibration verification is included in Table 5. These data are provided for guidance purposes only.

9.2.3 The analysis of a method blank (called an "unspiked control") is recommended by the manufacturer. This blank is prepared from reagent water (not provided with the testing product) and carried through the entire analytical process.

9.2.4 The analysis of a laboratory control sample (called a "spiked control") is recommended by the manufacturer. The LCS is prepared from reagent water (not provided with the testing product) that is spiked with a solution that is provided with the product containing TCE or another analyte of interest, and carried through the entire analytical process. Initially, the same acceptance criteria used for the calibration verification are used for the LCS. As more data are collected, in-house acceptance criteria should be developed as described in Method 8000.

9.3 The use of replicate analyses, particularly when results indicate concentrations near an action level, is recommended to refine information generated with the testing product.

9.4 Matrix spike samples may be prepared using additional volume of a sample and the spiking solution provided with the testing product. However, the matrix spike aliquot should only be prepared after completing the analysis of the original sample, in order to determine if the original sample is suitable for spiking (e.g., that you are not adding a small quantity of TCE to a sample that already contains a much larger amount, thus generating matrix spike results that are less than useful).

NOTE: The volume of spiking solution provided with each testing product will limit the number of quality control samples (LCS, MS, etc.) that can be prepared, so plan carefully.

10.0 CALIBRATION AND STANDARDIZATION

See Sec. 11.0 for information on calibration and standardization.

11.0 PROCEDURE

Follow the manufacturer’s instructions for use of the testing product. In general, this includes the following procedures. If this discussion conflicts with the manufacturer's instructions, follow the manufacturer's instructions.

CAUTION: The testing product is based on a photochemical reaction involving UV light. Therefore, it should be used in a location that is protected from direct sunlight, such as in a vehicle, a trailer, or under a covering.

11.1 Calibration

11.1.1 The Envirometer® is usually calibrated by analyzing three standards of TCE (5, 90, and 190 µg/L) that are provided with each testing product. The results for these standards are stored in the memory of the Envirometer® and are used by the instrument to calculate the sample results. Follow the manufacturer's instructions for performing the calibration.

11.1.2 The manufacturer also provides standards of PCE, chloroform, and carbon tetrachloride, so that if one of these compounds is the predominant contaminant at a given site, a site-specific calibration can be generated, using the predominant contaminant. Follow the manufacturer's instructions for such site-specific calibrations.

11.1.3 This procedure is based on a colorimetric determination that generally follows the Beer-Lambert Law which relates the logarithm of the absorption of light passed through the sample extract to the concentration of the reagent-analyte complex that is formed during the sample processing steps. Additional information on the calibration model may be obtained from the manufacturer.

The manufacturer has determined that the relationship between the logarithm of the Envirometer® reading and the concentration of the reagent-analyte complex is linear over the range of 5 to 190 µg/L. Hence, the standards provided with the testing product cover that range. The manufacturer has found that above 190 µg/L, the relationship is no longer linear.

Therefore, any sample with a result above the upper limit of the calibration range, e.g., >190 µg/L should be diluted and reanalyzed. However, if the action limit for a given project is well below 190 µg/L, then it may be appropriate to simply report the screening results as greater than the action limit, since a more accurate result may not change the decision to be made.

11.2 Sample extraction

11.2.1 Fill the extraction container with the water sample to the blue mark on the neck of the container. The extraction container will already contain a length of Teflon® tape.

11.2.2 Pour all of the solvent (octane) from the extraction solvent vial into the extraction container. Leave the red crystals (cobalt chloride) in the extraction solvent vial, for use later.

11.2.3 Shake the container vigorously by hand for 3 min. The solvent and the analytes of interest will partition into the Teflon® tape.

11.3 Transferring the extraction solvent

11.3.1 Remove the plunger from the barrel of the extraction solvent transfer syringe. Remove the cap of the extraction vial.

11.3.2 Using the plastic fork device, remove the Teflon® tape from the extraction container and place it in the syringe.

11.3.3 Place the tip of the syringe in the empty extraction solvent vial. Replace the plunger in the barrel of the syringe and force the plunger to the blue line on the barrel. This will transfer the extraction solvent and the analytes of interest from the Teflon® tape to the extraction solvent vial containing the cobalt chloride.

11.3.4 Cap the extraction solvent vial and invert it three or four times. Allow the two layers to separate. The clear upper layer is octane and contains the analytes of interest. The bottom red-colored layer is water.

11.4 Drying the extract

Remove the cap from the drying vial, which contains sodium sulfate. Using an adjustable pipette, transfer the entire clear upper layer from the extraction solvent vial to the drying vial.

11.5 Back extraction into acetonitrile

11.5.1 Using the pipette, transfer all the solvent from the drying vial to the liquid/liquid transfer vial, containing acetonitrile.

11.5.2 Cap the vial and shake it vigorously by hand for approximately 1 min.

11.5.3 Allow the contents to separate into two layers.

11.5.4 Transfer the upper octane layer to the drying vial and dispose of it appropriately.

11.5.5 Transfer 0.6 mL of the acetonitrile layer from the liquid/liquid transfer vial to the reaction vial.

11.6 Reaction and readout

11.6.1 Cap the reaction vial and invert it three to four times.

11.6.2 Place the reaction vial into the Envirometer®.

11.6.3 The Envirometer® performs the following steps automatically:

- UV exposure

- Calculation of concentration in µg/L, based on the calibration run at the beginning of the shift.

11.6.4 After the UV exposure is complete, record the results for the sample and remove the reaction vial from the Envirometer®.

11.7 Samples with results over the upper limit of the calibration range (e.g., >190 µg/L) should be diluted with reagent water and reprocessed, beginning with Sec. 11.2, unless, as noted in Sec. 11.1.3, the action limit for a given project is well below the upper limit of the calibration range.

NOTE: As noted in Sec. 4.5, the color in the sample extract decays rapidly and cannot be measured a second time. Therefore, it is not possible to dilute the sample extract when the results exceed the calibration range. The sample can only be brought within the calibration range by diluting another aliquot of the original sample. Given the potential loss of volatile analytes from any remaining volume of the original sample, the dilution and reanalysis of the sample should be carried out as soon as practical (e.g., within 1 hr of the original analysis).

11.8 Calculations

The Quick Test® Envirometer, an integral part of this method, performs all necessary calculations. See the manufacturer's instructions for additional information.

Because the test is not specific for any one halogenated hydrocarbon compound, report the screening results as the total volatile organic halide concentration equivalent to the concentration of the calibrant used, e.g., 45 µg/L of TCE, if TCE is used for the calibration. If another contaminant is used for the calibration (see Sec. 11.1.2), then report the results as the total volatile organic halide concentration equivalent to the concentration of that contaminant.

12.0 DATA ANALYSIS AND CALCULATIONS

See Sec. 11.8 for information on data analysis and calculations.

13.0 METHOD PERFORMANCE

13.1 Performance data and related information are provided in SW-846 methods only as examples and guidance. The data do not represent required performance criteria for users of the methods. Instead, performance criteria should be developed on a project-specific basis, and the laboratory should establish in-house QC performance criteria for the application of this method. These performance data are not intended to be and must not be used as absolute QC acceptance criteria for purposes of laboratory accreditation.

13.2 In the case of this method (which may be used in either the field or the laboratory), any test kits used must be able to meet the performance specifications for the intended application. However, required performance criteria for a particular testing product may be included in the manufacturer's instructions.

13.3 The rate of false positive results was evaluated by spiking a total of 20 water samples with 2.2 µg/L of TCE and analyzing them with the testing product. A limit of quantitation (LOQ) of 4 µg/L had previously been calculated and was used to assess the rate of false positive results, i.e., a testing product result of greater than 4 µg/L for a sample spiked at 2.2 µg/L. A semiquantitative result was determined for each sample by extrapolating the 3-point calibration down to zero. There were no false positive results for these 20 samples. Table 1 contains the results for the false positive evaluations. These data are provided for guidance purposes only.

13.4 The rate of false negative results was evaluated by spiking a total of 20 water samples with 8.8 µg/L of TCE and analyzing them with the testing product. An LOQ of 4 µg/L had previously been calculated and was used to assess the rate of false negative results, i.e., a testing product result of less than 4 µg/L for a sample spiked at 8.8 µg/L. There were no false

negative results for these 20 samples. Table 2 contains the results for the false negative evaluations. These data are provided for guidance purposes only.

13.5 An independent operator used the Quick Test® to analyze a set of water samples spiked with TCE and another set of water samples spiked with both TCE and PCE. The samples were also analyzed using Method 8021. A comparison of results is given in Table 7. These data are provided for guidance purposes only.

13.6 This method has been applied to water samples collected from sites contaminated with TCE and PCE and the results were compared with total volatile halogenated organic compounds determined using Method 8260. These results are provided in Table 8. All results represent determinations by a single laboratory. Example single laboratory results are provided in Table 6. These data are provided for guidance purposes only.

14.0 POLLUTION PREVENTION

14.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity and/or toxicity of a waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operations. EPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the Agency recommends recycling as the next best option.

14.2 For information about pollution prevention that may be applicable to laboratories and research institutions consult *Less is Better: Laboratory Chemical Management for Waste Reduction*, available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th St. NW, Washington, D.C. 20036, http://www.acs.org.

15.0 WASTE MANAGEMENT

The Environmental Protection Agency requires that laboratory waste management practices be conducted consistent with all applicable rules and regulations. The Agency urges laboratories to protect the air, water, and land by minimizing and controlling all releases from hoods and bench operations, complying with the letter and spirit of any sewer discharge permits and regulations, and by complying with all solid and hazardous waste regulations, particularly the hazardous waste identification rules and land disposal restrictions. For further information on waste management, consult *The Waste Management Manual for Laboratory Personnel* available from the American Chemical Society at the address listed in Sec. 14.2.

16.0 REFERENCES

1. Dong Chen, David Shattuck, Mark Hines and Joan McLean, *Field Analytical Chemistry and Technology,* 2(1):29-37, 1998.

17.0 TABLES, DIAGRAMS, FLOWCHARTS, AND VALIDATION DATA

The following pages contain the tables referenced by this method.

TABLE 1

FALSE POSITIVE ANALYSIS

Replicate	Semiquantitative Quick Test® Result (µg/L)	False Positive?
1	0.0	No
2	1.4	No
3	1.5	No
4	1.6	No
5	0.6	No
6	1.9	No
7	0.8	No
8	2.0	No
9	1.4	No
10	2.4	No
11	2.0	No
12	1.5	No
13	0.5	No
14	0.0	No
15	1.6	No
16	0.0	No
17	0.4	No
18	0.5	No
19	0.4	No
20	0.8	No
Mean (SD)	1.1 (0.7)	% FP = 0

All 20 replicates were spiked with 2.2 µg/L of TCE.

For the purposes of this evaluation, a false positive result was defined as a Quick Test® result above the calculated LOQ of 4 µg/L for a sample spiked with 2.2 µg/L of TCE.

These data are provided for guidance purposes only.

TABLE 2

FALSE NEGATIVE ANALYSIS

Replicate	Semiquantitative Quick Test® Result (µg/L)	False Negative?
1	10.4	No
2	8.3	No
3	6.5	No
4	11.3	No
5	9.3	No
6	5.9	No
7	7.3	No
8	7.2	No
9	8.2	No
10	8.6	No
11	6.2	No
12	8.8	No
13	9.3	No
14	8.2	No
15	7.3	No
16	9.0	No
17	7.1	No
18	7.9	No
19	6.5	No
20	4.9	No
Mean (SD)	7.9 (1.6)	% FN = 0

All 20 replicates were spiked with 8.8 µg/L of TCE.

For the purposes of this evaluation, a false negative result was defined as a Quick Test® result below the calculated LOQ of 4 µg/L for a sample spiked with 8.8 µg/L of TCE.

These data are provided for guidance purposes only.

TABLE 3

RESPONSES OF VARIOUS VOLATILE ORGANIC HALIDES AS PERCENT RELATIVE SENSITIVITY TO TCE, PCE, CARBON TETRACHLORIDE, AND CHLOROFORM

	Response for the Analyte Relative to Different Calibrants (%)			
Analyte	TCE	PCE	Carbon Tetrachloride	Chloroform
Trichloroethylene	100	122	88	122
Perchloroethylene	82	100	72	100
Carbon tetrachloride	114	139	100	139
Chloroform	82	100	72	100
1,1-Dichloroethene	69	84	61	84
Vinyl chloride	0.8	1	0.7	1
trans-1,2-Dichloroethene	61	74	54	74
cis-1,2-Dichloroethene	43	52	38	52
Dichloromethane	20	24	18	24
1,1,1-Trichloroethane	112	137	98	137
1,1,2-Trichloroethane	80	98	70	98
1,2-Dichloroethane	15	18	13	18
Bromoform	77	94	68	94
Bromodichloromethane	75	91	65	91
Chlorodibromomethane	71	87	63	87

The percent relative response is calculated as the result from the Quick Test® using the calibrant listed divided by the actual concentration of a standard containing the analyte. Thus, when each analyte is tested against itself, the percent relative response is 100%. Values less than 100% indicate that analyte responds less than the calibrant at the same concentration, while values greater than 100% indicate that the analyte responds more than the calibrant.

These data are provided for guidance purposes only.

TABLE 4

COMPOUNDS TESTED AS POTENTIAL INTERFERANTS

Analyte	Concentration that Produces a Detectable Interference (µg/L)
Benzene	>2,000
Methanol	>2,000
Toluene	>2,000
Oxalic acid	>2,000
Sodium trichloroacetate	>2,000
Sodium dichloroacetate	>2,000
2,2,2,-Trichloroethanol	>200

All potential interferants were tested in the presence of 20 µg/L of TCE.
These data are provided for guidance purposes only.

TABLE 5

EXAMPLE METHOD PERFORMANCE FOR THE CALIBRATION VERIFICATION

TCE Test Concentration (µg/L)	n	Mean	Std. Dev.	Conc. Range	Recovery Range (%)
90	20	85	3.9	80 - 91	89 - 101

These data are for guidance purposes only.

TABLE 6

EXAMPLE SINGLE-LABORATORY PERFORMANCE DATA

TCE Spiking Level (µg/L)	n	Mean	Std. Dev.	%RSD	Concentration Range
20	10	22	1.6	7.3	19 - 24
150	10	137	8.8	6.4	126 - 156

These data are for guidance purposes only.

TABLE 7

COMPARISON OF THE QUICK TEST FOR VOLATILE ORGANIC HALIDES® WITH GC METHODS FOR SPIKED WATER SAMPLES

	Quick Test® Results (µg/L)			GC Results (µg/L)			
Sample ID	Rep. 1	Rep. 2	Mean	Rep. 1	Rep. 2	Mean	%D
TCE-1	30	31	31	16	12	14	121
TCE-2	57	62	60	68	65	66	-9
TCE-3	192	65	129	309	319	314	-59
TCE-4	1410	1270	1340	1541	1528	1534	-13
TCE-5	O/L	O/L	O/L	2834	2867	2850	--
TCE/PCE-1	35	35	35	22	26	24	46
TCE/PCE-2	98	100	99	135	133	134	-26
TCE/PCE-3	610	540	575	577	602	590	-2.5
TCE/PCE-4	NA	2400	--	3283	3228	3256	-26
TCE/PCE-5	O/L	O/L	O/L	6287	5245	5766	--

O/L = Over the limits of the working range of the procedure.

NA = Not analyzed - sample lost during processing.

The percent difference (%D) was calculated from the mean result for each technique, and assuming that the GC results represented the "true value." Negative %D values indicate that the Quick Test® results were lower than those from the GC procedure (Method 8021).

These data are provided for guidance purposes only.

TABLE 8

COMPARISON OF THE QUICK TEST FOR VOLATILE ORGANIC HALIDES® WITH GC/MS RESULTS FOR FIELD SAMPLES CONTAMINATED WITH TCE

Quick Test® Results (µg/L)	GC/MS Results (µg/L)	%D
890	769	16
270	206	31
<4	<5	NC
6	<5	NC
99	102	-3
172	145	19
153	170	-10
57	66	-14
1670	1703	-2
2900	4040	-28
300	339	-12
119,000	98,208	21
12	10	20

NC = Not calculated

The percent difference (%D) was calculated assuming that the GC/MS results represented the "true value." Negative %D values indicate that the Quick Test® results were lower than those from the GC/MS procedure (Method 8260).

These data are provided for guidance purposes only.