State Of Connecticut
Department of Environmental Protection

Recommended Reasonable Confidence Protocols

Quality Assurance and Quality Control Requirements

Volatile Organics by Method 8021, SW-846

Version 3.0
July 2006

Written by the Connecticut DEP QA/QC Workgroup

Revision	Comments	Date
1.0	First version for publication	7/05/2005
2.0	Corrected holding time for frozen samples	8/30/2005
3.0	Final version based upon public comments	July 2006

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1.0 QA/QC Requirements for Method 8021

1.1 Method Overview

Method 8021 is used to determine volatile organic compounds in a variety of matrices. This method is applicable to nearly all types of samples, regardless of water content, including ground water, aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, mousses, tars, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, soils, and sediments.

The sample introduction procedure requires the use of the purge and trap system as described in Methods 5030 and 5035. All method references are to the latest promulgated version of the method found in Test Methods for Evaluating Solid Waste, SW-846.

It is strongly recommended that the use of Method 8021 be limited to the quantification of a limited list of pre-selected (and known) volatile contaminants of concern at disposal sites that have been previously characterized with qualitative certainty (i.e., SW-846 Method 8260) and/or have a known and un-complex site history. Even under these circumstances, if the laboratory encounters additional chromatographic peaks **with a peak height greater than 50% of the appropriate detector surrogate** that are not associated with calibrated target analytes, then these findings must be reported by the laboratory to the environmental professional ("EP") that requested the analysis in the Environmental Laboratory case narrative. Appropriate response actions to identify and quantify the reported unidentified peaks, to include re-analysis of the samples using SW-846 Method 8260B, must be considered by the data user.

1.1.1 Reporting Limits for Method 8021

The reporting limit (RL) for a compound is dependent on the concentration of the lowest standard in the initial calibration, sample weight/volume, sample introduction method, and moisture content. The following table lists approximate reporting limits for various matrices utilizing the standard photoionization/ electrolytic conductively detector (PID/HECD) combination. Solid matrices in this table assume 100% solids.

Reporting Limits (RL's) are compound dependent and vary with purging efficiency and concentration. The applicable concentration range of this method is compound and instrument dependent but is approximately 0.1 to 200 µg/L. Analytes that are inefficiently purged from water will not be detected when present at low concentrations, but they can be measured with acceptable accuracy and precision when present in sufficient amounts. Determination of some structural isomers (i.e., xylenes) may be hampered by coelution. Some analytes may require heated purge and trap in order to achieve the required RL. Therefore oxygenates and other compounds susceptible to acid

hydrolysis should not be preserved with acid if heated purge and trap (>45ºC) is to be used.

Moisture content of soils and sediments will also raise the RL, as all results must be reported on a dry weight basis for these two matrices. Sample dilution or lower sample weight/volume will also cause the RL's to be raised.

Sample container type, preservation requirements, and holding times for waters, soils, and sediments are presented in Table 2A of this document.

1.1.2 General Quality Control Requirements

Each laboratory is required to operate a formal quality assurance program and be certified by the Connecticut Department of Public Health for the analysis performed. The minimum requirements include initial demonstration of laboratory proficiency, ongoing analysis of standards and blanks to confirm acceptable continuing performance, and analysis of laboratory control samples (LCS) to assess precision and accuracy. The use of site-specific matrix spikes and matrix spike duplicates is highly recommended. Evaluation of sample matrix effects on compound recovery is key to making good decisions.

Laboratories must document and have on file an Initial Demonstration of Proficiency for each combination of sample preparation and determinative method being used. These data must meet or exceed the performance standards as presented in Section 1.5 and Table 1A. See Section 8.4 of Method 8000 in SW-846 for the procedure. The Initial Demonstration of Proficiency must include the following elements:

Table 1.1 IDOC Requirements

QC Element	Performance Criteria
Initial Calibration	Table 1A
Continuing Calibration	Table 1A
Method Blanks	Table 1A
Average Recovery	Table 1A
% Relative Standard Deviation	Table 1A
Surrogate Recovery	Table 1A
Internal Standards	Table 1A

Note: Because of the extensive analyte list and number of QC elements associated with the Initial Demonstration of Proficiency, it should be expected that one or more analytes may not meet the performance standards for one or more QC elements. The laboratory should make every effort to find and correct the problem, and repeat the analysis. All non-conforming analytes along with the laboratory acceptance criteria should be noted in the Initial Demonstration of Proficiency data.

Laboratories are required to generate laboratory specific performance criteria for LCS compound recovery limits, matrix spike/matrix spike duplicate compound recovery and precision (RPD) limits, and surrogate recovery limits. These limits must meet or exceed the limits specified in Table 1A.

1.2 Summary of Method 8021

The volatile compounds are introduced into the gas chromatograph by a purge and trap device or other technique. The analytes are then introduced directly to a capillary column by ballistic heating or cryo-focused onto a capillary pre-column before being flash evaporated to a capillary column for analysis. The gas chromatograph (GC) oven is temperature programmed to facilitate separation of the analytes which are then detected by a photoionization detector and/or an electrolytic conductively detector, which are interfaced to the GC. Preliminary identification of target analytes is accomplished by comparing the retention time of the chromatographic peaks of the sample to a standard analyzed under the exact same conditions. Confirmation is required and accomplished either by analysis on a dissimilar column, again comparing the retention times of the chromatographic peaks of the sample to a standard analyzed under the exact same conditions, or by using at least one other independent qualitative technique such as GC/MS. Quantitation is accomplished by constructing a calibration curve of analyte concentration vs. peak area or height. Confirmation is not required in the case where analytes are not detected above their specific reporting limit.

1.3 Method Interferences

1.3.1 Chemical Contaminants

Major contaminant sources for Method 8021 include, but are not limited to, volatiles chemicals (solvents) in the laboratory, impurities in the purge gas, sorbent trap break down products or impurities, etc. The use of non-polytetrafluoroethylene (PTFE) thread sealants, plastic tubing, or flow controllers with rubber components should be avoided, since such materials may contaminate the analytical system.

Analysis of blanks provides information about the presence of contaminants. When potential interfering peaks or high levels of target compounds are detected in blanks, the laboratory should try and find the source of the contamination and eliminate it. **Subtracting blank values from sample results is not permitted.** Any method blank exceedences should be fully documented in the laboratory report narrative.

1.3.2 Cross-contamination/ Carryover

Cross-contamination can occur when any sample is analyzed immediately after a sample containing high concentrations of VOC's. Autosampler positions on the purge and trap unit may also become contaminated in the same manner. If a high sample is inadvertently analyzed, the system must be demonstrated to be clean by analysis of method blanks at the same autosampler position as the high sample. If the autosampler uses VOA vials in place of sparging flasks, a method blank would be required. In addition, samples containing large amounts of water soluble materials, suspended solids, or high boiling point compounds may also present potential for cross-contamination/carryover. Laboratories should be aware that carryover from high boiling point compounds may not appear until a later run.

Many analytes exhibit low purging efficiencies from a 25-mL sample. This often results in significant amounts of these analytes remaining in the sparging flask.

1.3.3 Other Potential Interferences

Samples can be contaminated by diffusion of volatile organics (particularly chlorofluorocarbons and methylene chloride) through the sample container septum during shipment and storage. A trip blank carried through sampling and subsequent storage and handling can serve as a check on such contamination. Laboratories should have a storage blank program as part of their QA/QC plan to monitor refrigerators for potential cross contamination.

The use of sodium bisulfate as the low-level preservation method for solid samples with high organic matter or humic material content has been known to result in the formation of acetone and methyl ethyl ketone (MEK or 2-butanone) at potentially significant concentrations in samples. Sodium bisulfate preservation must **never** be used when these conditions are present or suspected. It should be noted that freezing (<-7ºC or 20ºF) and not sodium bisulfate addition, is the preferred low-level preservation method for solid samples (See Table 2A).

Use of methanol in the high level solid-preservation method may result in the detection of MEK at trace levels in samples due to the presence of MEK as a methanol contaminant.

1.3.4 Sulfur dioxide is a potential interference with vinyl chloride. Samples with residual chlorine should not be neutralized with sodium thiosulfate.

1.4 Alternative Sample Introduction Methods

Various alternatives are provided in SW-846 Method 8021B, Section 7.1, for sample introduction. All internal standards, surrogates, and matrix spiking compounds (when applicable) must be added to the samples before introduction into the GC system. Quality control procedures to ensure proper operation of the various sample introduction techniques may be found in SW-846 Methods 3500 and 5000, respectively.

This guidance document is primarily intended to provide QA/QC requirements and performance standards for SW-846 Method 8021B using conventional purge and trap sample introduction via Methods 5030 (ambient temperature) and 5035 for aqueous and solid samples, respectively. If other sample introduction methods are required and utilized because of analytical circumstances, the laboratory must provide a full explanation and justification in the Environmental Laboratory case narrative. This narrative should also include details and results of the QC samples and calibrations associated with the different sample introduction method.

1.5 Quality Control Requirements for SW-846 Method 8021

1.5.1 General Quality Control Requirements for Determinative Chromatography Methods

Refer to SW-846 Method 8000 for general quality control requirements for all chromatographic methods, including SW-846 Method 8021. These requirements insure that each laboratory maintain a formal quality assurance program and records to document the quality of all chromatographic data. Quality Control procedures necessary to evaluate the GC system operation may be found in SW-846 Method 8000, Section 7.0, and include evaluation of calibrations and chromatographic performance of sample analyses. Instrument quality control and method performance requirements for the GC/Hall/PID system may be found in SW-846 Method 8021, Sections 8.0 and 9.0, respectively.

1.5.2 Specific QA/QC Requirements and Performance Standards for SW-846 Method 8021

Specific QA/QC requirements and performance standards for SW-846 Method 8021 are presented in Table 1A. Strict compliance with the QA/QC requirements and performance standards for this method, as well as satisfying other analytical and reporting requirements will provide the EP with "Reasonable Confidence" regarding the usability of analytical data to support DEP decisions

While optional, parties electing to utilize these protocols will be assured that agency reviewers will, generally accept "Reasonable Confidence" data. In order to achieve "Reasonable Confidence" parties must:

1. Comply with the applicable QC analytical requirements prescribed in Table 1A for this test procedure;

2. Evaluate and narrate, as necessary, compliance with performance standards prescribed in Table 1A for this test method; and

3. Adopt the reporting formats and elements specified herein.

1.5.3 Site Specific Matrix Spike (MS), Matrix Spike Duplicate (MSD) Samples

It is strongly recommended that site specific MS/MSD samples be analyzed from each site, and each matrix type sampled. Percent recovery data from site specific samples allow the EP to make informed decisions regarding contamination levels at the site. Batch MS/MSD results do not give any indication of site specific matrix interferences or analytical problems related to the specific site matrices and are in general discouraged

and should not be reported for this protocol. Trip blanks, field blanks, etc. should not be used for MS/MSD's.

1.5.4 Recovery of Matrix Spike (MS) and Matrix Spike Duplicate (MSD) with Methanol Preserved Soil/Sediment Samples

The recovery of matrix spikes from a soil/sediment that has been preserved with methanol cannot be used to directly evaluate matrix-related bias/accuracy in the conventional definition of these terms. Quality control parameters expressed in terms of these percent recoveries (%R) may be more indicative of the variabilities associated with the analytical system (sample processing, introduction, and/or component separation). Because of this limitation, it is recommended that laboratories analyze standard reference materials and participate in relevant performance evaluation studies as frequently as possible. Recommended practices for additional quality assurance made be found in SW-846 Methods 5000 and 8000.

The inherent limitation of methanol preservation with respect to the evaluation of matrix spike recoveries is more than compensated for by the marked improvement in sample integrity and conservation/recoveries of the volatile analytes of concern from soil matrices by minimizing volatilization losses.

1.5.5 Trip Blanks and Field Duplicates for SW-846 Method 8021 Analyses

Trip blanks and field blanks are highly recommended. The use of these type QC samples can be invaluable in determining if contamination occurred during shipping and /or collection of samples. In those instances where unexpected sample results are obtained, the results of which do not have trip blank and or field blank supporting data, could require sample recollection in order to verify the results.

TABLE 1A Specific QA/QC Requirements and Performance Standards for Method 8021*

Required QA/QC Parameter	**Data Quality Objective**	**Required Performance Standard**	**Required Deliverable**	**Recommended Corrective Action**	**Analytical Response Action**
Retention Time Windows	Accurate identification of target analytes.	1) Prior to or during initial calibration when a new column is installed. 2) Calculate according to Method 8000, Section 7.6.	NO	N/A	N/A
Initial Calibration	Laboratory Analytical Accuracy	1) Minimum of 5 standards. Single point may be used for surrogates. (Note 1) 2) Low standard must be ≤ reporting limit (RL) 3) % RSD ≤ 20 or "r" ≥ 0.990 for all compounds 4) Must contain all target analytes 5) Curves must be verified by an independent ICV before sample analysis.	NO	1) Lab is allowed to have up to 10% of target analytes above 20% RSD as long as the RSD is ≤ 40%. 2) Recalibrate as required by the method.	Sample analysis cannot proceed without a valid initial calibration. Report non-conforming compounds in case narrative.
Continuing Calibration Std (CCAL)	Laboratory Analytical Accuracy	1) Every 12 hrs prior to analysis of samples or every 15 samples, whichever is more frequent, and at end of analytical sequence. 2) Concentration level near midpoint of curve 3) Must contain all target analytes 4) Percent difference or percent drift (%D) must be ≤15 for all compounds except gases which must be ≤20 %. 5) Verify all analytes within retention time windows.	NO	1) Lab is allowed to have up to 10% of target analytes above %D requirement as long as %D is ≤ 30%. 2) If closing cal chk fails, reanalyze associated samples. 3) Recalibrate and reanalyze samples as required by method.	Report non-conformances in case narrative.

Table1A Specific QA/QC Requirements and Performance Standards for Method 8021*

Required QA/QC Parameter	**Data Quality Objective**	**Required Performance Standard**	**Required Deliverable**	**Recommended Corrective Action**	**Analytical Response Action**
Method Blanks	Laboratory Contamination Evaluation	1) Every 20 samples or batch prior to running samples and after calibration standards. 2) Matrix and preservative-specific (e.g. water, MeOH, NaHSO4) 3) Target analytes must be <RL except for common lab contaminants which must be <3x the RL (Contaminants are acetone, methylene chloride, and 2-butanone)	YES	Locate source of contamination and correct problem. Reanalyze samples if compounds in method blank are present in sample.	1) Report non-conformances in case narrative. 2) All results for compounds present in method blank above the RL must be "B" flagged if detected in samples associated with the method blank. 3) If reanalysis performed in holding time, report only compliant data. 4)) If reanalysis performed outside holding time , report all data.
Laboratory Control Sample (LCS)	Laboratory Method Accuracy	1) Every 20 samples or every batch, whichever is more frequent. 2) Standard source different from initial calibration source. 3) Concentration level must be near or at the mid-point of the initial calibration. 4) Must contain all target analytes 5) Matrix and preservative specific (e.g. water, MeOH, NaHSO4) 6) Laboratory determined percent recoveries must be between 70-130% for target compounds. 7) Can also be used as CCAL	YES	Recalculate the percent recoveries Reanalyze the LCS Locate & correct problem, reanalyze associated samples	1) Report non-conformances in case narrative. 2) Individual laboratories must identify and document problem analytes which routinely fall outside the 70-130% limit. Any exceedances must be noted in narrative. Data to support laboratory problem compounds kept on file at lab for review during audit

TABLE 1A Specific QA/QC Requirements and Performance Standards for Method 8021*

Required QA/QC Parameter	**Data Quality Objective**	**Required Performance Standard**	**Required Deliverable**	**Recommended Corrective Action**	**Analytical Response Action**
Matrix Spike/Matrix Spike Duplicates (MS/MSD)	Method Accuracy in Sample Matrix Method Precision in Sample Matrix	1) Every 20 samples 2) Matrix Specific, not required for trip blanks or field blanks 3) Must contain all target analytes 4) Laboratory determined percent recoveries should be between 70-130% for target compounds 5) RPD's should be ≤ 30%	YES (When analyzed)	Compare to LCS recoveries, narrate any non-conformances	Report non-conformances in case narrative
Surrogates	Accuracy in Sample Matrix	1) A minimum of 2 surrogates must be added to all samples, blanks, etc prior to sample introduction. At least one surrogate must represent each detector. 2) Evaluate recoveries in each sample 3) Laboratory determined percent recoveries must be between 70-130% for individual surrogate compounds. Laboratory determined recovery limits may be outside 70-130% limits for difficult matrices (e.g. waste, sludges, etc). 4) Recommended surrogates: 1,4-Dichlorobutane Bromochlorobenzene	YES (Report surrogate recoveries from each detector and each column)	If the surrogate is outside criteria, reanalyze the sample on the affected detector unless obvious interference is present. Note: If reanalysis not performed due to interferences, laboratory must supply chromatogram.	1) Note exceedances in narrative 2) If reanalysis confirms matrix interference, report both sets of results and note in narrative 3) If reanalysis performed in holding time and surrogate recoveries are in range, report only the compliant data 4) If reanalysis performed outside of holding time and surrogate recoveries are in range, report both sets of data, note in narrative

TABLE 1A Specific QA/QC Requirements and Performance Standards for Method 8021*

Required QA/QC Parameter	**Data Quality Objective**	**Required Performance Standard**	**Required Deliverable**	**Recommended Corrective Action**	**Analytical Response Action**
Internal Standards (IS) (IF USED)	Laboratory Analytical Accuracy and Method Accuracy in Sample	1) Laboratory must use a minimum of 2 IS, one representing each detector 2) Area counts in samples must be within –50% to +100% of the area counts in the associated CCAL 3) Retention times of IS must be within retention time windows. 4) Recommended IS's: Fluorobenzene 2-Bromo-1-chloropropane	NO	If any IS is outside the QC limits, reanalyze the sample sample on the affected detector unless obvious interference is present. Note: If reanalysis not performed due to interferences, laboratory must supply chromatogram.	1) Note exceedances in narrative 2) If reanalysis confirms matrix interference, report both sets of results and note in narrative 3) If reanalysis performed in holding time and IS are in criteria, report only the compliant data 4) If reanalysis performed outside of holding time and IS are in out of criteria, report both sets of data, note in narrative
Identification and Quantitation	N/A	1) Quantitation must be based on average calibration factor. 2) Second column analysis: Laboratory must utilize a second dissimilar column to confirm all positive results above the RL. Report the higher of the two analyses unless obvious interference present. The QA/QC parameters in this document must be met for both columns. 3) GC/MS confirmation, if used, for qualitative use only.	N/A	N/A	1) If the RPD between the results for the two columns exceeds 40%, the laboratory must flag the results with a "P" suffix and note in narrative. Note: If a high RPD between the two columns can be definitely attributed to a matrix interference, report the lower value and note in the narrative with an explanation.

TABLE 1A Specific QA/QC Requirements and Performance Standards for Method 8021*

Required QA/QC Parameter	**Data Quality Objective**	**Required Performance Standard**	**Required Deliverable**	**Recommended Corrective Action**	**Analytical Response Action**
General Reporting Issues	N/A	1) The laboratory should report only concentrations detected above the sample specific RL, unless asked for by the client. 2) Concentrations below the reporting limit (RL) as "ND" with the reporting limit. 3) Dilutions: If diluted and undiluted analyses are performed, the laboratory should report results for both sets of data. Compounds that exceed the linear range should be flagged ("E" flag). Do not report more than 2 sets of data per sample. 4) If a dilution is performed, the highest detected analyte must be in the upper 60% of the calibration curve, unless there are non-target analytes whose concentrations are so high as to cause damage to the instrumentation or saturate the detector(s)	N/A	N/A	1) Qualification of any results reported below the RL is required. 2) Performance of dilutions must be documented in the case narrative

Notes for Table 1A

* Refers to latest promulgated version of SW-846 Method 8021.
GC/MS = Gas Chromatography/Mass Spectrometry
%RSD = Relative Percent Standard Deviation
RF = Response Factor
r = Correlation Coefficient
RPD = Relative Percent Difference
N/A = Not Applicable
CF = Calibration Factor
Note 1: Single point calibration may be used for surrogates if added at same concentration as added to samples, blanks, etc.

1.6 Analyte List for SW-846 Method 8021

The Connecticut DEP (DEP) analyte list for SW-846 Method 8021 is presented in Table 1B. The compounds listed are readily determined by Method 8021 using conventional purge and trap. Method SW-846 5030 should be used for aqueous samples and methanol extracts, SW-846 Method 5035 should be used for soil/solid samples. Most of the compounds listed have Connecticut Remediation Standard Criteria or are listed in the Approved Criteria for Additional Polluting Substances. The remaining compounds were selected based upon Drinking Water Monitoring requirements as described in Sections 19-13-B101 and 19-13-B102 of the Regulations of the Connecticut State Agencies.

1.6.1 Additional Reporting Requirements for SW-846 Method 8021

While it is not necessary to request and report all the analytes listed in Table 1B to obtain Reasonable Confidence status, it is necessary to document such a limitation, for site characterization and data representativeness considerations. DEP strongly recommends that full list of analytes be reported during the initial stages of a site investigation and/or at sites with an unknown or complicated history of chemical usage or storage.

In cases where a shortened list of analytes is selected, the laboratory must still meet the method specific quality control requirements and performance standards associated with the requested analytes list to obtain Reasonable Confidence.

The Reporting Limit (RL) is based upon the lowest standard in the initial calibration. It is the responsibility of the EP to specify to the laboratory the detection limits required for the samples. In order to meet the detection limits it may be necessary to modify the analytical method by using increased sample volume or mass. In such cases the modifications must be noted in the narrative.

1.7 Routine Reporting Deliverables for Method 8021

The following table (Table 1.2) lists the routine report deliverables. Note that while laboratories are not required to report certain items, they must keep the data on file and may be required to report these items in special circumstances.

1.7.1 Reporting and Flagging of Results

The following rules apply to reporting results:

Non-Detects: Report all non-detects and results below the reporting limit as "ND" (Not Detected at the specified Reporting Limit), unless asked for by the EP. The reporting limit for each compound in each sample must be listed on the report and take into account the exact sample mass, any dilution factors, percent moisture, etc.

Compounds detected above the reporting limit in blanks and found in samples, also above the reporting limit, shall be flagged with a "B" suffix (e.g. 25B).

Report results for any compounds reported below the lowest calibration standard must be flagged as estimated using a "J" suffix (e.g. 25J).

All soil/sediment results shall be reported on a dry weight basis.

1.7.2 Special requirements for methanol preserved soil/sediment samples

VOC results for methanol preserved soil/sediment samples must be corrected for the Methanol Preservation Dilution Effect as discussed in Method 8000C of SW-846. For methanol preserved samples the total methanol/water volume, Vt, is given by the following equation:

Vt = (mls methanol) + (decimal % moisture x g sample)

This Vt value should be substituted into the equation for Vt in Equation 11.10.1 of Method 8000C.

Table 1.2 Report Deliverables

PARAMETER	DELIVERABLE	COMMENTS
Retention Time Windows	NO	Note non-conformances in narrative
Initial Calibration	NO	Note non-conformances in narrative
Continuing Calibration	NO	Note non-conformances in narrative
Method Blanks	YES	Note non-conformances in narrative. Flag all positive results above RL with "B" flag.
Lab Control Sample (LCS)	YES	Note non-conformances in narrative
Site Specific Matrix Spike/ Matrix Spike Duplicate	YES (If requested)	Note non-conformances in narrative
Surrogate Recoveries	YES	Note non-conformances in narrative
Internal Standard Areas	NO (If used)	Note non-conformances in narrative
General Reporting Issues	YES	Note non-conformances in narrative
QA/QC Certification Form	YES	Signed by laboratory director or his/her designee.

Table 1B Analyte List For SW-846 Method 8021

ANALYTE	CAS NUMBER	NOTES
Benzene	71432	
Bromobenzene	108861	
n-Butylbenzene	104518	
Sec-Butylbenzene	135988	
Tert-Butylbenzene	98066	
Bromodichloromethane	75274	
Bromoform	75252	
Bromomethane	74839	
Carbon Tetrachloride	56235	
Chlorobenzene	108907	
Chloroethane	75003	
Chloroform	67663	
Chloromethane	74873	
2-Chlorotoluene	95498	
4-Chlorotoluene	106434	
Dibromochloromethane	124481	
1,2-Dibromo-3-chloropropane (DBCP)	96128	See 1
1,2-Dibromoethane (EDB)	106934	See 1
Dibromomethane	74953	
1,2-Dichlorobenzene	95501	
1,3-Dichlorobenzene	541731	
1,4-Dichlorobenzene	106467	
trans-1,4-Dichloro-2-butene	110576	
Dichlorodifluoromethane	75718	
1,1-Dichloroethane	75343	
1,2-Dichloroethane	107062	
1,1-Dichloroethene	75354	
cis-1,2-Dichloroethene	156592	
trans-1,2-Dichloroethene	156605	
1,2-Dichloropropane	78875	
1,3-Dichloropropane	142289	
2,2-Dichloropropane	594207	

Table 1B Analyte List For SW-846 Method 8021 (continued)

ANALYTE	CAS NUMBER	NOTES
cis-1,3-Dichloropropene	10061015	
trans-1,3-Dichloropropene	10061026	
Ethylbenzene	100414	
Hexachlorobutadiene	87683	
Isopropylbenzene (Cumene)	98828	
2-Isopropyltoluene	99876	
4-Isopropyltoluene	99876	
Methylene Chloride	75092	
Methyl-tert-butylether (MTBE)	1634044	
Naphthalene	91203	
n-Propylbenzene	103651	
Styrene	100425	
1,1,1,2-Tetrachloroethane	630206	
1,1,2,2-Tetrachloroethane	79345	
Tetrachloroethene (Perc)	127184	
Toluene	108883	
1,2,3-Trichlorobenzene	87616	
1,2,4-Trichlorobenzene	120821	
1,1,1-Trichloroethane	71556	
1,1,2-Trichloroethane	79005	
Trichloroethene (TCE)	79016	
Trichlorofluoromethane	75694	
1,2,3-Trichloropropane	96184	
Trichlorotrifluoroethane (Freon-113)	76131	
1,2,4-Trimethylbenzene	95636	
1,3,5-Trimethylbenzene	108678	
Vinyl Chloride	75014	
o-Xylene	95476	See 2
m-Xylene	108383	See 2
p-Xylene	106423	See 2
1,1-Dichloropropene	563586	

Notes:
1. These compounds require analysis by either Methods 504.1 or other method approved by the Commissioner to achieve the RSR GPC limit in aqueous samples.
2. May be reported as total xylenes or any combination of the three isomers.

Table 2A Sample Containers, Preservation and Holding Times

MATRIX	ANALYTE	CONTAINER	PRESERVATIVE	HOLDING TIME
Aqueous with no chlorine present	All VOC's with purge & trap ≤ 45ºC.	(2) x 40-mL VOC vials with Teflon lined screw caps protected from light	Adjust to pH < 2 with either HCl or sodium bisulfate at time of collection (Note 1). Store at 4 ± 2º C.	14 days
Aqueous with chlorine present	All VOC's with purge & trap ≤ 45ºC.	(2) x 40-mL VOC vials with Teflon lined screw caps protected from light	Neutralize chlorine with either 25 mg ascorbic acid. Adjust to pH < 2 with either HCl or sodium bisulfate (Note 1). Store at 4 ± 2º C.	14 days
Aqueous with no chlorine present	VOC's + MTBE with purge & trap >45ºC.	(2) x 40-mL VOC vials with Teflon lined screw caps protected from light	Adjust to pH > 11 with 0.7 g trisodium phosphate at time of collection . Store at 4 ± 2º C.	14 days
Aqueous with chlorine present	VOC's + MTBE with purge & trap >45ºC.	(2) x 40-mL VOC vials with Teflon lined screw caps protected from light	Neutralize chlorine with either 25 mg ascorbic acid. Adjust to pH > 11 with 0.7 g trisodium phosphate. Store at 4 ± 2º C.	14 days

Notes:
The number of sample containers is optional. Laboratories should supply enough containers to allow for any reanalysis or breakage.

Note 1: If samples effervesce upon addition of hydrochloric acid or sodium bisulfate, samples must be collected unpreserved and stored at 4 ± 2º C. Holding time is 7-days from collection.

Table 2A Sample Containers, Preservation and Holding Times (continued)

MATRIX	ANALYTE	CONTAINER	PRESERVATIVE	HOLDING TIME
Soil and Sediment samples.	All VOC's with purge & trap ≤ 45ºC. (Note 4)	Samples should be collected and stored according to DEP *Guidance For Collecting And Preserving Soil and Sediment Samples for Laboratory Determination of Volatile Organic Compounds, ver. 2.0 Feb. 28, 2006.* Laboratories are reminded to include a separate container for % solids determination.	Ice samples in field and proceed with preservation option selected. Preservation options include methanol, sodium bisulfate, and freezing. (See notes 2 & 3).	14 days if preserved. 48 hours if unpreserved. (Note 5).
High Conc. Waste Samples	All VOC's	Collect in screw top jar protected from light.	Cool 4 ± 2º C.	14 days

Notes:

The number of sample containers is optional. Laboratories should supply enough containers to allow for any reanalysis or breakage.

Note 2: EnCore Samplers may not be suitable for all soil types. See Method 5035A in SW-846 and the DEP *Guidance For Collecting And Preserving Soil and Sediment Samples for Laboratory Determination of Volatile Organic Compounds, ver. 2.0 Feb. 28, 2006* for guidance.

Note 3: If samples effervesce upon addition of sodium bisulfate, than bisulfate cannot be used as a preservative. Another preservation option must be selected.

Note 4: If the purge temperature is >45ºC, bisulfate cannot be used as degradation of certain analytes (e.g. MTBE) may occur.

Note 5: If the freezing option is selected, the sample must be frozen within 48 hours of collection. The holding time recommences when thawing begins. The total holding time is calculated from the time of collection to freezing plus the time allowed for thawing. The total elapsed time must be less than 48 hours.