CHAPTER TWO

CHOOSING THE CORRECT PROCEDURE

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 these methods 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.

2.0 INTRODUCTION

The purpose of this chapter is to aid the analyst in choosing the appropriate methods for sample analyses, based upon the sample matrix and the analytes to be determined. The ultimate responsibility for producing reliable analytical results lies with the entity subject to the regulation. Therefore, members of the regulated community are advised to refer to this chapter and to consult with knowledgeable laboratory personnel when choosing the most appropriate suite of analytical methods. 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.

SW-846 analytical methods are written as quantitative trace analytical methods to demonstrate that a waste does not contain analytes of concern that cause it to be managed as a hazardous waste. As such, these methods typically contain relatively stringent recommended quality control (QC) criteria appropriate to trace analyses. However, if a particular application does not require data of this quality, less stringent QC criteria may and should be used.

The choice of the appropriate sequence of analytical methods depends on the information sought and on the experience of the analyst. Appropriate selection is confirmed by the usability of data (i.e., adequate for its intended use). The use of the recommended procedures, whether they are approved or mandatory, does not release the analyst from demonstrating the correct execution of the method.

Sec. 2.1 provides guidance regarding the analytical flexibility inherent to SW-846 methods and the precedence of various QC criteria. Sec. 2.2 reviews the information required to choose the correct combination of methods for an analytical procedure. Sec. 2.3 provides useful information on implementing the method selection guidance for organic analyses. Sec. 2.4 provides guidance on choosing procedures for characteristic analyses. Sec. 2.5 provides guidance on the determination of analytes in groundwater. Finally, Sec. 2.6 provides information regarding choosing procedures for inorganic analyte analyses. Tables and figures referenced in this chapter are sequentially located after the last page chapter text.

2.1 GUIDANCE REGARDING FLEXIBILITY INHERENT TO SW-846 METHODS AND THE PRECEDENCE OF SW-846 QUALITY CONTROL CRITERIA

The specific products and instrument settings cited in SW-846 methods represent those products and settings used during method development or subsequently evaluated by the Agency for use in the method. Glassware, reagents, supplies, equipment and settings other than those listed in this manual may be employed, provided that method performance appropriate for the intended RCRA application has been documented. Such performance includes consideration of precision, accuracy (or bias), recovery, representativeness, comparability, and sensitivity (quantitation or reporting limits) relative to the data quality objectives for the intended use of the analytical results. In response to this inherent flexibility, if an alternative analytical procedure is employed, then EPA expects the laboratory to demonstrate and document that the procedure is capable of providing appropriate performance for its intended application. This demonstration must not be performed after the fact, but as part of the laboratory's initial demonstration of proficiency with the method. The documentation should be in writing, maintained in the laboratory, and available for inspection upon request by authorized representatives of the appropriate regulatory authorities. The documentation should include the performance data as well as a detailed description of the procedural steps as performed (i.e., a written standard operating procedure).

Given this allowance for flexibility, EPA wishes to emphasize that this manual also contains procedures for "method-defined parameters," where the analytical result is wholly dependant on the process used to make the measurement. Examples include the use of the toxicity characteristic leaching procedure (TCLP) to prepare a leachate, and the flash point, pH, paint filter liquids, and corrosivity tests. In these instances, changes to the specific methods may change the end result and incorrectly identify a waste as nonhazardous. Therefore, when the measurement of such method-defined parameters is required by regulation, those methods are <u>not</u> subject to the flexibility afforded in other methods.

Analysts and data users are advised that even for those analytes that are not method-defined, different procedures may produce some difference in results. Common examples include the differences in recoveries of phenolic compounds extracted from water by separatory funnel (Method 3510) and continuous liquid-liquid (Method 3520) extraction techniques, differences in recoveries of many compounds between Soxhlet (Method 3540) and ultrasonic (Method 3550) extraction techniques, and differences resulting from the choice of acid digestion of metals (Method 3050) or microwave digestion (Method 3051). Where practical, the Agency has included guidance in the individual methods regarding known potential problems, and analysts are advised to review this information carefully in choosing or modifying analytical procedures. Chapter One describes a variety of QC procedures that may be used to evaluate the quality of the analytical results. Additional QC procedures may be described in the individual methods. The results of these QC procedures should be used by the analyst to evaluate if the choice of the analytical procedures and/or any modifications are appropriate to generate data of the quality necessary to satisfy the data quality needs of the intended application.

The performance data included in the SW-846 methods are <u>not</u> intended to be used as absolute QC acceptance criteria for method performance. The data are intended to be guidance, by providing typical method performance in typical matrices, to assist the analyst in selection of the appropriate method for the intended application. In addition, it is the responsibility of the laboratory to establish actual operating parameters and in-house QC acceptance criteria, based on its own laboratory SOPs and in-house QC program, to demonstrate appropriate performance of the methods used in that laboratory for the RCRA analytical applications for which they are intended.

The regulated community is further advised that the methods here or from other sources need only be used for those specific analytes of concern that are subject to regulation or other monitoring requirements. The fact that a method provides a long list of analytes does not mean that each of those analytes is subject to any or all regulations, or that all of those analytes must be analyzed each time the method is employed, or that all of the analytes can be analyzed using a single sample preparation procedure. It is EPA's intention that the target analyte list for any procedure includes those analytes necessary to meet the data quality objectives of the project, i.e., those analytes subject to monitoring requirements and set out in a RCRA permit (or other applicable regulation), plus those analytes used in the methods for QC purposes, such as surrogates, internal standards, system performance check compounds, etc. Additional analytes, not included on the analyte list of a particular method(s) but needed for a specific project, may be analyzed by that particular method(s), if appropriate performance can be demonstrated for the analytes of concern in the matrices of concern at the levels of concern.

2.1.1 Trace analysis vs. macroanalysis

Through the choice of sample size and concentration procedures, the methods presented in SW-846 were designed to address the problem of "trace" analyses (<1000 ppm), and have been developed for an optimized working range. These methods are also applicable to "minor" (1000 ppm - 10,000 ppm) and "major" (>10,000 ppm) analyses, as well, through use of appropriate sample preparation techniques that result in analyte concentrations within that optimized range. Such sample preparation techniques include:

1. adjustment of size of sample prepared for analysis (for homogeneous samples),
2. adjustment of injection volumes,
3. dilution or concentration of sample,
4. elimination of concentration steps prescribed for "trace" analyses, and
5. direct injection (of samples to be analyzed for volatile constituents).

The performance data presented in each of these methods were generated from "trace" analyses, and may not be applicable to "minor" and "major" analyses. Generally, extraction efficiency improves as concentration increases.

CAUTION: Great care should be taken when performing trace analyses after the analysis of concentrated samples, given the possibility of contamination.

2.1.2 Choice of apparatus and preparation of reagents

Since many types and sizes of glassware and supplies are commercially available, and since it is possible to prepare reagents and standards in many different ways, the apparatus, reagents, and volumes included in these methods may be replaced by any similar types as long as this substitution does not affect the overall quality of the analyses.

2.1.3 Quality control criteria precedence

Chapter One contains general quality control (QC) guidance for analyses using SW-846 methods. QC guidance specific to a given analytical technique (e.g., extraction, cleanup, sample introduction, or analysis) may be found in Methods 3500, 3600, 5000, 7000, and 8000. Method-specific QC criteria may be found in Sec. 8.0 of most older individual methods, in Sec. 9.0 of newer methods, or in Sec. 11.0 of some air sampling methods. When inconsistencies exist between the information in these locations, method-specific QC criteria take precedence over both technique-specific criteria and those criteria given in Chapter One, and technique-specific QC criteria take precedence over the criteria in Chapter One.

2.2 INFORMATION NECESSARY FOR CHOOSING THE CORRECT PROCEDURE

In order to choose the correct combination of methods to comprise the appropriate analytical procedure, some basic information is necessary. This includes information on:

- The physical state of the sample
- The analytes of interest
- The sensitivity or quantitation limits needed
- The analytical objective
- Whether the purpose is quantitation or monitoring
- What sample containers and preservation will be used and what holding times may apply

2.2.1 Physical state(s) of sample

The phase characteristics of the sample must be known. There are several general categories of phases into which the sample may be categorized, including:

Aqueous	Oil or other Organic Liquid
Sludge	Stack Sampling (VOST) Condensate
TCLP or EP Extract	Multiphase Sample
Solid	
Groundwater	

There may be a substantial degree of overlap between the phases listed above and it may be useful to further divide these phases in certain instances. A multiphase sample may be a combination of aqueous, organic liquid, sludge, and/or solid phases, and generally must undergo a phase separation as the first step in the analytical procedure.

2.2.2 Analytes of interest

Analytes may be divided into various classes, based on the determinative methods which are used to identify and quantify them. The most basic differentiation is between organic (e.g., carbon-containing) analytes and inorganic (e.g., metals and anions) analytes.

Table 2-1 is an alphabetical list of analytes cited within the SW-846 organic determinative methods (excludes immunoassay and other screening methods). These analytes have been evaluated by those methods. The methods may also be applicable to other analytes that are similar to those listed. Tables 2-2 through 2-38 list the analytes for each organic determinative method. Table 2-39 indicates which methods are applicable to inorganic analytes.

NOTE: Analysts should review the discussion in Sec. 2.1 of this chapter with regard to the presence of an analyte in a method versus the need for its analysis for a given project.

2.2.3 Sensitivity or quantitation limits

Some regulations may require a specific sensitivity or quantitation limit for an analysis, as in the determination of analytes for the Toxicity Characteristic (TC). Drinking water quantitation limits, for those specific organic and metallic analytes covered by the National Primary Drinking Water Regulations, are desired in the analysis of groundwater.

2.2.4 Analytical objective

Knowledge of the analytical objective is essential in the choice of sample preparation procedures and in the selection of a determinative method. This is especially true when the

sample has more than one phase. Knowledge of the analytical objective may not be possible or desirable at all management levels, but that information should be included in the project planning document and transmitted to the analytical laboratory management to ensure that the correct techniques are used during the analytical effort.

2.2.5 Quantitation or monitoring

The strategy for quantitation of compounds in environmental or process samples may be contrasted with the strategy for collecting monitoring data. Quantitation samples define initial conditions. When there is little information available about the composition of the sample source, e.g., a well or process stream, mass spectral identification of organic analytes leads to fewer false positive results. Thus, the most practical form of quantitation for organic analytes is often mass spectral identification. However, where the sensitivity requirements exceed those that can be achieved using mass spectral methods (e.g., GC/MS or HPLC/MS), it may be necessary to employ a more sensitive quantitation method (e.g., electron capture). In these instances, the risk of false positive results may be minimized by confirming the results through a second analysis with a dissimilar detector or chromatographic column. Thus, the choice of technique for organic analytes may be governed by the quantitation limit requirements and potential interferants.

Similarly, the choice of technique for metals is governed by the quantitation limit requirements and potential interferants.

In contrast, monitoring samples are analyzed to confirm existing and on-going conditions, tracking the presence or absence of known constituents in an environmental or process matrix. In well-defined matrices and under stable analytical conditions, less compound-specific quantitation modes may be used, as the risk of false positive results is less.

2.2.6 Sample preservation and holding times

Table 2-40 provides information regarding recommended sample preservation techniques, sample holding times, and other information. Similar information may be found in Table 3-1 of Chapter Three (inorganic analytes) and Table 4-1 of Chapter Four (organic analytes). Samples need to be extracted and analyzed within the recommended holding times for the results to be considered reflective of native concentrations as collected. Analytical data generated outside of the recommended holding times should typically be considered as minimum values only. Such data may be used to demonstrate that a waste is hazardous where it shows the concentration of a constituent to be above the regulatory threshold, but cannot be used to demonstrate that a waste is <u>not</u> hazardous. However, regarding the information in Table 2-40, a longer holding time may be appropriate if it can be demonstrated that reported concentrations are not adversely affected from preservation, storage and analyses performed outside the recommended holding times.

2.3 CHOOSING PROCEDURES FOR ORGANIC ANALYSES

Figure 2-1 summarizes the organic analysis options available in SW-846.

2.3.1 Extraction and sample preparation procedures for organic analytes

SW-846 methods for preparing samples for organic analytes are shown in Table 2-41. Method 3500 and associated methods should be consulted for further details on preparing the sample for analysis.

2.3.1.1 Aqueous samples

Methods 3510, 3520, and 3535 may be used for extraction of the semivolatile organic compounds from aqueous samples. The choice of a preparative method depends on the sample. Method 3510, a separatory funnel liquid-liquid extraction technique, is appropriate for samples which will not form a persistent emulsion interface between the sample and the extraction solvent. The formation of an emulsion that cannot be broken up by mechanical techniques will prevent proper extraction of the sample. Method 3520, a continuous liquid-liquid extraction technique, may be used for any aqueous sample and will minimize emulsion formation.

Method 3535 is solid-phase extraction technique that has been tested for organochlorine pesticides, phthalate esters, polychlorinated biphenyls (PCBs), organophosphorus pesticides, nitroaromatics and nitramines, and some explosive compounds, and may be applicable to other semivolatile and extractable compounds as well. The aqueous sample is passed through a solid sorbent material which traps the analytes. They are then eluted from the solid-phase sorbent with a small volume of organic solvent. This technique may be used to minimize the volumes of organic solvents that are employed, but may not be appropriate for aqueous samples with high suspended solids contents.

2.3.1.1.1 Acidic extraction of phenols and acid analytes

The solvent extract obtained by performing Method 3510, 3520, or 3535 at a pH less than or equal to 2 will contain the phenols and acid/neutral extractable organics of interest, and may contain some mildly basic compounds. The particular pH extraction conditions needs to be defined during the project planning process based on the desired target analytes and performance goals.

2.3.1.1.2 Basic or neutral extraction of semivolatile analytes

The solvent extract obtained by performing Method 3510, 3520, or 3535 at a basic pH will contain the organic bases of interest, if acid extraction is performed first. It will also contain the neutral compounds of interest, if acid extraction is not performed. Refer to Table 1 in the extraction methods (3510 and/or 3520) for guidance on the requirements for pH adjustment prior to extraction and analysis.

2.3.1.2 Solid samples

Soxhlet extraction (Methods 3540, 3541 and 3542), pressurized fluid extraction (Method 3545), microwave extraction (Method 3546) and ultrasonic extraction (Method 3550) may be used with solid samples. Consolidated samples should be ground finely enough to pass through a 1-mm sieve. In limited applications, waste dilution (Methods 3580 and 3585) may be used if the entire sample is soluble in the specified solvent.

Methods 3540, 3541, 3542, 3545, 3546 and 3550 are neutral-pH extraction techniques and therefore, depending on the analysis requirements, acid-base partition cleanup (Method 3650) may be necessary. Method 3650 will only be needed if chromatographic interferences are severe enough to prevent quantitation of the analytes of interest. This separation will be most important if a GC method is chosen for analysis of the sample. If GC/MS is used, the ion selectivity of the technique may compensate for chromatographic interferences.

There are three extraction procedures for solid samples that employ supercritical fluid extraction (SFE). Method 3560 is a technique for the extraction of petroleum hydrocarbons from various solid matrices using carbon dioxide at elevated temperature and pressure. Method 3561 may be used to selectively extract polynuclear aromatic hydrocarbons (PAHs) from solid matrices using supercritical carbon dioxide and appropriate modifiers, based on the determinative procedure to be used. Method 3562 may be used to selectively extract organochlorine pesticides or PCBs from solid matrices using supercritical carbon dioxide.

2.3.1.3 Oils and organic liquids

Method 3580, waste dilution, may be used to prepare oils and organic liquid samples for analysis of semivolatile and extractable organic analytes by GC or GC/MS. Method 3585 may be employed for the preparation of these matrices for volatiles analysis by GC or GC/MS. To avoid overloading the analytical detection system, care must be exercised to ensure that proper dilutions are made. Methods 3580 and 3585 give guidance on performing waste dilutions.

To remove interferences for semivolatiles and extractables, Method 3611 (Alumina cleanup) may be performed on an oil sample directly, without prior sample preparation.

Method 3650 is the only other preparative procedure for oils and other organic liquids. This procedure is a back extraction into an aqueous phase. It is generally introduced as a cleanup procedure for extracts rather than as a preparative procedure. Oils generally have a high concentration of semivolatile compounds and, therefore, preparation by Method 3650 should be done on a relatively small aliquot of the sample. Generally, extraction of 1 mL of oil will be sufficient to obtain a saturated aqueous phase and avoid emulsions.

NOTE: The use of traditional extraction techniques, i.e., 3510, 3520, 3535, 3540, 3541, 3545, 3546, and 3550, is neither suitable nor recommended for use in these matrices due to a high potential for hydrocarbon interferences and decreased determinative method sensitivity, i.e., poor analytical performance.

2.3.1.4 Sludge samples

Determining the appropriate methods for analysis of sludges is complicated because of the lack of precise definitions of sludges with respect to the relative percent of liquid and solid components. There is no set ratio of liquid to solid which enables the analyst to determine which of the three extraction methods cited is the most appropriate. Sludges may be classified into three categories: liquid sludges, solid sludges, and emulsions, but with appreciable overlap.

If the sample is an organic sludge (solid material and organic liquid, as opposed to an aqueous sludge), the sample should be handled as a multiphase sample.

2.3.1.4.1 Liquid sludges

Method 3510 or Method 3520 may be applicable to sludges that behave like, and have the consistency of, aqueous liquids. Ultrasonic extraction (Method 3550) and Soxhlet-type (Method 3540 series) procedures will, most likely, be ineffective because of the overwhelming presence of the liquid aqueous phase.

2.3.1.4.2 Solid sludges

Soxhlet extraction (Methods 3540 and 3541), pressurized fluid (Method 3545) extraction, microwave extraction (Method 3546) and ultrasonic extraction (Method 3550) will be more effective when applied to sludge samples that resemble solids. Samples may be dried or centrifuged to form solid materials for subsequent determination of semivolatile compounds.

Using Method 3650, Acid-Base Partition Cleanup, on the extract may be necessary, depending on whether chromatographic interferences prevent determination of the analytes of interest.

2.3.1.4.3 Emulsions

Attempts should be made to break up and separate the phases of an emulsion. Several techniques are effective in breaking emulsions or separating the phases of emulsions, including:

1. Freezing/thawing -- Certain emulsions will separate if exposed to temperatures below 0 °C.

2. Salting out -- Addition of a salt to make the aqueous phase of an emulsion too polar to support a less polar phase promotes separation.

3. Centrifugation -- Centrifugal force may separate emulsion components by density.

4. Addition of water or ethanol -- Emulsion polymers may be destabilized when a preponderance of the aqueous phase is added.

5. Forced filtering through glass wool -- Many emulsions can be broken by forcing the emulsion through a pad of Pyrex glass wool in a drying column using a slight amount of air pressure (using a rubber bulb usually provides sufficient pressure).

If techniques for breaking emulsions fail, use Method 3520. If the emulsion can be broken, the different phases (aqueous, solid, or organic liquid) may then be analyzed separately.

2.3.1.5 Multiphase samples

Choice of the procedure for separating multiphase samples is highly dependent on the objective of the analysis. With a sample in which some of the phases tend to separate rapidly, the percent weight or volume of each phase should be calculated and each phase should be individually analyzed for the required analytes.

An alternate approach is to obtain a homogeneous sample and attempt a single analysis on the combination of phases. This approach will give no information on the abundance of the analytes in the individual phases other than what can be implied by solubility.

A third alternative is to select phases of interest and to analyze only those selected phases. This tactic must be consistent with the sampling/analysis objectives or it will yield

insufficient information for the time and resources expended. The phases selected should be compared with Figure 2-1 and Table 2-41 for further guidance.

2.3.2 Cleanup procedures

Cleanup procedure selection is determined by the analytes of interest within the extract. Each analyte type in Table 2-42, Cleanup Methods for Organic Analyte Extracts, corresponds to one or more of the possible determinative methods available in the manual. However, the necessity of performing cleanup may also depend upon the matrix from which the extract was developed. Cleanup of a sample may be done exactly as instructed in the cleanup method for some of the analytes. There are some instances when cleanup using one of the methods may only proceed after the procedure is modified to optimize recovery and separation. Several cleanup techniques may be possible for each analyte category. The information provided is not meant to imply that any or all of these methods must be used for the analysis to be acceptable. Extracts with components which interfere with spectral or chromatographic determinations are expected to be subjected to cleanup procedures.

The analyst in consultation with the regulator, customer and other project planning participants, as necessary, must determine the necessity for cleanup procedures, as there are no clear cut criteria for indicating their use. Method 3600 and associated methods should be consulted for further details on extract cleanup.

2.3.3 Determinative procedures

In Table 2-43. the determinative methods for organic analytes are divided into four categories, specifically: gas chromatography/mass spectrometry (GC/MS); gas chromatography (GC) with electromagnetic spectrometric (ES) detectors, i.e., Fourier Transform infrared (FT-IR) or atomic emission (AES); specific quantitation methods, i.e., gas chromatography (GC) with specific non-MS detectors; and high performance liquid chromatography (HPLC). This division is intended to help an analyst choose which determinative method will apply. Under each analyte column, SW-846 method numbers are indicated, if appropriate, for the determination of the analyte. A blank has been left if no chromatographic determinative method is available.

Generally, the MS procedures are more specific but less sensitive than the appropriate gas chromatographic/specific quantitation or ES method.

Method 8000 gives a general description of the techniques of gas chromatography and high performance liquid chromatography. Method 8000 should be consulted prior to application of any of the gas chromatographic methods.

Method 8081 (organochlorine pesticides), Method 8082 (polychlorinated biphenyls), Method 8141 (organophosphorus pesticides), and Method 8151 (chlorinated herbicides), are preferred over GC/MS because of the combination of selectivity and sensitivity of the flame photometric, nitrogen-phosphorus, and electron capture detectors.

Method 8260 is a GC/MS method for volatile analytes, which employs a capillary column. A variety of sample introduction techniques may be used with Method 8260, including Methods 5021, 5030, 5031, 5035, 5041, and 3585. A GC with a selective detector is also useful for the determination of volatile organic compounds in a monitoring scenario, as described in Sec. 2.2.5.

Method 8270 is a GC/MS method for semivolatile analytes, which employs a capillary column. Method 8410 is another capillary GC method for semivolatile analytes which uses a

Fourier Transform IR (FT-IR) detector. Method 8085 is a capillary GC method for pesticides which uses an atomic emission detector (AES).

Table 2-43 lists several GC and HPLC methods that apply to only a small number of analytes. Methods 8031 and 8033 are GC methods for acrolein, acrylonitrile, and acetonitrile. Methods 8315 and 8316 are HPLC methods for these three analytes. Method 8316 also addresses acrylamide, which may be analyzed by Method 8032.

HPLC methods have been developed for other types of analytes, most notably N-methyl carbamates (Method 8318); azo dyes, phenoxy acid herbicides, carbamates, and organophosphorus pesticides (Method 8321); PAHs (Method 8310); explosives (Methods 8330, 8331, and 8332); and some volatile organics (Methods 8315 and 8316).

Method 8430 utilizes a fourier transform infrared spectrometer (FT-IR) coupled to a gas chromatograph to determine bis(2-chloroethyl) ether and its hydrolysis products. The sample is introduced by direct aqueous injection. Method 8440 may be employed for the determination of total recoverable petroleum hydrocarbons (TRPH) in solid samples by infrared (IR) spectrophotometry. The samples may be extracted with supercritical carbon dioxide, using Method 3560.

2.4 CHOOSING PROCEDURES FOR CHARACTERISTIC ANALYSES

2.4.1 Figure 2-2 outlines a sequence for determining if a waste exhibits one or more of the characteristics of a hazardous waste.

2.4.2 EP and TCLP extracts

The leachate obtained from using either the EP (Figure 2-3A) or the TCLP (Figure 2-3B) is an aqueous sample, and therefore, requires further solvent extraction prior to the analysis of semivolatile compounds.

The TCLP leachate is solvent extracted with methylene chloride at a pH <2 and at a pH >11 by either Method 3510 or 3520. The leachate may also be extracted as received for organochlorine pesticides and semivolatiles and at pH <1.0 for phenoxyacid herbicides using the solid phase extraction (SPE) disk option in Method 3535. The best recoveries are usually obtained using either Method 3520 or Method 3535.

The solvent extract obtained by performing either Method 3510 or 3520 at an acidic pH will contain the acid/neutral compounds of interest. Refer to the specific determinative method for guidance on the pH requirements for extraction prior to analysis. Method 5031 (azeotropic distillation) may be used as an effective preparative method for pyridine.

Due to the high concentration of acetate in the TCLP extract, it is recommended that purge-and-trap be used to introduce the volatile sample into the gas chromatograph.

The EP and TCLP extracts can also be digested using acids (Method 3010, 3015, or 3020) and analyzed for metals using a 6000 or 7000 series method (Figures 2-3A and 2-3B).

2.5 CHOOSING PROCEDURES FOR GROUNDWATER ANALYSES

Appropriate analysis schemes for the determination of analytes in groundwater are presented in Figures 2-4A, 2-4B, and 2-4C. Quantitation limits for the inorganic analytes should correspond to the drinking water limits, where such limits are available.

2.5.1 Special techniques for inorganic analytes

All atomic absorption analyses should employ appropriate background correction systems whenever spectral interferences could be present. Several background correction techniques are employed in modern atomic absorption spectrometers. Matrix modification can complement background correction in some cases. Since no approach to interference correction is completely effective in all cases, the analyst should attempt to verify the adequacy of correction. If the interferant is known (e.g., high concentrations of iron in the determination of selenium), accurate analyses of synthetic solutions of the interferant (with and without analyte) could establish the efficacy of the background correction. If the nature of the interferant is not established, good agreement of analytical results using two substantially different wavelengths could substantiate the adequacy of the background correction.

To reduce matrix interferences, all graphite furnace atomic absorption (GFAA) analyses should be performed using techniques which maximize an isothermal environment within the furnace cell. Data indicate that two such techniques, L'vov platform and the delayed atomization cuvette (DAC), are equivalent in this respect, and produce high quality results.

All furnace atomic absorption analysis should be carried out using the best matrix modifier for the analysis. Some examples of modifiers are listed below. (See also the appropriate methods.)

Element(s)	Modifier(s)
As and Se	Nickel nitrate, palladium
Pb	Phosphoric acid, ammonium phosphate, palladium
Cd	Ammonium phosphate, palladium
Sb	Ammonium nitrate, palladium
Tl	Platinum, palladium

ICP, AA, and GFAA calibration standards need to match the acid composition and strength of the acids contained in the samples. Acid strengths of the calibration standards should be stated in the raw data. When using a method which permits the use of internal standardization, and the internal standardization option is being used, matrix matching is not required.

2.6 CHOOSING PROCEDURES FOR INORGANIC ANALYSES

Methods for preparing different sample matrices for inorganic analyses are shown in Table 2-44. Guidance regarding the use of leaching and digestive methods for inorganic analysis is provided in Table 2-45.

2.7 REFERENCES

1. M. J. Barcelona, "TOC Determinations in Ground Water," Ground Water 1984, 22(1), 18-24.

2. R. Riggin, et al.; Development and Evaluation of Methods for Total Organic Halide and Purgeable Organic Halide in Wastewater; U.S. Environmental Protection Agency; Office of Research and Development; Environmental Monitoring and Support Laboratory; ORD Publication Offices of Center for Environmental Research Information; Cincinnati, OH, 1984; EPA-600/4-84-008.

3. G. McKee, et al.; Determination of Inorganic Anions in Water by Ion Chromatography (Technical addition to Methods for Chemical Analysis of Water and Wastewater, EPA 600/4-79-020); U.S. Environmental Protection Agency; Environmental Monitoring and Support Laboratory; ORD Publication Offices of Center for Environmental Research Information; Cincinnati, OH, 1984; EPA-600/4-84-017.

TABLE 2-1

DETERMINATIVE METHODS FOR ORGANIC ANALYTES
Analytes are listed in alphabetical order and alternative analyte names are in parenthesis.
The applicable method listing does not include immunoassay or screening methods.

Analyte	Applicable Method
Abate (Temephos)	8085
Acenaphthene	8100, 8270, 8275, 8310, 8410
Acenaphthylene	8100, 8270, 8275, 8310, 8410
Acetaldehyde	8315
Acetone	8015, 8260, 8261, 8315
Acetonitrile	8015, 8033, 8260, 8261
Acetophenone	8261, 8270
2-Acetylaminofluorene	8270
1-Acetyl-2-thiourea	8270
Acifluorfen	8085, 8151
Acrolein (Propenal)	8015, 8260, 8261, 8315, 8316
Acrylamide	8032, 8316
Acrylonitrile	8015, 8031, 8260, 8261, 8316
Alachlor	8081,8085
Aldicarb (Temik)	8318, 8321
Aldicarb sulfone	8318, 8321
Aldicarb sulfoxide	8321
Aldrin	8081, 8085, 8270
Allyl alcohol	8015, 8260
Allyl chloride	8021, 8260, 8261
Ametryn	8085
2-Aminoanthraquinone	8270
Aminoazobenzene	8270
4-Aminobiphenyl	8270
Aminocarb	8321
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	8095, 8330
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	8095, 8330
3-Amino-9-ethylcarbazole	8270
t-Amyl alcohol (TAA)	8015
t-Amyl ethyl ether (TAEE, 4,4-Dimethyl-3-oxahexane)	8015, 8261
t-Amyl methyl ether (TAME)	8015, 8261
Anilazine	8270
Aniline	8131, 8261, 8270
o-Anisidine	8270
Anthracene	8100, 8270, 8275, 8310, 8410
Aramite	8270
Aroclor-1016 (PCB-1016)	8082, 8270
Aroclor-1221 (PCB-1221)	8082, 8270
Aroclor-1232 (PCB-1232)	8082, 8270
Aroclor-1242 (PCB-1242)	8082, 8270
Aroclor-1248 (PCB-1248)	8082, 8270
Aroclor-1254 (PCB-1254)	8082, 8270
Aroclor-1260 (PCB-1260)	8082, 8270
Aspon	8141
Asulam	8321

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
Atraton	8085
Atrazine	8041, 8085, 8141
Azinphos-ethyl (Ethyl guthion)	8085, 8141
Azinphos-methyl (Guthion)	8085, 8141, 8270
Barban	8270, 8321
Baygon (Propoxur)	8318, 8321
Bendiocarb	8141, 8318, 8321
Benefin	8091
Benfluralin	8085
Benomyl	8321
Bentazon	8151
Benzal chloride	8121
Benzaldehyde	8315
Benz(a)anthracene	8100, 8270, 8275, 8310, 8410
Benzene	8015, 8021, 8260, 8261
Benzenethiol (Thiophenol)	8270
Benzidine	8270, 8325
Benzo(b)fluoranthene	8100, 8270, 8275, 8310
Benzo(j)fluoranthene	8100
Benzo(k)fluoranthene	8100, 8270, 8275, 8310
Benzoic acid	8270, 8410
Benzo(g,h,i)perylene	8100, 8270, 8275, 8310
Benzo(a)pyrene	8100, 8270, 8275, 8310, 8410
p-Benzoquinone	8270
Benzotrichloride	8121
Benzoylprop ethyl	8325
Benzyl alcohol	8270
Benzyl chloride	8021, 8121, 8260
α-BHC (α-Hexachlorocyclohexane)	8081, 8085, 8121, 8270
β-BHC (β-Hexachlorocyclohexane)	8081, 8085, 8121, 8270
δ-BHC (δ-Hexachlorocyclohexane)	8081, 8085, 8121, 8270
γ-BHC (Lindane, γ-Hexachlorocyclohexane)	8081, 8085, 8121, 8270
Bis(2-chloroethoxy)methane	8111, 8270, 8410
Bis(2-chloroethyl) ether	8111, 8270, 8410, 8430
Bis(2-chloroethyl)sulfide	8260
Bis(2-chloroisopropyl) ether	8021, 8111, 8270, 8410
Bis(2-n-butoxyethyl) phthalate	8061
Bis(2-ethoxyethyl) phthalate	8061
Bis(2-ethylhexyl) phthalate	8061, 8270, 8410
Bis(2-methoxyethyl) phthalate	8061
Bis(4-methyl-2-pentyl)-phthalate	8061
Bolstar (Sulprofos)	8085, 8141
Bromacil	8085, 8321
Brominal (Bromoxynil)	8085, 8270
Bromoacetone	8021, 8260
4-Bromoaniline	8131
Bromobenzene	8021, 8260
Bromochloromethane	8021, 8260, 8261

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
2-Bromo-6-chloro-4-nitroaniline	8131
Bromodichloromethane	8021, 8260, 8261
2-Bromo-4,6-dinitroaniline	8131
Bromoform	8021, 8260, 8261
Bromomethane	8021, 8260, 8261
4-Bromophenyl phenyl ether	8111, 8270, 8275, 8410
Bromoxynil (Brominal)	8085, 8270
Butachlor	8085
Butanal	8315
1-Butanol (*n*-Butyl alcohol, *n*-Butanol)	8260
n-Butanol (1-Butanol, *n*-Butyl alcohol)	8260
2-Butanone (Methyl ethyl ketone, MEK)	8015, 8260, 8261
Butifos (DEF)	8085
Butralin	8091
n-Butyl alcohol (1-Butanol, *n*-Butanol)	8260
t-Butyl alcohol	8015, 8260
Butylate	8085, 8141, 8321
n-Butylbenzene	8021, 8260, 8261
sec-Butylbenzene	8021, 8260, 8261
tert-Butylbenzene	8021, 8260, 8261
Butyl benzyl phthalate	8061, 8270, 8410
2-*sec*-Butyl-4,6-dinitrophenol (DNBP, Dinoseb)	8041, 8085, 8151, 8270, 8321
Captafol	8081, 8085, 8270
Captan	8085, 8270
Carbaryl (Sevin)	8270, 8318, 8321, 8325
Carbendazim	8321
Carbofuran (Furaden)	8270, 8318, 8321
Carbofuran phenol	8321
Carbon disulfide	8260, 8261
Carbon tetrachloride	8021, 8260, 8261, 8535
Carbophenothion	8081, 8085, 8141, 8270
Carbosulfan	8321
Carboxin	8085
Casoron (Dichlobenil)	8085
Chloral hydrate	8260
Chloramben	8151
Chlordane (NOS)	8081, 8270
cis-Chlordane	8081
trans-Chlordane	8085, 8081
Chlorfenvinphos	8141, 8270
Chloroacetonitrile	8260
2-Chloroaniline	8131
3-Chloroaniline	8131
4-Chloroaniline	8131, 8270, 8410
Chlorobenzene	8021, 8260, 8261
Chlorobenzilate	8081, 8270
2-Chlorobiphenyl	8082, 8275
2-Chloro-1,3-butadiene (Chloroprene)	8021, 8260

Analyte	Applicable Method(s)
1-Chlorobutane	8260
Chlorodibromomethane (Dibromochloromethane)	8021, 8260, 8261
2-Chloro-4,6-dinitroaniline	8131
1-Chloro-2,4-dinitrobenzene	8091
1-Chloro-3,4-dinitrobenzene	8091
Chloroethane	8021, 8260, 8261
2-Chloroethanol	8021, 8260, 8430
2-(2-Chloroethoxy)ethanol	8430
2-Chloroethyl vinyl ether	8021, 8260
Chloroform	8021, 8260, 8261
1-Chlorohexane	8260
Chloromethane	8021, 8260, 8261
5-Chloro-2-methylaniline	8270
Chloromethyl methyl ether	8021
2-Chloro-5-methylphenol	8041
4-Chloro-2-methylphenol	8041
4-Chloro-3-methylphenol	8041, 8270, 8410
3-(Chloromethyl)pyridine hydrochloride	8270
1-Chloronaphthalene	8270, 8275
2-Chloronaphthalene	8121, 8270, 8410
Chloroneb	8081
2-Chloro-4-nitroaniline	8131
4-Chloro-2-nitroaniline	8131
1-Chloro-2-nitrobenzene	8091
1-Chloro-4-nitrobenzene	8091
2-Chloro-6-nitrotoluene	8091
4-Chloro-2-nitrotoluene	8091
4-Chloro-3-nitrotoluene	8091
2-Chlorophenol	8041, 8270, 8410
3-Chlorophenol	8041
4-Chlorophenol	8410
4-Chloro-1,2-phenylenediamine	8270
4-Chloro-1,3-phenylenediamine	8270
4-Chlorophenyl phenyl ether	8111, 8270, 8410
2-Chlorophenyl 4-nitrophenyl ether	8111
3-Chlorophenyl 4-nitrophenyl ether	8111
4-Chlorophenyl 4-nitrophenyl ether	8111
o-Chlorophenyl thiourea	8325
Chloroprene (2-Chloro-1,3-butadiene)	8021, 8260
3-Chloropropionitrile	8260
Chloropropham	8085, 8321
Chloropropylate	8081
Chlorothalonil	8081
2-Chlorotoluene	8021, 8260, 8261
4-Chlorotoluene	8021, 8260, 8261
Chloroxuron	8321
Chlorpyrifos	8085, 8141
Chlorpyrifos methyl	8141

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
Chlorthalonil (Daconil)	8085
Chrysene	8100, 8270, 8275, 8310, 8410
Coumaphos	8085, 8141, 8270
p-Cresidine	8270
o-Cresol (2-Methylphenol)	8041, 8270, 8410
m-Cresol (3-Methylphenol)	8041, 8270
p-Cresol (4-Methylphenol)	8041, 8270, 8410
Crotonaldehyde	8015, 8260, 8315
Crotoxyphos	8141, 8270
m-Cumenyl methylcarbamate	8318, 8321
Cyanazine	8085
Cycloate	8085
Cyclohexanone	8315
2-Cyclohexyl-4,6-dinitrophenol	8041, 8270
2,4-D	8151, 8321
2,4-D (acid)	8085
2,4-D (butoxyethanol ester)	8321
2,4-D (ethylhexyl ester)	8321
Dacthal (DCPA)	8081, 8085
Daconil (Chlorthalonil)	8085
Dalapon	8151, 8321
2,4-DB	8151, 8321
2,4-DB (acid)	8085
DBCP (1,2-Dibromo-3-chloropropane)	8011, 8021, 8081, 8260, 8261, 8270
2,4-D, butoxyethanol ester	8321
DCM (Dichloromethane, Methylene chloride)	8021, 8260, 8261
DCPA (Dacthal)	8081, 8085
DCPA diacid	8151
2,4'-DDD	8085
4,4'-DDD	8081, 8085, 8270
2,4'-DDE	8085
4,4'-DDE	8081, 8085, 8270
2,4'-DDT	8085
4,4'-DDT	8081, 8085, 8270
DDVP (Dichlorvos, Dichlorovos)	8085, 8141, 8270, 8321
2,2',3,3'4,4'5,5',6,6'-Decachlorobiphenyl	8275
Decanal	8315
DEF (Butifos)	8085
Demeton-O, and Demeton-S	8085, 8141, 8270
2,4-D, ethylhexyl ester	8321
Diallate	8081, 8085, 8270
Diamyl phthalate	8061
2,4-Diaminotoluene	8270
Diazinon	8085, 8141
Dibenz(*a,h*)acridine	8100
Dibenz(*a,j*)acridine	8100, 8270
Dibenz(*a,h*)anthracene	8100, 8270, 8275, 8310
7H-Dibenzo(*c,g*)carbazole	8100

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
Dibenzofuran	8270, 8275, 8410
Dibenzo(*a,e*)pyrene	8100, 8270
Dibenzo(*a,h*)pyrene	8100
Dibenzo(*a,i*)pyrene	8100
Dibenzothiophene	8275
Dibromochloromethane (Chlorodibromomethane)	8021, 8260, 8261
1,2-Dibromo-3-chloropropane (DBCP)	8011, 8021, 8081, 8260, 8261, 8270
Dibromofluoromethane	8260
Dibromomethane	8021, 8260, 8261
1,2-Dibromoethane (EDB, Ethylene dibromide)	8011, 8021, 8260
2,6-Dibromo-4-nitroaniline	8131
2,4-Dibromophenyl 4-nitrophenyl ether	8111
Di-*n*-butyl phthalate	8061, 8270, 8410
Dicamba	8085, 8151, 8321
Dichlobenil (Casoron)	8085
Dichlone	8081, 8270
Dichloran	8081
3,4-Dichloroaniline	8131
1,2-Dichlorobenzene	8021, 8121, 8260, 8261, 8270, 8410
1,3-Dichlorobenzene	8021, 8121, 8260, 8261, 8270, 8410
1,4-Dichlorobenzene	8021, 8121, 8260, 8261, 8270, 8410
3,3'-Dichlorobenzidine	8270,8325
3,5-Dichlorobenzoic acid	8085, 8151
2,3-Dichlorobiphenyl	8082
3,3'-Dichlorobiphenyl	8275
cis-1,4-Dichloro-2-butene	8260, 8261
trans-1,4-Dichloro-2-butene	8260, 8261
Dichlorodifluoromethane	8021, 8260, 8261
1,1-Dichloroethane	8021, 8260, 8261
1,2-Dichloroethane	8021, 8260, 8261
1,1-Dichloroethene (Vinylidene chloride)	8021, 8260, 8261
cis-1,2-Dichloroethene	8021, 8260, 8261
trans-1,2-Dichloroethene	8021, 8260, 8261
Dichlorofenthion	8141
Dichloromethane (DCM, Methylene chloride)	8021, 8260, 8261
2,6-Dichloro-4-nitroaniline	8131
2,3-Dichloronitrobenzene	8091
2,4-Dichloronitrobenzene	8091
3,5-Dichloronitrobenzene	8091
3,4-Dichloronitrobenzene	8091
2,5-Dichloronitrobenzene	8091
2,3-Dichlorophenol	8041
2,4-Dichlorophenol	8041, 8270, 8410
2,5-Dichlorophenol	8041
2,6-Dichlorophenol	8041, 8270
3,4-Dichlorophenol	8041
3,5-Dichlorophenol	8041
2,4-Dichlorophenol 3-methyl-4-nitrophenyl ether	8111

Analyte	Applicable Method(s)
2,3-Dichlorophenyl 4-nitrophenyl ether	8111
2,4-Dichlorophenyl 4-nitrophenyl ether	8111
2,5-Dichlorophenyl 4-nitrophenyl ether	8111
2,6-Dichlorophenyl 4-nitrophenyl ether	8111
3,4-Dichlorophenyl 4-nitrophenyl ether	8111
3,5-Dichlorophenyl 4-nitrophenyl ether	8111
Dichloroprop (Dichlorprop)	8085, 8151, 8321
1,2-Dichloropropane	8021, 8260, 8261
1,3-Dichloropropane	8021, 8260, 8261
2,2-Dichloropropane	8021, 8260, 8261
1,3-Dichloro-2-propanol	8021, 8260
1,1-Dichloropropene	8021, 8260, 8261
cis-1,3-Dichloropropene	8021, 8260, 8261
trans-1,3-Dichloropropene	8021, 8260, 8261
Dichlorovos (DDVP, Dichlorvos)	8085, 8141, 8270, 8321
Dichlorprop (Dichloroprop)	8085, 8151, 8321
Dichlorvos (DDVP, Dichlorovos)	8085, 8141, 8270, 8321
Dicrotophos	8141, 8270
Diclofol (Kelthane)	8085
Diclofop-methyl	8085
Dicofol	8081
Dicyclohexyl phthalate	8061
Dieldrin	8081, 8085, 8270
1,2,3,4-Diepoxybutane	8260
Diesel range organics (DRO)	8015
Diethylene glycol	8430
Diethyl ether	8015, 8260, 8261
Diethyl phthalate	8061, 8270, 8410
Diethylstilbestrol	8270
Diethyl sulfate	8270
Dihexyl phthalate	8061
Diisobutyl phthalate	8061
Diisopropyl ether (DIPE)	8015, 8261
Dimethoate	8141, 8270,8085, 8321
3,3'-Dimethoxybenzidine	8270, 8325
Dimethylaminoazobenzene	8270
2,5-Dimethylbenzaldehyde	8315
7,12-Dimethylbenz(a)anthracene	8270
3,3'-Dimethylbenzidine	8270, 8325
4,4-Dimethyl-3-oxahexane (*t*-Amyl ethyl ether, TAEE)	8015, 8261
α,α-Dimethylphenethylamine	8270
2,3-Dimethylphenol	8041
2,4-Dimethylphenol	8041, 8270
2,5-Dimethylphenol	8041
2,6-Dimethylphenol	8041
3,4-Dimethylphenol	8041
Dimethyl phthalate	8061, 8270, 8410
Dinitramine	8091

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
2,4-Dinitroaniline	8131
3,5-Dinitroaniline	8095
1,2-Dinitrobenzene	8091, 8270
1,3-Dinitrobenzene (1,3-DNB)	8091, 8095, 8270, 8330
1,4-Dinitrobenzene	8091, 8270
4,6-Dinitro-2-methylphenol	8270, 8410
2,4-Dinitrophenol	8041, 8270, 8410
2,5-Dinitrophenol	8041
2,4-Dinitrotoluene (2,4-DNT)	8091, 8095, 8270, 8330, 8410
2,6-Dinitrotoluene (2,6-DNT)	8091, 8095, 8270, 8330, 8410
Dinocap	8270
Dinonyl phthalate	8061
Dinoseb (2-*sec*-Butyl-4,6-dinitrophenol, DNBP)	8041, 8085, 8151, 8270, 8321
Di-*n*-octyl phthalate	8061, 8270, 8410
Dioxacarb	8318
1,4-Dioxane	8260, 8261
Dioxathion	8085, 8141
Di-*n*-propyl phthalate	8410
DIPE (Diisopropyl ether)	8015, 8261
Diphenamid	8085
Diphenylamine	8270
5,5-Diphenylhydantoin	8270
1,2-Diphenylhydrazine	8270
Disperse Blue 3	8321
Disperse Blue 14	8321
Disperse Brown 1	8321
Disperse Orange 3	8321
Disperse Orange 30	8321
Disperse Red 1	8321
Disperse Red 5	8321
Disperse Red 13	8321
Disperse Red 60	8321
Disperse Yellow 5	8321
Disulfoton	8085, 8141, 8270, 8321
Diuron	8085, 8321, 8325
1,3-DNB (1,3-Dinitrobenzene)	8091, 8095, 8270, 8330
DNBP (2-*sec*-Butyl-4,6-dinitrophenol, Dinoseb)	8041, 8085, 8151, 8270, 8321
2,4-DNT (2,4-Dinitrotoluene)	8091, 8095, 8270, 8330, 8410
2,6-DNT (2,6-Dinitrotoluene)	8091, 8270, 8330, 8410
EDB (1,2-Dibromoethane, Ethylene dibromide)	8011, 8021, 8260
Endosulfan I	8081, 8085, 8270
Endosulfan II	8081, 8085, 8270
Endosulfan sulfate	8081, 8085, 8270
Endrin	8081, 8085, 8270
Endrin aldehyde	8081, 8085, 8270
Endrin ketone	8081, 8085, 8270
Epichlorohydrin	8021, 8260
EPN	8141, 8085, 8270

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
Eptam (EPTC)	8085, 8141, 8321
EPTC (Eptam)	8085, 8141, 8321
ETBE (Ethyl *tert*-butyl ether)	8015, 8261
Ethalfluralin (Sonalan)	8085
Ethanol	8015, 8260, 8261
Ethion	8085, 8141, 8270
Ethoprop	8085, 8141
Ethyl acetate	8015, 8260, 8261
Ethyl benzene	8015, 8021, 8260, 8261
Ethyl carbamate	8270
Ethyl cyanide (Propionitrile)	8015, 8260, 8261
Ethylene dibromide (EDB, 1,2-Dibromoethane)	8011, 8021, 8260
Ethylene glycol	8430
Ethyl guthion (Azinphos-ethyl)	8085, 8141
Ethylene oxide	8015, 8260
Ethyl methacrylate	8260, 8261
Ethyl methanesulfonate	8270
Ethyl *tert*-butyl ether (ETBE)	8015, 8261
Etridiazole	8081
Famphur	8141, 8270, 8321
Fenamiphos	8085
Fenarimol	8085
Fenitrothion	8085, 8141
Fensulfothion	8085, 8141, 8270, 8321
Fenthion	8085, 8141, 8270
Fenuron	8321
Fluchloralin	8270
Fluometuron	8321
Fluoranthene	8100, 8270, 8275, 8310, 8410
Fluorene	8100, 8270, 8275, 8310, 8410
Fluridone	8085
Fonophos	8085, 8141
Formaldehyde	8315
Formetanate hydrochloride	8318, 8321
Furaden (Carbofuran)	8270, 8318, 8321
Gardona (Tetrachlovinphos, Stirophos)	80858141, 8270
Garlon (Triclopyr)	8085
Gasoline range organics (GRO)	8015
Guthion (Azinphos-methyl)	8085, 8141, 8270
Halowax-1000	8081
Halowax-1001	8081
Halowax-1013	8081
Halowax-1014	8081
Halowax-1051	8081
Halowax-1099	8081
Heptachlor	8081, 8085, 8270
2,2',3,3',4,4',5-Heptachlorobiphenyl	8082, 8275
2,2',3,4,4',5,5'-Heptachlorobiphenyl	8082, 8275

Analyte	Applicable Method(s)
2,2',3,4,4',5',6-Heptachlorobiphenyl	8082
2,2',3,4',5,5',6-Heptachlorobiphenyl	8082, 8275
Heptachlor epoxide	8081, 8085, 8270
Heptanal	8315
Hexachlorobenzene	8081, 8085, 8121, 8270, 8275, 8410
2,2',3,3,4,4'-Hexachlorobiphenyl	8275
2,2',3,4,4',5'-Hexachlorobiphenyl	8082, 8275
2,2',3,4,5,5'-Hexachlorobiphenyl	8082
2,2',3,5,5',6-Hexachlorobiphenyl	8082
2,2',4,4',5,5'-Hexachlorobiphenyl	8082
Hexachlorobutadiene (1,3-Hexachlorobutadiene)	8021, 8121, 8260, 8261, 8270, 8410
α-Hexachlorocyclohexane (α-BHC)	8081, 8085, 8121, 8270
β-Hexachlorocyclohexane (β-BHC)	8081, 8085, 8121, 8270
δ-Hexachlorocyclohexane (δ-BHC)	8081, 8085, 8121, 8270
γ-Hexachlorocyclohexane (γ-BHC, Lindane)	8081, 8085, 8121, 8270
Hexachlorocyclopentadiene	8081, 8085, 8121, 8270, 8410
Hexachloroethane	8121, 8260, 8270, 8410
Hexachlorophene	8270
Hexachloropropene	8141, 8270
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8095, 8330, 8510
Hexamethyl phosphoramide (HMPA)	, 8270
Hexanal	8315
2-Hexanone	8260, 8261
Hexazinone	8085
Hexyl 2-ethylhexyl phthalate	8061
HMPA (Hexamethyl phosphoramide)	8141, 8270
HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	8095, 8330
1,2,3,4,6,7,8-HpCDD	8280, 8290
HpCDD, total	8280, 8290
1,2,3,4,6,7,8-HpCDF	8280, 8290
1,2,3,4,7,8,9-HpCDF	8280, 8290
HpCDF, total	8280, 8290
1,2,3,4,7,8-HxCDD	8280, 8290
1,2,3,6,7,8-HxCDD	8280, 8290
1,2,3,7,8,9-HxCDD	8280, 8290
HxCDD, total	8280, 8290
1,2,3,4,7,8-HxCDF	8280, 8290
1,2,3,6,7,8-HxCDF	8280, 8290
1,2,3,7,8,9-HxCDF	8280, 8290
2,3,4,6,7,8-HxCDF	8280, 8290
HxCDF	8280, 8290
Hydroquinone	8270
3-Hydroxycarbofuran	8318, 8321
5-Hydroxydicamba	8151
2-Hydroxypropionitrile	8260
Igran (Terbutryn)	8085
Imidan (Phosmet)	8085, 8141, 8270
Indeno(1,2,3-cd)pyrene	8100, 8270, 8275, 8310

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
Iodomethane (Methyl iodide)	8260, 8261
Ioxynil	8085
Isobutyl alcohol (2-Methyl-1-propanol)	8260, 8261
Isodrin	8081, 8270
Isophorone	8270, 8410
Isopropalin	8091
Isopropyl alcohol (2-Propanol)	8015, 8260
Isopropylbenzene	8021, 8260
p-Isopropyltoluene	8021, 8260, 8261
Isosafrole	8270
Isovaleraldehyde	8315
Kelthane (Diclofol)	8085
Kepone	8270
Kerb (Pronamide)	8085, 8270
Lannate (Methomyl)	8318, 8321
Leptophos	8141, 8270
Lindane (γ-Hexachlorocyclohexane, γ-BHC)	8081, 8085, 8121, 8270
Linuron (Lorox)	8321, 8325
Lorox (Linuron)	8321, 8325
Malathion	8085, 8141, 8270
Maleic anhydride	8270
Malononitrile	8260
MCPA	8151, 8321
MCPA (acid)	8085
MCPP	8151, 8321
MCPP (acid)	8085
MEK (Methyl ethyl ketone, 2-Butanone)	8015, 8260, 8261
Merphos	8085, 8141, 8321
Mestranol	8270
Mesurol (Methiocarb)	8141, 8318, 8321
Methacrylonitrile	8260, 8261
Metalaxyl	8085
Methanol	8015, 8260
Methapyrilene	8270
Methiocarb (Mesurol)	8141, 8318, 8321
Methomyl (Lannate)	8318, 8321
Methoxychlor	8081, 8085, 8270
Methyl acrylate	8260
Methyl chlorpyrifos	8085
Methyl-*tert*-butyl ether (MTBE)	8015, 8260, 8261
3-Methylcholanthrene	8100, 8270
2-Methyl-4,6-dinitrophenol	8041
4,4'-Methylenebis(2-chloroaniline)	8270
4,4'-Methylenebis(*N,N*-dimethylaniline)	8270
Methyl ethyl ketone (MEK, 2-Butanone)	8015, 8260, 8261
Methylene chloride (Dichloromethane, DCM)	8021, 8260, 8261
Methyl iodide (Iodomethane)	8260, 8261
Methyl isobutyl ketone (MIBK, 4-Methyl-2-pentanone)	8260, 8261

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
Methyl methacrylate	8260, 8261
Methyl methanesulfonate	8270
1-Methylnaphthalene	8261
2-Methylnaphthalene	8261, 8270, 8410
Methyl paraoxon	8085
Methyl parathion (Parathion, methyl)	8085, 8270, 8141, 8321
4-Methyl-2-pentanone (MIBK, Methyl isobutyl ketone)	8260, 8261
2-Methylphenol (*o*-Cresol)	8041, 8270, 8410
3-Methylphenol (*m*-Cresol)	8041, 8270
4-Methylphenol (*p*-Cresol)	8041, 8270, 8410
2-Methyl-1-propanol (Isobutyl alcohol)	8260, 8261
2-Methyl-2-propanol (*t*-Butyl alcohol)	8015, 8260
2-Methylpyridine (2-Picoline)	8015, 8260, 82618270
Methyl-2,4,6-trinitrophenyl-nitramine (Tetryl)	8330
Metolachlor	8085
Metolcarb	8318, 8321
Metribuzin	8085
Mevinphos	8085, 8141, 8270
Mexacarbate	8270, 8318, 8321
MGK-264	8085
MIBK (Methyl isobutyl ketone, 4-Methyl-2-pentanone)	8260, 8261
Mirex	8081, 8085, 8270
Molinate	8085, 8141, 8321
Monocrotophos	8141, 8270, 8321
Monuron	8321, 8325
MTBE (Methyl-*tert*-butyl ether)	8015, 8260, 8261
Naled	8141, 8270, 8321
Naphthalene	8021, 8100, 8260, 8261, 8270, 8275, 8310, 8410
Napropamide	8085
NB (Nitrobenzene)	8091, 8095, 8260, 8270, 8330, 8410
1,2-Naphthoquinone	8091
1,4-Naphthoquinone	8270, 8091
1-Naphthylamine	8270
2-Naphthylamine	8270
Neburon	8321
Nicotine	8270
5-Nitroacenaphthene	8270
2-Nitroaniline	8131, 8270, 8410
3-Nitroaniline	8131, 8270, 8410
4-Nitroaniline	8131, 8270, 8410
5-Nitro-*o*-anisidine	8270
Nitrobenzene (NB)	8091, 8095, 8260, 8270, 8330, 8410
4-Nitrobiphenyl	8270
Nitrofen	8081, 8270
Nitroglycerin	8095, 8332
2-Nitrophenol	8041, 8270, 8410
3-Nitrophenol	8041
4-Nitrophenol	8041, 8085, 8151, 8270, 8410

Analyte	Applicable Method(s)
4-Nitrophenyl phenyl ether	8111
2-Nitropropane	8260
Nitroquinoline-1-oxide	8270
N-Nitroso-di-*n*-butylamine (*N*-Nitrosodibutylamine)	8015, 8260, 8261, 8270
N-Nitrosodiethylamine	8261, 8270
N-Nitrosodimethylamine	8070, 8261, 8270, 8410
N-Nitrosodiphenylamine	8070, 8270, 8410
N-Nitroso-di-*n*-propylamine	8070, 8261, 8270, 8410
N-Nitrosomethylethylamine	8261, 8270
N-Nitrosomorpholine	8270
N-Nitrosopiperidine	8270
N-Nitrosopyrrolidine	8270
2-Nitrotoluene (*o*-Nitrotoluene, 2-NT)	8091, 8095, 8330
3-Nitrotoluene (*m*-Nitrotoluene, 3-NT)	8091, 8095, 8330
4-Nitrotoluene (*p*-Nitrotoluene, 4-NT)	8091, 8095, 8330
o-Nitrotoluene (2-Nitrotoluene, 2-NT)	8091, 8095, 8330
m-Nitrotoluene (3-Nitrotoluene, 3-NT)	8091, 8095, 8330
p-Nitrotoluene (4-Nitrotoluene, 4-NT)	8091, 8095, 8330
5-Nitro-*o*-toluidine	8270
trans-Nonachlor	8081
2,2'3,3'4,4'5,5'6-Nonachlorobiphenyl	8082, 8275
Nonanal	8315
Norflurazon	8085
2-NT (2-Nitrotoluene, *o*-Nitrotoluene)	8091, 8095, 8330
3-NT (3-Nitrotoluene, *m*-Nitrotoluene)	8091, 8095, 8330
4-NT (4-Nitrotoluene, *p*-Nitrotoluene)	8091, 8095, 8330
OCDD	8280, 8290
OCDF	8280, 8290
2,2',3,3',4,4'5,5'-Octachlorobiphenyl	8275
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8095, 8330
Octamethyl pyrophosphoramide	8270
Octanal	8315
Oxamyl	8318, 8321
4,4'-Oxydianiline	8270
Oxyfluorfen	8085
Paraldehyde	8015, 8260
Parathion	8085, 8270
Parathion, ethyl	8141
Parathion, methyl	8085, 8270, 8141, 8321
PCB-1016 (Aroclor-1016)	8082, 8270
PCB-1221 (Aroclor-1221)	8082, 8270
PCB-1232 (Aroclor-1232)	8082, 8270
PCB-1242 (Aroclor-1242)	8082, 8270
PCB-1248 (Aroclor-1248)	8082, 8270
PCB-1254 (Aroclor-1254)	8082, 8270
PCB-1260 (Aroclor-1260)	8082, 8270
PCBs, as congeners	8082
PCNB (Pentachloronitrobenzene)	8081, 8091, 8270

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
Pebulate	8085, 8141, 8321
1,2,3,7,8-PeCDD	8280, 8290
PeCDD, total	8280, 8290
1,2,3,7,8-PeCDF	8280, 8290
2,3,4,7,8-PeCDF	8280, 8290
PeCDF, total	8280, 8290
Pendimethaline (Penoxalin)	8085, 8091
Penoxalin (Pendimethaline)	8085, 8091
Pentachlorobenzene	8121, 8270
2,2',3,4,5'-Pentachlorobiphenyl	8082
2,3',4,4',5-Pentachlorobiphenyl	8275
2,2',4,5,5'-Pentachlorobiphenyl	8082, 8275
2,3,3',4',6-Pentachlorobiphenyl	8082
Pentachloroethane	8260, 8261
Pentachloronitrobenzene (PCNB)	8081, 8091, 8270
Pentachlorophenol	8041, 8085, 8151, 8270, 8410
Pentaerythritoltetranitrate	8095
Pentafluorobenzene	8260
Pentanal (Valeraldehyde)	8315
2-Pentanone	8015, 8260
Perchloroethylene (Tetrachloroethene, Tetrachloroethylene)	8021, 8260, 8261
Permethrin (*cis* + *trans*)	8081
Perthane	8081
Phenacetin	8270
Phenanthrene	8100, 8270, 8275, 8310, 8410
Phenobarbital	8270
Phenol	8041, 8270, 8410
1,4-Phenylenediamine	8270
1,2-Phenylenediamine (*o*-Phenylenediamine)	8141, 8321
Phorate	8085, 8141, 8270, 8321
Phosalone	8270
Phosmet (Imidan)	8085, 8141, 8270
Phosphamidon	8085, 8141, 8270
Phthalic anhydride	8270
Physostigmine	8321
Physostigmine salicylate	8321
Picloram	8085, 8151
2-Picoline (2-Methylpyridine)	8015, 8260, 8261, 8270
Piperonyl sulfoxide	8270
Polychlorinated biphenyls (PCBs), as Aroclors or congeners	8082, 8270
Profluralin	8085, 8091
Pramitol 5p (Prometon)	8085
Promecarb	8318, 8321
Prometon (Pramitol 5p)	8085
Prometryn	8085
Pronamide (Kerb)	8085, 8270
Propachlor (Ramrod)	8081, 8085
Propanal (Propionaldehyde)	8315

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
1-Propanol (*n*-Propyl alcohol)	8015, 8260
2-Propanol (Isopropyl alcohol)	8015, 8260
Propargite (S-181)	8085
Propargyl alcohol	8260
Propazine	8085
Propenal (Acrolein)	8015, 8260, 8261, 8315, 8316
Propetamidophos	8085
Propham	8141, 8321
ß-Propiolactone	8260
Propionaldehyde (Propanal)	8315
Propionitrile (Ethyl cyanide)	8015, 8260, 8261
Propoxur (Baygon)	8318, 8321
n-Propylalcohol (1-Propanol)	8015, 8260
n-Propylamine	8260
n-Propylbenzene	8021, 8260, 8261
Propylthiouracil	8270
Prosulfocarb	8141, 8321
Prothiophos (Tokuthion)	8141
Pyrene	8100, 8270, 8275, 8310, 8410
Pyridine	8015, 8260, 8261
Ramrod (Propachlor)	8085
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	8095, 8330
Resorcinol	8270
Ronnel	8085, 8141
Rotenone	8325
S-181 (Propargite)	8085
Safrole	8270
Sevin (Carbaryl)	8270, 8318, 8321, 8325
Siduron	8321, 8325
Simazine	8085, 8141
Silvex (2,4,5-TP)	8085, 8151, 8321
Solvent Red 3	8321
Solvent Red 23	8321
Sonalan (Ethalfluralin)	8085
Stirophos (Tetrachlorvinphos, Gardona)	8085, 8141, 8270
Strobane	8081
Strychnine	8270
Styrene	8021, 8260, 8261
Sulfallate	8270
Sulfotepp	8085, 8141
Sulprofos (Bolstar)	8085, 8141
2,4,5-T	8151, 8321
2,4,5-T (acid)	8085
2,4,5-TB	8085
TAA (t-Amyl alcohol)	8015
TAEE (t-Amyl ethyl ether, 4,4-Dimethyl-3-oxahexane)	8015, 8261
TAME (t-Amyl methyl ether)	8015, 8261
2,4,5-T, butoxyethanol ester	8321

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
2,4,5-T, butyl ester	8321
2,3,7,8-TCDD	8280, 8290
TCDD, total	8280, 8290
2,3,7,8-TCDF	8280, 8290
TCDF, total	8280, 8290
Tebuthiuron	8085, 8321
Temephos (Abate)	8085
Temik (Aldicarb)	8318, 8321
TEPP (Tetraethyl pyrophosphate)	8141, 8270
Terbacil	8085
Terbufos	8141, 8270
Terbutryn (Igran)	8085
1,2,3,4-Tetrachlorobenzene	8121
1,2,3,5-Tetrachlorobenzene	8121
1,2,4,5-Tetrachlorobenzene	8121, 8270
2,2',3,5'-Tetrachlorobiphenyl	8082, 8275
2,2',4,5'-Tetrachlorobiphenyl	8275
2,2',5,5'-Tetrachlorobiphenyl	8082, 8275
2,3',4,4'-Tetrachlorobiphenyl	8082, 8275
1,1,1,2-Tetrachloroethane	8021, 8260
1,1,2,2-Tetrachloroethane	8021, 8260, 8261
Tetrachloroethene (Perchloroethylene, Tetrachloroethylene)	8021, 8260, 8261
2,3,4,5-Tetrachloronitrobenzene	8091
2,3,5,6-Tetrachloronitrobenzene	8091
2,3,4,5-Tetrachlorophenol	8041, 8085
2,3,4,6-Tetrachlorophenol	8041, 8085, 8270
2,3,5,6-Tetrachlorophenol	8041
Tetrachlorvinphos (Stirophos, Gardona)	8085, 8141, 8270
Tetraethyl dithiopyrophosphate	8270
Tetraethyl pyrophosphate (TEPP)	8141, 8270
Tetrahydrofuran (THF)	8261
THF (Tetrahydrofuran)	8261
Tetrazene	8331
Tetryl (Methyl-2,4,6-trinitrophenylnitramine)	8330
Thiodicarb	8318, 8321
Thiofanox	8321
Thiophanate-methyl	8321
Thionazin (Zinophos)	8141, 8270
Thiophenol (Benzenethiol)	8270
1,3,5-TNB (1,3,5-Trinitrobenzene)	8095, 8270, 8330
2,4,6-TNT (2,4,6-Trinitrotoluene)	8095, 8330
TOCP (Tri-*o*-cresylphosphate)	8141
Tokuthion (Prothiofos)	8141
m-Tolualdehyde	8315
o-Tolualdehyde	8315
p-Tolualdehyde	8315
Toluene	8015, 8021, 8260, 8261
Toluene diisocyanate	8270

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
o-Toluidine	8015, 8260, 8261, 8270
Toxaphene	8081, 8270
2,4,5-TP (Silvex)	8085, 8151, 8321
Treflan (Trifluralin)	8081, 8085, 8091, 8270
Triademefon	8085
Triallate	8085, 8141, 8321
Triclopyr (Garlon)	8085
Trichlorfon	8141, 8321
2,4,6-Trichloroaniline	8131
2,4,5-Trichloroaniline	8131
1,2,3-Trichlorobenzene	8021, 8121, 8260, 8261
1,2,4-Trichlorobenzene	8021, 8121, 8260, 8261, 8270, 8275, 8410
1,3,5-Trichlorobenzene	8121
2,2',5-Trichlorobiphenyl	8082, 8275
2,3',5-Trichlorobiphenyl	8275
2,4',5-Trichlorobiphenyl	8082, 8275
1,1,1-Trichloroethane	8021, 8260, 8261
1,1,2-Trichloroethane	8021, 8260, 8261
Trichloroethene (Trichloroethylene)	8021, 8260, 8261, 8535
Trichlorofluoromethane	8021, 8260, 8261
Trichloronate	8141
1,2,3-Trichloro-4-nitrobenzene	8091
1,2,4-Trichloro-5-nitrobenzene	8091
2,4,6-Trichloronitrobenzene	8091
2,3,4-Trichlorophenol	8041
2,3,5-Trichlorophenol	8041
2,3,6-Trichlorophenol	8041
2,4,5-Trichlorophenol	8041, 8085, 8270, 8410
2,4,6-Trichlorophenol	8041, 8085, 8270, 8410
2,3,4-Trichlorophenyl 4-nitrophenyl ether	8111
2,3,5-Trichlorophenyl 4-nitrophenyl ether	8111
2,3,6-Trichlorophenyl 4-nitrophenyl ether	8111
2,4,5-Trichlorophenyl 4-nitrophenyl ether	8111
2,4,6-Trichlorophenyl 4-nitrophenyl ether	8111
3,4,5-Trichlorophenyl 4-nitrophenyl ether	8111
1,2,3-Trichloropropane	8021, 8260, 8261
Tri-*o*-cresylphosphate (TOCP)	8141
Triethylamine	8015
O,O,O-Triethyl phosphorothioate	8270
Trifluralin (Treflan)	8081, 8085, 8091, 8270
Trihalomethanes	8535
2,4,5-Trimethylaniline	8270
1,2,4-Trimethylbenzene	8021, 8260, 8261
1,3,5-Trimethylbenzene	8021, 8260, 8261
Trimethyl phosphate	8270
1,3,5-Trinitrobenzene (1,3,5-TNB)	8095, 8270, 8330
2,4,6-Trinitrophenylmethylnitramine	8095
2,4,6-Trinitrotoluene (2,4,6-TNT)	8095, 8330

TABLE 2-1
(continued)

Analyte	Applicable Method(s)
Tris-BP (Tris(2,3-dibromopropyl) phosphate)	8270, 8321
Tri-*p*-tolyl phosphate	8270
Tris(2,3-dibromopropyl) phosphate (Tris-BP)	8270, 8321
Valeraldehyde (Pentanal)	8315
Vernolate	8085
Vinyl acetate	8260
Vinyl chloride	8021, 8260, 8261
Vinylidene chloride (1,1-Dichloroethene)	8021, 8260, 8261
m-Xylene	8015, 8021, 8260, 8261
o-Xylene	8015, 8021, 8260, 8261
p-Xylene	8015, 8021, 8260, 8261
Zinophos (Thionazin)	8141, 8270

TABLE 2-2

METHOD 8011 (MICROEXTRACTION AND GAS CHROMATOGRAPHY)

1,2-Dibromo-3-chloropropane (DBCP)
1,2-Dibromoethane (EDB)

TABLE 2-3

METHOD 8015 (GC/FID) - NONHALOGENATED VOLATILES

Acetone	Ethyl *tert*-butyl ether (ETBE)
Acetonitrile	Gasoline range organics (GRO)
Acrolein	Isopropyl alcohol
Acrylonitrile	Methanol
Allyl alcohol	Methyl ethyl ketone (MEK, 2-Butanone)
t-Amyl alcohol (TAA)	*N*-Nitroso-di-*n*-butylamine
t-Amyl ethyl ether (TAEE)	Paraldehyde
t-Amyl methyl ether (TAME)	2-Pentanone
Benzene	2-Picoline
t-Butyl alcohol	1-Propanol (*n*-Propyl alcohol)
Crotonaldehyde	Propionitrile
Diesel range organics (DRO)	Pyridine
Diethyl ether	Toluene
Diisopropyl ether (DIPE)	*o*-Toluidine
Ethanol	*o*-Xylene
Ethyl acetate	*m*-Xylene
Ethyl benzene	*p*-Xylene
Ethylene oxide	Triethylamine

TABLE 2-4

METHOD 8021 (GC, PHOTOIONIZATION AND ELECTROLYTIC CONDUCTIVITY DETECTORS) - AROMATIC AND HALOGENATED VOLATILES

Allyl chloride	*cis*-1,2-Dichloroethene
Benzene	*trans*-1,2-Dichloroethene
Benzyl chloride	1,2-Dichloropropane
Bis(2-chloroisopropyl) ether	1,3-Dichloropropane
Bromoacetone	2,2-Dichloropropane
Bromobenzene	1,3-Dichloro-2-propanol
Bromochloromethane	1,1-Dichloropropene
Bromodichloromethane	*cis*-1,3-Dichloropropene
Bromoform	*trans*-1,3-Dichloropropene
Bromomethane	Epichlorhydrin
n-Butylbenzene	Ethylbenzene
sec-Butylbenzene	Hexachlorobutadiene
tert-Butylbenzene	Isopropylbenzene
Carbon tetrachloride	*p*-Isopropyltoluene
Chlorobenzene	Methylene chloride
Chlorodibromomethane	Naphthalene
Chloroethane	*n*-Propylbenzene
2-Chloroethanol	Styrene
2-Chloroethyl vinyl ether	1,1,1,2-Tetrachloroethane
Chloroform	1,1,2,2-Tetrachloroethane
Chloromethyl methyl ether	Tetrachloroethene
Chloroprene	Toluene
Chloromethane	1,2,3-Trichlorobenzene
2-Chlorotoluene	1,2,4-Trichlorobenzene
4-Chlorotoluene	1,1,1-Trichloroethane
1,2-Dibromo-3-chloropropane	1,1,2-Trichloroethane
1,2-Dibromoethane	Trichloroethene
Dibromomethane	Trichlorofluoromethane
1,2-Dichlorobenzene	1,2,3-Trichloropropane
1,3-Dichlorobenzene	1,2,4-Trimethylbenzene
1,4-Dichlorobenzene	1,3,5-Trimethylbenzene
Dichlorodifluoromethane	Vinyl chloride
1,1-Dichloroethane	*o*-Xylene
1,2-Dichloroethane	*m*-Xylene
1,1-Dichloroethene	*p*-Xylene

TABLE 2-5

METHODS 8031 AND 8033 (GC WITH NITROGEN-PHOSPHORUS DETECTION)
AND METHOD 8032 (GC WITH ELECTRON CAPTURE DETECTION)

Method 8031: Acrylonitrile
Method 8032: Acrylamide
Method 8033: Acetonitrile

TABLE 2-6

METHOD 8041 (GC) - PHENOLS

2-Chloro-5-methylphenol	2,5-Dinitrophenol
4-Chloro-2-methylphenol	Dinoseb (2-*sec*-butyl-4,6-dinitro phenol)
4-Chloro-3-methylphenol	2-Methyl-4,6-dinitrophenol
2-Chlorophenol	2-Methylphenol (*o*-Cresol)
3-Chlorophenol	4-Methylphenol (*p*-Cresol)
4-Chlorophenol	2-Nitrophenol
2-Cyclohexyl-4,6-dinitrophenol	3-Nitrophenol
2,3-Dichlorophenol	4-Nitrophenol
2,4-Dichlorophenol	Pentachlorophenol
2,5-Dichlorophenol	Phenol
2,6-Dichlorophenol	2,3,4,5-Tetrachlorophenol
3,4-Dichlorophenol	2,3,4,6-Tetrachlorophenol
3,5-Dichlorophenol	2,3,5,6-Tetrachlorophenol
2,3-Dimethylphenol	2,3,4-Trichlorophenol
2,4-Dimethylphenol	2,3,5-Trichlorophenol
2,5-Dimethylphenol	2,3,6-Trichlorophenol
2,6-Dimethylphenol	2,4,5-Trichlorophenol
3,4-Dimethylphenol	2,4,6-Trichlorophenol
2,4-Dinitrophenol	

TABLE 2-7

METHOD 8061 (GC/ECD) - PHTHALATE ESTERS

Benzyl benzoate	Dihexyl phthalate
Bis(2-*n*-butoxyethyl) phthalate	Diisobutyl phthalate
Bis(2-ethoxyethyl) phthalate	Di-*n*-butyl phthalate
Bis(2-ethylhexyl) phthalate	Diethyl phthalate
Bis(2-methoxyethyl) phthalate	Dinonyl phthalate
Bis(4-methyl-2-pentyl)-phthalate	Dimethyl phthalate
Butyl benzyl phthalate	Di-*n*-octyl phthalate
Diamyl phthalate	Hexyl 2-ethylhexyl phthalate
Dicyclohexyl phthalate	

TABLE 2-8

METHOD 8070 (GC) - NITROSAMINES

N-Nitrosodimethylamine
N-Nitrosodiphenylamine
N-Nitrosodi-*n*-propylamine

TABLE 2-9

METHOD 8081 (GC) - ORGANOCHLORINE PESTICIDES

Alachlor	Diallate	Hexachlorobenzene
Aldrin	Dichlone	Hexachlorocyclopentadiene
α-BHC	Dichloran	Isodrin
β-BHC	Dicofol	Methoxychlor
δ-BHC	Dieldrin	Mirex
γ-BHC (Lindane)	Endosulfan I	Nitrofen
Captafol	Endosulfan II	*trans*-Nonachlor
Carbophenothion	Endosulfan sulfate	Pentachloronitrobenzene (PCNB)
cis-Chlordane	Endrin	Permethrin (*cis* + *trans*)
trans-Chlordane	Endrin aldehyde	Perthane
Chlordane (NOS)	Endrin ketone	Propachlor
Chlorobenzilate	Etridiazole	Strobane
Chloroneb	Halowax-1000	Toxaphene
Chloropropylate	Halowax-1001	Trifluralin
Chlorothalonil	Halowax-1013	
DBCP	Halowax-1014	
Dacthal (DCPA)	Halowax-1051	
4,4'-DDD	Halowax-1099	
4,4'-DDE	Heptachlor	
4,4'-DDT	Heptachlor epoxide	

TABLE 2-10

METHOD 8082 (GC) - POLYCHLORINATED BIPHENYLS

Aroclor 1016	2,3',4,4'-Tetrachlorobiphenyl
Aroclor 1221	2,2',3,4,5'-Pentachlorobiphenyl
Aroclor 1232	2,2',4,5,5'-Pentachlorobiphenyl
Aroclor 1242	2,3,3',4',6-Pentachlorobiphenyl
Aroclor 1248	2,2',3,4,4',5'-Hexachlorobiphenyl
Aroclor 1254	2,2',3,4,5,5'-Hexachlorobiphenyl
Aroclor 1260	2,2',3,5,5',6-Hexachlorobiphenyl
PCBs as congeners	2,2',4,4',5,5'-Hexachlorobiphenyl
2-Chlorobiphenyl	2,2',3,3',4,4',5-Heptachlorobiphenyl
2,3-Dichlorobiphenyl	2,2',3,4,4',5,5'-Heptachlorobiphenyl
2,2',5-Trichlorobiphenyl	2,2',3,4,4',5',6-Heptachlorobiphenyl
2,4',5-Trichlorobiphenyl	2,2',3,4',5,5',6-Heptachlorobiphenyl
2,2',3,5'-Tetrachlorobiphenyl	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl
2,2',5,5'-Tetrachlorobiphenyl	

TABLE 2-11

METHOD 8085 (GC/AED) - PESTICIDES

Abate (Temephos)	Dichlorprop	Metolachlor
Acifluorfen	Dichlorvos (DDVP)	Metribuzin
Alachlor	Diclofol (Kelthane)	Mevinphos
Aldrin	Diclofop-methyl	MGK-264
Ametryn	Dieldrin	Mirex
Atraton	Dimethoate	Molinate
Atrazine	Dinoseb	Napropamide
Azinphos ethyl (Ethyl guthion)	Dioxathion	Norflurazon
Azinphos methyl (Guthion)	Diphenamid	4-Nitrophenol
Benfluralin	Disulfoton (Disyston)	Oxyfluorfen
α-BHC	Diuron	Parathion
β-BHC	Endosulfan I	Pebulate
δ-BHC	Endosulfan II	Pendimethalin
γ-BHC (Lindane)	Endosulfan sulfate	Pentachlorophenol (PCP)
Bromacil	Endrin	Phorate
Bromoxynil (Brominal)	Endrin aldehyde	Phosphamidon
Butachlor	Endrin ketone	Picloram
Butylate	EPN	Profluralin
Captafol	Eptam (EPTC)	Prometon (Pramitol 5p)
Captan	Ethalfluralin (Sonalan)	Prometryn
Carbophenothion	Ethion	Pronamide (Kerb)
Carboxin	Ethoprop	Propachlor (Ramrod)
trans-Chlordane	Fenamiphos	Propargite (S-181)
Chlorpropham	Fenarimol	Propazine
Chlorpyrifos	Fenitrothion	Propetamidophos
Chlorthalonil (Daconil)	Fensulfothion	Ronnel
Cyanazine	Fluridone	Simazine
Cycloate	Fonofos	Sulfotepp
2,4-D acid	Gardona (Tetrachlovinphos)	Sulprofos (Bolstar)

TABLE 2-11
(continued)

Coumaphos	Fenthion	Silvex
2,4-DB acid	Heptachlor	2,4,5-T acid
DCPA (Dacthal)	Heptachlor epoxide	2,4,5-TB
2,4'-DDD	Hexachlorobenzene	Tebuthiuron
4,4'-DDD	Hexachlorocyclopentadiene	Terbacil
2,4'-DDE	Hexazinone	Terbutryn (Igran)
4,4'-DDE	Imidan (Phosmet)	2,3,4,5-Tetrachlorophenol
2,4'-DDT	Ioxynil	2,3,4,6-Tetrachlorophenol
4,4'-DDT	Malathion	Triademefon
DEF (Butifos)	MCPA acid	Triallate
Demeton-O	MCPP acid	Triclopyr (Garlon)
Demeton-S	Merphos	2,4,5-Trichlorophenol
Diallate	Metalaxyl	2,4,6-Trichlorophenol
Diazinon	Methoxychlor	Trifluralin (Treflan)
Dicamba	Methyl chlorpyrifos	Vernolate
Dichlobenil (Casoron)	Methyl paraoxon	
3,5-Dichlorobenzoic acid	Methyl parathion	

TABLE 2-12

METHOD 8091 (GC) - NITROAROMATICS AND CYCLIC KETONES

Benefin	2,4-Dinitrotoluene
Butralin	2,6-Dinitrotoluene
1-Chloro-2,4-dinitrobenzene	Isopropalin
1-Chloro-3,4-dinitrobenzene	1,2-Naphthoquinone
1-Chloro-2-nitrobenzene	1,4-Naphthoquinone
1-Chloro-4-nitrobenzene	Nitrobenzene
2-Chloro-6-nitrotoluene	2-Nitrotoluene
4-Chloro-2-nitrotoluene	3-Nitrotoluene
4-Chloro-3-nitrotoluene	4-Nitrotoluene
2,3-Dichloronitrobenzene	Penoxalin [Pendimethalin]
2,4-Dichloronitrobenzene	Pentachloronitrobenzene
3,5-Dichloronitrobenzene	Profluralin
3,4-Dichloronitrobenzene	2,3,4,5-Tetrachloronitrobenzene
2,5-Dichloronitrobenzene	2,3,5,6-Tetrachloronitrobenzene
Dinitramine	1,2,3-Trichloro-4-nitrobenzene
1,2-Dinitrobenzene	1,2,4-Trichloro-5-nitrobenzene
1,3-Dinitrobenzene	2,4,6-Trichloronitrobenzene
1,4-Dinitrobenzene	Trifluralin

TABLE 2-13

METHOD 8095 (GC) - EXPLOSIVES

2-Amino-4,6-dinitrotoluene	2-Nitrotoluene
4-Amino-2,6-dinitrotoluene	3-Nitrotoluene
3,5-Dinitroaniline	4-Nitrotoluene
1,3-Dinitrobenzene	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
2,4-Dinitrotoluene	Pentaerythritoltetranitrate
2,6-Dinitrotoluene	1,3,5-Trinitrobenzene
Hexahydro-1,3,5-trinitro-1,3,5-triazine	2,4,6-Trinitrophenylmethylnitramine
Nitrobenzene	2,4,6-Trinitrotoluene
Nitroglycerine	

TABLE 2-14

METHOD 8100 - POLYNUCLEAR AROMATIC HYDROCARBONS

Acenaphthene	Dibenz(*a,h*)anthracene
Acenaphthylene	7H-Dibenzo(*c,g*)carbazole
Anthracene	Dibenzo(*a,e*)pyrene
Benz(*a*)anthracene	Dibenzo(*a,h*)pyrene
Benzo(*b*)fluoranthene	Dibenzo(*a,i*)pyrene
Benzo(*j*)fluoranthene	Fluoranthene
Benzo(*k*)fluoranthene	Fluorene
Benzo(*g,h,i*)perylene	Indeno(1,2,3-*cd*)pyrene
Benzo(*a*)pyrene	3-Methylcholanthrene
Chrysene	Naphthalene
Dibenz(*a,h*)acridine	Phenanthrene
Dibenz(*a,j*)acridine	Pyrene

TABLE 2-15

METHOD 8111 (GC) - HALOETHERS

Bis(2-chloroethoxy)methane	2,5-Dichlorophenyl 4-nitrophenyl ether
Bis(2-chloroethyl) ether	2,4-Dichlorophenyl 4-nitrophenyl ether
Bis(2-chloroisopropyl) ether	2,3-Dichlorophenyl 4-nitrophenyl ether
4-Bromophenyl phenyl ether	3,4-Dichlorophenyl 4-nitrophenyl ether
4-Chlorophenyl phenyl ether	4-Nitrophenyl phenyl ether
2-Chlorophenyl 4-nitrophenyl ether	2,4,6-Trichlorophenyl 4-nitrophenyl ether
3-Chlorophenyl 4-nitrophenyl ether	2,3,6-Trichlorophenyl 4-nitrophenyl ether
4-Chlorophenyl 4-nitrophenyl ether	2,3,5-Trichlorophenyl 4-nitrophenyl ether
2,4-Dibromophenyl 4-nitrophenyl ether	2,4,5-Trichlorophenyl 4-nitrophenyl ether
2,4-Dichlorophenyl 3-methyl-4-nitrophenyl ether	3,4,5-Trichlorophenyl 4-nitrophenyl ether
2,6-Dichlorophenyl 4-nitrophenyl ether	2,3,4-Trichlorophenyl 4-nitrophenyl ether
3,5-Dichlorophenyl 4-nitrophenyl ether	

TABLE 2-16

METHOD 8121 (GC) - CHLORINATED HYDROCARBONS

Benzal chloride	δ-Hexachlorocyclohexane (δ-BHC)
Benzotrichloride	γ-Hexachlorocyclohexane (γ-BHC)
Benzyl chloride	Hexachlorocyclopentadiene
2-Chloronaphthalene	Hexachloroethane
1,2-Dichlorobenzene	Pentachlorobenzene
1,3-Dichlorobenzene	1,2,3,4-Tetrachlorobenzene
1,4-Dichlorobenzene	1,2,3,5-Tetrachlorobenzene
Hexachlorobenzene	1,2,4,5-Tetrachlorobenzene
Hexachlorobutadiene	1,2,3-Trichlorobenzene
α-Hexachlorocyclohexane (α-BHC)	1,2,4-Trichlorobenzene
β-Hexachlorocyclohexane (β-BHC)	1,3,5-Trichlorobenzene

TABLE 2-17

METHOD 8131 (GC) - ANILINE AND SELECTED DERIVATIVES

Aniline	2,6-Dibromo-4-nitroaniline
4-Bromoaniline	3,4-Dichloroaniline
2-Bromo-6-chloro-4-nitroanilne	2,6-Dichloro-4-nitroaniline
2-Bromo-4,6-dintroaniline	2,4-Dinitroaniline
2-Chloroaniline	2-Nitroaniline
3-Chloroaniline	3-Nitroaniline
4-Chloroaniline	4-Nitroaniline
2-Chloro-4,6-dinitroaniline	2,4,6-Trichloroaniline
2-Chloro-4-nitroaniline	2,4,5-Trichloroaniline
4-Chloro-2-nitroaniline	

TABLE 2-18

METHOD 8141 (GC) - ORGANOPHOSPHORUS COMPOUNDS

Aspon	Disulfoton	Parathion, methyl
Atrazine	EPN	Pebulate
Azinphos-ethyl	EPTC	*o*-Phenylenediamine
Azinphos-methyl	Ethion	Phorate
Bendiocarb	Ethoprop	Phosmet
Bolstar (Sulprofos)	Famphur	Phosphamidon
Butylate	Fenitrothion	Propham
Carbophenothion	Fensulfothion	Prosulfocarb
Chlorfenvinphos	Fenthion	Ronnel
Chlorpyrifos	Fonophos	Simazine
Chlorpyrifos methyl	Hexamethyl phosphoramide (HMPA)	Stirophos (Tetrachlorvinphos, Gardona)
Coumaphos	Leptophos	Sulfotepp
Crotoxyphos	Malathion	Tetraethyl pyrophosphate (TEPP)
Demeton-O, and -S	Merphos	Terbufos
Diazinon	Methiocarb	Triallate
Dichlorofenthion	Mevinphos	Thionazin (Zinophos)
Dichlorvos (DDVP)	Molinate	Tokuthion (Prothiofos)
Dicrotophos	Monocrotophos	Trichlorfon
Dimethoate	Naled	Trichloronate
Dioxathion	Parathion, ethyl	Tri-*o*-cresyl phosphate (TOCP)

TABLE 2-19

METHOD 8151 (GC USING METHYLATION OR PENTAFLUOROBENZYLATION DERIVATIZATION) - CHLORINATED HERBICIDES

Acifluorfen	Dicamba	MCPP
Bentazon	3,5-Dichlorobenzoic acid	4-Nitrophenol
Chloramben	Dichloroprop	Pentachlorophenol
2,4-D	Dinoseb	Picloram
Dalapon	5-Hydroxydicamba	2,4,5-TP (Silvex)
2,4-DB	MCPA	2,4,5-T
DCPA diacid		

TABLE 2-20

METHOD 8260 (GC/MS) - VOLATILE ORGANIC COMPOUNDS

Acetone	Dibromofluoromethane	Methylene chloride
Acetonitrile	Dibromomethane	Methyl acrylate
Acrolein (Propenal)	1,2-Dichlorobenzene	Methyl methacrylate
Acrylonitrile	1,3-Dichlorobenzene	4-Methyl-2-pentanone (MIBK)
Allyl alcohol	1,4-Dichlorobenzene	Naphthalene
Allyl chloride	*cis*-1,4-Dichloro-2-butene	Nitrobenzene
Benzene	*trans*-1,4-Dichloro-2-butene	2-Nitropropane
Benzyl chloride	Dichlorodifluoromethane	*N*-Nitroso-di-*n*-butylamine
Bis(2-chloroethyl)-sulfide	1,1-Dichloroethane	Paraldehyde
Bromoacetone	1,2-Dichloroethane	Pentachloroethane
Bromobenzene	1,1-Dichloroethene	Pentafluorobenzene
Bromochloromethane	*cis*-1,2-Dichloroethene	2-Pentanone
Bromodichloromethane	*trans*-1,2-Dichloroethene	2-Picoline
Bromoform	1,2-Dichloropropane	1-Propanol
Bromomethane	1,3-Dichloropropane	2-Propanol
n-Butanol	2,2-Dichloropropane	Propargyl alcohol
2-Butanone (MEK)	1,3-Dichloro-2-propanol	ß-Propiolactone
t-Butyl alcohol	1,1-Dichloropropene	Propionitrile (Ethyl cyanide)
n-Butylbenzene	*cis*-1,3-Dichloropropene	*n*-Propylamine
sec-Butylbenzene	*trans*-1,3-Dichloropropene	*n*-Propylbenzene
tert-Butylbenzene	1,2,3,4-Diepoxybutane	Pyridine
Carbon disulfide	Diethyl ether	Styrene
Carbon tetrachloride	1,4-Dioxane	1,1,1,2-Tetrachloroethane
Chloral hydrate	Epichlorohydrin	1,1,2,2-Tetrachloroethane
Chloroacetonitrile	Ethanol	Tetrachloroethene
Chlorobenzene	Ethyl acetate	Toluene

TABLE 2-20
(continued)

1-Chlorobutane	Ethylbenzene	*o*-Toluidine
Chlorodibromomethane	Ethylene oxide	1,2,3-Trichlorobenzene
Chloroethane	Ethyl methacrylate	1,2,4-Trichlorobenzene
2-Chloroethanol	Hexachlorobutadiene	1,1,1-Trichloroethane
2-Chloroethyl vinyl ether	Hexachloroethane	1,1,2-Trichloroethane
Chloroform	2-Hexanone	Trichloroethene
1-Chlorohexane	2-Hydroxypropionitrile	Trichlorofluoromethane
Chloromethane	Iodomethane	1,2,3-Trichloropropane
Chloroprene	Isobutyl alcohol	1,2,4-Trimethylbenzene
3-Chloropropionitrile	Isopropylbenzene	1,3,5-Trimethylbenzene
2-Chlorotoluene	*p*-Isopropyltoluene	Vinyl acetate
4-Chlorotoluene	Malononitrile	Vinyl chloride
Crotonaldehyde	Methacrylonitrile	*o*-Xylene
1,2-Dibromo-3-chloropropane	Methanol	*m*-Xylene
1,2-Dibromoethane	Methyl-*t*-butyl ether	*p*-Xylene

TABLE 2-21

METHOD 8261 (VD/GC/MS) - VOLATILE ORGANIC COMPOUNDS

Acetone	1,3-Dichlorobenzene	Methacrylonitrile
Acetonitrile	1,4-Dichlorobenzene	Methyl *t*-butyl ether (MTBE)
Acetophenone	*cis*-1,4-Dichloro-2-butene	Methylene chloride
Acrolein	*trans*-1,4-Dichloro-2-butene	Methyl methacrylate
Acrylonitrile	Dichlorodifluoromethane	1-Methylnaphthalene
Allyl Chloride	1,1-Dichloroethane	2-Methylnaphthalene
t-Amyl ethyl ether (TAEE) (4,4-Dimethyl-3-oxahexane)	1,2-Dichloroethane	4-Methyl-2-pentanone
t-Amyl methyl ether (TAME)	1,1-Dichloroethene	Naphthalene
Aniline	*trans*-1,2-Dichloroethene	*N*-Nitrosodimethylamine
Benzene	*cis*-1,2-Dichloroethene	*N*-Nitrosodi-*n*-propylamine
Bromochloromethane	1,2-Dichloropropane	*N*-Nitrosomethylethylamine
Bromodichloromethane	1,3-Dichloropropane	*N*-Nitrosodibutylamine
Bromoform	2,2-Dichloropropane	*N*-Nitrosodiethylamine
Bromomethane	1,1-Dichloropropene	Pentachloroethane
2-Butanone	*cis*-1,3-Dichloropropene	2-Picoline
n-Butylbenzene	*trans*-1,3-Dichloropropene	Propionitrile
sec-Butylbenzene	Diethyl ether	*n*-Propylbenzene
tert-Butylbenzene	Diisopropyl ether (DIPE)	Pyridine
Carbon disulfide	1,4-Dioxane	Styrene
Carbon tetrachloride	Ethanol	1,1,2,2-Tetrachloroethane
Chlorobenzene	Ethyl acetate	Tetrachloroethene
Chlorodibromomethane	Ethylbenzene	Tetrahydrofuran
Chloroethane	Ethyl *t*-butyl ether (ETBE)	Toluene
Chloroform	Ethyl methacrylate	*o*-Toluidine
Chloromethane	Hexachlorobutadiene	1,2,3-Trichlorobenzene
2-Chlorotoluene	2-Hexanone	1,2,4-Trichlorobenzene
4-Chlorotoluene	Iodomethane	1,1,1-Trichloroethane
1,2-Dibromo-3-chloropropane	Isobutyl alcohol	1,1,2-Trichloroethane
Dibromomethane	Isopropylbenzene	Trichloroethene
1,2-Dichlorobenzene	*p*-Isopropyltoluene	Trichlorofluoromethane

TABLE 2-21
(continued)

1,2,3-Trichloropropane	*o*-Xylene
1,2,4-Trimethylbenzene	*m*-Xylene
1,3,5-Trimethylbenzene	*p*-Xylene
Vinyl chloride	

TABLE 2-22

METHOD 8270 (GC/MS) - SEMIVOLATILE ORGANIC COMPOUNDS

Acenaphthene	Endrin aldehyde
Acenaphthylene	Endrin ketone
Acetophenone	EPN
2-Acetylaminofluorene	Ethion
1-Acetyl-2-thiourea	Ethyl carbamate
Aldrin	Ethyl methanesulfonate
2-Aminoanthraquinone	Famphur
Aminoazobenzene	Fensulfothion
4-Aminobiphenyl	Fenthion
3-Amino-9-ethylcarbazole	Fluchloralin
Anilazine	Fluoranthene
Aniline	Fluorene
o-Anisidine	Heptachlor
Anthracene	Heptachlor epoxide
Aramite	Hexachlorobenzene
Aroclor-1016	Hexachlorobutadiene
Aroclor-1221	Hexachlorocyclopentadiene
Aroclor-1232	Hexachloroethane
Aroclor-1242	Hexachlorophene
Aroclor-1248	Hexachloropropene
Aroclor-1254	Hexamethylphosphoramide

TABLE 2-22
(continued)

Aroclor-1260	Hydroquinone
Azinphos-methyl	Indeno(1,2,3-cd)pyrene
Barban	Isodrin
Benz(a)anthracene	Isophorone
Benzidine	Isosafrole
Benzo(b)fluoranthene	Kepone
Benzo(k)fluoranthene	Leptophos
Benzoic acid	Malathion
Benzo(g,h,i)perylene	Maleic anhydride
Benzo(a)pyrene	Mestranol
p-Benzoquinone	Methapyrilene
Benzyl alcohol	Methoxychlor
α-BHC	3-Methylcholanthrene
β-BHC	4,4'-Methylenebis(2-chloroaniline)
δ-BHC	4,4'-Methylenebis(*N,N*-dimethylaniline)
γ-BHC (Lindane)	Methyl methanesulfonate
Bis(2-chloroethoxy)-methane	2-Methylnaphthalene
Bis(2-chloroethyl)ether	Methyl parathion
Bis(2-chloroisopropyl)ether	2-Methylphenol
Bis(2-ethylhexyl)phthalate	3-Methylphenol
4-Bromophenyl phenyl ether	4-Methylphenol
Bromoxynil	Mevinphos
Butyl benzyl phthalate	Mexacarbate
Captafol	Mirex
Captan	Monocrotophos
Carbaryl	Naled
Carbofuran	Naphthalene
Carbophenothion	1,4-Naphthoquinone
Chlordane (NOS)	1-Naphthylamine
Chlorfenvinphos	2-Naphthylamine

TABLE 2-22
(continued)

4-Chloroaniline	Nicotine
Chlorobenzilate	5-Nitroacenaphthene
5-Chloro-2-methylaniline	2-Nitroaniline
4-Chloro-3-methylphenol	3-Nitroaniline
3-(Chloromethyl)pyridine hydrochloride	4-Nitroaniline
1-Chloronaphthalene	5-Nitro-*o*-anisidine
2-Chloronaphthalene	Nitrobenzene
2-Chlorophenol	4-Nitrobiphenyl
4-Chloro-1,2-phenylenediamine	Nitrofen
4-Chloro-1,3-phenylenediamine	2-Nitrophenol
4-Chlorophenyl phenyl ether	4-Nitrophenol
Chrysene	Nitroquinoline-1-oxide
Coumaphos	*N*-Nitrosodi-*n*-butylamine
p-Cresidine	*N*-Nitrosodiethylamine
Crotoxyphos	*N*-Nitrosodimethylamine
2-Cyclohexyl-4,6-dinitrophenol	*N*-Nitrosodiphenylamine
4,4'-DDD	*N*-Nitrosodi-*n*-propylamine
4,4'-DDE	*N*-Nitrosomethylethylamine
4,4'-DDT	*N*-Nitrosomorpholine
Demeton-O	*N*-Nitrosopiperidine
Demeton-S	*N*-Nitrosopyrrolidine
Diallate (*cis* or *trans*)	5-Nitro-*o*-toluidine
2,4-Diaminotoluene	Octamethyl pyrophosphoramide
Dibenz(*a,j*)acridine	4,4'-Oxydianiline
Dibenz(*a,h*)anthracene	Parathion
Dibenzofuran	Pentachlorobenzene
Dibenzo(*a,e*)pyrene	Pentachloronitrobenzene
1,2-Dibromo-3-chloropropane	Pentachlorophenol
Di-*n*-butyl phthalate	Phenacetin
Dichlone	Phenanthrene

TABLE 2-22
(continued)

1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
3,3'-Dichlorobenzidine
2,4-Dichlorophenol
2,6-Dichlorophenol
Dichlorovos
Dicrotophos
Dieldrin
Diethyl phthalate
Diethylstilbestrol
Diethyl sulfate
Dimethoate
3,3'-Dimethoxybenzidine
Dimethylaminoazobenzene
7,12-Dimethylbenz(*a*)anthracene
3,3'-Dimethylbenzidine
α,α-Dimethylphenethylamine
2,4-Dimethylphenol
Dimethyl phthalate
1,2-Dinitrobenzene
1,3-Dinitrobenzene
1,4-Dinitrobenzene
4,6-Dinitro-2-methylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Dinocap
Di-*n*-octyl phthalate
Diphenylamine
Phenobarbital
Phenol
1,4-Phenylenediamine
Phorate
Phosalone
Phosmet
Phosphamidion
Phthalic anhydride
2-Picoline (2-Methylpyridine)
Piperonyl sulfoxide
Pronamide
Propylthiouracil
Pyrene
Resorcinol
Safrole
Strychnine
Sulfallate
Terbufos
1,2,4,5-Tetrachlorobenzene
2,3,4,6-Tetrachlorophenol
Tetrachlorvinphos
Tetraethyl dithiopyrophosphate
Tetraethyl pyrophosphate
Thionazine
Thiophenol (Benzenethiol)
Toluene diisocyanate
o-Toluidine
Toxaphene
1,2,4-Trichlorobenzene
2,4,5-Trichlorophenol

TABLE 2-22
(continued)

5,5-Diphenylhydantoin	2,4,6-Trichlorophenol
1,2-Diphenylhydrazine	*O,O,O*-Triethylphosphorothioate
Dinoseb	Trifluralin
Disulfoton	2,4,5-Trimethylaniline
Endosulfan I	Trimethyl phosphate
Endosulfan II	1,3,5-Trinitrobenzene
Endosulfan sulfate	Tris(2,3-dibromopropyl)phosphate
Endrin	Tri-*p*-tolyl phosphate

TABLE 2-23

METHOD 8275 (TE/GC/MS) - SEMIVOLATILE ORGANIC COMPOUNDS

Acenaphthene	1,2,4-Trichlorobenzene
Acenaphthylene	2-Chlorobiphenyl
Anthracene	3,3'-Dichlorobiphenyl
Benz(*a*)anthracene	2,2',5-Trichlorobiphenyl
Benzo(*a*)pyrene	2,3',5-Trichlorobiphenyl
Benzo(*b*)fluoranthene	2,4',5-Trichlorobiphenyl
Benzo(*g,h,i*)perylene	2,2',5,5'-Tetrachlorobiphenyl
Benzo(*k*)fluoranthene	2,2'4,5'-Tetrachlorobiphenyl
4-Bromophenyl phenyl ether	2,2'3,5'-Tetrachlorobiphenyl
1-Chloronaphthalene	2,3',4,4'-Tetrachlorobiphenyl
Chrysene	2,2',4,5,5'-Pentachlorobiphenyl
Dibenzofuran	2,3',4,4',5-Pentachlorobiphenyl
Dibenz(*a,h*)anthracene	2,2',3,4,4',5'- Hexachlorobiphenyl
Dibenzothiophene	2,2',3,3',4,4'- Hexachlorobiphenyl
Fluoranthene	2,2',3,4',5,5',6- Heptachlorobiphenyl
Fluorene	2,2',3,4,4',5,5'- Heptachlorobiphenyl
Hexachlorobenzene	2,2',3,3',4,4',5- Heptachlorobiphenyl
Indeno(1,2,3-*cd*)pyrene	2,2',3,3',4,4',5,5'- Octachlorobiphenyl
Naphthalene	2,2',3,3'4,4',5,5',6- Nonachlorobiphenyl
Phenanthrene	2,2',3,3'4,4',5,5',6,6'- Decachlorobiphenyl
Pyrene	

TABLE 2-24

METHODS 8280 (HRGC/LRMS) AND 8290 (HRGC/HRMS) -
POLYCHLORINATED DIBENZO-*p*-DIOXINS (PCDDs)
AND POLYCHLORINATED DIBENZOFURANS (PCDFs)

2,3,7,8-TCDD	1,2,3,7,8-PeCDF
TCDD, total	2,3,4,7,8-PeCDF
1,2,3,7,8-PeCDD	PeCDF, total
PeCDD, total	1,2,3,4,7,8-HxCDF
1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDF
1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDF
1,2,3,7,8,9-HxCDD	2,3,4,6,7,8-HxCDF
HxCDD, total	HxCDF, total
1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF
HpCDD, total	1,2,3,4,7,8,9-HpCDF
OCDD	HpCDF, total
2,3,7,8-TCDF	OCDF
TCDF, total	

TABLE 2-25

METHOD 8310 (HPLC) - POLYNUCLEAR AROMATIC HYDROCARBONS

Acenaphthene	Chrysene
Acenaphthylene	Dibenzo(*a,h*)anthracene
Anthracene	Fluoranthene
Benz(*a*)anthracene	Fluorene
Benzo(*a*)pyrene	Indeno(1,2,3-*cd*)pyrene
Benzo(*b*)fluoranthene	Naphthalene
Benzo(*g,h,i*)perylene	Phenanthrene
Benzo(*k*)fluoranthene	Pyrene

TABLE 2-26

METHOD 8315 - CARBONYL COMPOUNDS

Acetaldehyde	Decanal	Octanal
Acetone	2,5-Dimethylbenzaldehyde	Pentanal (Valeraldehyde)
Acrolein	Formaldehyde	Propanal (Propionaldehyde)
Benzaldehyde	Heptanal	*m*-Tolualdehyde
Butanal (Butyraldehyde)	Hexanal (Hexaldehyde)	*o*-Tolualdehyde
Crotonaldehyde	Isovaleraldehyde	*p*-Tolualdehyde
Cyclohexanone	Nonanal	

TABLE 2-27

METHOD 8316 (HPLC)

Acrylamide
Acrylonitrile
Acrolein

TABLE 2-28

METHOD 8318 (HPLC) - *N*-METHYLCARBAMATES

Aldicarb (Temik)	Dioxacarb	Mexacarbate
Aldicarb sulfone	Formetanate hydrochloride	Oxamyl
Bendiocarb	3-Hydroxycarbofuran	Promecarb
Carbaryl (Sevin)	Methiocarb (Mesurol)	Propoxur (Baygon)
Carbofuran (Furadan)	Methomyl (Lannate)	Thiodicarb
m-Cumenyl methylcarbamate	Metolcarb	

TABLE 2-29

METHOD 8321 (HPLC/TS/MS) - NONVOLATILE ORGANIC COMPOUNDS

Azo Dyes	Carbamates
Disperse Red 1	Aldicarb
Disperse Red 5	Aldicarb sulfone
Disperse Red 13	Aldicarb sulfoxide
Disperse Yellow 5	Aminocarb
Disperse Orange 3	Barban
Disperse Orange 30	Benomyl
Disperse Brown 1	Bendiocarb
Solvent Red 3	Bromacil
Solvent Red 23	Butylate
	Carbaryl
	Carbendazim
Chlorinated Phenoxyacid Compounds	Carbofuran
2,4-D	Carbofuran phenol
2,4-D, butoxyethanol ester	Carbosulfan
2,4-D, ethylhexyl ester	Chloropropham
2,4-DB	Chloroxuron
Dalapon	*m*-Cumenyl methyl carbamate
Dicamba	Diuron
Dichlorprop	EPTC
Dinoseb	Fenuron
MCPA	Fluometuron
MCPP	Formetanate hydrochloride
Silvex (2,4,5-TP)	3-Hydroxycarbofuran
2,4,5-T	Linuron
2,4,5-T, butyl ester	Methiocarb
2,4,5-T, butoxyethanol ester	Methomyl
	Metolcarb

TABLE 2-29
(continued)

Organophosphorus Compounds	Carbamates (cont.)
Asulam	Mexacarbate
Fensulfothion	Molinate
Dichlorvos (DDVP)	Monuron
Dimethoate	Neburon
Disulfoton	Oxamyl
Parathion methyl	Pebulate
Merphos	*o*-Phenylenediamine
Methomyl	Physostigmine
Monocrotophos	Physostigmine salicylate
Famphur	Promecarb
Naled	Propham
Phorate	Propoxur
Trichlorfon	Prosulfocarb
Thiofanox	Siduron
Tris(2,3-dibromopropyl) phosphate (Tris-BP)	Tebuthiuron
	Thiodicarb
Anthraquinone Dyes	Thiophanate-methyl
Disperse Blue 3	Triallate
Disperse Blue 14	
Disperse Red 60	

TABLE 2-30

METHOD 8325 (HPLC/PB/MS) - NONVOLATILE ORGANIC COMPOUNDS

Benzidine	3,3'-Dimethylbenzidine
Benzoylprop ethyl	Diuron
Carbaryl	Linuron (Lorox)
o-Chlorophenyl thiourea	Monuron
3,3'-Dichlorobenzidine	Rotenone
3,3'-Dimethoxybenzidine	Siduron

TABLE 2-31

METHOD 8330 (HPLC) - NITROAROMATICS AND NITRAMINES

4-Amino-2,6-dinitrotoluene (4-Am-DNT)	Nitrobenzene (NB)
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	2-Nitrotoluene (2-NT)
1,3-Dinitrobenzene (1,3-DNB)	3-Nitrotoluene (3-NT)
2,4-Dinitrotoluene (2,4-DNT)	4-Nitrotoluene (4-NT)
2,6-Dinitrotoluene (2,6-DNT)	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1,3,5-Trinitrobenzene (1,3,5-TNB)
Methyl-2,4,6-trinitrophenyl-nitramine (Tetryl)	2,4,6-Trinitrotoluene (2,4,6-TNT)

TABLE 2-32

METHOD 8331 (HPLC)

Tetrazene

TABLE 2-33

METHOD 8332 (HPLC)

Nitroglycerine

TABLE 2-34

METHOD 8410 - SEMIVOLATILE ORGANIC COMPOUNDS

Acenaphthene	2,6-Dinitrotoluene
Acenaphthylene	Di-*n*-octyl phthalate
Anthracene	Di-*n*-propyl phthalate
Benzo(*a*)anthracene	Fluoranthene
Benzo(*a*)pyrene	Fluorene
Benzoic acid	Hexachlorobenzene
Bis(2-chloroethoxy)methane	1,3-Hexachlorobutadiene
Bis(2-chloroethyl) ether	Hexachlorocyclopentadiene
Bis(2-chloroisopropyl) ether	Hexachloroethane
Bis(2-ethylhexyl) phthalate	Isophorone
4-Bromophenyl phenyl ether	2-Methylnaphthalene
Butyl benzyl phthalate	2-Methylphenol
4-Chloroaniline	4-Methylphenol
4-Chloro-3-methylphenol	Naphthalene
2-Chloronaphthalene	2-Nitroaniline
2-Chlorophenol	3-Nitroaniline
4-Chlorophenol	4-Nitroaniline
4-Chlorophenyl phenyl ether	Nitrobenzene
Chrysene	2-Nitrophenol
Dibenzofuran	4-Nitrophenol
Di-*n*-butyl phthalate	*N*-Nitrosodimethylamine
1,2-Dichlorobenzene	*N*-Nitrosodiphenylamine
1,3-Dichlorobenzene	*N*-Nitroso-di-*n*-propylamine
1,4-Dichlorobenzene	Pentachlorophenol
2,4-Dichlorophenol	Phenanthrene
Diethyl phthalate	Phenol
Dimethyl phthalate	Pyrene
4,6-Dinitro-2-methylphenol	1,2,4-Trichlorobenzene
2,4-Dinitrophenol	2,4,5-Trichlorophenol
2,4-Dinitrotoluene	2,4,6-Trichlorophenol

TABLE 2-35

METHOD 8430 (GC/FT-IR) - BIS(2-CHLOROETHYL) ETHER
AND ITS HYDROLYSIS PRODUCTS

Bis(2-chloroethyl) ether
2-Chloroethanol
2-(2-Chloroethoxy)ethanol
Diethylene glycol
Ethylene glycol

TABLE 2-36

METHOD 8510 (COLORIMETRIC SCREENING) - RDX AND HMX

Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)

TABLE 2-37

METHOD 8535 (COLORIMETRIC SCREENING) - VOLATILE ORGANIC HALIDES

Trichloroethylene
Perchloroethylene (Tetrachloroethene)
Carbon tetrachloride
Trihalomethanes

TABLE 2-38

METHOD 8540 (UV-INDUCED COLORIMETRY) - PENTACHLOROPHENOL

Pentachlorophenol

TABLE 2-39

DETERMINATIVE METHODS FOR INORGANIC ANALYTES

Analyte	Applicable Methods
Aluminum	6010, 6020, 7000, 7010
Antimony	6010, 6020, 6200, 6800, 7000, 7062
Arsenic	6010, 6020, 6200, 7010, 7061, 7062, 7063
Barium	6010, 6020, 6200, 6800, 7000, 7010
Beryllium	6010, 6020, 7000, 7010
Boron	6010, 6800
Bromide	6500, 9056, 9211
Cadmium	6010, 6020, 6200, 6800, 7000, 7010
Calcium	6010, 6020, 6200, 6800, 7000
Chloride	6500, 9056, 9057, 9212, 9250, 9251, 9253
Chromium	6010, 6020, 6200, 6800, 7000, 7010
Chromium, hexavalent	6800, 7195, 7196, 7197, 7198, 7199
Cobalt	6010, 6020, 6200, 7000, 7010
Copper	6010, 6020, 6200, 6800, 7000, 7010
Cyanide	9010, 9012, 9013, 9213
Fluoride	6500, 9056, 9214
Iron	6010, 6020, 6200, 6800, 7000, 7010
Lead	6010, 6020, 6200, 6800, 7000, 7010
Lithium	6010, 7000
Magnesium	6010, 6020, 6800, 7000
Manganese	6010, 6020, 6200, 7000, 7010
Mercury	6010, 6020, 6200, 6800, 7470, 7471, 7472, 7473, 7474
Molybdenum	6010, 6200, 6800, 7000, 7010
Nickel	6010, 6020, 6200, 6800, 7000, 7010
Nitrate	6500, 9056, 9210
Nitrite	6500, 9056, 9216
Osmium	7000
Phosphate	6500, 9056
Phosphorus	6010
Phosphorus, white	7580
Potassium	6010, 6020, 6200, 6800, 7000
Rubidium	6200
Selenium	6010, 6020, 6200, 6800, 7010, 7741, 7742
Silver	6010, 6020, 6200, 6800, 7000, 7010
Silica	6010
Sodium	6010, 6020, 7000
Strontium	6010, 6200, 6800, 7000
Sulfate	6500, 9035, 9036, 9038, 9056
Sulfide	9030, 9031, 9215
Thallium	6010, 6020, 6200, 6800, 7000, 7010
Thorium	6200
Tin	6010, 6200, 7000
Titanium	6010, 6200
Vanadium	6010, 6020, 6200, 6800, 7000, 7010
Zinc	6010, 6020, 6200, 6800, 7000, 7010
Zirconium	6200

TABLE 2-40(A)

RECOMMENDED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR ORGANIC ANALYTES[a]
(Note: Footnotes are located on the last page of the table.)

VOLATILE ORGANICS

Sample Matrix	Container	Preservative[1]	Holding Time[2]
Concentrated waste samples	Method 5035: See method. Method 5021: See method. Methods 5031 and 5032: See methods. Use PTFE-lined lids for all procedures.	Cool to ≤6 °C.	14 days
Aqueous samples with no residual chlorine present	Methods 5030, 5031, and 5032: 2 x 40-mL vials with PTFE-lined septum caps	Cool to ≤6 °C and adjust pH to less than 2 with H_2SO_4, HCl, or solid $NaHSO_4$	14 days
		If carbonaceous materials are present, or if MTBE and other fuel oxygenate ethers are present and a high temperature sample preparative method is to be used, do not acid preserve the samples.	*7 days*
		If vinyl chloride, styrene, or 2-chloroethyl vinyl ether are analytes of interest, collect a second set of samples without acid preservatives and analyze as soon as possible.	*7 days*

VOLATILE ORGANICS (continued)			
Sample Matrix	Container	Preservative[1]	Holding Time[2]
Aqueous samples WITH residual chlorine present	Methods 5030, 5031, and 5032: 2 x 40-mL vials with PTFE-lined septum caps	Collect sample in a 125-mL container which has been pre-preserved with 4 drops of 10% sodium thiosulfate solution. Gently swirl to mix sample and transfer to a 40-mL VOA vial. Cool to ≤6 °C and adjust pH to less than 2 with H_2SO_4, HCl, or solid $NaHSO_4$.	14 days
		If carbonaceous materials are present, or if MTBE and other fuel oxygenate ethers are present and a high temperature sample preparative method is to be used, do not acid preserve the samples.	*7 days*
		If vinyl chloride, styrene, or 2-chloroethyl vinyl ether are analytes of interest, collect a second set of samples without acid preservatives and analyze as soon as possible.	*7 days*
Acrolein and acrylonitrile in aqueous samples	Methods 5030, 5031, and 5032: 2 x 40-mL vials with PTFE-lined septum caps	Adjust to pH 4-5. Cool to ≤6 °C. *These compounds are highly reactive and should be analyzed as soon as possible.*	7days
Solid samples (e.g. soils, sediments, sludges, ash)	Method 5035: See method. Method 5021: See method. Methods 5031 and 5032: See methods.	See the individual methods.	14 days
		If vinyl chloride, styrene, or 2-chloroethyl vinyl ether are analytes of interest, collect a second set of samples without acid preservatives and analyze as soon as possible.	7 days

SEMIVOLATILE ORGANICS/ORGANOCHLORINE PESTICIDES AND HERBICIDES

Sample Matrix	Container	Preservative[1]	Holding Time[2]
Concentrated waste samples	125-mL wide-mouth glass with PTFE-lined lid	None	Samples extracted within 14 days and extracts analyzed within 40 days following extraction.
Aqueous samples with no residual chlorine present	4 x 1-L amber glass container with PTFE-lined lid, or other size, as appropriate, to allow use of entire sample for analysis.	Cool to ≤6 °C.	Samples extracted within 7 days and extracts analyzed within 40 days following extraction.

SEMIVOLATILE ORGANICS/ORGANOCHLORINE PESTICIDES AND HERBICIDES (continued)

Sample Matrix	Container	Preservative[1]	Holding Time[2]
Aqueous samples WITH residual chlorine present	4 x 1-L amber glass container with PTFE-lined lid, or other size, as appropriate, to allow use of entire sample for analysis.	Add 3-mL 10% sodium thiosulfate solution per gallon (or 0.008%). Addition of sodium thiosulfate solution to sample container may be performed in the laboratory prior to field use. Cool to ≤6 °C.	Samples extracted within 7 days and extracts analyzed within 40 days following extraction.
Solid samples (e.g. soils, sediments, sludges, ash)	250-mL wide-mouth glass container with PTFE-lined lid	Cool to ≤6 °C.	Samples extracted within 14 days and extracts analyzed within 40 days following extraction.

POLYCHLORINATED BIPHENYLS, POLYCHLORINATED DIBENZO-*p*-DIOXINS, AND POLYCHLORINATED DIBENZOFURANS

Sample Matrix	Container	Preservative[1]	Holding Time[2]
Concentrated waste samples	125-mL wide-mouth glass with PTFE-lined lid	None	None
Aqueous samples with no residual chlorine present	4 x 1-L amber glass container with PTFE-lined lid, or other size, as appropriate, to allow use of entire sample for analysis.	Cool to ≤6 °C.	None

POLYCHLORINATED BIPHENYLS, POLYCHLORINATED DIBENZO-*p*-DIOXINS, AND POLYCHLORINATED DIBENZOFURANS (continued)

Sample Matrix	Container	Preservative[1]	Holding Time[2]
Aqueous samples WITH residual chlorine present	4 x 1-L amber glass container with PTFE-lined lid, or other size, as appropriate, to allow use of entire sample for analysis.	Add 3-mL 10% sodium thiosulfate solution per gallon (or 0.008%). Addition of sodium thiosulfate solution to sample container may be performed in the laboratory prior to field use. Cool to ≤6 °C.	None
Solid samples (e.g. soils, sediments, sludges, ash)	250-mL wide-mouth glass container with PTFE-lined lid.	Cool to ≤6 °C.	None

[a] The information presented in this table does not represent EPA requirements, but rather it is intended solely as guidance. Selection of containers, preservation techniques and applicable holding times should be based on the stated project-specific data quality objectives. See Chapter Three, Chapter Four, or the individual methods for more information.

[1] The exact sample, extract, and standard storage temperature should be based on project-specific requirements and/or manufacturer's recommendations for commercially available standards. Furthermore, alternative storage temperatures may be appropriate based on demonstrated analyte stability in a given matrix, provided the stated data quality objectives for a project-specific application are still attainable.

[2] A longer holding time may be appropriate if it can be demonstrated that the reported analyte concentrations are not adversely affected from preservation, storage and analyses performed outside the recommended holding times.

TABLE 2-40(B)

RECOMMENDED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR INORGANIC AND OTHER ANALYTES IN AQUEOUS MATRICES[a] (SEE CHAPTER THREE FOR MORE DETAILED GUIDANCE, INCLUDING REGARDING SOLID MATRICES)

Name	Container[1]	Preservation[2]	Holding Time[3]
Inorganic Tests:			
Chloride	P, G	None required	28 days
Cyanide, total and amenable to chlorination	P, G	Cool to ≤6 °C; if oxidizing agents present add 5 mL 0.1N $NaAsO_2$ per L or 0.06 g of ascorbic acid per L; adjust pH>12 with 50% NaOH. See Method 9010 for other interferences.	14 days
Hydrogen ion (pH)	P, G	None required	As soon as possible
Nitrate	P, G	Cool to ≤6 °C.	48 hours
Sulfate	P, G	Cool to ≤6 °C.	28 days
Sulfide	P, G	Cool to ≤6 °C , add zinc acetate NaOH to pH >9	7 days
Metals:			
Chromium VI	P, G	Cool to ≤6 °C.	24 hours
Mercury	P, G	HNO_3 to pH<2	28 days
All Other Metals	P, G	HNO_3 to pH<2	6 months
Hexane Extractable Material (HEM; Oil and grease)	G	Cool ≤6 °C, HCl or H_2SO_4 to pH<2	28 days
Organic carbon, total (TOC)	P, G	Cool to ≤6 °C, store in dark HCl or H_2SO_4 to pH<2	28 days
Radiological Tests:			
Alpha, beta and radium	P, G	HNO_3 to pH<2	6 months

[a] The information presented in this table does not represent EPA requirements, but rather it is intended solely as guidance. Selection of containers, preservation techniques and applicable holding times should be based on the stated project-specific data quality objectives. See Chapter Three, Chapter Four, or the individual methods for more information.

[1] Polyethylene (P) or glass (G)

[2] The exact sample, extract, and standard storage temperature should be based on project-specific requirements and/or manufacturer's recommendations for commercially available standards. Furthermore, alternative storage temperatures may be appropriate based on demonstrated analyte stability in a given matrix, provided the stated data quality objectives for a project-specific application are still attainable.

[3] A longer holding time may be appropriate if it can be demonstrated that the reported analyte concentrations are not adversely affected by preservation, storage and analyses performed outside the recommended holding times.

TABLE 2-41

PREPARATION METHODS FOR ORGANIC ANALYTES
(Note: Footnotes are located on the last page of the table.)

	Matrix			
Analyte Type	Aqueous[1]	Solids	Sludges and Emulsions[1,2]	Organic Liquids, Tars, Oils
Acid Extractable	3510 3520 (pH ≤ 2)	3540 3541 3542[13] 3545 3546 3550	3520 (pH ≤ 2)	3650 3580[3]
Acrolein[12], Acrylonitrile[12], and Acetonitrile	5031 5032[12]	5031 5032[12]	5031 5032[12]	3585
Acrylamide	8032[4]			
Aniline and Selected Derivatives	3510 3520 (pH >11) 5031[11]	3540 3541 3545 3550	3520 (pH >11)	3580[3]
Aromatic Volatiles	5021 5030 5032	5021 5032 5035	5030 5032	3585
Base/Neutral Extractable	3510 3520 (pH >11)	3540 3541 3542[13] 3545 3546 3550	3520 (pH >11)	3650 3580[3]
Carbamates	8318[5] 8321	8318[5] 8321	8318[5]	8318[5]
Chlorinated Herbicides	3535 (pH < 1) 8151[6] (pH ≤ 2) 8321	3545 3546 8151[6] 8321	8151[6] (pH ≤ 2)	3580[3]
Chlorinated Hydrocarbons	3510 3520 (pH as received)	3540 3541 3550	3520 (pH as received)	3580[3]
Dyes	3510 3520	3540 3541 3545 3550		
Explosives	3535 8330[7] 8331[8]	8330[7] 8331[8]		
Formaldehyde	8315[9]	8315[9]		

TABLE 2-41
(continued)

Analyte Type	Matrix: Aqueous[1]	Solids	Sludges and Emulsions[1,2]	Organic Liquids, Tars, Oils
Haloethers	3510 3520	3540 3541 3545 3550		
Halogenated Volatiles	5021 5030 5032	5021 5032 5035	5030	3585
Nitroaromatics and Cyclic Ketones	3510 3520 (pH 5-9) 3535	3540 3541 3545 3550	3520 (pH 5-9)	3580[3]
Nitrosamines	3510 3520	3540 3541 3545 3550		
Non-halogenated Volatiles	5021 5031 5032	5021 5031 5032	5021 5031 5032	5032 3585
Organochlorine Pesticides	3510 3520 3535 (pH 5-9)	3540 3541 3545 3546 3550 3562	3520 (pH 5-9)	3580[3]
Organophosphorus Pesticides	3510 3520 (pH 5-8) 3535	3540 3541 3545 3546	3520 (pH 5-8)	3580[3]
Phenols	3510 3520 (pH $\leq$ 2) 3535	3540 3541 3545 3546 3550 3562	3520 (pH $\leq$ 2)	3650 3580[3]
Phthalate Esters	3510 3520 3535 (pH 5-7)	3540 3541 3545 3546 3550	3520 (pH 5- 7)	3580[3]
Polychlorinated Biphenyls	3510 3520 3535 (pH 5-9)	3540 3541 3545 3546 3562	3520 (pH 5-9)	3580[3]

TABLE 2-41
(continued)

Analyte Type	Matrix			
	Aqueous[1]	Solids	Sludges and Emulsions[1,2]	Organic Liquids, Tars, Oils
PCDDs and PCDFs	8280[10] 8290[10]	3545 3546 8280[10] 8290[10]	8280[10] 8290[10]	8280[10] 8290[10]
Polynuclear Aromatic Hydrocarbons	3510 3520 (pH as received)	3540 3541 3545 3546 3550 3561	3520 (pH as received)	3580[3]
Volatile Organics	5021 5030 5031 5032	5021 5031 5032 5035	5021 5030 5031 5032	3585

1 The pH at which extraction should be performed is shown in parentheses.
2 If attempts to break an emulsion are unsuccessful, these methods may be used.
3 Method 3580 is only appropriate if the sample is soluble in the specified solvent.
4 Method 8032 contains the extraction, cleanup, and determinative procedures for this analyte.
5 Method 8318 contains the extraction, cleanup, and determinative procedures for these analytes.
6 Method 8151 contains the extraction, cleanup, and determinative procedures for these analytes.
7 Method 8330 contains the extraction, cleanup, and determinative procedures for these analytes.
8 Method 8331 is for Tetrazene only, and contains the extraction, cleanup, and determinative procedures for this analyte.
9 Method 8315 contains the extraction, cleanup, and determinative procedures for this analyte.
10 Methods 8280 and 8290 contain the extraction, cleanup, and determinative procedures for these analytes.
11 Method 5031 may be used when only aniline is to be determined.
12 Method 5032 may be used for acrolein and acrylonitrile.
13 Method 3542 is used for extraction of semivolatiles from stack samples collected using Method 0010.

TABLE 2-42

CLEANUP METHODS FOR ORGANIC ANALYTE EXTRACTS

Analyte Type	Method
Acid Extractable	3650, 3640
Base/Neutral Extractable	3650, 3640
Carbamates	8318[1]
Chlorinated Herbicides	8151[2]
Chlorinated Hydrocarbons	3620, 3640
Haloethers	3620, 3640
Nitroaromatics & Cyclic Ketones	3620, 3640
Nitrosamines	3610, 3620, 3640
Organochlorine Pesticides	3620, 3630, 3640 3660
Organophosphorus Pesticides	3620
Phenols	3630, 3640, 3650 8041[3]
Phthalate Esters	3610, 3611, 3620 3640
Polychlorinated Biphenyls	3620, 3630, 3640 3660, 3665
Polychlorinated Dibenzo-*p*-Dioxins and Polychlorinated Dibenzofurans	8280[4] 8290[4]
Polynuclear Aromatic Hydrocarbons	3610, 3611 3630, 3640, 3650

[1] Method 8318 contains the extraction, cleanup, and determinative procedures for these analytes.
[2] Method 8151 contains the extraction, cleanup, and determinative procedures for these analytes.
[3] Method 8041 includes a derivatization technique followed by GC/ECD analysis, if interferences are encountered using GC/FID.
[4] Methods 8280 and 8290 contain the extraction, cleanup, and determinative procedures for these analytes.

TABLE 2-43

DETERMINATIVE METHODS ORGANIC ANALYTES

Analyte Type	GC/MS Method	Specific GC Method[6]	HPLC Method
Acid Extractable	8270	8410[6]	
Acrolein, Acrylonitrile, Acetonitrile	8260, 8261	8015, 8031, 8033[1]	8315[2], 8316
Acrylamide	8260	8032	8316
Aniline and Selected Derivatives	8270	8131	
Aromatic Volatiles	8260, 8261	8021	
Base/Neutral Extractable	8270	8410[6]	8325[4]
Carbamates			8318, 8321
Chlorinated Herbicides	8270[3]	8151	8321
Chlorinated Hydrocarbons	8270	8121	
Diesel Range Organics (DRO)		8015, 8440[7]	
Dyes			8321
Explosives		8095	8330, 8331, 8332
Formaldehyde			8315
Gasoline Range Organics (GRO)		8015	
Haloethers	8270	8111	
Halogenated Volatiles	8260, 8261	8011, 8021	
Nitroaromatics and Cyclic Ketones	8270	8091	8330[5]
Nitrosoamines	8270	8070	
Non-halogenated Volatiles	8260	8015	8315
Organochlorine Pesticides	8270[3]	8081, 8085[6]	
Organophosphorus Pesticides	8270[3]	8141, 8085[6]	8321
Phenols	8270	8041, 8410[6]	
Phthalate Esters	8270	8061, 8410[6]	
Polychlorinated Biphenyls	8270[3]	8082	
PCDDs and PCDFs	8280, 8290		
Polynuclear Aromatic Hydrocarbons	8270	8100, 8410[6]	8310
Volatile Organics	8260, 8261	8011, 8015, 8021, 8031, 8032, 8033	8315, 8316

[1] Of these analytes, Method 8033 is for acetonitrile only.
[2] Of these analytes, Method 8315 is for acrolein only.
[3] This method is an alternative confirmation method, not the method of choice.
[4] Benzidines and related compounds.
[5] Nitroaromatics (see "Explosives").
[6] Includes GC/ES methods, e.g., Methods 8085 and 8410.
[7] FT-IR determinative method only. Does not use GC.

TABLE 2-44

PREPARATION METHODS FOR INORGANIC ANALYSES [1]

Matrix	Method
Surface water	3005, 3010, 3015, 3020
Groundwater	3005, 3010, 3015, 3020
Extracts	3010, 3015, 3020
Aqueous samples containing suspended solids	3010, 3015, 3020
Oils	3031, 3040, 3051, 3052[2]
Oil sludges	3031, 3052[2]
Tars	3031, 3052[2]
Waxes	3031, 3040, 3052[2]
Paints	3031, 3052[2]
Paint sludges	3031, 3052[2]
Petroleum products	3031, 3040, 3052[2]
Sediments	3050, 3051, 3052[2], 3060[3]
Sludges	3050, 3051, 3052[2], 3060[3]
Soil samples	3050, 3051, 3052[2], 3060[3]
Ashes	3052[2]
Biological tissues	3052[2]

[1]It is the responsibility of the analyst to refer to each analytical method to determine applicability of the chosen method to a specific waste type and target analyte.

[2]For total decomposition analysis ONLY.

[3]For the analysis of samples for hexavalent chromium ONLY.

TABLE 2-45

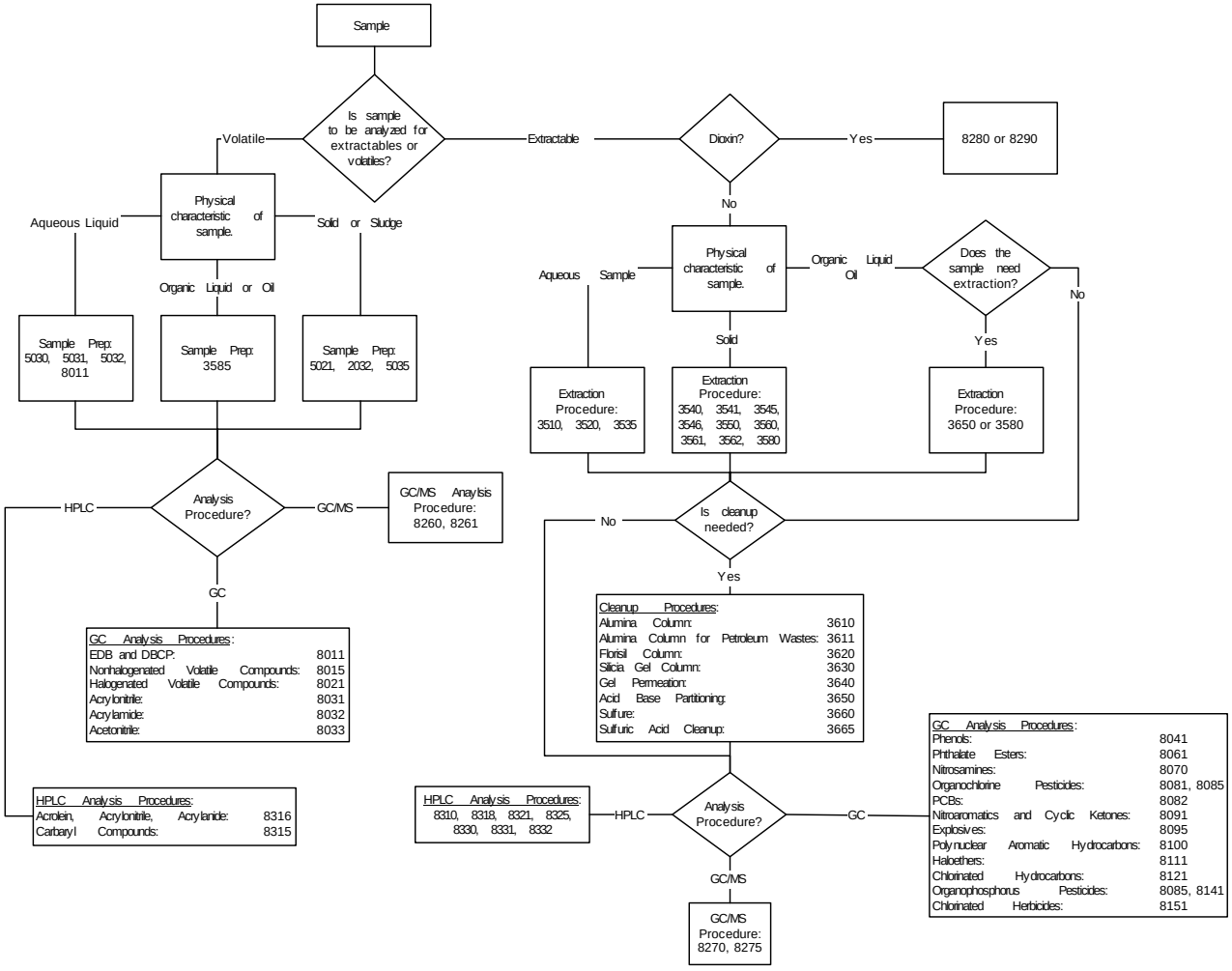
USE OF LEACHING, EXTRACTION AND DIGESTION METHODS
FOR INORGANIC ANALYSIS (In order of increasing strength)

Method	Reagents & Conditions	Use
1310	Dilute acetic acid	Simulate leaching that would result from codisposal of a solid waste and municipal waste in a sanitary landfill[1]
1311	Extraction Fluid # 1 -- Dilute glacial acetic acid and NaOH, pH 4.93 ± 0.05 Extraction Fluid # 2 -- Dilute glacial acetic acid, pH 2.88 ± 0.05	Simulate leaching that would result from codisposal of a solid waste and municipal waste in a sanitary landfill[1]
1312	Dilute H_2SO_4 and HNO_3 (synthetic acid rain)	Simulate acid rain leaching of a waste
1320	Dilute H_2SO_4 and HNO_3 (synthetic acid rain)	Simulate long-term acid rain leaching of a waste
3005	HNO_3, heat	Surface water and groundwater
3010	HNO_3, HCl, heat	Aqueous samples and extracts
3015	HNO_3 or alternatively HNO_3 and HCl, (pressure, heat)	Aqueous samples and extracts
3020	HNO_3, heat	Aqueous samples and extracts for GFAA work only
3031	Potassium permanganate, H_2SO_4, HNO_3, HCl, heat	Oils, oily sludges, tars, waxes, paint, paint sludge, and other viscous petroleum products
3040	Solvent (e.g., xylene, kerosene, or MIBK)	Dissolution of oils, oily wastes, greases and waxes
3050	HNO_3 and H_2O_2, heat (for GFAA or ICPMS) HNO_3, H_2O_2, and HCl, heat (for ICP-AES or FLAA)	Sediments, soils, and sludges
3051	HNO_3, or alternatively HNO_3 and HCl, microwave assisted (pressure, heat)	Sludges, sediments, soils and oils
3052	HNO_3, HF, HCl (optional) H_2O_2 (optional), heat, pressure	Siliceous, organic and other complex matrices for total sample decomposition
3060A	Na_2CO_3/NaOH, heat	Soils, sludges, sediments and some industrial wastes for the analysis of hexavalent chromium only.

[1] As described in the respective background documents developed in support of the rulemakings which added required use of these methods to the Toxicity Characteristic regulation (Method 1311 replaced Method 1310 for Toxicity Characteristic determinations on March 29, 1990, 55 FR 11862).

FIGURE 2-1

ORGANIC ANALYSIS OPTIONS FOR SOLID AND LIQUID MATRICES



For illustrative purposes only. See the disclaimer and Sec. 2.1 for information on the flexibility inherent in SW-846 methods.

FIGURE 2-2
SCHEMATIC OF SEQUENCE TO DETERMINE
IF A WASTE IS HAZARDOUS BY CHARACTERISTIC

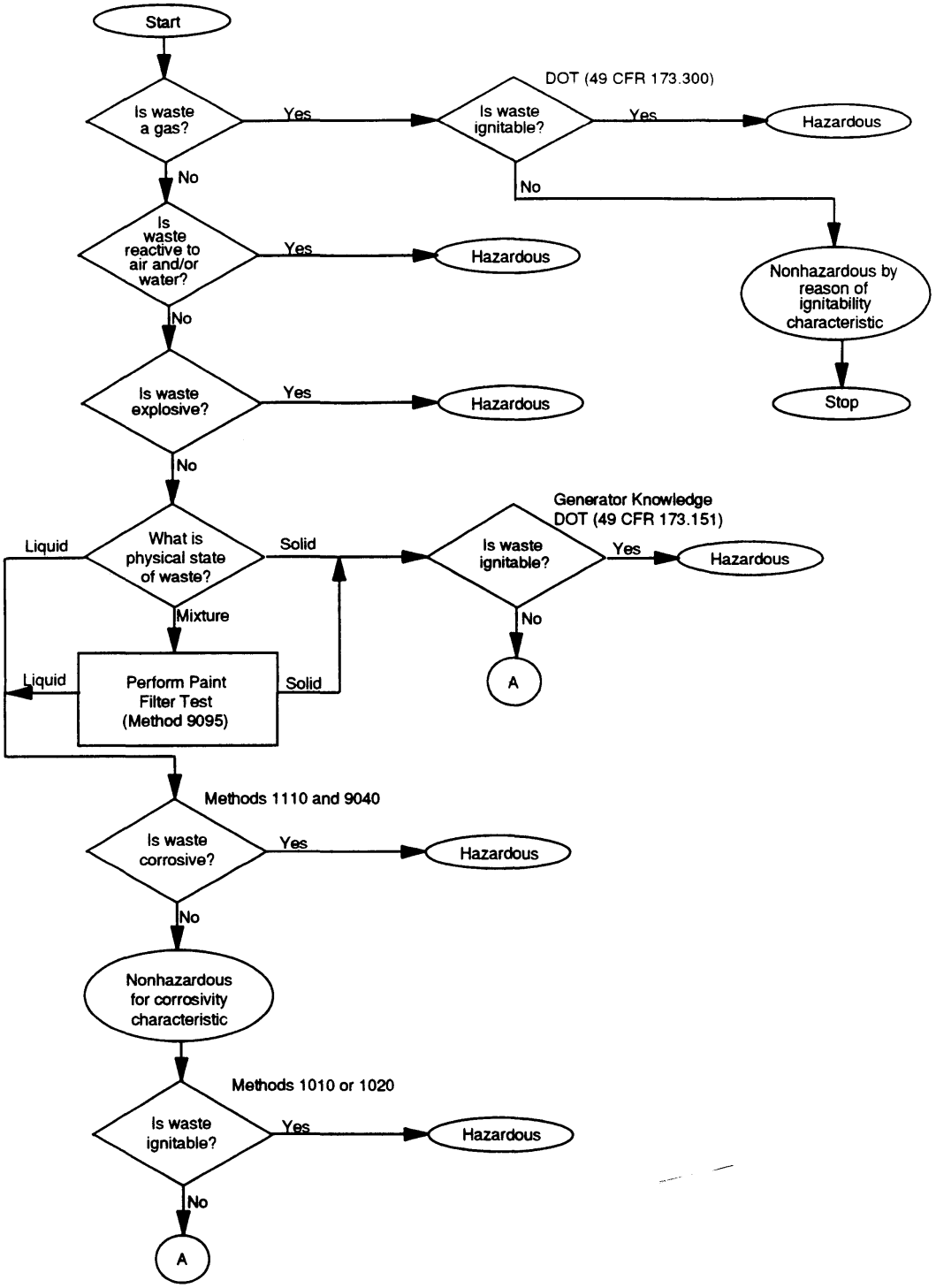


FIGURE 2-2
(continued)

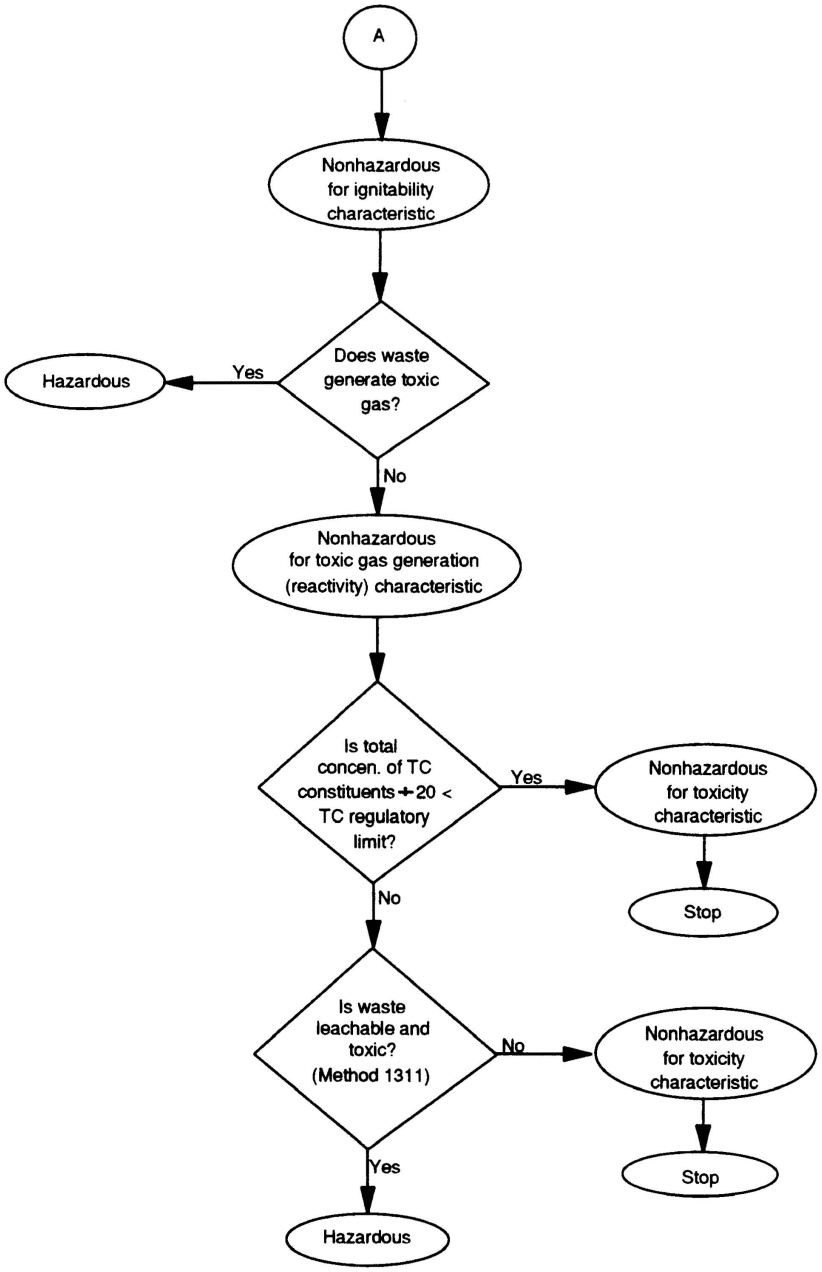


FIGURE 2-3A
RECOMMENDED SW-846 METHODS FOR ANALYSIS OF EP LEACHATES

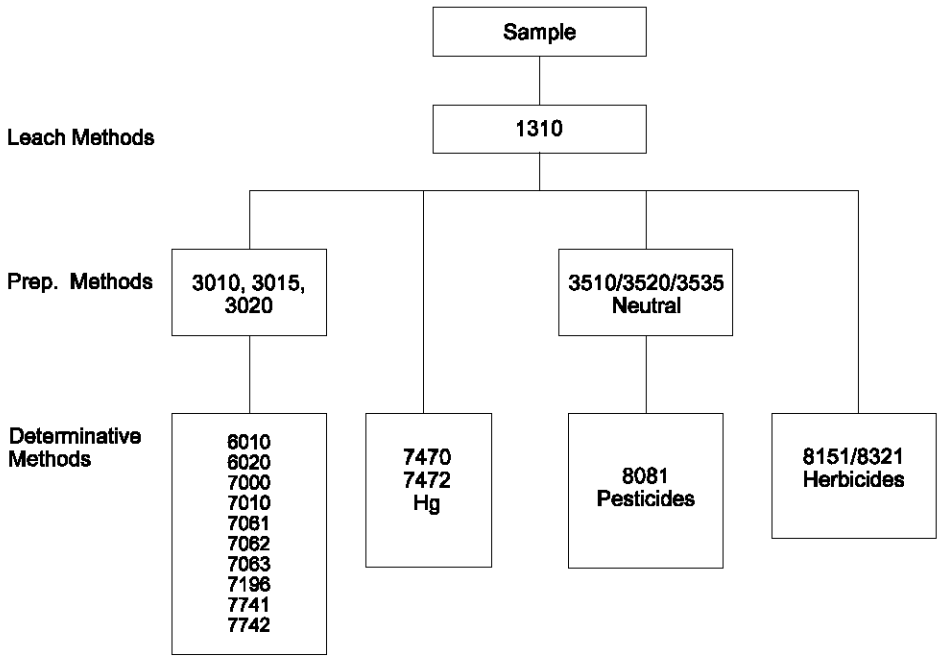


FIGURE 2-3B

RECOMMENDED SW-846 METHODS FOR ANALYSIS OF TCLP LEACHATES

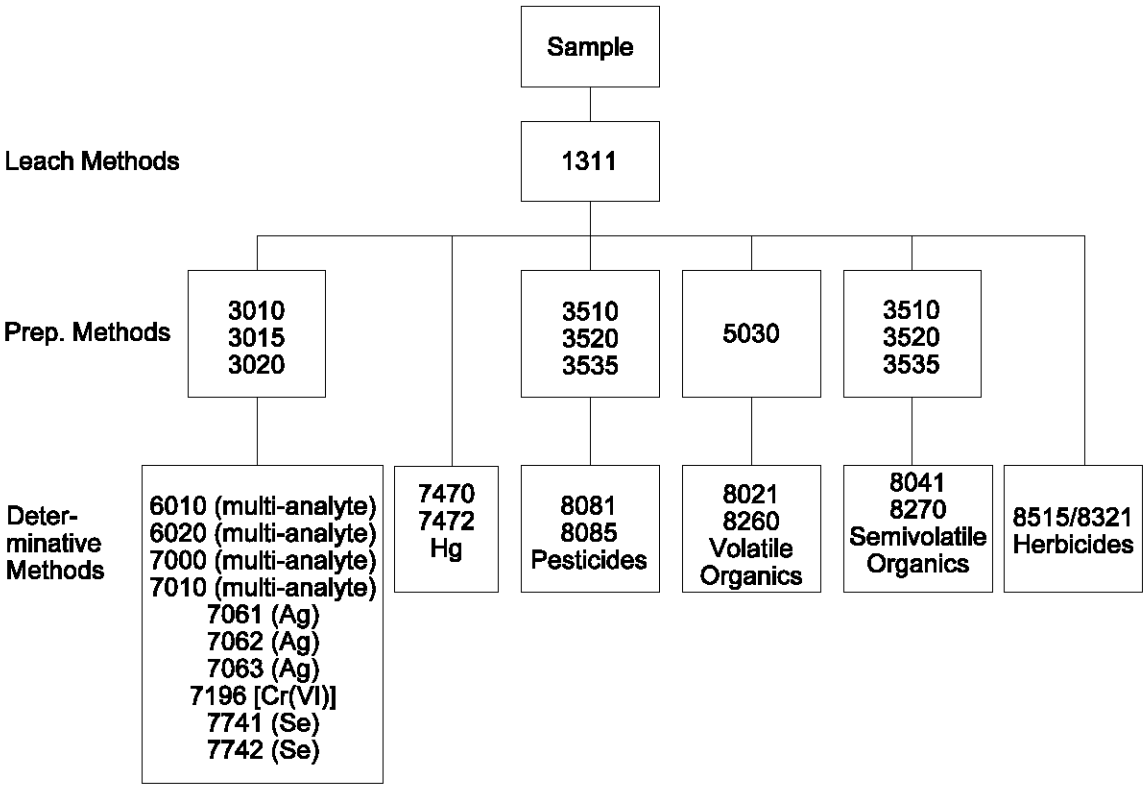
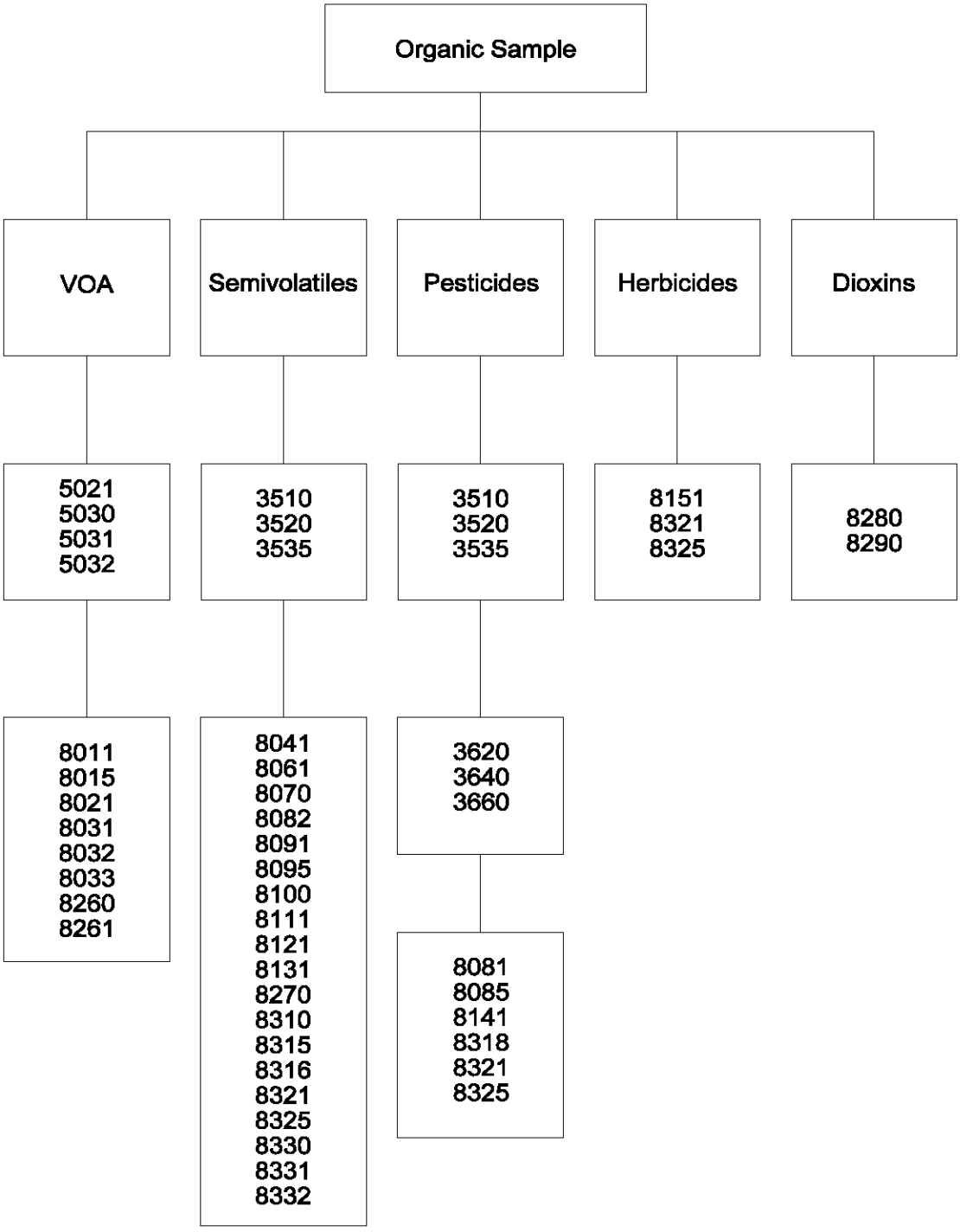
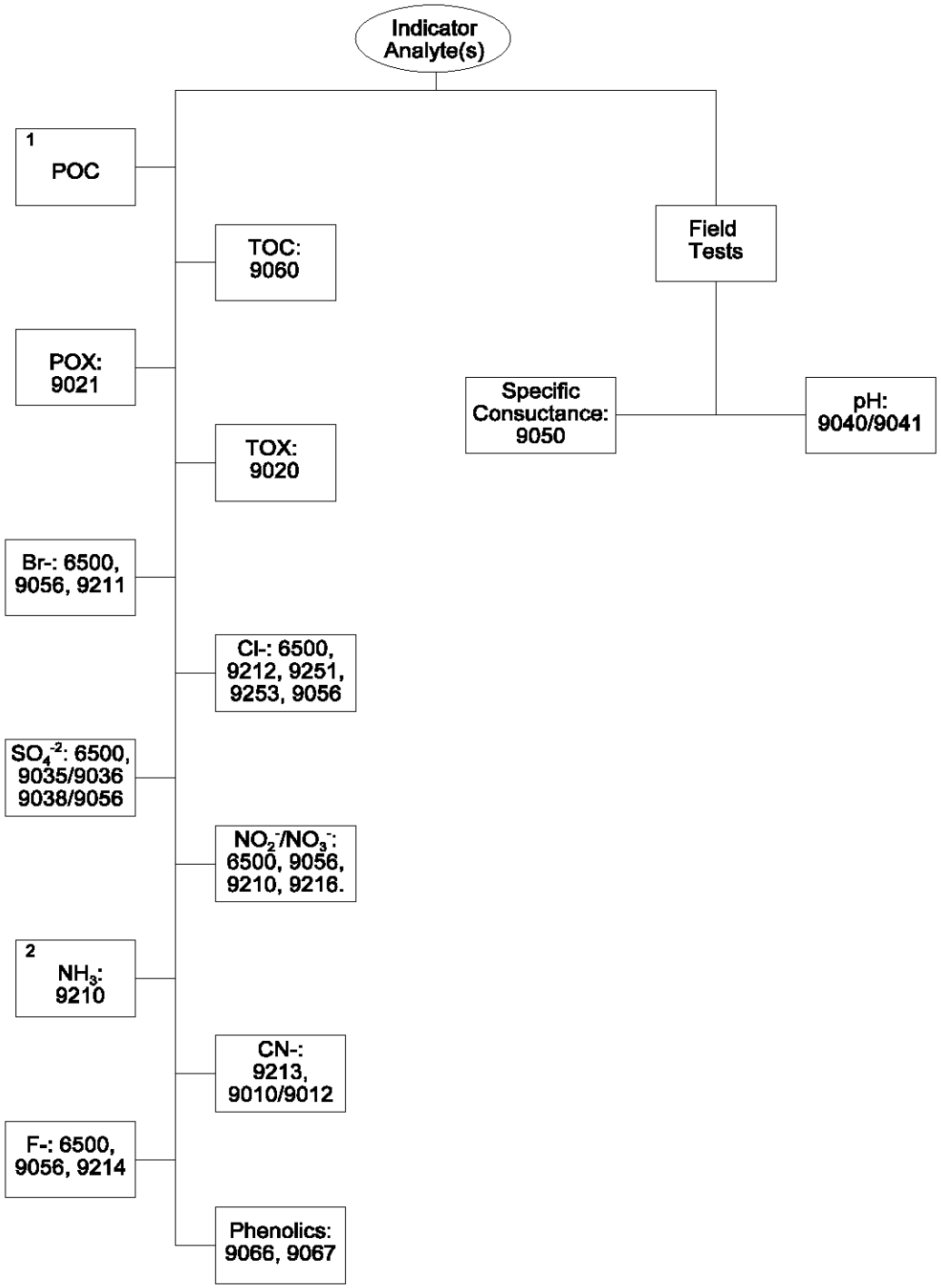


FIGURE 2-4A
GROUNDWATER ANALYSIS - ORGANIC ANALYTES



For illustrative purposes only. See the disclaimer and Sec. 2.1 for information on the flexibility inherent in SW-846 methods.

FIGURE 2-4B
GROUNDWATER ANALYSIS - INDICATOR ANALYTES

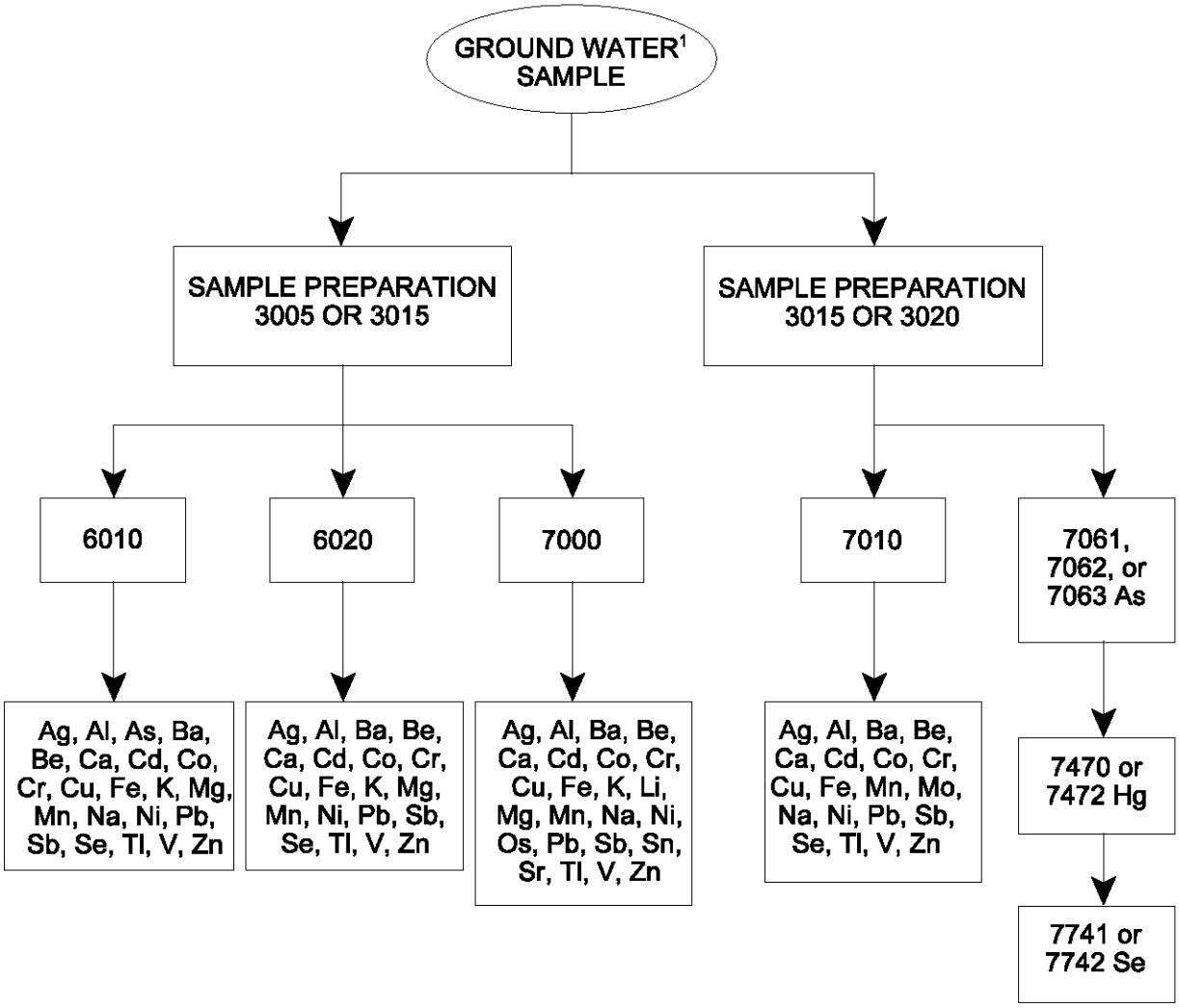


1- Barcelona 1984, (See Reference 1)
2- Riggin, 1984, (See Reference 2)

For illustrative purposes only. See the disclaimer and Sec. 2.1 regarding the flexibility inherent in SW-846 methods.

FIGURE 2-4C

GROUNDWATER ANALYSIS - INORGANIC ANALYTES



1. When analyzing for total dissolved metals, digestion is not necessary if the samples are filtered to the same concentration as the standards.

For illustrative purposes only. See the disclaimer and Sec. 2.1 regarding the flexibility inherent in SW-846 methods.