

**CHAPTER 16. WATER QUALITY TOXICS MANAGEMENT STRATEGY—STATEMENT OF POLICY**

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**Cross References**

This chapter cited in 25 Pa. Code § 91.15 (relating to basin-wide compliance); 25 Pa. Code § 93.1 (relating to definitions); and 25 Pa. Code § 93.8a (relating to toxic substances).

**Subchapter A. GUIDELINES FOR DEVELOPMENT OF CRITERIA FOR TOXIC SUBSTANCES AND WATER QUALITY CRITERIA FOR TOXIC SUBSTANCES**

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**Source**

The provisions of this Chapter 16 adopted March 10, 1989, effective March 11, 1989, 19 Pa.B. 1059, unless otherwise noted.

**Cross References**

This section cited in 25 Pa. Code § 93.8a (relating to toxic substances).

**INTRODUCTION****§ 16.1. General.**

Water quality criteria are the numeric concentrations, levels or surface water conditions that need to be maintained or attained to protect existing and designated uses. They are designed to protect the water uses listed in Chapter 93 (relating to water quality standards). The most sensitive of these protected uses are generally water supply, recreation and fish consumption, and aquatic life related. Therefore, criteria designed to protect these uses will normally protect the other uses listed in Chapter 93. This chapter specifies guidelines and procedures for development of criteria for toxic substances and also lists those site-specific criteria which have been developed.

**Source**

The provisions of this § 16.1 amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2543. Immediately preceding text appears at serial page (271866).

**DISCUSSION****§ 16.11. Toxic substances.**

(a) These guidelines cover section 307(a) of The Federal Clean Water Act (33 U.S.C.A. § 1317(a)) priority pollutants and other toxic substances which the Department determines to be of concern due to their verified or suspected presence in wastewater discharges. Priority pollutants are the primary focus of concern because the EPA has determined them to be the most commonly used, persistent and toxic substances in wastewater discharges. They include many heavy metals and solvents.

(b) In November 1980, the EPA published criteria for protection of human health and aquatic life for 104 of the 129 priority pollutants. (There are currently 126 priority pollutants since three have subsequently been deleted.) These criteria were developed in accordance with National guidelines summarized at 45 FR 79318 (1980). The EPA has updated the criteria or issued new criteria since 1980 based upon new data, and more recently, new methodologies for developing human health criteria as summarized in the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (EPA-822-B-00-004, October 2000) and the *National Recommended Water Quality Criteria* (EPA-822-H-04-001, 2004), as amended and updated. The Department's procedures for establishing criteria for aquatic life and human health protection for priority pollutants, and other toxics of concern are discussed in this subchapter.

#### Source

The provisions of this § 16.11 adopted March 10, 1989, effective March 11, 1989, 19 Pa.B. 1059; amended April 9, 1993, effective April 10, 1993, 23 Pa.B. 1727; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2543. Immediately preceding text appears at serial pages (271866) to (271867).

### GUIDELINES FOR DEVELOPMENT OF AQUATIC LIFE CRITERIA

#### § 16.21. Acute and chronic protection.

To provide for protection of aquatic life, it is necessary to consider both chronic, that is, long-term (reproduction, growth, survival) and acute or short-term (survival) concepts. Aquatic life can generally survive excursions of elevated concentrations of a pollutant as long as the excursion is of relatively short duration and does not frequently recur. However, to provide protection over a lifetime, a lower concentration shall be maintained. Thus, each aquatic life criterion consists of two components. The EPA defines these as a criterion maximum concentration (CMC) for acute protection and a criterion continuous concentration (CCC) for chronic protection. Each component is further defined in terms of magnitude (a scientifically derived number), duration (the period of time over which the number must be achieved), and the maximum desired frequency (the number of repetitions per unit time) of occurrence. Consistent with this approach, the Department whenever possible develops acute and chronic criteria and specifies the applicable magnitude and duration. The frequency of occurrence is accounted for through the specification of factors appropriate to the criteria in Chapter 96 (relating to water quality standards implementation).

#### Source

The provisions of this § 16.21 adopted March 10, 1989, effective March 11, 1989, 19 Pa.B. 1059; amended April 9, 1993, effective April 10, 1993, 23 Pa.B. 1727; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111. Immediately preceding text appears at serial page (239599).

**§ 16.22. Criteria development.**

The Department will establish criteria for toxic substances to provide for protection of aquatic life in accordance with the following guidelines:

(1) For those toxics for which the EPA has developed criteria in accordance with the National guidelines as set forth in “Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses” (1985), as amended and updated, the Department will review and evaluate the criteria. If the Department determines that the criteria are adequate to protect indigenous aquatic communities in the State’s waters, these criteria will serve as the basis for establishing total maximum daily loads (TMDLs) under Chapter 96 (relating to water quality standards implementation) or NPDES effluent limitations under Chapter 92 (relating to National Pollutant Discharge Elimination System permitting, monitoring and compliance). If the Department determines that the EPA National criteria are inappropriate, the Department will adjust these criteria in accordance with National guidelines to reflect the levels required for protection of aquatic life in this Commonwealth’s waters.

(2) For those toxics identified or expected in a discharge for which the EPA has not developed criteria, the Department will develop criteria using EPA approved National guidelines.

**Source**

The provisions of this § 16.22 amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5067; amended December 26, 1997, effective December 27, 1997, 27 Pa.B. 6817; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2543. Immediately preceding text appears at serial page (271868).

**Cross References**

This section cited in 25 Pa. Code § 16.61 (relating to special provisions for the Great Lakes System).

**§ 16.23. Sources of information.**

The Department will use the following sources of information in establishing criteria for aquatic life protection:

- (1) United States EPA 1986 Quality Criteria for Water (Goldbook).
- (2) United States EPA Ambient Water Quality Criteria Development Documents and updates.
- (3) Aquatic life toxicity data available in the published scientific literature.
- (4) Aquatic life toxicity data available on EPA computerized databases (for example, aquire, Great Lakes Initiative (GLI) Clearinghouse).

**Source**

The provisions of this § 16.23 amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5067; amended December 26, 1997, effective December 27, 1997, 27 Pa.B. 6817; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111. Immediately preceding text appears at serial page (239601).

**§ 16.24. Metals criteria.**

(a) The criteria are established to control the toxic portion of a substance in the water column. Depending upon available data, aquatic life criteria for metals are expressed as either dissolved or total recoverable. As information develops, the chemical identifiers for the toxic portion may be added, changed or refined. The criteria form one of the bases for water quality-based effluent limitations, which are expressed as total recoverable metal.

(b) Chemical translators are used to convert dissolved criteria into effluent limitations which are required by Federal regulations to be expressed as total recoverable metal. The default chemical translator used by the Department is the reciprocal of the conversion factor (listed in the Conversion Factors Table located in § 93.8b (relating to metals criteria)) that was used to determine the dissolved criterion.

(c) NPDES dischargers may request alternate effluent limitations by using site-specific water quality characteristics. This is accomplished by performing a site-specific chemical translator study for a dissolved criterion. A water effect ratio (WER) study may also be conducted, based on either total recoverable or dissolved criteria, depending on the form of the criterion.

(d) A WER is a factor that expresses the difference between the measures of the toxicity of a substance in laboratory water and the toxicity in site water. The WER provides a mechanism to account for that portion of a metal which is toxic under certain physical, chemical or biological conditions. At this time, WERs are applicable only to certain metals, which are listed by the EPA in "Guidance on the Determination and Use of Water-Effect Ratios for Metals" (February 1994), as amended and updated. Subject to Departmental approval of the testing and its results, the Department will use the WER to establish an alternate site-specific criterion.

(e) Chemical translator studies must be conducted in accordance with the EPA's interim final document, "The Metals Translator: A Guidance for calculating a total recoverable permit limit from a dissolved criterion" (June 1996), as amended and updated.

(f) Final reports on the studies shall be submitted to the Department within 60 days of completion. Upon approval of the study results, the Department will use the chemical translator or WER, or both, to determine revised effluent limitations.

**Source**

The provisions of this § 16.24 adopted November 17, 1995, effective November 18, 1995, 25 Pa.B. 5067; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended February 11, 2005, effective February 12, 2005, 35 Pa.B. 1223; corrected June 23, 2006, effective February 12, 2005, 36 Pa.B. 3117; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2543. Immediately preceding text appears at serial pages (320513) to (320514).

**GUIDELINES FOR DEVELOPMENT OF HUMAN  
HEALTH-BASED CRITERIA****§ 16.31. Application.**

In the development of water quality criteria for human health protection, the principles of risk assessment and risk management are applied in two distinct ways depending upon the toxic effect to be protected against. Traditional toxicology is developed upon a theory that the “dose determines the poison” (any substance is toxic if the dose becomes large enough). It is generally recognized, however, that for most substances there is a safe level below which no adverse effects will be seen. This “threshold level” approach is in contrast to the “no threshold level” approach generally ascribed to carcinogens.

**§ 16.32. Threshold level toxic effects.**

(a) A threshold effect is defined as an adverse impact that occurs in the exposed individual only after a physiological reserve is depleted. For these effects there exists a dose below which no adverse response will occur. Threshold toxic effects include most systemic effects and developmental toxicity, including teratogenicity. Developmental toxicity includes all adverse effects in developing offspring resulting from prenatal exposure to a causative agent.

(b) Control of threshold toxics is based upon animal testing or epidemiological studies that report no- or lowest-observed adverse effect levels of the substance (NOAEL or LOAEL). In evaluating a particular toxic, toxicologists weigh the merits of all the tests, and choose, in their best professional judgment, the safe level. By applying standard margins of safety to the NOAEL, extrapolations from the laboratory animals to humans (factor of 10), for sensitive subpopulations (10), and from short-term to chronic studies (10) can be taken into account. An additional factor of 10 is used if only a LOAEL is available. Modifying factors (1-10), which account for deficiencies in the toxicity studies, are also considered in determining an acceptable exposure level. The current term for this acceptable level is reference dose (RfD); it was previously called the acceptable daily intake (ADI). The RfD is adjusted for protection of an average (70 Kg) person. It is then divided by expected exposure condition to result in an applicable criterion. Except as provided in § 16.61(b)(2) (relating to special provisions for the Great Lakes System), exposure conditions by means of water include 2 liters per day of drinking water and consumption of 17.5 grams of fish per day. Bioconcentration

of toxics in edible portions of fish is accounted for by use of bioconcentration factors (BCF). BCF is the ratio in liters per kilogram of a substance's concentration in tissues of an aquatic organism to its concentration in the ambient water.

(c) The Department will establish criteria for threshold toxics in accordance with the following guidelines:

(1) If the EPA has developed criteria, the Department will evaluate and accept the criteria when it is determined that they are adequate to protect the designated water uses.

(2) If the EPA criteria have been evaluated, and have been determined to be inadequate to protect designated uses, or when no criteria have been developed for a substance identified or expected in a discharge, the Department will develop criteria following EPA's standard toxicological procedures outlined in the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (EPA-822-B-00-004, October 2000) and the *National Recommended Water Quality Criteria* (EPA-822-H-04-001, 2004), as amended and updated or Exhibit 3-1 of the Water Quality Standards Handbook, Second Edition, EPA 823-0-94-005A, August, 1994, as amended and updated.

(3) If no data are available to characterize the human health hazard of a chemical, no criterion will be developed. A criterion to protect the next most sensitive use will be used. A threshold criterion will be developed at a future date if information becomes available.

(d) The sources the Department uses to obtain relevant risk assessment values for protection for threshold level toxic effects to human health are as follows:

(1) Verified reference doses, listed in the EPA agency-wide supported data system known as IRIS (Integrated Risk Information System) and other EPA approved data sources referred through IRIS.

(2) Maximum Contaminant Level Goals.

(3) The EPA's CWA § 304(a) health criteria listed under the National Toxics Rule in 40 CFR 131.36 (57 FR 80848, December 22, 1992) (relating to toxics criteria for those States not complying with Clean Water Act section 303(c)(2)(B)), as amended and updated and other final criteria published by the EPA and the Great Lakes Initiative Clearinghouse.

(4) Teratology and other data that have been peer-reviewed may provide information for criteria development.

#### Source

The provisions of this § 16.32 adopted March 10, 1989, effective March 11, 1989, 19 Pa.B. 1059; amended April 9, 1993, effective April 10, 1993, 23 Pa.B. 1727; amended December 26, 1997, effective December 27, 1997, 27 Pa.B. 6817; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2523. Immediately preceding text appears at serial pages (271871) to (271872).

**Cross References**

This section cited in 25 Pa. Code § 16.33 (relating to nonthreshold effects (cancer)); and 25 Pa. Code § 16.61 (relating to special provisions for the Great Lakes System).

**§ 16.33. Nonthreshold effects (cancer).**

(a) A nonthreshold effect is defined as an adverse impact, including cancer, for which no exposure greater than zero assures protection to the exposed individual. Thus, in contrast to the threshold concept discussed in § 16.32 (relating to threshold level toxic effects), the nonthreshold approach to toxics control is based upon the premise that there is no safe concentration of the toxic.

(b) The Department has determined that the regulation of carcinogens from a water quality perspective in accordance with the procedure specified in the following subsections will adequately and reasonably protect human health.

(c) The Department accepts the evaluation and extrapolation modeling used by the EPA to quantitate the carcinogenic risk of particular chemicals. Cancer risk level criteria are, therefore, adaptations of the EPA's cancer potency (slope) factors. Criteria based on cancer risk levels are average lifetime exposure values.

(d) The Department's water quality toxics management program controls carcinogens to an overall risk management level of one excess case of cancer in a population of one million ( $1 \times 10^{-6}$ ). Expressing this another way, the probability of an individual getting cancer from an ambient water exposure to a carcinogen is increased by a factor of one in one million. This level appears to be protective of human health to a significant degree when compared to other risks encountered in life.

(e) The Department uses a  $1 \times 10^{-6}$  cancer risk level as specified in § 93.8a(d) (relating to water quality criteria for toxic substances). Attainment of this risk level is predicated on exposure that includes drinking 2 liters of water and ingesting 17.5 grams of fish per day over a 70-year lifetime, except as provided in § 16.61(b)(2) (relating to special criteria for the Great Lakes Systems). Bioaccumulation of carcinogenic toxics in edible portions of fish are accounted for by use of bioaccumulation factors (BAFs).

(f) The Department will use the following guidelines in establishing criteria for nonthreshold toxics:

(1) The determination as to whether a substance is a carcinogen will be its identification by the EPA.

(2) For toxics for which (cancer potency) slope factors have been developed as evidenced by listing on IRIS the Department will either use the EPA developed criteria or will develop criteria based upon these potency factors using the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (EPA-822-B-00-004, October 2000) and the *National Recommended Water Quality Criteria* (EPA-822-H-04-001, 2004), as amended and updated or EPA's Standard Toxicological Procedures outlined in

Exhibit 3-2 of the *Water Quality Standards Handbook*, Second Edition, EPA 823-0-94-005A, August, 1994, as amended and updated.

(3) For carcinogens or suspected carcinogens for which cancer potency (slope) factors have not been developed, the Department will use an additional margin of safety (factor of 10) with threshold toxicity data to develop a protective health criterion.

#### Source

The provisions of this § 16.33 adopted March 10, 1989, effective March 11, 1989, 19 Pa.B. 1059; amended April 9, 1993, effective April 10, 1993, 23 Pa.B. 1727; amended December 26, 1997, effective December 27, 1997, 27 Pa.B. 6817; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2523. Immediately preceding text appears at serial pages (271872) to (271873).

#### Cross References

This section cited in 25 Pa. Code § 16.61 (relating to special provisions for the Great Lakes System).

### CRITERIA MODIFICATION

#### § 16.41. Changes and additions.

The criteria in Chapter 93, Table 5 and site-specific criteria in Appendix A, Table 1A for toxic substances are based on the best scientific information currently available. These criteria may, however, be added to or modified if the Department determines upon evaluation of new scientific findings and information that a change is warranted. Submittal of data and information will be considered by the Department for this purpose. Site-specific criteria development will be performed in accordance with § 93.8d (relating to development of site-specific water quality criteria). Changes and additions to the tables will be published in the *Pennsylvania Bulletin*.

#### Source

The provisions of this § 16.41 amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2543. Immediately preceding text appears at serial pages (271873) to (271874).

#### § 16.42. [Reserved].

#### Source

The provisions of this § 16.42 adopted April 9, 1993, effective April 10, 1993, 23 Pa.B. 1728; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5067; reserved November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111. Immediately preceding text appears at serial page (239608).

**WATER QUALITY CRITERIA  
FOR TOXIC SUBSTANCES****§ 16.51. Human health and aquatic life criteria.**

(a) Appendix A, Table 1A and Chapter 93, Table 5 list the human health and aquatic life criteria for toxic substances which the Department uses in development of effluent limitations in NPDES Permits and for other purposes. Appendix A, Table 1A lists site-specific human health and aquatic life criteria that have been developed or reviewed and approved by the Department. The human health criteria, which include exposures from drinking water and fish consumption, are further defined as to the specific effect (that is, cancer or threshold health effects). For those aquatic life criteria which are hardness related and specified as a formula, such as several of the heavy metals, the Department will use the specific hardness of the receiving stream after mixing with the waste discharge in calculating criteria on a case-by-case basis. The priority pollutant numbers (PP NO) used by the EPA to identify priority pollutants are included in Table 1A for reference purposes. Some of these criteria may be superseded for the Delaware Estuary, Ohio River Basin, Lake Erie Basin, and Genesee River Basin under interstate and international compact agreements with the Delaware River Basin Commission, Ohio River Valley Sanitation Commission and International Joint Commission respectively. The toxics substances in Chapter 93, Table 5 without a PP NO are state-derived criteria. The criteria in Appendix A, Table 1A and Chapter 93, Table 5 do not apply to the Great Lakes System. Water quality criteria for the Great Lakes System are contained in § 93.8e, Tables 6 and 7 (relating to special criteria for the Great Lakes System). Criteria may be developed for the Great Lakes System for substances other than those listed in Table 6 under the methodologies in § 16.61 (relating to special provisions for the Great Lake System).

(b) If the Department determines that the natural quality of a surface water segment is of lower quality than the applicable criteria listed in Chapter 93, Table 5, the natural quality shall constitute the aquatic life criterion for that segment. All draft natural quality determinations shall be published in the *Pennsylvania Bulletin* and be subject to a minimum 30 day comment period. The Department will maintain a publicly available list of surface waters and parameters where this subsection applies, and will, from time to time, submit appropriate amendments to these chapters.

**Source**

The provisions of this § 16.51 adopted March 10, 1989, effective March 11, 1989, 19 Pa.B. 1059; amended December 21, 1990, effective December 22, 1990, 20 Pa.B. 6299; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5067; amended December 26, 1997, effective December 27, 1997, 27 Pa.B. 6817; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2543. Immediately preceding text appears at serial pages (271874) and (309665).

**§ 16.52. Whole Effluent Toxicity Testing (WETT).**

The Department may impose WETT requirements on wastewater discharges where it is determined that the testing is necessary to assure the protection of aquatic life. Where WETT is required, the Department will use the criteria of 0.3 TUA (Toxic Units Acute) and 1 TUC (Toxic Units Chronic) as a basis for evaluating test results. WETT shall be conducted in accordance with 40 CFR Part 136 (relating to the establishment of test procedures for the analysis of pollutants), Quality Assurance Quality Control (QA/QC) guidance issued by the Department, or other protocols approved by the Department.

**Source**

The provisions of this § 16.52 adopted December 26, 1997, effective December 27, 1997, 27 Pa.B. 6817; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111. Immediately preceding text appears at serial page (239609).

**GREAT LAKES SYSTEM****§ 16.61. Special provisions for the Great Lakes System.**

(a) *Definitions.* The following words and terms, when used in this section, have the following meanings, unless the context clearly indicates otherwise:

*BAF—Bioaccumulation Factor*—The ratio in liters per kilogram of a substance's concentration in tissues of an aquatic organism to its concentration in the ambient water, when both the organism and its food are exposed and the ratio does not change substantially over time.

*BCC—Bioaccumulative Chemical of Concern*—A chemical that has the potential to cause adverse effects which, upon entering the surface waters, by itself or its toxic transformation product, accumulates in aquatic organisms by a human health BAF greater than 1,000, after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation, under the methodology in 40 CFR Part 132 Appendix B (relating to Great Lakes Water Quality Initiative). Current BCCs are listed in 40 CFR 132.6, Table 6 (relating to pollutants of initial focus in the Great Lakes Water Quality Initiative).

*Great Lakes System*—The streams, rivers, lakes and other bodies of surface water within the drainage basin of the Great Lakes in this Commonwealth.

(b) *Water quality criteria for the Great Lakes System.*

(1) *Aquatic life criteria.* Aquatic life criteria for toxic substances in the Great Lakes System will be developed under the methodologies in § 16.22 (relating to criteria development) to the extent they are consistent with 40 CFR Part 132, Appendix A (relating to Great Lakes Water Quality Initiative methodologies for developments of aquatic life values). If there are insufficient data to develop aquatic life criteria for a toxic substance identified in a discharge into these waters, the Department will develop or require a discharger to develop, subject to Department approval, protective aquatic life values using the meth-

odologies in 40 CFR Part 132, Appendix A and guidance issued by the Department. For non-BCCs, WETT may be used in lieu of Tier II values to determine aquatic toxicity.

(2) *Human health criteria.* Human health criteria for the Great Lakes System will be developed using the methods in §§ 16.32 and 16.33 (relating to threshold level toxic effects; and nonthreshold effects (cancer)), except that fish consumption is 15 grams per day. If there are insufficient data to develop human health threshold criteria for a toxic substance identified in a discharge into these waters, the Department will develop, or require the discharger to develop, subject to Department approval, protective human health values using the methodologies in 40 CFR Part 132, Appendix C, Section III, as it relates to Tier II values, and guidance issued by the Department.

(3) *BAFs.* Human health criteria for BCCs will be developed under the methodologies in 40 CFR Part 132, Appendix B relating to bioaccumulation factors, and will be listed by the EPA in the GLI Clearinghouse. Because substances other than BCCs (Non-BCCs) bioaccumulate to a much lesser degree, BAFs for Non-BCCs are similar to bioconcentration factors (BCFs). Field measured BAFs, or BAFs equal to BCFs will be used for the development of non-BCC criteria in the Great Lakes.

(4) *Additional requirements.* Additivity of toxic effects for chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans will be accounted for under 40 CFR Part 132, Appendix F, Procedure 4 (relating to Great Lakes Water Quality Initiative implementation procedures).

(c) *Minimum protections.* The Department will follow guidance that is as protective as the final water quality guidance for the Great Lakes System at 40 FR 15366 (March 23, 1995), as updated and amended.

#### Source

The provisions of this § 16.61 adopted December 26, 1997, effective December 27, 1997, 27 Pa.B. 6817; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended February 11, 2005, effective February 12, 2005, 35 Pa.B. 1223; corrected March 25, 2005, effective March 7, 1998, 35 Pa.B. 1890; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2543. Immediately preceding text appears at serial pages (309665) to (309666) and (310141) to (310143).

#### Cross References

This section cited in 25 Pa. Code § 16.32 (relating to threshold level toxic effects); 25 Pa. Code § 16.33 (relating to nonthreshold effects (cancer)); 25 Pa. Code § 16.51 (relating to human health and aquatic life criteria); 25 Pa. Code § 93.8c (relating to human health and aquatic life criteria for toxic substances); and 25 Pa. Code § 93.8e (relating to special criteria for the Great Lake System).

**Subchapter B. ANALYTICAL METHODS AND  
DETECTION LIMITS FOR TOXIC SUBSTANCES**

**GENERAL PROVISIONS**

Sec.

16.101. Introduction.

16.102. Approved EPA Analytical Methods and Detection Limits.

**GENERAL PROVISIONS**

**§ 16.101. Introduction.**

(a) This subchapter contains information on the final EPA guidelines establishing test procedures for the analysis of priority pollutants under the Federal Water Pollution Control Act, known as the Clean Water Act (33 U.S.C.A. §§ 1251—1376). The procedures of analysis for the organic compounds are contained in 40 CFR 136 (relating to guidelines establishing test procedures). Procedures for inorganic substances are cited in this source, but details are found elsewhere. Analytical procedures for free cyanide are approved by the Department and are contained in Appendix A, Table 2A.

(b) This information provides the expected levels of analytical detectability for toxic priority pollutants. It is intended as a basis for review of NPDES application forms, and for establishing appropriate detection limits and methods of analysis to accompany final effluent limitations in permits.

(c) The Department recommends that clean techniques be employed as appropriate in collecting, handling, storing, preparing and analyzing samples. Clean techniques refer to methods that reduce contamination and enable the accurate and precise measurement of substances, and to related issues concerning detection limits, quality control and quality assurance. Clean techniques are those requirements or practices for sample collection and handling necessary to produce reliable analytical data to at least the microgram per liter ( $\mu\text{g/l}$ ) or part per billion (ppb) range, or lower as required by the analytical method. The use of clean techniques reduces the incidence of overstatement of environmental concentrations of trace substances.

**Source**

The provisions of this § 16.101 adopted March 10, 1989, effective March 11, 1989, 19 Pa.B. 1059; amended April 9, 1993, effective April 10, 1993, 23 Pa.B. 1727; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5067; amended February 11, 2005, effective February 12, 2005, 35 Pa.B. 1223; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2543. Immediately preceding text appears at serial page (310144).

**§ 16.102. Approved EPA Analytical and Detection Limits.**

(a) Appendix A, Tables 2A and 2B contain the following data elements and is to be used as follows:

(1) Parameter + (CAS) is the chemical name preceded by an alphanumeric code for the priority pollutants. Other inorganics (metals) listed on the application form have also been included. The Chemical Abstracts Service (CAS) number, a unique chemical identifier, is also listed for completeness of identification. The CAS number should always be verified to ensure proper identification, particularly with chemicals with ambiguous or unfamiliar names, or both.

(2) Methods number + (description) includes the approved EPA procedures by identifying number and an abbreviated description of each. The methods are detailed in one or more of the following sources:

(i) *Methods for Chemical Analysis of Water and Wastes*, EPA 600/4-79-020, Revised March 1984.

(ii) 40 CFR Part 136 (relating to guidelines establishing test procedures). The EPA provides a list of still other sources for these methods in 40 CFR Part 136. Methods that were not developed by the EPA, that is, have no EPA identifying method number, but are approved by the EPA for use in NPDES related analyses are marked with an asterisk (\*) in Appendix A, Tables 2A and 2B.

(iii) *Standard Methods for the Examination of Water and Wastewater*, 20th Edition, APHA-AWWA-WEF, 1998.

(iv) *Hach Handbook of Wastewater Analysis*, Hach Chemical Company, 1979.

(v) *Direct Current Plasma (DCP) Optical Emission Spectrometric Method for Trace Elemental Analysis of Water and Wastes, Method AES0029*. Applied Research Laboratories, Inc., 1986-Revised 1991, Fison Instruments, Inc.

(vi) *ASTM Annual Book of Standards, Section 11, Water*. American Society for Testing and Materials, 1999.

(3) MDL is the method detection limit for each chemical for each method. The MDL is defined as the minimum concentration that can be measured and reported with 99% confidence that the value is above zero—that is, something is really there. The MDL concentrations listed were obtained using reagent water. Similar results were achieved using representative wastewaters. The MDL achieved in a given analysis will vary depending on instrument sensitivity and matrix effects.

(i) When MDLs are not available, detection limits based on other criteria, such as instrument signal to noise ratios, are included in Appendix A. Table 3 Detection limits for metals are generally instrument detection limits.

(ii) For any pollutant with an effluent limitation below the method detection limit, the permittee is expected to generally achieve the detection limit of the most sensitive method that is below detection available.

(iii) If two approved analytical methods for the same parameter have detection limits that differ by less than 1 ug/l or a factor of 2 (whichever is greater), the permit may be written designating either method as acceptable. The permittee also has the option of using an alternate method approved by the Department and the EPA that the permittee selects as long as he achieves the level of detection of the cited method or the numerical water quality-based limit.

(iv) The primary source for detection limits in Appendix A, Tables 2A and 2B is EPA MDL studies. However, when the EPA has not performed an MDL study or reported the detection limit, other sources—particularly, Standard Methods—are consulted. When there is no literature on detection limit, the Department's Bureau of Laboratories may be asked to determine the detection limit based on an MDL study.

(4) Permittees will be required to meet the detection limits listed in Appendix A, Tables 2A and 2B. If the detection limit is not listed, a permittee shall develop a detection limit using an MDL study.

(5) When permittees cannot meet a listed detection limit, they may be granted case-specific MDLs if they submit complete documentation demonstrating a matrix effect in their particular effluent. The permittees shall follow the procedure for determining MDLs published as Appendix B of 40 CFR Part 136 (relating to guidelines establishing test procedures). The Bureau of Laboratories will evaluate the data and advise the regional office of their decision.

(b) Appendix A, Table 3 gives a more detailed description of the EPA 600-series of analytical procedures for organic pollutants. Further detail is contained in 40 CFR Part 136.

#### Source

The provisions of this § 16.102 adopted March 10, 1989, effective March 11, 1989, 19 Pa.B. 1059; amended April 9, 1993, effective April 10, 1993, 23 Pa.B. 1727; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5067; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended February 11, 2005, effective February 12, 2005, 35 Pa.B. 1223; corrected March 18, 2005, effective February 12, 2005, 35 Pa.B. 1761 and 1890. Immediately preceding text appears at serial pages (309607) to (309672).

#### Cross References

This section cited in 25 Pa. Code § 250.10 (relating to measurement of regulated substances in media).

APPENDIX A  
TABLE 1  
[Reserved]

TABLE 1A

**SITE-SPECIFIC WATER QUALITY CRITERIA FOR TOXIC SUBSTANCES**

The following table contains water quality criteria that were developed based on a need for a site-specific water quality criterion, and according to the guidelines for criteria development, as contained in this chapter. The sources the Department of Environmental Protection (Department) uses to obtain relevant risk assessment values for these criteria include, but is not limited to, United States Environmental Protection Agency agency-wide supported data systems such as Integrated Risk Information System (IRIS) and ECOTOX; the Great Lakes' Tier II aquatic life criteria guidelines; and other nationally developed criteria as reviewed and approved by the Department for Statewide use. A criterion placed in this table will remain a site-specific criterion as originally developed and be incorporated into the appropriate portion of §§ 93.9a—93.9z that relates to “exceptions to specific criteria” unless, during rulemaking, it is determined that the same criteria has general State-wide applicability.

PP NO	Chemical Name	CAS Number	Criteria Continuous Concentrations (ug/l)	Criteria Maximum Concentration (ug/l)	Fish and Aquatic Life Criteria			Water Body/County
					Human Health Criteria (ug/l)	Health Effect	Drainage List	
-	1,4 Dioxane	123911	103000	515000	3.0	CRL	F	West Branch Perkiomen Creek, Berks County
-	Acrylamide	79061	N/A	N/A	.008	CRL	S	Stump Creek, Henderson Township, Jefferson County

**Acronyms and Footnotes to Table 1A**

CAS—Chemical Abstract Service number

CRL—Cancer risk level at  $1 \times 10^{-6}$

H—Threshold effect human health criterion; incorporates additional uncertainty factor for some Group C carcinogens.

ln [H]—Natural Logarithm of the Hardness of stream as mg/l CaCO<sub>3</sub>

ug/L—Micrograms per liter

N/A—Criterion not developed

PP NO—Priority Pollutant Number

TABLE 2A

**APPROVED EPA ANALYTICAL METHODS AND  
DETECTION LIMITS: INORGANICS**

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (µ/l)
— ALUMINUM (07429905)	3111 D (AA, flame)	NA
	3113 B (AA, furnace)	3
	200.7 (ICP/AES)	20
	200.8 (ICP/MS)	1
	200.9 (STGFAA)	7.8
	3500 Al B* <sup>1</sup> (Colorimetric)	6
	D4190-94* <sup>4</sup> (DCP)	NA
1M ANTIMONY (07440360)	3111 B (AA, flame)	70
	3113 B (AA, furnace)	3
	200.7 (ICP)	32
	200.8 (ICP/MS)	0.4
	200.9 (STGFAA)	0.8
2M ARSENIC (07440382)	3113 B (AA, furnace)	1
	3114 B. d (AA, hydride)	NA
	3500 B (SDDC)	2
	200.7 (ICP/AES)	8
	200.8 (ICP/MS)	1.4
	200.9 (STGFAA)	0.5
— BARIUM (14798084)	3111 D (AA, flame)	NA
	3113 B (AA, furnace)	2
	200.7 (ICP/AES)	1
	200.8 ICP/MS	1.4
	—* <sup>3</sup> (DCP)	NA
3M BERYLLIUM	3111 D (AA, flame)	NA
	3113 B (AA, furnace)	0.2
	200.7 (ICP/AES)	0.3
	200.8 (ICP/MS)	0.3
	200.9 (STGFAA)	.02
	3500-Be D* <sup>1</sup> (Colorimetric)	5
	D4190-94, 99* <sup>4</sup> (DCP)	NA
— BORON (07440428)	4500 B B (Colorimetric)	0.2
	200.7 (ICP/AES)	3
	D4190-94, 99* <sup>4</sup> (DCP)	NA

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (µ/l)
4M CADMIUM (07440439)	3111 B OR C (AA, flame)	3
	3113 B (AA, furnace)	0.1
	200.7 (ICP/AES)	1
	200.8 (ICP/MS)	0.5
	200.9 (STGFAA)	.05
	3500-Cd D* <sup>1</sup> (Colorimetric)	0.5
	D3557-95, 02(C)* <sup>4</sup> (Voltametry)	NA
	D4190-94, 99* <sup>4</sup> (DCP)	NA
5M CHROMIUM TOTAL (07440473)	3111 B (AA, flame)	20
	3113 B (AA, furnace)	2
	3111 C (AA, extraction)	N/A
	200.7 (ICP/AES)	4
	200.8 (ICP/MS)	0.9
	200.9 (STGFAA)	0.1
	D4190-94, 99* <sup>4</sup> (DCP)	NA
	3500-Cr B* <sup>1</sup> (Colorimetric)	NA
5M CHROMIUM VI (07440473)	3111 C (AA extraction)	NA
	3120* <sup>1</sup> (ICP)	7
	218.6 (Ion Chromatography)	NA
— COBALT (07440484)	3111 B (AA, flame)	30
	3113 B (AA, furnace)	1
	200.7 (ICP/AES)	2
	200.8 (ICP/MS)	.09
	200.9 (STGFAA)	0.7
	D4190-94, 99* <sup>4</sup> (DCP)	NA
6M COPPER (07440508)	3111 B (AA, flame)	10
	3113 B (AA, furnace)	1
	200.7 (ICP/AES)	3
	200.8 (ICP/MS)	0.5
	200.9 (STGFAA)	0.7
	3500-Cu B* <sup>1</sup> (Colorimetric)	3
	3500-Cu C* <sup>1</sup> (Colorimetric)	20
	D4190-94, 99* <sup>4</sup> (DCP)	NA
— IRON (07439921)	3111 B or C (AA, flame)	20
	3113 B (AA, furnace)	1
	200.7 (ICP/AES)	30

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (µ/l)
	200.9 (STGFAA)	NA
	3500-Fe B* <sup>1</sup> (Colorimetric)	10
	D4190-94, 99* <sup>4</sup> (DCP)	NA
7M LEAD (07439921)	3111 B or C (AA, flame)	50
	3113 B (AA, furnace)	1
	200.7 (ICP/AES)	10
	200.8 (ICP/MS)	0.6
	200.9 (STGFAA)	0.7
	3500-Pb B* <sup>1</sup> (Colorimetric)	NA
	D3559-96, 03(C)* <sup>4</sup> (Voltametry)	NA
	D4190-94, 99* <sup>4</sup> (DCP)	NA
— MAGNESIUM (07439954)	3111 B (AA, flame)	0.5
	200.7 (ICP/AES)	20
	3500-Mg D* <sup>1</sup> (Gravimetric)	NA
	—* <sup>3</sup> (DCP)	NA
— MANGANESE (07439965)	3111 B (AA, flame)	10
	3113 B (AA, furnace)	0.2
	200.7 (ICP/AES)	1
	200.8 (ICP/MS)	0.1
	200.9 (STGFAA)	0.3
	3500-Mn B* <sup>1</sup> (Colorimetric)	6
	8034-* <sup>2</sup> (Colorimetric)	NA
	D4190-94, 99* <sup>4</sup> (DCP36)	NA
8M MERCURY (07439976)	245.1 (Cold vapor, Man)	0.2
	245.2 (Cold vapor, Auto)	0.2
	245.7 (CVAFS)	NA
	1631 E (Purge and Trap CVAFS)	0.0002
— MOLYBDENUM (07439987)	3111 D (AA, flame)	NA
	3113 B (AA, furnace)	1
	200.7 (ICP/AES)	4
	200.8 (ICP/MS)	0.3
9M NICKEL (07440020)	3111 B or C (AA, flame)	20
	3113 B (AA, furnace)	1
	200.7 (ICP/AES)	5
	200.8 (ICP/MS)	0.5

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (µ/l)
	200.9 (STGFAA)	0.6
	3500-Ni D* <sup>1</sup> (Colorimetric)	NA
	D4190-94, 99* <sup>4</sup> (DCP)	NA
10M SELENIUM (07782492)	3113 B (AA, furnace)	2
	200.7 (ICP/AES)	20
	200.8 (ICP/MS)	7.9
	200.9 (STGFAA)	0.6
	3114B* <sup>1</sup> (AA, gaseous hydride)	2
11M SILVER (07440224)	3111 B or C (AA, flame)	10
	3113 B (AA, furnace)	0.2
	200.7 (ICP/AES)	2
	200.8 (ICP/MS)	0.1
	200.9 (STGFAA)	0.6
	—* <sup>3</sup> (DCP)	NA
12M THALLIUM (07440280)	3111 B (AA, flame)	NA
	279.2 (AA, furnace)	1
	200.7 (ICP/AES)	1
	200.8 (ICP/MS)	0.3
	200.9 (STGFAA)	0.7
— TIN (07440315)	3111 B (AA, flame)	800
	3113 B (AA, furnace)	5
	200.7 (ICP/AES)	7
	200.9 (STGFAA)	1.7
— TITANIUM (07440326)	3111 D (AA, flame)	400
	283.2 (AA, furnace)	10
	—* <sup>3</sup> (DCP)	NA
13M ZINC (07440666)	200.7 (ICP/AES)	2
	3500-Zn E* <sup>1</sup> (Colorimetric)	1
	3500-Zn B* <sup>1</sup> (Colorimetric)	20
	289.2 (AA furnace)	.05
	200.8 (ICP/MS)	1.8
	D4190-94, 99* <sup>4</sup> (DCP)	NA

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (µ/l)
14M CYANIDE, TOTAL (00057125)	4500-CN D* <sup>1</sup> (Titrimetric)	1000
	4500-CN E (Spectrophometric)	20
	335.4 (Color., Auto)	5
** CYANIDE, FREE 14M (00057125)	—(DEP Free CN method, Auto)	1
	Not EPA approved 4500-CN I* <sup>1</sup>	NA
	Not EPA approved 335.1 (Amenable to Chlor.)	NA
PHENOLS	420.1 (4AAP, Manual)	5
TOTAL	420.4 (4AAP, Auto)	2

\* Not an EPA developed method, but approved by EPA

Source is:

<sup>1</sup>—Standard Methods for the Examination of Water and Wastewater, 20th Edition. APHA-AWWA-WEF, 1998. The approved methods may also be found in Standard Methods for the Examination of Water and Wastewater, 18th or 19th Editions, but with different identifying numbers. For Selenium, the method number quoted is from the 19th Edition.

<sup>2</sup>—Hach Handbook of Wastewater Analysis. 1979.

<sup>3</sup>—Direct Current Plasma (DCP) Optical Emission Spectrometric Method for Trace Elemental Analysis of Water and Wastes, Method AES0029. Applied Research Laboratories, Inc., 1986—Revised 1991.

<sup>4</sup>—ASTM Annual Book of Standards, Section 11, Water. American Society for Testing and Materials, 1999.

\*\* EPA currently measures “total cyanide” to satisfy cyanide limits and has not yet approved analytical methods for “free cyanide.” Free cyanide is a DEP required analysis, and either of the three listed methods are acceptable for its determination.

NOTE: Metal samples are to be unfiltered and predigested for measurement of the total recoverable (not dissolved) fraction. Samples for dissolved measurement are to be field filtered.

TABLE 2B

**APPROVED EPA ANALYTICAL METHODS AND DETECTION  
LIMITS: ORGANICS**

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
1A 2-CHLOROPHENOL (00095578)	604—GC/FID	0.31
	604—GC/ECD	0.58
	625—GC/MS	3.3
	1625B—GC/MS(isotope)	10
2A 2,4-DICHLOROPHENOL (00120832)	604—GC/FID	0.39
	604—GC/ECD	0.68
	625—GC/MS	2.7
	1625B—GC/MS(isotope)	10
3A 2,4-DIMETHYLPHENOL (00105679)	604—GC/FID	0.32
	604—GC/ECD	0.63
	625—GC/MS	2.7
	1625B—GC/MS(isotope)	10
4A 4,6-DINITRO-o-CRESOL (00534521)	604—GC/FID	16.0
	604—GC/ECD	NA
	625—GC/MS	24
	1625B—GC/MS(isotope)	20
5A 2,4-DINITROPHENOL (00051285)	604—GC/FID	13.0
	604—GC/ECD	NA
	625—GC/MS	42
	1625B—GC/MS(isotope)	50
6A 2-NITROPHENOL (00088755)	604—GC/FID	0.45
	604—GC/ECD	0.77
	625—GC/MS	3.6
	1625B—GC/MS(isotope)	20
7A 4-NITROPHENOL (00100027)	604—GC/FID	2.8
	604—GC/ECD	0.70
	625—GC/MS	2.4
	1625B—GC/MS(isotope)	50
8A p-CHLORO-m-CRESOL (00059507)	604—GC/FID	0.36
	604—GC/ECD	1.8
	625—GC/MS	3.0
	1625B—GC/MS(isotope)	10

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
9A PENTACHLOROPHENOL (00087865)	604—GC/FID	7.4
	604—GC/ECD	0.59
	625—GC/MS	3.6
	1625B—GC/MS(isotope)	50
10A PHENOL (00108952)	604—GC/FID	0.14
	604—GC/ECD	2.2
	625—GC/MS	1.5
	1625B—GC/MS(isotope)	10
11A 2,4,6-TRICHLOROPHENOL (00088062)	604—GC/FID	0.64
	604—GC/ECD	0.58
	625—GC/MS	2.7
	1625B—GC/MS(isotope)	10
1V ACROLEIN <sup>(1)</sup> (00107028)	603—GC/FID	0.7
	624—GC/MS	NA
	1624B—GC/MS(isotope)	50
2V ACRYLONITRILE <sup>(1)</sup> (00107131)	603—GC/FID	0.5
	624—GC/MS	NA
	1624B—GC/MS(isotope)	50
3V BENZENE (00071432)	602—GC/PID	0.20
	624—GC/MS	4.4
	1624B—GC/MS(isotope)	10
5V BROMOFORM (00075252)	601—GC/Hal.	0.20
	624—GC/MS	4.7
	1624B—GC/MS(isotope)	10
6V CARBON TETRACHLORIDE (00056235)	601—GC/Hal.	0.12
	624—GC/MS	2.8
	1624B—GC/MS(isotope)	10
7V CHLOROBENZENE (00108907)	601—GC/Hal.	0.25
	602—GC/PID	0.20
	624—GC/MS	6.0
	1624B—GC/MS(isotope)	10
8V CHLORODIBROMOMETHANE (00124481)	601—GC/Hal.	0.09
	624—GC/MS	3.1
	1624B—GC/MS(isotope)	10

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
9V CHLOROETHANE (00075003)	601—GC/Hal.	0.52
	624—GC/MS	NA
	1624B—GC/MS(isotope)	50
10V 2-CHLOROETHYL VINYL ETHER (00110758)	601—GC/Hal.	0.13
	624—GC/MS	NA
	1624B—GC/MS(isotope)	10
11V CHLOROFORM (00067663)	601—GC/Hal.	0.05
	624—GC/MS	1.6
	1624B—GC/MS(isotope)	10
12V DICHLOROBROMOMETHANE (00075274)	601—GC/Hal.	0.10
	624—GC/MS	2.2
	1624B—GC/MS(isotope)	10
14V 1,1-DICHLOROETHANE (00075343)	601—GC/Hal.	0.07
	624—GC/MS	4.7
	1624B—GC/MS(isotope)	10
15V 1,2-DICHLOROETHANE (00107062)	601—GC/Hal.	0.03
	624—GC/MS	2.8
	1624B—GC/MS(isotope)	10
16V 1,1-DICHLOROETHYLENE (00075354)	601—GC/Hal.	0.13
	624—GC/MS	2.8
	1624B—GC/MS(isotope)	10
17V 1,2-DICHLOROPROPANE (00078875)	601—GC/Hal.	0.04
	624—GC/MS	6.0
	1624B—GC/MS(isotope)	10
18V 1,3-DICHLOROPROPYLENE (00542756) (cis—10061-01-5) (trans—10061-02-6)	601—GC/Hal.	0.34-cis
	624—GC/MS	0.20-trans
	1624B—GC/MS(isotope)	5.0-cis 10-trans
19V ETHYLBENZENE (00100414)	602—GC/PID	0.20
	624—GC/MS	7.2
	1624B—GC/MS(isotope)	10
20V METHYL BROMIDE (00074839)	601—GC/Hal.	1.18
	624—GC/MS	NA
	1624B—GC/MS(isotope)	50

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
21V METHYL CHLORIDE (00074873)	601—GC/Hal.	0.08
	624—GC/MS	NA
	1624B—GC/MS(isotope)	50
22V METHYLENE CHLORIDE (00075092)	601—GC/Hal.	0.25
	624—GC/MS	2.8
	1624B—GC/MS(isotope)	10
23V 1,1,2,2-TETRACHLOROETHANE (00079345)	601—GC/Hal.	0.03
	624—GC/MS	6.9
	1624B—GC/MS(isotope)	10
24V TETRACHLOROETHYLENE (00127184)	601—GC/Hal.	0.03
	624—GC/MS	4.1
	1624B—GC/MS(isotope)	10
25V TOLUENE (00108883)	602—GC/PID	0.20
	624—GC/MS	6.0
	1624B—GC/MS(isotope)	10
26V 1,2-trans-DICHLOROETHYLENE (00156605)	601—GC/Hal.	0.10
	624—GC/MS	1.6
	1624B—GC/MS(isotope)	10
27V 1,1,1-TRICHLOROETHANE (00071556)	601—GC/Hal.	0.03
	624—GC/MS	3.8
	1624B—GC/MS(isotope)	10
28V 1,1,2-TRICHLOROETHANE (00079005)	601—GC/Hal.	0.02
	624—GC/MS	5.0
	1624B—GC/MS(isotope)	10
29V TRICHLOROETHYLENE (00079016)	601—GC/Hal.	0.12
	624—GC/MS	1.9
	1624B—GC/MS(isotope)	10
31V VINYL CHLORIDE (00075014)	601—GC/Hal	0.18
	624—GC/MS	NA
	1624B—GC/MS(isotope)	10
1B ACENAPHTHENE (00083329)	610—GC/FID	NA
	610—HPLC	1.8
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
2B ACENAPHTHYLENE (00208968)	610—GC/FID	NA
	610—HPLC	2.3
	625—GC/MS	3.5
	1625B—GC/MS(isotope)	10
3B ANTHRACENE (00120127)	610—GC/FID	NA
	610—HPLC	0.66
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
4B BENZIDINE <sup>(2)</sup> (00092875)	625—GC/MS	44
	1625B—GC/MS(isotope)	50
5B BENZO(a)ANTHRACENE (00056553)	610—GC/FID	NA
	610—HPLC	0.013
	625—GC/MS	7.8
	1625B—GC/MS(isotope)	10
6B BENZO(a)PYRENE (00050328)	610—GC/FID	NA
	610—HPLC	0.023
	625—GC/MS	2.5
	1625B—GC/MS(isotope)	10
7B 3,4-BENZOFLUORANTHENE (00205992)	610—GC/FID	NA
	610—HPLC	0.018
	625—GC/MS	4.8
	1625B—GC/MS(isotope)	10
8B BENZO(ghi)PERYLENE (00191242)	610—GC/FID	NA
	610—HPLC	0.076
	625—GC/MS	4.1
	1625B—GC/MS(isotope)	20
9B BENZO(k)FLUORANTHENE (00207089)	610—GC/FID	NA
	625—GC/MS	0.017
	1625B—GC/MS(isotope)	2.5
		10
10B BIS(2-CHLOROETHOXY) METHANE (00111911)	611—GC/Hal.	0.5
	625—GC/MS	5.3
	1625B—GC/MS(isotope)	10

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
11B BIS(2-CHLOROETHYL) ETHER (00111444)	611—GC/Hal.	0.3
	625—GC/MS	5.7
	1625B—GC/MS(isotope)	10
12B BIS(2-CHLOROISOPROPYL) ETHER (39638329)	611—GC/Hal.	0.8
	625—GC/MS	5.7
	1625B—GC/MS(isotope)	10
13B BIS(2-ETHYLHEXYL) PHTHALATE (00117817)	606—GC/ECD	2.0
	625—GC/MS	2.5
	1625B—GC/MS(isotope)	10
14B 4-BROMOPHENYL PHENYL ETHER (00101553)	611—GC/Hal.	2.3
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
15B BUTYLBENZYL PHTHALATE (00085687)	606—GC/ECD	0.34
	625—GC/MS	2.5
	1625B—GC/MS(isotope)	10
16B 2-CHLORONAPHTHALENE (00091587)	612—GC/ECD	0.94
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
17B 4-CHLOROPHENYL PHENYL ETHER (07005723)	611—GC/Hal.	3.9
	625—GC/MS	4.2
	1625B—GC/MS(isotope)	10
18B CHRYSENE (00218019)	610—GC/FID	NA
	610—HPLC	0.15
	625—GC/MS	2.5
	1625B—GC/MS(isotope)	10
19B DIBENZO(a,h) ANTHRACENE (00053703)	610—GC/FID	NA
	610—HPLC	0.030
	625—GC/MS	2.5
	1625B—GC/MS(isotope)	20
20B 1,2-DICHLOROBENZENE (00095501)	601—GC/Hal.	0.15
	602—GC/PID	0.40
	624—GC/MS	NA
	1625B—GC/MS(isotope)	10

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
21B 1,3-DICHLOROBENZENE (00541731)	601—GC/Hal.	0.32
	602—GC/PID	0.40
	624—GC/MS	NA
	1625B—GC/MS(isotope)	10
22B 1,4-DICHLOROBENZENE (00106467)	601—GC/Hal.	0.24
	602—GC/PID	0.30
	624—GC/MS	NA
	1625B—GC/MS(isotope)	10
23B 3,3'-DICHLOROBENZIDINE <sup>(2)</sup> (00091941)	605—HPLC	0.13
	625—GC/MS	16.5
	1625B—GC/MS(isotope)	50
24B DIETHYL PHTHALATE (00084662)	606—GC/ECD	0.49
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
25B DIMETHYL PHTHALATE (00131113)	606—GC/ECD	0.29
	625—GC/MS	1.6
	1625B—GC/MS(isotope)	10
26B DI-N-BUTYL PHTHALATE (00084742)	606—GC/ECD	0.36
	625—GC/MS	2.5
	1625B—GC/MS(isotope)	10
27B 2,4-DINITROTOLUENE (00121142)	609—GC/ECD	0.02
	625—GC/MS	5.7
	1625B—GC/MS(isotope)	10
28B 2,6-DINITROTOLUENE (00606202)	609—GC/ECD	0.01
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
29B DI-N-OCTYL PHTHALATE (00117840)	606—GC/ECD	3.0
	625—GC/MS	2.5
	1625B—GC/MS(isotope)	10
30B 1,2-DIPHENYLHYDRAZINE (00122667)	625—GC/MS	10
	1625B—GC/MS(isotope)	20
31B FLUORANTHENE (00206440)	610—GC/FID	NA
	610—HPLC	0.21
	625—GC/MS	2.2
	1625B—GC/MS(isotope)	10

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
32B FLUORENE (00086737)	610—GC/FID	NA
	610—HPLC	0.21
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
33B HEXACHLOROBENZENE (00118741)	612—GC/ECD	0.05
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
34B HEXACHLOROBUTADIENE (00087683)	612—GC/ECD	0.34
	625—GC/MS	0.9
	1625B—GC/MS(isotope)	10
35B HEXACHLOROCYCLOPENTA- DIENE <sup>(3)</sup> (00077474)	612—GC/ECD	0.40
	625—GC/MS	NA
	1625B—GC/MS(isotope)	10
36B HEXACHLOROETHANE (00067721)	612—GC/ECD	0.03
	625—GC/MS	1.6
	1625B—GC/MS(isotope)	10
37B INDENO(1,2,3-cd)PYRENE (00193395)	610—GC/FID	NA
	610—HPLC	0.043
	625—GC/MS	3.7
	1625B—GC/MS(isotope)	20
38B ISOPHORONE (00078591)	609—GC/FID	5.7
	609—GC/ECD	15.7
	625—GC/MS	2.2
	1625B—GC/MS(isotope)	10
39B NAPHTHALENE (00091203)	610—GC/FID	NA
	610—HPLC	1.8
	625—GC/MS	1.6
	1625B—GC/MS(isotope)	10
40B NITROBENZENE (00098953)	609—GC/FID	3.6
	609—GC/ECD	13.7
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
41B N-NITROSODIMETHYLAMINE <sup>(4)</sup> (00062759)	607—GC/N-PD	0.15
	625—GC/MS	NA
	1625B—GC/MS(isotope)	50

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
42B N-NITROSODI-N-PROPYLAMINE (00621647)	607—GC/ECD	0.46
	625—GC/MS	NA
	1625B—GC/MS(isotope)	20
43B N-NITROSODI-PHENYLAMINE <sup>(4)</sup> (00086306)	607—GC/N-PD	0.81
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	20
44B PHENANTHRENE (00085018)	610—GC/FID	NA
	610—HPLC	0.64
	625—GC/MS	5.4
	1625B—GC/MS(isotope)	10
45B PYRENE (00129000)	610—GC/FID	NA
	610—HPLC	0.27
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
46B 1,2,4-TRICHLORO-BENZENE (00120821)	612—GC/ECD	0.05
	625—GC/MS	1.9
	1625B—GC/MS(isotope)	10
1P ALDRIN (00309002)	608 - GC/ECD	0.004
	625 - GC/MS	1.9
2P alpha-BHC <sup>(5)</sup> (00319846)	608 - GC/ECD	0.003
	625 - GC/MS	NA
3P beta-BHC (00319857)	608 - GC/ECD	0.006
	625 - GC/MS	4.2
4P gamma-BHC <sup>(5)</sup> (LINDANE) (00058899)	608 - GC/ECD	0.004
	625 - GC/MS	NA
5P delta-BHC (00319868)	608 - GC/ECD	0.009
	625 - GC/MS	3.1

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
6P CHLORDANE (00057749)	608 - GC/ECD 625 - GC/MS	0.014 NA
7P 4,4'-DDT (00050293)	608 - GC/ECD 625 - GC/MS	0.012 4.7
8P 4,4'-DDE (00072559)	608 - GC/ECD 625 - GC/MS	0.004 5.6
9P 4,4'-DDD (00072548)	608 - GC/ECD 625 - GC/MS	0.011 2.8
10P DIELDRIN (00060571)	608 - GC/ECD 625 - GC/MS	0.002 2.5
11P alpha-ENDOSULFAN <sup>(5)</sup> (00095988)	608 - GC/ECD 625 - GC/MS	0.014 NA
12P beta-ENDOSULFAN <sup>(5)</sup> (33212659)	608 - GC/ECD 625 - GC/MS	0.004 NA
13P ENDOSULFAN SULFATE (01031078)	608 - GC/ECD 625 - GC/MS	0.066 5.6
14P ENDRIN <sup>(5)</sup> (00072208)	608 - GC/ECD 625 - GC/MS	0.006 NA
15P ENDRIN ALDEHYDE (07421934)	608 - GC/ECD 625 - GC/MS	0.023 NA

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
16P HEPTACHLOR (00076448)	608 - GC/ECD 625 - GC/MS	0.003 1.9
17P HEPTACHLOR EPOXIDE (01024573)	608 - GC/ECD 625 - GC/MS	0.083 2.2
18P PCB-1242 (53469219)	608 - GC/ECD 625 - GC/MS	0.065 NA
19P PCB-1254 (11097691)	608 - GC/ECD 625 - GC/MS	NA 36
20P PCB-1221 (11104282)	608 - GC/ECD 625 - GC/MS	NA 30
21P PCB-1232 (11141165)	608 - GC/ECD 625 - GC/MS	NA NA
22P PCB-1248 (12672296)	608 - GC/ECD 625 - GC/MS	NA NA
23P PCB-1260 (11096825)	608 - GC/ECD 625 - GC/MS	NA NA
24P PCB-1016 (12674112)	608 - GC/ECD 625 - GC/MS	NA NA
25P TOXAPHENE (08001352)	608 - GC/ECD 625 - GC/MS	0.24 NA

Parameter (CAS)	Method Number (Description) *Source	Detection Limit (MDL) (µ/l)
PP 2,3,7,8-TCDD (01746016)	613 - GC/MS	0.002

NA = Not available.

(1)—If acrolein and/or acrylonitrile is expected, use method 603 as screening method.

(2)—EPA says “When Benzidine is known to be present, screen with EPA 605.” However, because HPLC is a generally unavailable procedure at this time, GC-MS enhanced to achieve a detection level more sensitive than the EPA’s MDL can be used. Permit monitoring requirements for these two chemicals can also be set using EPA 625 as an acceptable analytical procedure.

(3)—When Hexachlorocyclopentadiene is known to be present, screen with EPA 612.

(4)—When N-Nitrosodimethylamine and/or N-Nitrosodiphenylamine are known to be present, screen with EPA 607.

(5)—When alpha-BHC, gamma-BHC (Lindane) alpha-Endosulfan (I), beta-Endosulfan (II) and/or Endrin are known to be present, screen with EPA 608.

TABLE 3

**DESCRIPTION OF EPA METHODS FOR THE  
ANALYSIS OF PRIORITY POLLUTANT ORGANICS**

EPA Method Number	Description of Method	Types of Compounds Analyzed
601	Gas chromatography (GC) using purge and trap system with halide specific detector (HAL).	29 Purgeable Halocarbons (Volatile fraction)
602	Gas chromatography using purge and trap system photorization detector (PED).	Purgeable aromatics (4 Volatiles 3 base/neutrals)
603	Gas chromatography using purge and trap system with flame ionization detector (FID).	Acrolein Acrylonitrile
604	Gas chromatography preceded by extraction, using a flame ionization detector.	Acid extractable fraction (10 phenols)
605	High performance liquid chromatography (HPLC) preceded by acid-back extraction with electrochemical detector.	Benzidine 3,3'-Dichlorobenzidine
606	Gas chromatography preceded by extraction using a flame ionizator or electron capture detector (ECD).	6 Phthalate esters
607	Gas chromatography preceded by extraction using a nitrogenphosphorous detector.	N-Nitrosodimethylamine N-Nitrosodi-n-propylamine N-Nitrosodiphenylamine
608	Gas chromatography preceded by extraction and measured with a electron capture detector.	Pesticide fraction, including PCBs (25 cmpds)
609	Gas chromatography preceded by extraction using a flame ionization or electron capture detector.	2,4-Dinitrotoluene 2,6-Dinitrotoluene Isophorone Nitrobenzene
610	Extraction followed by separation by a) gas chromatography with flame ionization detector, or b) high performance liquid chromatography with ultraviolet (UV) or fluorescence detector.	16 Polynuclear aromatic hydrocarbons
611	Gas chromatography preceded by extraction using a halide specific detector.	5 Haloethers
612	Gas chromatography preceded by extraction using an electron capture detector.	9 chlorinated hydrocarbons

EPA Method Number	Description of Method	Types of Compounds Analyzed
613	Gas chromatography preceded by extraction and measured with a mass spectrometer (MS)	2,3,7,8-TCDD
624	Gas chromatography, using purge and trap system, detected with a mass spectrometer.	Purgeable (volatile) fraction
625	Gas chromatography, preceded by separation via acid and basic extraction, detected with a mass spectrometer.	Acid and base/neutral fractions
1624	Volatile organic compounds by isotope dilution GC/MS.	Purgeable (volatile) fraction
1625B	Semivolatile organic compounds by isotope dilution GC/MS.	Acid and base/neutral fractions

#### Source

The provisions of this Appendix A adopted March 10, 1989, effective March 11, 1989, 19 Pa.B. 1059; corrected April 7, 1989, effective March 11, 1989, 19 Pa.B. 1575; amended August 31, 1990, effective September 1, 1990, 20 Pa.B. 4628; amended December 21, 1990, effective December 22, 1990, 20 Pa.B. 6299; amended January 18, 1991, effective January 19, 1991, 21 Pa.B. 234; amended April 9, 1993, effective April 10, 1993, 23 Pa.B. 1727; amended October 15, 1993, effective October 16, 1993, 23 Pa.B. 4906; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5067; amended November 17, 2000, effective November 18, 2000, 30 Pa.B. 6111; amended May 15, 2009, effective May 16, 2009, 39 Pa.B. 2543. Immediately preceding text appears at serial pages (309673) to (309674), (271885) to (271888), (309675) to (309694), and (309813) to (309814).

#### Cross References

This appendix cited in 25 Pa. Code § 16.41 (relating to changes and additions); 25 Pa. Code § 16.51 (relating to table); and 25 Pa. Code § 16.102 (relating to approved EPA analytical methods and detection limits).

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