**FOOTNOTES KEY**

**The footnotes provided in this key have been identified and notated to correspond to the individual sections contained within Attachment J, TECHNICAL SPECIFICATIONS FOR ANALYTICAL SERVICES.**

**III. PROTOCOL ANALYTE LISTS**

**SW-846 PROTOCOLS**

**TOTAL METALS – Group A,** RCRA Metals

**1** In order to achieve detection limits below the required reporting limit and MCL, Method 6010 will not be allowed for these analytes in aqueous samples unless the instrument is modified for trace analysis (e.g., with axially oriented torch).

**2** Method 7010 is found in SW-846 Update IVA, which appeared as a NODA in the *Federal Register* on May 8, 1998 (63 *FR* 25430). It incorporates graphite furnace atomic absorption (GFAA) analysis for all non-derivatized metals into one method. It replaces Methods 7041, 7060, 7131, 7191, 7740, etc.

**3** If Method 6020 is proposed for mercury analysis, Method Detection Limit studies must be submitted that demonstrate required reporting limits can be achieved in matrix(es) proposed.

**TOTAL METALS – Group B,** Additional CERCLA Metals and non-RCRA Metals with Primary MCLs

**1** In order to achieve detection limits below the required reporting limit and MCL, Method 6010 will not be allowed for these analytes in aqueous samples unless the instrument is modified for trace analysis (e.g., with axially oriented torch).

**2** Method 7010 is found in SW-846 Update IVA, which appeared as a NODA in the *Federal Register* on May 8, 1998 (63 *FR* 25430). It incorporates graphite furnace atomic absorption (GFAA) analysis for all non-derivatized metals into one method. It replaces Methods 7041, 7060, 7131, 7191, 7740, etc.

**TOTAL METALS – Group C,** Indicator and Water Quality Metals

**4** Method 7010 is found in SW-846 which appeared as a NODA in the *Federal Register* on May 8, 1998 (63 *FR* 25430). It incorporates graphite furnace atomic absorption (GFAA) analysis for all non-derivatized into one method. It replaces Methods 7041, 7060, 7131, 7191, 7740 etc.

**TOTAL METALS - Group D,** Hexavalent Chromium

**5** EPA Office of Water Method 218.6 is also acceptable for hexavalent chromium analysis. If aqueous samples are filtered and preserved with ammonium sulfate buffer solution, holding time for hexavalent chromium is increased from 24 hours to 28 days. See footnote 20 in 40 CFR 136.3, Table II and EPA Office of Water Method 218.6, Sections 2.1, 7.9, and 8.42. The allowance in this footnote supersedes preservation and holding time requirements in the approved hexavalent chromium methods, unless this supersession would compromise the measurement, in which case requirements in this method must be followed.

**6** SW-846 Method 3060 (alkaline digestion) is required for digestion for soils, sediments, sludges, and solid wastes that will be analyzed for hexavalent chromium. The State will not pay for hexavalent chromium analyses if acid digestions are performed.

**TOTAL METALS - Group E,** Metals, Other

This group has no applicable footnotes.

**GENERAL CHEMISTRY – Group A,** Cyanide and Sulfide

**7** Determination of **free cyanide** is for Risk Integrated System of Closure (**RISC**)/Remediation Closure Guide (**RCG**).

**GENERAL CHEMISTRY – Group B,** Solid Waste Standard List

**GENERAL CHEMISTRY – Group C,** Additional Ground Water Indicator Parameters

**GENERAL CHEMISTRY – Group D,** Non-Specific Organic Determinations

**GENERAL CHEMISTRY – Groups E-1 and E-2,** Feedlot Runoff and Manure Spill Characterization

8 This Method appears in the EPA Clean Water Act (CWA, 40 CFR 136) Analytical Methods, currently available at: <https://www.epa.gov/cwa-methods>, and/or the EPA Drinking Water Analytical Methods, currently available at: <https://www.epa.gov/dwanalyticalmethods>.

9 This Method appears in *Standard Methods for the Examination of Water and Wastewater,* 20th edition, 1998 – or more recent edition. Information currently available at: <https://www.standardmethods.org>.

**GENERAL CHEMISTRY – Group F,** General Chemistry – Other/Miscellaneous: Physical Testing

8 This Method appears in the EPA Clean Water Act (CWA, 40 CFR 136) Analytical Methods, currently available at: <https://www.epa.gov/cwa-methods>, and/or the EPA Drinking Water Analytical Methods, currently available at: <https://www.epa.gov/dwanalyticalmethods>.

**VOA – Group A,** OLQ Standard Volatiles List

10 The 8260 methodis preferred for SW-846 Protocol VOA Group A, the full OLQ Standard Volatiles List.

**11** Reporting limits that are bolded are important in order to meet or come as close as possible to RISC/RCG levels.

**VOA – Group B,** BTEX, MTBE

12 The 8260 methodis preferred for SW-846 Protocol VOA Group B, the BTEX and MTBE Volatiles List.

**VOA – Group C,** Antifreeze/Coolant

13 The 8015 methodis preferred for SW-846 Protocol VOA Group C, the Antifreeze/Coolant Volatiles List.

**SVOA – Group A,** OLQ Standard Semi-volatiles List

14 The 8270 is preferred for SW-846 Protocol SVOA Group A, the full OLQ Standard Semi-Volatiles List.

**15** The 8270 aqueous detection limits do not meet RISC/RCG levels. The soil detection limit for some do not meet the RISC/RCG level. These PAH analytes should be analyzed by Method 8270SIM or 8310 if they are COCs for the affected matrix(es) at sites pursuing RISC/RCG levels. (See SVOA – Group C.)

**16** The 8270 soil detection limits do not meet RISC/RCG levels. The aqueous detection limits do not meet RISC/RCG levels, and the aqueous limit for bis(2-chloroethyl)ether also does not meet the RISC/RCG levels. These haloether analytes should be analyzed by alternate methods if they are COCs at sites pursuing RISC/RCG levels. Method 8410 is recommended for soils 8111 for water.

**17** The 8270 aqueous detection limits do not meet the RISC /RCG levels. This phthalate ester analyte should be analyzed by Method 8061A if it is a ground water COC at a site pursuing RISC/RCG levels.

18The 8270 aqueous and soil detection limits do not meet RISC/RCG levels. This analyte should be analyzed by an alternate method if it is a COC at a site pursuing RISC/RCG levels. Method 8325 is recommended for water and EPA Method 1625C for soils.

19The 8270 aqueous and soil detection limits do not meet RISC/RCG levels. These nitroaromatic compounds should be analyzed by other methods if they are COCs at sites pursuing RISC/RCG levels. Method 8410 is recommended for soils and 8330 for water.

20The 8270 aqueous detection limits for both compounds do not meet RISC/RCG levels, and the aqueous limit for hexachlorobenzene does not meet the RISC/RCG levels. Hexachloro-1,3-butadiene should be analyzed by Method 8121 if it is a ground water COC at a site pursuing RISC/RCG levels. If hexachlorobenzene is a ground water COC at site pursuing RISC/RCG levels, it should be analyzed by Method 8121, or by Method 8081B (See SVOA – Group C.)

21 The 8270 aqueous and soil detection limits do not meet RISC/RCG levels. These nitroaromatic compounds should be analyzed by other methods if they are COCs at sites pursuing RISC/RCG levels. Method 8410 is recommended for soils and Method 8330 is recommended for water. Nitrobenzene in soil at industrial sites may also be analyzed by Method 8330.

22 The 8270 aqueous and soil detection limits do not meet RISC/RCG levels. This compound should be analyzed by another method if a COC at sites pursuing RISC/RCG levels. Method 8410 is recommended for soils, and Method 8070A is recommended for water.

23 The 8270 aqueous and soil detection limits do not meet RISC/RCG levels. This chlorinated herbicide should be analyzed by Method 8151A if a ground water COC, and by Method 8151A or Method 8410 if a soil COC, at sites pursuing RISC/RCG levels.

**SVOA – Group B,** Polychlorinated Biphenyl Compounds (PCBs) as Aroclors

This group has no applicable footnotes.

**SVOA – Group C,** Polynuclear Aromatic Hydrocarbons by HPLC (Meets RISC/RCG Levels

24 Reporting limits that are bolded are lower than the standard SW-846 Method 8310 Practical Quantitation Limits (PQLs) for those analytes. They are either the Method 8310 MDL, or the MDL times a factor less than the standard SW-846 matrix factor (10 for ground water and 670 for low level soils). The bolded reporting limits are necessary for samples from sites pursuing RISC/RCG levels.

25 **T**he Method 8310 detection limits for naphthalenes do not meet RISC/RCG values. If naphthalenes are chemicals of concern (COC) at a site pursuing residential closure, they must be analyzed by Method 8270SIM or 8260.

**SVOA – Group D,** Organochlorine Pesticides by GC/ECD (Meets RISC/RCG Levels)

26 Reporting limits that are bolded are lower than the standard SW-846 Method 8081 Estimated Quantitation Limits (EQLs) for those analytes. They are either the Method 8081 (09/94) MDL, or the MDL times a factor less than the standard SW-846 matrix factor (10 for ground water and 670 for low level soils). The bolded reporting limits are necessary for samples from sites pursuing RISC/RCG levels.

**Petroleum – Group A,**

Total Petroleum Hydrocarbons (TPH) or Total Recoverable Petroleum Hydrocarbons (TRPH) by GC/FID

**27** The Method 8015 provides instructions for quantitation of GRO and DRO total petroleum hydrocarbons.

**Petroleum – Group B,**

Total Recoverable Petroleum Hydrocarbons (TRPH) by Infrared Spectrophotometry (soils and sediments) or Gravimetry (water)

8 This Method appears in the EPA Clean Water Act (CWA, 40 CFR 136) Analytical Methods, currently available at: <https://www.epa.gov/cwa-methods>, and/or the EPA Drinking Water Analytical Methods, currently available at: <https://www.epa.gov/dwanalyticalmethods>.

**RCRA Characteristics – Group A,**

40 CFR 261 Characteristics: Ignitability, Corrosivity, and Reactivity

**28** These methods may not be substituted. RCRA characteristic testing currently does not allow for the use of PBMS.

**29** Per SW-846 Chapter 7, Section 7.3.1 – “The Agency [EPA] relies entirely on a descriptive, prose definition of reactivity because available tests for measuring the variegated class of effects embraced by the reactivity definition suffer from a number of deficiencies.” The reactivity guidance threshold levels and laboratory methods were removed from SW-846 Chapter Seven in Update IIIB. See 40 CFR 261.23 for the regulatory definition of reactivity.

**RCRA Characteristics – Group B,**

40 CFR 261 Characteristic of Toxicity: Toxic Characteristic Leaching Procedure (TCLP): SW-846 Method 1311

**28** These methods may not be substituted. RCRA characteristic testing currently does not allow for the use of PBMS.

30 Method 6010 will not be allowed for these analytes in aqueous samples unless the required reporting limits can be met.

**Additional Analytical Services**

TPH Fractionation and Fraction of Organic Carbon

This group has no applicable footnotes.

**SW-846 SAS Group A,** GENERAL CHEMISTRY – Miscellaneous

**8** This Method appears in the EPA Clean Water Act (CWA, 40 CFR 136) Analytical Methods, currently available at: <https://www.epa.gov/cwa-methods>, and/or the EPA Drinking Water Analytical Methods, currently available at: <https://www.epa.gov/dwanalyticalmethods>.

**9** This Method appears in *Standard Methods for the Examination of Water and Wastewater,* 20th edition, 1998 – or more recent edition. Information currently available at: <https://www.standardmethods.org>.

**SW-846 SAS Group B,** RADIONUCLIDES – Miscellaneous

**8** This Method appears in the EPA Clean Water Act (CWA, 40 CFR 136) Analytical Methods, currently available at: <https://www.epa.gov/cwa-methods>, and/or the EPA Drinking Water Analytical Methods, currently available at: <https://www.epa.gov/dwanalyticalmethods>.

**31** Radionuclides: The reference for Methods 900.0, 901.0, 901.1, 902.0, 903.1, 904.0, 905.0, 906.0, and 908.0 is *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA 600 4-80-032 – August 1980. Alternative methods for these radionuclides may be acceptable but must be approved by IDEM when laboratory analysis scheduled.

**SW-846 SAS – Group C Thru Group H**

These groups have no applicable footnotes.

**SW-846 SAS – Group I**

**8** This Method appears in the EPA Clean Water Act (CWA, 40 CFR 136) Analytical Methods, currently available at: <https://www.epa.gov/cwa-methods>, and/or the EPA Drinking Water Analytical Methods, currently available at: <https://www.epa.gov/dwanalyticalmethods>.

**SW-846 SAS – Group J,** Polychlorinated Biphenyl Compounds (PCBs) as Individual Congeners

**32** When the sample matrix is biosolids and tissue, EPA Method 1668a (EPA 821/R-97-001 1997 or NTIS PB98-149213) may be used.

**SW-846 SAS – Group K,** Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs)

**8** This Method appears in the EPA Clean Water Act (CWA, 40 CFR 136) Analytical Methods, currently available at: <https://www.epa.gov/cwa-methods>, and/or the EPA Drinking Water Analytical Methods, currently available at: <https://www.epa.gov/dwanalyticalmethods>.

**SW-846 SAS Group L thru Group O**

These groups have no applicable footnotes.

**SW-846 SAS – Group P,** Neutral Leaching Method for Industrial Wastes

**33** See 329 IAC 10-9 in Indiana Solid Waste Regulations.

**SW-846 SAS – Group Q,** USACE Modified Elutriate

34 Test procedures are included in the document, “Interim Guidance for Predicting Quality of Effluent Discharged from Confined Dredged Material Disposal Areas--Test Procedures” (June 1985), available from the USACE web site as document number EEDP-04-2 at:. <https://www.govinfo.gov/content/pkg/CZIC-kfn2247-n49-1996/html/CZIC-kfn2247-n49-1996.htm>

**DRINKING WATER PROTOCOLS**

**Drinking Water – Volatiles Group A,** Drinking Water 524.2 VOCs List

**Drinking Water – Semi-volatiles Group A,** Method 525.2 SVOC Extractables List

**Drinking Water – Semi-volatiles Group B,** Aroclors List

**Drinking Water – SAS Group A,** Additional Volatile Organic Compounds (not on 524.2 list)

**Drinking Water SAS Group B,** Method 525.2 Organochlorine Pesticides List

**Drinking Water – SAS Group C,** Method 525.2 Nitrogen/Phosphorus Pesticides List

**Drinking Water – SAS Group D,** Method 525.2 PCB Congeners List

**Drinking Water – SAS Group E,** Semi-volatile Organic Compound Extractables List

**Drinking Water – SAS Group H,** Chlorinated Acid Pesticides and Herbicides

**Drinking Water – SAS Group I,** N-Methylcarbamoyloxime and N-Methyl-Carbamate Pesticides

**Drinking Water – SAS Group J,** Additional Pesticides and Herbicides, Miscellaneous

35 The 524.2 Method, Revision 4.1 is preferred for Drinking Water Protocol VOA Group A.

**36** Reporting limits that are **bolded** are important in order to meet or come as close as possible to RISC/RCG levels.

**37** The 525.2 Method, Revision 4.1 is preferred for Drinking Water Protocol SVOA Group A, SVOA Group B – Aroclors, Special Analytical Services (SAS) Group B Organochloride Pesticides, Special Analytical Services (SAS) Group C Nitrogen/Phosphorous Pesticides, and Special Analytical Services (SAS) Group G Pesticides.

**38** Reporting limits that are **bolded** are important in order to meet or come as close as possible to RISC/RCG levels.

**39** All other Water Method reporting limits that are **bolded** are important in order to meet or come as close as possible to RISC/RCG levels.

**USEPA INDOOR AIR and AMBIENT AIR PROTOCOLS**

**41** The TO-15, TO-15 SIM, TO-17, and TO-17 SIM Methods are preferred for Indoor Air and Ambient Air Protocols. Canister cleanliness certification will be specified at the time of sample setup. Mass flow regulators, connecting tubing, filters, and fittings for canisters should be dedicated and will be specified at the time of sample setup in order to meet the sample duration needed for the objective. Selection of sorbent tubes or sorbent tube mix tailored for a target compound list, data quality objectives and sampling will be identified during sample setup.

**PER- and POLYFLUOROALKYL SUBSTANCES (PFAS) PROTOCOLS**

**50** Lowest Concentration Minimum Reporting Levels (LCMRLs) that are bolded are important in order to meet or come as close as possible to RISC/RCG levels.

51 Unless specified otherwise by a regulatory authority or in a discharge permit, results for analytes that meet the identification criteria are reported down to the concentration of the LOQ established by the laboratory through calibration of the instrument (see the glossary for the derivation of the LOQ).

52 Method 8327 provides no typical RLs in the method. Laboratories RLs must meet the IDEM Risk levels for the project.

**40** USEPA developed and validated EPA Method 533 to target “short chain” PFAS (none greater than C12), including perfluorinated acids, sulfonates, fluorotelemers, and poly/perfluorinated ether carboxylic acids. Many of these could not be analyzed using Method 537.1 due to physicochemical properties. In December 2019, USEPA published Method 533, which includes a total of 25 PFAS (14 of the 18 PFAS in Method 537.1 plus an additional 11 “short chain” PFAS) and specifies isotope dilution quantitation. Method 533 excludes NEtFOSAA, MeFOSAA, PFTA, and PFTrDA which may be analyzed by Method 537.1. Unless otherwise notified by IDEM, the LCMRLs for PFAS compound analysis in drinking water samples must meet the LCMRLs listed in Method 533 or Method 537.1, as applicable.

**8** This Method appears in the EPA Clean Water Act (CWA, 40 CFR 136) Analytical Methods, currently available at: <https://www.epa.gov/cwa-methods>, and/or the EPA Drinking Water Analytical Methods, currently available at: <https://www.epa.gov/dwanalyticalmethods>.

**IV. SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIME REQUIREMENTS – TABLE 1**

**5** EPA Office of Water Method 218.6 is also acceptable for hexavalent chromium analysis. If aqueous samples are filtered and preserved with ammonium sulfate buffer solution, holding time for hexavalent chromium is increased from 24 hours to 28 days. See footnote 20 in 40 CFR 136.3, Table II and EPA Office of Water Method 218.6, Sections 2.1, 7.9, and 8.42. The allowance in this footnote supersedes preservation and holding time requirements in the approved hexavalent chromium methods, unless this supersession would compromise the measurement, in which case requirements in this method must be followed.

42 Reanalysis of out-of-control samples may require that the reanalysis be performed past holding time requirements. It is preferred that samples be analyzed or reanalyzed within holding times. But, if that is not possible for reanalysis to be performed within holding time requirements, reanalysis may still need to be performed to meet analytical requirements. If reanalysis is performed past the holding time, both analysis results must be reported. The acceptance of results analyzed beyond holding time requirements must be predicated on project DQOs and threshold requirements, along with the analyst’s best judgement. Resampling may be necessary in some cases. This reanalysis statement will be applicable to all of the following analytical protocols.

**XII. USEPA SW846 PROTOCOLS ANALYTICAL AND QA/QC REQUIREMENTS**

1. **Inorganic and General Analysis**

These groups have no applicable footnotes.

1. **TCLP**

This group has no applicable footnotes.

**C. Volatile Organic Analysis by Gas Chromatography and Mass Spectrometry**

Initial Calibration

**43** If project DQOs required detection limits lower than 1 part per billion (ppb), it may be necessary to use selective ion monitoring (SIM) techniques or, for aqueous samples, to follow GC/MS Method 524.2 procedures. Another alternative would be to perform analysis by a GC method that does not use MS detection.

**44** Alternatively, rather than reattempting linear calibration, it may be appropriate to use a non-linear calibration model. The non-linear option must be reserved for appropriate circumstances, such as the need to achieve low detection limits. Non-linear calibration may not be used to compensate for detector saturation at higher concentrations or to avoid proper instrument maintenance.

Calibration Verification

**45** RF %D is calculated when the calibration model used is average response factor. If a non-linear regression fit model is used, percent drift is calculated instead. See SW-846 Method 8000B.

**D. Semi-volatile Organic Analysis by Gas Chromatography/Mass Spectrometry**

Initial Calibration

**44** Alternatively, rather than reattempting linear calibration, it may be appropriate to use a non-linear calibration model. The non-linear option must be reserved for appropriate circumstances, such as the need to achieve low detection limits. Non-linear calibration may not be used to compensate for detector saturation at higher concentrations or to avoid proper instrument maintenance.

Calibration Verification

**45** RF %D is calculated when the calibration model used is average response factor. If a non-linear regression fit model is used, percent drift is calculated instead. See SW-846 Method 8000B.

**E. Corrective Action for Organic Analysis by GC/MS (VOCs and SVOCs)**

46The corrective action for internal standards does not require re-extraction of samples affected by out-of-control results. However, reanalysis of the affected sample is required. (See Sections **C.7 and D7.,** **Internal Standards.**)

47 The State’s position on holding times for reanalysis of out-of-control results is that it would be preferred that sample analysis be performed within holding times, but if that is not possible, reanalysis, based on analytical requirements, may still need to be performed for analytical obligations to be considered met. The acceptance of results analyzed beyond holding time requirements will be predicated on DQO and threshold requirements along with analyst's best judgment.

**F. Pesticides and PCBs Analyses by Gas Chromatography/Electron Capture Detector**

Calibration Process (External Standard Procedure)

48 If an internal standard calibration procedure is used (e.g., for PCB congeners) peak responses are tabulated against concentrations rather than mass. A response factor is calculated instead of a calibration factor. See **Section F. 2.** and SW-846 Method 8000B for the RF calculation and linearity determination.

Initial Calibration Control Criteria

49 SW-846 Method 8000B, Section 7.5, (3rd edition Final Update III, December 1996) provides criteria for linear as well as for non-linear calibration models. A linear calibration curve is preferred. In some situations, it may be appropriate to use a non-linear calibration model. The nonlinear option must be reserved for appropriate circumstances, such as the need to achieve low detection limits. Non-linear calibration may not be used to compensate for detector saturation at higher concentrations or to avoid proper instrument maintenance.

**G. Volatile and Semi-volatile Organic Analysis Including Petroleum Hydrocarbons by Gas Chromatography with Method-Specified Detectors (other than MS or ECD) (FID, PID, HECD, etc.)**

Initial Calibration Control Criteria

**49** SW-846 Method 8000B, Section 7.5, (3rd edition Final Update III, December 1996) provides criteria for linear as well as for non-linear calibration models. Linear calibration curves are preferred. At times, it may be appropriate to use a non-linear calibration model. The non-linear option must be reserved for appropriate circumstances, such as the need to achieve low detection limits. Non-linear calibration may not be used to compensate for detector saturation at higher concentrations or to avoid proper instrument maintenance.

**H. Semi-volatile and Non-Volatile Organic Compound Analysis by High Performance Liquid Chromatography**

Initial Calibration

**49** SW-846 Method 8000B, Section 7.5, (3rd edition Final Update III, December 1996) provides criteria for linear as well as for non-linear calibration models. Linear calibration curves are preferred. At times, it may be appropriate to use a non-linear calibration model. The non-linear option must be reserved for appropriate circumstances, such as the need to achieve low detection limits. Non-linear calibration may not be used to compensate for detector saturation at higher concentrations or to avoid proper instrument maintenance.

**XIII. USEPA DRINKING WATER ANALYTICAL AND QA/QC REQUIREMENTS**

This group has no applicable footnotes.

**XIV. USEPA AIR ANALYTICAL AND QA/QC REQUIREMENTS**

This group has no applicable footnotes.

**XV. USEPA PFAS ANALYTICAL AND QA/QC REQUIREMENTS**

This group has no applicable footnotes.