

WASTES

List of Acronyms

SW 6010B	Inductively Coupled Plasma (ICP) (Analytical Method)	ICP-MS	Inductively Coupled Plasma - Mass Spectrometry
SW 6020	Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) (Analytical Method)	MWMP	Meteoritic Water Mobility Procedure
A	Standard Methods	NIOSH	National Institute of Occupational Safety & Health
AOAC	Association of Official Analytical Chemists	PCBs	Polychlorinated Biphenyls
ASTM	American Society for Testing & Materials	RCRA	Resource Conservation Recovery Act
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes	SW	Solid Waste 846
DRO	Diesel Range Organics	SPLP	Synthetic Precipitation Leaching Procedure
E or EPA	US Environmental Protection Agency	TCLP	Toxicity Characteristic Leaching Procedure
FLAA	Flame Atomic Absorption	TPH	Total Petroleum Hydrocarbons
GFAA	Graphite Furnace Atomic Absorption	TPH-IR	Total Petroleum Hydrocarbons - Infrared Spectroscopy
GRO	Gasoline Range Organics	VOCs	Volatile Organic Chemicals
ICP	Inductively Coupled Plasma		

The analytical methods listed above are typically referenced for liquid and solid waste regulations.

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1. **RESOURCE CONSERVATION RECOVERY ACT (RCRA) CHARACTERISTICS - IGNITABILITY, CORROSIVITY, REACTIVITY, AND TOXICITY.**

PARAMETER	METHOD	REGULATORY LIMIT, mg/L	REPORTING LIMIT, mg/L
IGNITABILITY , flashpoint			
	SW 1010	>140 ° F	° F
CORROSIVITY , pH of solids or liquids			
	SW 9045D/ SW 9040C	pH 2 to 12.5	0.01 std. units
REACTIVITY , reactive cyanide and sulfide			
Reactive Cyanide	SW Sec. 7.3.3.2	250 mg/Kg	0.05 mg/Kg
Reactive Sulfide	SW Sec. 7.3.4.2	500 mg/Kg	20 mg/Kg
TOXICITY - Toxicity Characteristic Leaching Procedure (TCLP)			
TCLP Extractions - Prior to analysis			
TCLP Metals Digestion as Totals for water	SW 3010		
TCLP Metals Digestion as Totals for oil matrix	SW 3050 / SW 7471 (Hg)		
TCLP extraction for metals, base neutrals, acid extractables, pesticides and herbicides.	SW 1311		
TCLP zero headspace extraction for volatiles	SW 1311		
TCLP METALS		CAS No.	
Arsenic	7440-38-2	SW 7062/ SW 6010B	5.0
Barium	7440-39-3	SW 6010B	100
Cadmium	7440-43-9	SW 6010B	1.0
Chromium	7440-47-3	SW6010B	5.0
Lead	7439-92-1	SW 6010B	5.0
Mercury	7439-97-6	SW 7470A/ SW 6010B	0.2
Selenium	7782-49-2	SW 7742/ SW 6010B	1.0
Silver	7440-22-4	SW 6010B	5.0

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1. **RESOURCE CONSERVATION RECOVERY ACT (RCRA) CHARACTERISTICS - IGNITABILITY, CORROSIVITY, REACTIVITY, AND TOXICITY (continued)**

PARAMETER	CAS No.	METHOD	REGULATORY LIMIT, mg/L	REPORTING LIMIT, mg/L
Analysis of TCLP extracts continued				
TCLP BASE NEUTRALS		SW 8270C		
2,4-Dinitrotoluene	121-14-2		0.13	0.05
Hexachloro-1,3-Butadiene	87-68-3		0.5	0.05
Hexachlorobenzene	118-74-1		0.13	0.05
Hexachloroethane	67-72-1		3.0	0.05
Nitrobenzene	98-95-3		2.0	0.05
Pyridine	110-86-1		5.0	0.1
TCLP ACID EXTRACTABLES		SW 8270C		
Cresols (m,p,o)	108-39-4, 106-44-5, 95-48-7		200	0.15
Pentachlorophenol	87-86-5		100	0.25
2,4,5-Trichlorophenol	95-95-4		400	0.05
2,4,6-Trichlorophenol	88-06-2		2.0	0.05
TCLP PESTICIDES		SW 8081A		
Chlordane	57-74-9		0.03	0.005
Heptachlor(+hydroxide)	76-44-8		0.008	0.0005
Endrin	72-20-8		0.02	0.0010
Lindane	58-89-9		0.4	0.0005
Methoxychlor	72-43-5		10	0.005
Toxaphene	8001-35-2		0.5	0.05
TCLP HERBICIDES		SW 8151A		
2,4-D	94-75-7		10	0.01
2,4,5-TP(Silvex)	93-72-1		1	0.01

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1. RESOURCE CONSERVATION RECOVERY ACT (RCRA) CHARACTERISTICS - IGNITABILITY, CORROSIVITY, REACTIVITY, AND TOXICITY (continued)

PARAMETER	CAS No.	METHOD	REGULATORY LIMIT, mg/L	REPORTING LIMIT, mg/L
Analysis of TCLP extracts continued				
TCLP VOLATILES		SW 8260B	-	-
Benzene	71-43-2		0.5	0.01
Carbon Tetrachloride	56-23-5		0.5	0.01
Chlorobenzene	108-90-7		100	0.01
Chloroform	67-66-3		6	0.01
1,4-Dichlorobenzene	106-46-7		7.5	0.01
1,2-Dichloroethane	107-06-2		0.5	0.01
1,1-Dichloroethylene	75-35-4		0.7	0.01
Methyl Ethyl Ketone	78-93-3		200	0.25
Tetrachloroethylene	127-18-4		0.7	0.01
Trichloroethylene	79-01-6		0.5	0.01
Vinyl Chloride	75-01-4		0.2	0.01
Benzene only in TCLP extract	71-43-2	SW 8260B	0.5	0.01

2. USED OIL ANALYSIS

PARAMETER	CAS No.	METHOD	REGULATORY LIMIT, mg/Kg	REPORTING LIMIT, mg/Kg
Arsenic	7440-38-2	SW 7062/SW 6010B	5	1
Cadmium	7440-43-9	SW 6010B	2	0.5
Chromium	7440-47-3	SW 6010B	10	0.5
Lead	7439-92-1	SW 6010B	100	5
Metals Digestion	-	SW 3050	-	-
Total Halogens	-	ASTM D808	1000*	200
Flashpoint	-	SW 1010	100°F min.	-

NOTE: Total Halogens of 4000 mg/Kg is acceptable if it can be proven that the oil was not mixed with a hazardous waste.

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3. HYDROCARBONS AND HYDROCARBON CONTAMINATED MATERIALS

PARAMETER	METHOD
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	E602/SW 8021B/SW 8260B
Gasoline Range Organics (GRO)	SW 8015B
BTEX and GRO together	E602/SW 8021B + SW 8015B (GRO)
Purgeable Organics (VOCs)	SW 8260B
Hydrocarbons in headspace gas	GC/FID
Diesel Range Organics (DRO)	SW 8015B
Extractable Petroleum Hydrocarbons (EPH) Screen	MT DEQ MA EPH
Extractable Petroleum Hydrocarbons (EPH) (after screening option without PAHs – if required)	MT DEQ MA EPH
Extractable Petroleum Hydrocarbons (EPH) (after screening option with PAHs-if required)	MT DEQ MA EPH
Volatile Petroleum Hydrocarbons (VPH)	MT DEQ MA VPH
Carbon Scan with DRO (product identification – fingerprinting)	GC/FID
Total Petroleum Hydrocarbons	TCEQ 1005
Total Petroleum Hydrocarbons by Infrared Spectroscopy (TPH-IR)	E418.1
Oil and Grease, gravimetric	1664
Oil and Grease, infrared spectroscopy	E413.2
TPH by Soxhlet Extraction	SW 9071

4. ICP SCAN

Aluminum	Calcium	Lead	Phosphorus	Strontium
Barium	Chromium	Magnesium	Potassium	Thallium
Beryllium	Cobalt	Manganese	Silicon	Titanium
Boron	Copper	Molybdenum	Silver	Vanadium
Cadmium	Iron	Nickel	Sodium	Zinc
Notes: The elements are analyzed by ICP to 50 mg/Kg (solids) reporting limit. Other elements available on request.				

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5. METALS – ANALYSIS BY SW 6000 SERIES METHODS, MERCURY METHOD SW 7471

METAL	REPORTING LIMIT, mg/Kg
Total Metals Digestion (Method SW 3050)	
Total Metals Digestion, Mercury (Method SW 7471)	
Aluminum	5
Antimony	1
Antimony, Low Level	0.02
Arsenic	1
Arsenic, Low Level	0.2
Barium	1
Barium, Low Level	0.05
Beryllium	1
Beryllium, Low Level	0.05
Bismuth	1
Boron	1
Boron, Low Level	0.1
Cadmium	1
Cadmium, Low Level	0.05
Calcium	5
Calcium, Low Level	1
Chromium	1
Chromium, Low Level	0.1
Cobalt	1
Cobalt, Low Level	0.05
Copper	1
Copper, Low Level	0.5
Gallium	1
Iron	0.6
Lead	1
Lead, Low Level	0.05
Lithium	1
Lithium, Low Level	0.1
Magnesium	5
Magnesium, Low Level	1
Manganese	1
Manganese, Low Level	0.05
Mercury	1
Mercury, SW7473	0.1
Molybdenum	1
Molybdenum, Low Level	0.05
Nickel	1
Nickel, Low Level	0.5
Phosphorus	5
Phosphorus, Low Level	0.5
Potassium	5
Selenium	1
Selenium, Low Level	0.2
Silicon	5
Silver	1
Silver, Low Level	0.05
Sodium	5
Strontium	0.05

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5. METALS – ANALYSIS BY SW 6000 SERIES METHODS, MERCURY METHOD SW 7471, continued

METALS, CONTINUED	REPORTING LIMIT, mg/Kg
Strontium, Low Level	0.05
Thallium	1
Thallium, Low Level	0.05
Tin	1
Tin, Low Level	0.5
Titanium	1
Titanium, Low Level	0.05
Vanadium	1
Vanadium, Low Level	0.1
Zinc	1
Zinc, Low Level	0.5

6. 503 ANALYSIS – TEST GROUP PARAMETERS FOR SOLID WASTE/SLURRY ANALYSIS OF WASTEWATER SYSTEM SOLIDS AS PRESCRIBED BY 40CFR PART 503

PARAMETER	METHOD	DETECTION LIMIT, mg/Kg
Arsenic	SW 6010B	1
Cadmium	SW 6010B	1
Chromium	SW 6010B	1
Copper	SW 6010B	1
Lead	SW 6010B	1
Nickel	SW 6010B	1
Mercury	SW 7471	1
Molybdenum	SW 6010B	1
Selenium	SW 6010B	1
Zinc	SW 6010B	1
Total Metals Digestion	SW 3050 and SW 7471	N/A
OTHER ANALYSIS		
Ammonia as Nitrogen	ASA Monograph No. 9, Method 33-7.3.3	1
Fecal Coliform Bacteria, dry	A 9222D	100 cfu/g
... or Fecal Coliform Bacteria, dry	A 9221E	1 MPN/g
Nitrate plus Nitrite as Nitrogen	ASA Monograph No. 9, Method 33-8.1	1
Percent Solids	Loss @ 105°C	0.1 wt %
Total Kjeldahl Nitrogen	ASA Monograph No. 9, Method 31-3	1
NOTE: Reported detection limit is dependent on the % solids of the sample.		

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7. OTHER ANALYSIS OF WASTES

PARAMETER	METHOD
Digestion for Total Metals	SW 3005A/SW 3010B/SW 3015/SW 3020A/ SW 3050B/SW 3051A/SW 7471
Water or Weak Acid Extraction for metals	-
Synthetic Precipitation Leaching Procedure (SPLP)	SW 1312
Meteoric Water Mobility Procedure (MWMP)	-
NOTE: Analysis of the above digestions or extracts are done according to TCLP or Water methods and fees	
Asbestos, soil	Point Count Method
Asbestos, bulk sample, 1-3 Layers	E600/M4-82-020
Asbestos, bulk sample – Each Additional	E600/M4-82-020
Ash	A 2540G
Density	ASTM E1109
Fluoride, total	Sodium Hydroxide Fusion
Lead in paint	SW 3050 with SW 6010B/SW 6020
Loss on ignition, calculated from % ash	A 2540G
Moisture and Total Solids	Loss at 105°C/A 2540G
Paint Filter Test	SW 9095
PCBs in transformer oil, 5 µg/g	SW 8082
pH	SW9045D / SW9040C
Sulfur, Total	LECO Combustion IR Detection
Total Organic Halogen (TOX)	ASTM D808

8. CYANIDE

PARAMETER	METHOD	DETECTION LIMIT, mg/Kg
Cyanide, Total	SW 9012	0.5 mg/Kg
Cyanide, Weak Acid Dissociable	ASTM D2036 Mod.	0.5 mg/Kg
Cyanide, Free	Electrode Manufacturer's Instruction	2.0 mg/Kg

9. PREPARATORY METHODS

SAMPLE PREPARATIONS	DESCRIPTION
METHOD 3005A	Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by FLAA, ICP, or ICP-MS
METHOD 3010A	Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by FLAA, ICP or ICP-MS.
METHOD 3050A	Acid Digestion of Sediments, Sludges, and Soils
NOTES: These preparatory methods from SW-846, <u>Test Methods For Evaluating Solid Waste</u> , are used to extract, prepare or cleanup samples for analysis. Unless specified by the sample submitter, the laboratory will select the appropriate method based on the matrix, the analytical method, and the data objectives. For samples being examined for organic constituents, see page Organics – 5.	

WASTES SAMPLING AND PRESERVATION

MEASUREMENT	MATRIX	SAMPLE SIZE/ SAMPLE BOTTLE ¹	PRESERVATIVE ²	HOLDING TIME
Flashpoint	liquid	100 mL P or G	None	NA
pH	water	25 mL P or G	None	analyze as soon as possible
pH	non-aqueous	50 g P or G	None	analyze as soon as possible
Cyanide, Reactive	water	250 mL P or G	NaOH to pH >12	14 days
Cyanide, Reactive	non-aqueous	50 g P or G	None	NA
Sulfide, Reactive	water	250 mL P or G	Zinc Acetate and NaOH to pH >9	7 days
Sulfide, Reactive	non-aqueous	50 g P or G	None	NA
TCLP	water	See individual methods in the <i>water</i> or <i>organics</i> sections		
TCLP	solids	500 g P or G	None	See chart at the end of this section.
TCLP	multiphasic	call the laboratory for advice on sampling		
Metals, total	water	250 mL P or G	HNO ₃ to pH < 2	6 mo. (Hg: 28 days)
Metals, total	non-aqueous	50 g P or G	None (Hg: cooled to 6°C, when possible)	6 mo. (Hg: 28 days)
BTEX	water	3-40 mL VOA vials ³	5-10 drops HCl to pH <2	14 days
BTEX	solids	4oz w/m Amber Glass	None, No headspace	14 days
GRO	water	3-40 mL VOA vials ³	5-10 drops HCl to pH <2	14 days
GRO	solids	4oz w/m Amber Glass	None, No headspace	14 days
DRO	water	2-1000 mL G	H ₂ SO ₄ to pH <2	7 days to extract; 40 to analysis
DRO	solids	4oz w/m Amber Glass	None	14 days to extract; 40 to analysis
VPH	water	3-40 mL VOA vials ³	5-10 drops HCl to pH <2	14 days to analysis
VPH	solids	4oz w/m Amber Glass	None	7 days to extract; 28 days to analysis
EPH	water	2-1000 mL G	H ₂ SO ₄ to pH <2	14 days to extract; 40 to analysis
EPH	solids	4oz w/m Amber Glass	None	7 days to extract; 40 to analysis
TPH, IR	water	1-1000 mL G	H ₂ SO ₄ to pH <2	7 days to extract; 40 to analysis
TPH, IR	solids	4oz w/m Amber Glass	None	14 days to extract; 40 to analysis
TPH, Soxhlet ext.	solids	4oz w/m Amber Glass	None	NA
PCBs, Transformers	Oil	5 mL G	None	40 days
Waste oil analysis	Oil	250 mL P or G	None	Refer to individual parameter
BTU	NA	25 g P or G	None	NA

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SAMPLING AND PRESERVATION, continued

MEASUREMENT	MATRIX	SAMPLE SIZE/ SAMPLE BOTTLE ¹	PRESERVATIVE ²	HOLDING TIME
Density	solids	100 g depends on particle size	None	NA
Loss on ignition	solids	50 g P or G	None	NA
Moisture/solids	solids	50 g P or G	None	NA
Paint filter test	-	100 + g P or G	NA	NA
Lead in paint	solids	5 g P or G	NA	NA

NOTES:

1. Sample bottles: P = plastic; G = glass; w/m = wide mouth.
2. Most parameters should be shipped and stored at 6°C.
3. Samples collected for volatiles must be taken with zero headspace. The VOA vial must be completely full, no headspace.

HOLDING TIMES FOR TCLP ANALYSIS (days)

ANALYSIS	SAMPLING TO TCLP EXTRACTION	TCLP EXTRACTION TO METHOD EXTRACTION	METHOD EXTRACTION TO ANALYSIS	TOTAL SAMPLING TO ANALYSIS
Metals (not mercury)	180	NA	180	360
Mercury	28	NA	28	56
Base Neutrals	14	7	40	61
Acid Extractables	14	7	40	61
Pesticides	14	7	40	61
Herbicides	14	7	40	61
Volatiles	14	NA	14	28