



# Waste Assessment – Guidance for Solid and Hazardous Waste Generators



# Overview



- Representative Sample
- Sample and Analysis Plans
- Method 1311 (TCLP)
- Waste Characterization Report
- Landfill Disposal of Non-Hazardous Waste

# SCHWMR 61-79

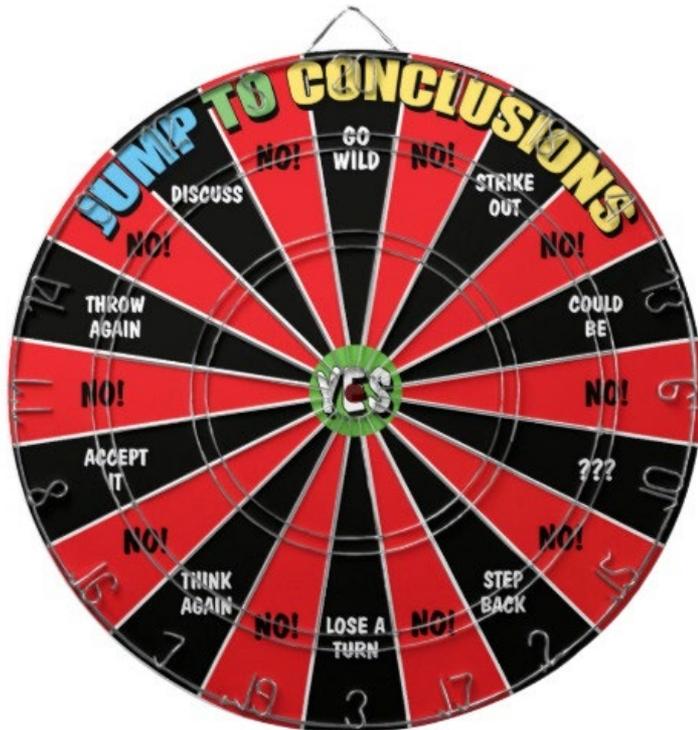


Is the waste a "**solid waste**" as defined in R.60-79.261 Subpart A Section 261.2 ?

Is the waste specifically **excluded** from the RCRA regulations?

Is the waste a "**listed**" hazardous waste?

Does the waste **exhibit a characteristic** of hazardous waste?





**261.2 Table 1 Summary of definitions of Solid Waste**

<p>[Note: The terms "spent materials", "sludges", "by-products" and "scrap metal" are defined in 261.1] (11/99)</p>	<p>Use Constituting Disposal (261.2(c)(1))</p>	<p>Energy Recovery/Fuel (261.2(c)(2))</p>	<p>Reclamation (261.2(c)(3)), except as provided in 261.2(a)(2)(ii), 261.4(a)(17), 261.4(a)(23), 261.4(a)(24), or 261.4(a)(25)</p>	<p>Speculative Accumulation (261.2(c)(4))</p>
Spent Materials	(x)	(x)	(x)	(x)
Sludges (listed in Section 261.31 or .32)	(x)	(x)	(x)	(x)
Sludges exhibiting a characteristic of hazardous waste	(x)	(x)	---	(x)
By-products (listed in Section 261.31 or 261.32)	(x)	(x)	(x)	(x)
By-products exhibiting a characteristic of hazardous waste	(x)	(x)	---	(x)
Commercial chemical products listed in Section 261.33	(x)	(x)	---	---
Scrap metal that is not excluded under 261.4(a)(13)	(x)	(x)	(x)	(x)

# SCHWMR – Representative Sample

- **R.61-79.260.10 "Representative sample"** means a sample of a universe or whole (e.g., waste pile, lagoon, ground water) which can be expected to exhibit the **average properties of the universe or whole.**





# SCHWMR

## Subpart C: Characteristics of HW

261.20(c) For purposes of this subpart, the Department will consider a sample obtained using **any of the applicable sampling methods specified in Appendix I** to be a representative sample within the meaning of R.61-79.260.10

# SCHWMR 261 Appendix I

- American Standard Test Methods (ASTM)
- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," U.S. Environmental Protection Agency Publication SW-846.
- “Department will consider other methodologies”
- **\*\*\*Must meet the representative sample definition\*\*\***

# ASTM

- **ASTM International**, formerly known as **American Society for Testing and Materials**
- Publishes standard test methods, specifications, practices, guides, classifications and terminology

# ASTM – Representative Sample

“a sample collected in such a manner that it reflects one or more characteristics of interest (as defined by the project objectives) of a population from which it was collected" (ASTM D 6044)

## Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium (SW-846)

- EPA's official collection of methods for use in complying with the Resource Conservation and Recovery Act (RCRA) regulations
- Analytical and sampling methods for organic and inorganic compounds plus physical properties and characteristics
- Method 1311 a.k.a TCLP – Chapter 8



# SW-846 Representativeness

A measure of the degree to which data accurately represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition.

# Other Methodologies

- Must see the analyte of concern.....in the matrix of concern.....at the level of concern

# SW-846 Chapter 9 - Sampling Plan

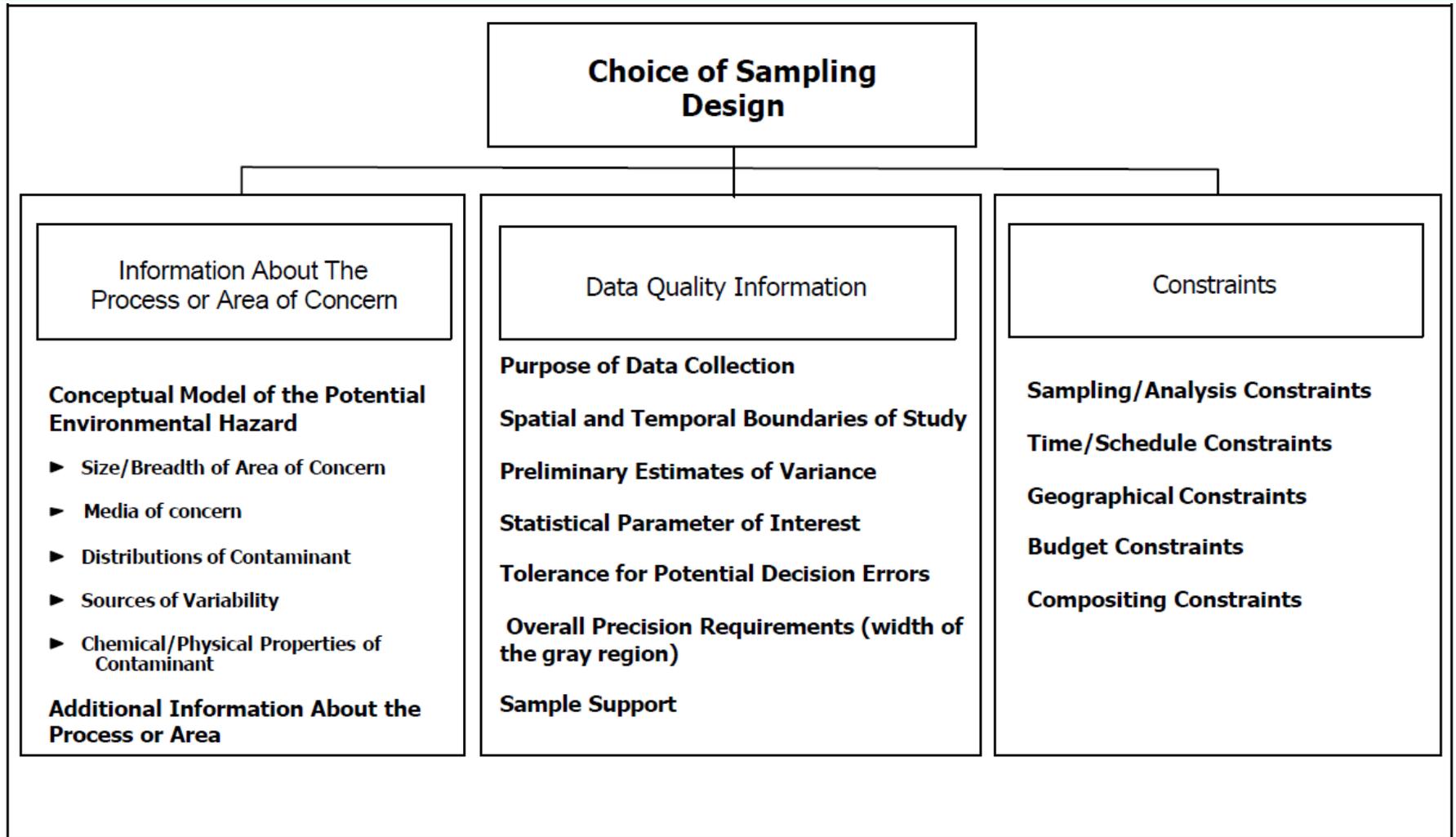
- **responsibility** for developing a technically sound sampling plan **rests with the waste producer.....**

# Sampling Plan Development

- What are your objectives?
- RCRA?
- SW Landfill disposal?

# Sampling Plan Development

- Begins with generator knowledge
- Chemical and physical nature of waste
- Consistency with waste stream
- Goal is to ensure samples are representative
- Department will accept a **minimum of 2 samples for initial characterization if statistically representative** (additional may be required)



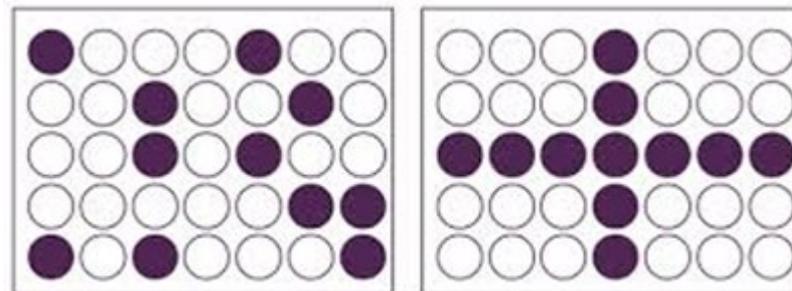
# Sampling Plan Development

Things to consider....

- Probability vs. Authoritative
- Equipment preparation / Decontamination
- Duplicate samples
- Equipment, field, and trip blanks

# Probability Sampling

- Provide the ability to reliably estimate variability (range of values)
- Utilizes **randomization**
- Several designs (i.e. simple random, stratified random, etc.)

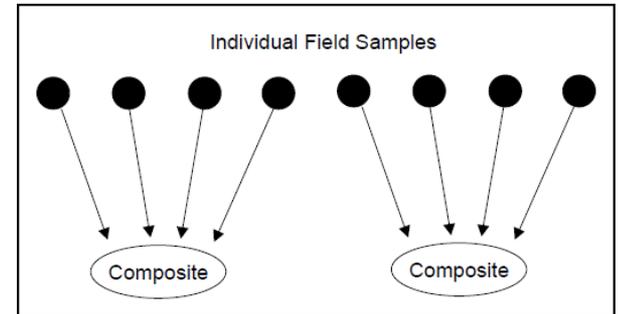


Probability Sampling Vs Non-Probability Sampling

## Non-Probability Sampling (Authoritative)

- Does not accurately estimate the population variance
- Preliminary information to facilitate planning
- Identify an actual release to the environment
- Screening for “hot” samples
- “prove the positive”

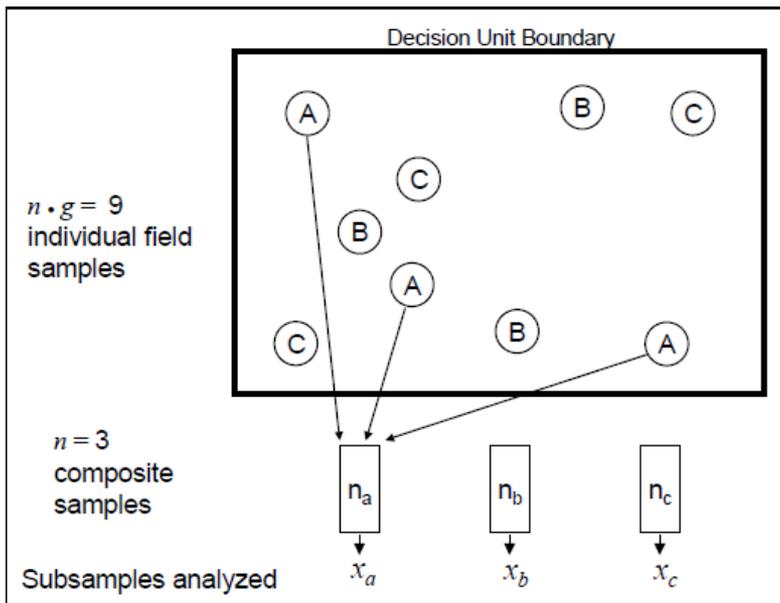
# Composite Sampling



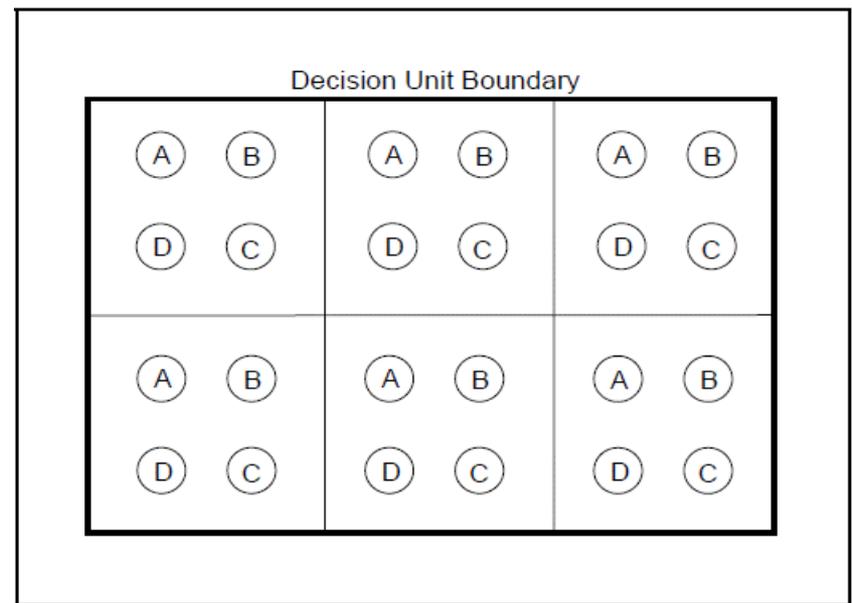
- Multiple individual or “grab” samples
- Collected from different locations or times
- Advantages vs. disadvantages
  - Reduced # of analyses = Reduced \$\$
  - Mixing may compromise VOC samples

# Composite Sampling

## Simple Random



## Systematic



# Analysis Plan

- Second goal is to ensure that samples are properly prepared and analyzed by a lab **certified** by the Department
- Ensure adequate reporting limits
- Don't assume the lab knows your objectives - Talk to the Lab Project Manager



# Other Considerations

- Type of Lab Report (Level 1, 2, 3, or 4)
- Summary page
- QA/QC (LCS, MS/MSD, Method Blanks)
- Signs of sample matrix interference
- Chain of Custody
- Hold times



# SCHWMR 261.24.

## **Toxicity characteristic.**

(a) A solid waste (except manufactured gas plant waste) exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, test Method 1311 in “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” EPA Publication SW-846, as incorporated by reference in 260.11, **the extract from a representative sample of the waste contains any of the contaminants listed in Table I at the concentration equal to or greater than the respective value given in that table.** Where the waste contains less than 0.5 percent filterable solids, the waste itself, after filtering using the methodology outlined in Method 1311, is considered to be the extract for the purpose of this section.



# RCRA 8 Metals

<b>METALS</b>	<b>TCLP Regulatory Level, mg/L</b>	<b>EPA Hazardous Waste Number</b>
Arsenic	5.0	D004
Barium	100.0	D005
Cadmium	1.0	D006
Chromium	5.0	D007
Lead	5.0	D008
Mercury	0.2	D009
Selenium	1.0	D010
Silver	5.0	D011



# VOCs

<b>VOLATILE ORGANICS</b>	<b>TCLP Regulatory Level, mg/L</b>	<b>EPA Hazardous Waste Number</b>
Benzene	0.5	D018
Carbon Tetrachloride	0.5	D019
Chlorobenzene	100.0	D021
Chloroform	6.0	D022
1,4-Dichlorobenzene	7.5	D027
1,2-Dichloroethane	0.5	D028
1,1-Dichloroethylene	0.7	D029
Methyl Ethyl Ketone	200.0	D035
Tetrachloroethylene	0.7	D039
Trichloroethylene	0.5	D040
Vinyl Chloride	0.2	D043



# SVOC's

<b>SEMIVOLATILE ORGANICS</b>	<b>TCLP Regulatory Level, mg/L</b>	<b>EPA Hazardous Waste Number</b>
o-Cresol	<sup>1</sup> 200	D023
m-Cresol	<sup>1</sup> 200	D024
p-Cresol	<sup>1</sup> 200	D025
Cresol	<sup>1</sup> 200	D026
2,4-Dinitrotoluene	0.13	D030
Hexachlorobenzene	0.13	D032
Hexachlorobutadiene	0.5	D033
Hexachloroethane	3.0	D034
Nitrobenzene	2.0	D036
Pentachlorophenol	100.0	D037
Pyridine	2 5.0	D038
2,4,5-Trichlorophenol	400.0	D041
2,4,6-Trichlorophenol	2.0	D042



## Chlorinated Pesticides and Herbicides

<b>ORGANOCHLORINE PESTICIDES</b>	<b>TCLP Regulatory Level, mg/L</b>	<b>EPA Hazardous Waste Number</b>
Chlordane	0.03	D020
Endrin	0.02	D012
Heptachlor (and its Epoxide)	0.008	D031
Lindane	0.4	D013
Methoxychlor	10.0	D014
Toxaphene	0.5	D015

<b>CHLOROPHENOXY ACID HERBICIDES</b>	<b>TCLP Regulatory Level, mg/L</b>	<b>EPA Hazardous Waste Number</b>
2,4-D	10.0	D016
2,4,5-TP (Silvex)	1.0	D017



# Solid Waste Landfill and Structural Fill R.61-107.19

C.1.b. The toxicity characteristic leaching procedure (TCLP) (USEPA method 1311) shall be used to obtain all extracts for the purpose of characterizing a waste stream proposed for disposal in a solid waste landfill.

## SW 846 Method 1311 - TCLP

- Designed to model a **theoretical scenario** in which a waste is mismanaged by placing it in an unlined landfill containing municipal solid waste.
- The acetic acid solution in Method 1311 is **designed to simulate the result of rainwater infiltrating the landfill**, reacting with the municipal solid waste, and then leaching through the waste being tested.
- The numerical limits for the RCRA toxicity characteristic (40 CFR 261.24) were derived using the same scenario and **were set at levels that would prevent the groundwater under the landfill from posing a threat to human health and the environment.**



South Carolina Department of Health and Environmental Control  
Healthy People. **Healthy Communities.**

---

# Totals Analysis



# Totals Analysis Summary

**261.24(a)** If the waste is 99.5% or more liquid then the waste itself (after filtration) is the extract, and you can analyze it directly without performing the TCLP.

If a total analysis of the waste, not the extract, demonstrates that the individual contaminants are not present in the waste, or present in levels that could not possibly exceed the regulatory threshold, then you don't need to run the TCLP. **[Section 1.2 of the TCLP procedure]**

For wastes that are 100% physically solid, the maximum theoretical leachate concentration is 1/20 of the total concentration in the waste. If this value is below the regulatory threshold, the TCLP need not be run. **[60 FR 66389, December 21, 1995]**

# R.61-107.19 Solid Waste Landfill and Structural Fill - Waste Characterization Report



# Waste Characterization for Landfill Disposal

- Determination of the proper landfill class for disposal of a waste stream is based on the chemical and physical properties of the waste and not on the source of generation of the waste.
- The **Permittee** shall submit to the Department a waste characterization report



# Waste Characterization Report

**[Part I C 1 a]** The waste characterization report shall consist of a comprehensive analytical evaluation of the chemical and physical nature of each waste stream.

Hazardous wastes as defined in R.61-79, Hazardous Waste Management Regulations shall not be disposed of in the landfills under the purview of this regulation.



# Waste Characterization Report

## **Class II Landfill Waste (other than Appendix I or land clearing debris)**

- **Sample and Analysis Plan**
- **Waste Characterization Report**
- **Submit to SW Permitting**

# Waste Characterization Report

## Class III Landfill

- Shall have a Department approved SWAIP
- Includes necessary information to meet requirements under Waste Characterization

# Determining appropriate Landfill for Disposal

- Results of the TCLP compared to the MCLs in SC R.61-58 State Primary Drinking Water Regulations
- If no MCL exists, then risk based concentrations recognized by EPA Region IV used (i.e. RSL table)
- Where no MCL or risk based values exist, then Department will develop an appropriate value with input from permittee.

# Example

- Roll-off boxes of sludge



# Example

- Paint booth filters



# Example

- 55 gallon drum



# Example

- 40 ft X 30 ft X 10 ft waste pit





## Contact Us

Jeff Schrag  
Waste Assessment Section Manager  
803-898-4326



## Stay Connected





### TCLP Metals

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch	Leachate Date
1	1311/3010A	6010D	10	02/28/2017 1336	CJZ	02/27/2017 1531	35703	02/26/2017 1745
1	1311/7470A	7470A	1	02/28/2017 1411	COH	02/28/2017 0920	35743	02/26/2017 1745

Parameter	CAS Number	Analytical Method	Result	Q	PQL	Units	Run
Arsenic	7440-38-2	6010D	ND		0.15	mg/L	1
Barium	7440-39-3	6010D	1.1		0.25	mg/L	1
Cadmium	7440-43-9	6010D	1.1		0.050	mg/L	1
Chromium	7440-47-3	6010D	0.25		0.10	mg/L	1
Lead	7439-92-1	6010D	ND		0.10	mg/L	1
Mercury	7439-97-6	7470A	ND		0.00020	mg/L	1
Selenium	7782-49-2	6010D	ND		0.20	mg/L	1



## TCLP 6 Step Process

1. Separate the liquid and solid portions of the waste (as needed).
2. Crush the solid portion of the waste.
3. Place the crushed solid portion in a system that simulates the conditions of a landfill by filtering a large quantity of water through it.
4. Collect the leachate from the system.
5. Recombine the separated liquid portion of the waste (if any) with the collected leachate.
6. Analyze the total leachate for constituents of concern.



## Total Constituent Analysis Instead of TCLP Analysis

**Question:** Is it acceptable to perform a **total constituent analysis** instead of a TCLP analysis and then divide the total concentration by 20 to determine if a waste is non-hazardous, as is implied in Section 1.2 of Method 1311, TCLP?



## Answer:

Section 1.2 of the TCLP **does** allow for a total constituent analysis in lieu of the TCLP extraction. If a waste is 100% solid, as defined by the TCLP method, then the results of the total constituent analysis may be divided by twenty to convert the total results into the maximum leachable concentration. This factor is derived from the 20:1 liquid-to-solid ratio employed in the TCLP. If a waste has filterable liquid, then the concentration of the analyte in each phase (liquid and solid) must be determined.



# DHEC Forms

- 3660
- 3661
- 3662
- 3657
- 3658
- 3659



South Carolina Department of Health and Environmental Control  
 Healthy People. Healthy Communities.



Type Data:

**RCRA-HW/MSW - TCLP & Other Volatiles**

6/9/2017

Company Name:

Subject/Project:

(Class 3, MSW, Subtitle D Landfill and RCRA/HW Determination)

**D-3658**

								Results in Milligrams per Liter					
								Waste Stream 1		Waste Stream 2		Waste Stream 3	
								Sample 1 Date 1	Sample 2 Date 2	Sample 1 Date 1	Sample 2 Date 2	Sample 1 Date 1	Sample 2 Date 2
<b>(Consult the Department for any Radiation / Chemical Mixed Wastes.)</b>													
Facility Sample ID #													
Laboratory Sample ID #													
Laboratory Name													
SC Laboratory Certification #													
Subcontracted Laboratory Certification #													
Subcontracted Laboratory Name													
Laboratory Receipt Information (Chain of Custody Must be Attached)													
<b>TCLP Volatile Organic Compounds (SW1311 Extraction)</b>								Subcontract <sup>1</sup>		Subcontract <sup>1</sup>		Subcontract <sup>1</sup>	
Analytical Parameter <sup>2</sup>	Preparation Method	Analytical Method	Detection Limit (mg/l)	Quantitation Limit (mg/l)	MCL <sup>3,4</sup> (mg/l)	Class 3 (mg/l)	TCLP (mg/l)						
Benzene	5030B	8260B	0.1000	0.001	0.005	0.15	0.5						
Carbon Tetrachloride	5030B	8260B	0.1000	0.001	0.005	0.15	0.5						
Tetrachloroethylene	5030B	8260B	0.1000	0.001	0.005	0.15	0.7						
Trichloroethylene	5030B	8260B	0.1000	0.001	0.005	0.15	0.5						
Vinyl Chloride	5030B	8260B	0.1000	0.001	0.002	0.06	0.2						
1,1-Dichloroethylene	5030B	8260B	0.1000	0.001	0.007	0.21	0.7						
1,2-Dichloroethane	5030B	8260B	0.1000	0.001	0.0024	0.072	0.5						
Chloroform	5030B	8260B	0.1000	0.001	0.08	2.4	6						
MEK (2-Butanone)	5030B	8260B	0.1000	0.001	4.9	147	200						
Chlorobenzene	5030B	8260B	0.1000	0.001	0.1	3	100						
Other (See Pick List)													
<b>Quality Assurance (for above samples)</b>													
TCLP ZHE Extraction Batch #													
Volatile Analysis Batch #													
Surrogates, % Recovery													
1,2- Dichloroethane, d4													
Toluene, dB													
4-Bromofluorobenzene													
Other													
Other													



South Carolina Department of Health and Environmental Control  
 Healthy People. Healthy Communities.

Date: 04/01/09



Type Data: **Industrial RCRA - TCLP Metals**  
 Company Name:  
 Subject/Project:

(Subtitle C, Subtitle D or Class Three Landfills only.)

(Consult the Department for any Radiation / Chemical Mixed Wastes.)

								Results in Milligrams per Liter					
								Waste Stream 1		Waste Stream 2		Waste Stream 3	
								Sample 1 Date 1	Sample 2 Date 2	Sample 1 Date 1	Sample 2 Date 2	Sample 1 Date 1	Sample 2 Date 2
Facility Sample ID #								AB 090399	AB 090499	CD 090399	CD 090499	EF 090397	EF 090499
Laboratory Sample ID #								PF 090699-1	PF 090699-2	PF 090699-1	PF 090799-1	GL 121097	GL 120998
Laboratory Name								Pine Forest	Pine Forest	Pine Forest	Pine Forest	Good Lab	Good Lab
SC Laboratory Certification #								SCL #12345	SCL #12345	SCL #12345	SCL #12345	SCL #56789	SCL #56789
Subcontracted Laboratory Certification #													
Subcontracted Laboratory Name													
Laboratory Receipt Information (Chain of Custody Must be Attached)													
Inorganic TCLP Chemicals								Subcontr. <sup>1</sup>		Subcontr. <sup>1</sup>		Subcontr. <sup>1</sup>	
Analytical Parameter	Digestion Method	Analytical Method	Detection Limit (mg/l)	Quantitation Limit (Mg/l)	MCL (mg/l)	Class 2 (mg/l)	TCLP Limits (mg/l)						
Arsenic	SW3015A	SW6010C	0.0050		0.010	0.10	5						
Barium	SW3015A	SW6010C	0.0500		2.000	20.00	100						
Cadmium	SW3015A	SW6010C	0.0001		0.005	0.05	1						
Chromium	SW3015A	SW6010C	0.0100		0.100	1.00	5						
Lead	SW3015A	SW6010C	0.0050		0.015	0.15	5						
Mercury		SW7470A	0.0002		0.002	0.02	0.2						
Selenium	SW3015A	SW6010C	0.0020		0.050	0.50	1						
Silver	SW3015A	SW6010C	0.0300		0.100	1.00	5						
Other													
Quality Assurance (for above samples)													
TCLP Bottle Extraction #													
TCLP Extraction Blank													
Digestion Batch #													
Digestion Blank													
Laboratory Control sample													
Matrix Spike (MS)													
Matrix Spike Duplicate (MSD)													
Unspiked Duplicate (If Used)													
Analysis Batch Number													
LCS Recovery													
MS & MSD													

# References

- SW 846 Chapter 8 Method 1311
- SW 846 Chapter 9 Sampling Plan
- USEPA. [https://archive.epa.gov/epawaste/hazard/web/html/faq\\_tclp.html#Total](https://archive.epa.gov/epawaste/hazard/web/html/faq_tclp.html#Total)
- USEPA Guidance on Choosing a Sampling Design for Environmental Data Collection. EPA QA/G-5S
- SCHWMR
- SWM: Solid Waste Landfills and Structural Fill
- Introduction to Hazardous Waste Identification. Solid Waste and Emergency Response (5305W) EPA530-K-05-012;  
<https://www.epa.gov/sites/production/files/2015-09/documents/hwid05.pdf>
- RCRA Waste Sampling Draft Technical Guidance – Planning, Implementation, and Assessment. EPA530-D-02-002 August 2002