Hazardous Waste Identification

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22nd Annual California CUPA Training Conference

February 3 - 6, 2020

South San Francisco

www.calcupa.org

Objectives

A hazardous waste determination process

Hazardous waste laws and regulations pertaining to the hazardous waste identification process

Understanding the terms “waste”, “exemption”, “exclusion”, “listing”, “characteristic” (i.e., the definition of a hazardous waste), “mixture”, “derived-from” and “contained-in”

Introduction

Laws and Regulations

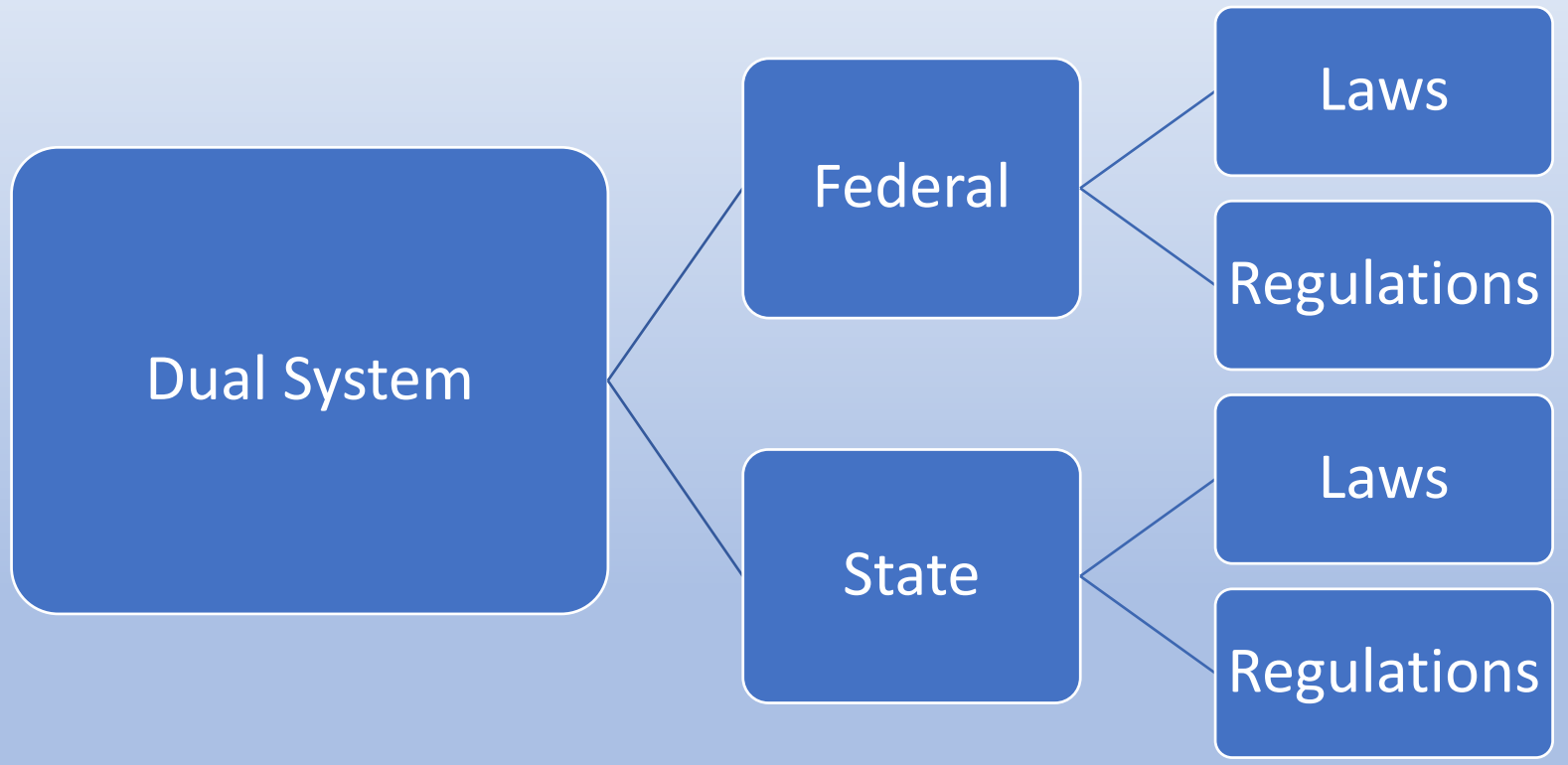
General overview of Hazardous waste determination process

Accuracy

When misclassification happens – Does it really matter?

Who does it? How to do it?

Laws and Regulations



Statue and Regulations?

- Statute: passed by the Legislature
- Regulation: A policy or procedure that implements, interprets, or makes specific a statute the state agency enforces or administers

Federal Law and Regulations

- Statute: Resource Conservation and Recovery Act (RCRA), Chapter 42, United States Code
- Regulations: Title 40, Code of Federal Regulations (40 CFR parts 260 – 279)

State Law and Regulations

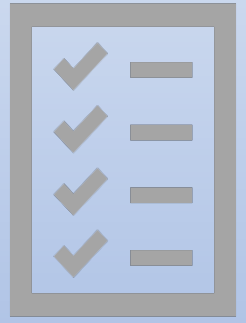
- Statute: Hazardous Waste Control Law, California Health and Safety Code, division 20, chapter 6.5 (HSC)
- Regulations: California Code of Regulations, title 22, division 4.5 (22 CCR)

California is a Federally "Authorized" State

- DTSC implements the RCRA regulations in CA instead of U.S. EPA
- Generally, California's regulations contain all hazardous waste requirements that apply in California
- Most newly adopted federal regulations do not apply in California until California adopts them

22 CCR Contents:

Chapter 10 –
Scope and definitions



Chapter 11 –
Identification and listing of hazardous wastes
"Core chapter"

Chapter 12 –
Generator standards

See section 66262.11

Organization of Chapter 11

- Article 1
  - General provisions
  - Definition of a waste
  - Definition of a hazardous waste
- Article 2
  - Criteria for identifying the characteristics of a hazardous waste
- Article 3*
  - Characteristics of a hazardous waste
- Article 4*
  - List of RCRA hazardous waste
- Article 4.1
  - Additional lists of hazardous waste
- Article 5
  - Categories of hazardous waste
  - Waste classification

* Main Criteria

Accuracy is Essential

- All other waste management requirements hinge upon this one decision!!!

Mistakes happen because:

- Lack of information
- Poor judgement
- Misinformation
- Lack of knowledge about the laws and regulations

Common Mistakes

Scenario 1 – Nonhazardous Waste

- Misclassified as hazardous waste
  - Generator – legally no problem
  - Regulators – could result in unsuccessful litigation: wasted resources and effort

Scenario 2 - Hazardous Waste

- Misclassified as nonhazardous waste:
  - Generators - Legally big problem, illegal management/disposal of hazardous waste
  - Regulators - Big problem – fails to identify hazardous waste mismanagement - prolongs conditions that endanger public health and the environment, affects enforcement cases

Who determines if the waste is a hazardous waste?

Who determines if the waste is a hazardous waste?

- 22 CCR §66260.200, subsection (c)
  - Generator's responsibility to make determination

Hazardous Waste Determination
22 CCR §66262.11

- How?

- The information a waste generator may use to classify its waste fall into two categories:

  1. Knowledge of the materials and process

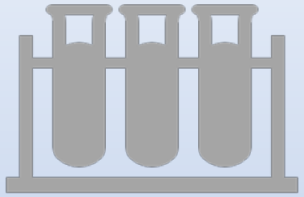
  2. Analytical testing data

Two Categories

1. KNOWLEDGE

Generator's knowledge: Any information that generator finds that helps them to understand or anticipate their wastes characteristics or properties OR

A generator may use anything known about the physical properties and characteristics of the waste in lieu of testing the waste



2. ANALYTICAL TESTING

Analytical testing for any criteria for which information is not available

Examples of Knowledge

Industry studies

Internet searches

Multiple business locations

Hotline information

Safety Data Sheets

Information from chemical manufacturers

Online sources

HW generation process

HMBP inventories

Analytical Testing

- What characteristics are expected (or cannot be ruled out through knowledge)?
- What tests correspond to the hazardous waste criteria?
- Sampling

Part 1: Hazardous Waste Determination Process

Step 1	Do I have a waste?
Step 2	Excluded or exempted?
Step 3	Listed? (Article 4, Article 5, Appendix X)
Step 4	Characteristic?

Part 2: Categories of Hazardous Waste

Part 3: Waste Classification Options

Part 1: Hazardous Waste Determination Process

- Step 1: Do I have a waste?

What is a waste?
General Definition

- Something that someone has but they don’t have a use for anymore.
- Probably going to get rid of it.

Definition of a Waste

- 22 CCR §66261.2 and HSC §25124

  A waste is any "**discarded material**" (in any physical form, such as solid, semi-solid, liquid or contained gas) that is not excluded under section 66261.4(a) or (e) or 25143.2(b) or (d)).

What does discarded mean?

- 22 CCR §66261.2
- A material is discarded if it is:
  - Relinquished
  - Recycled
  - Inherently waste-like

Relinquished

- 22 CCR §66261.2(b)

- A material is relinquished if it is:
  - Disposed of
  - Burned or incinerated
  - Accumulated, stored or treated (but not recycled) before, or in lieu of being relinquished

Recycled

·22 CCR §66261.2(b)

A material is a waste if it is recycled (or accumulated, stored or treated prior to recycling) by being:

1. Used in a manner constituting disposal	2. Burned for energy recovery	3. Reclaimed	4. Accumulated speculatively

Inherently Waste-like Materials

- 22 CCR §66261.2(b)
- The following materials are waste when recycled:
  - RCRA waste codes F020, F021, F022, F023, F026 and F028 (contain dioxins)
  - Secondary materials that are otherwise hazardous and fed to a halogen acid furnace.

Improper labeling and packaging

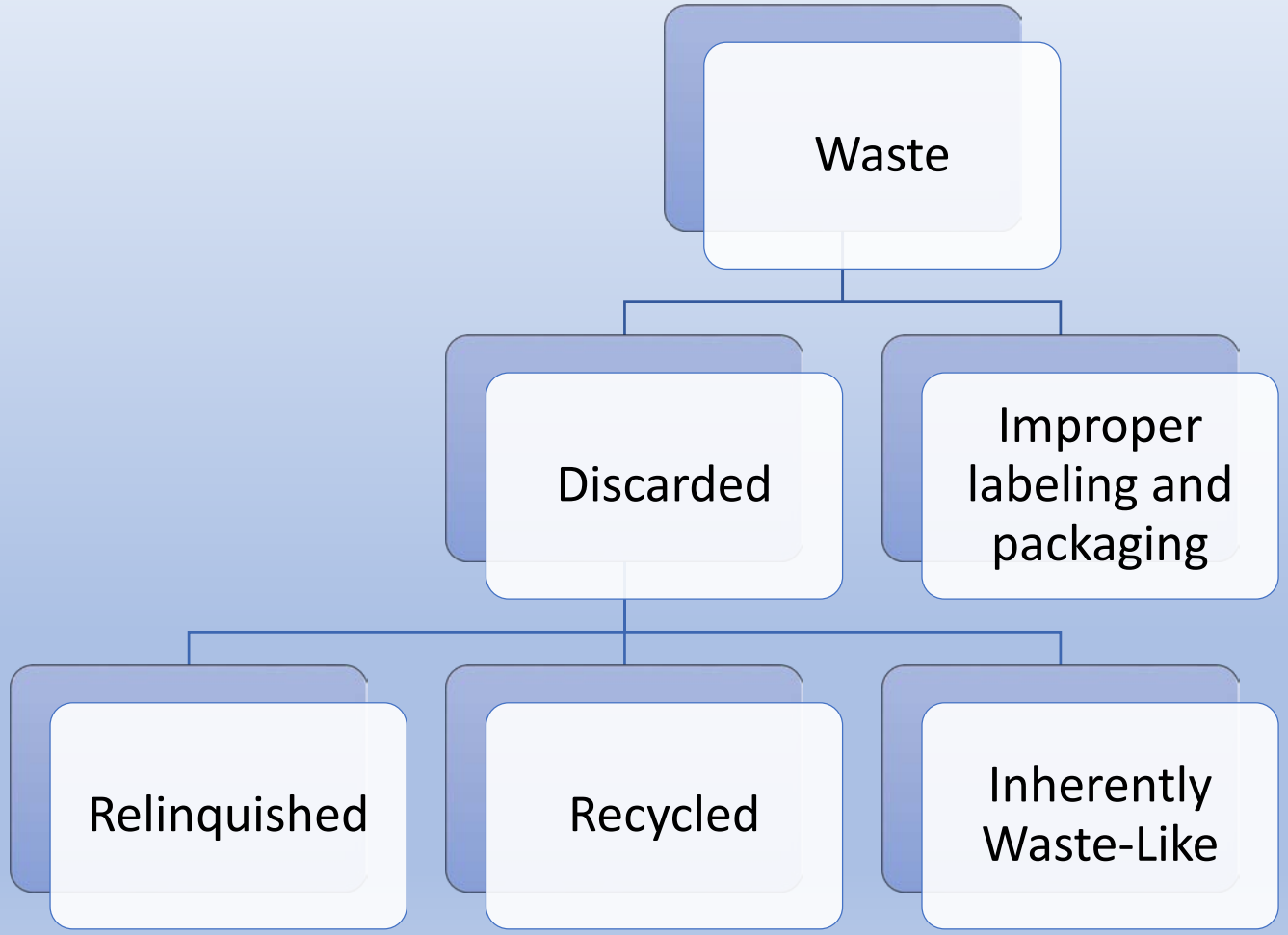
22 CCR §66261.2(f)

Material are also waste if they are:

- Mislabeled or inadequately labeled, unless labeled within 10 days
- In deteriorated or damaged containers, unless repackaged within 96 hours

Must pose a threat to human health or the environment

Summary


Waste
Discarded
Improper labeling and packaging
Relinquished
Recycled
Inherently Waste-Like

Part 1: Hazardous Waste Determination Process

Step 1	Do I have a waste?
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Step 3	Listed? (Article 4, Article 5, Appendix X)
Step 4	Characteristic?

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Difference between EXCLUSIONS and EXEMPTIONS

35

- Excluded means “out up front”, not even a waste or hazardous waste, depending on the exclusion…

- Exempted means wastes are identified as hazardous but not subject to all management requirements or less requirements or exempted from being regulated if meet certain conditions

EXCLUSIONS

Is it Excluded?

Three types of exclusions to consider:

1. §66261.4(a) Materials are not wastes:

   Example: spent sulfuric acid used to produce virgin sulfuric acid, unless it is accumulated speculatively; source, spent nuclear or by-product material as defined by the federal Atomic Energy Act; industrial wastewater discharges that are point source discharges subject to the CWA

2. §66261.4(b) Wastes are not hazardous waste:

   Example: Wastes excluded under 40 CFR §261.4 (unless the waste listed in 4.1 or exhibits a characteristic); infectious waste, etc.

3. HSC §25143.2(b) and (d) (recycling exclusions)
4. Additional HSC exclusions

California did not adopt all federal exclusions

1. CCR §66261.4(a) Materials are not wastes:

Materials that are excluded (not "wastes")
(§66261.4(a) of 22 CCR & §261.4(a) of 40 CFR)

Material	RCRA	Calif.
(1) Domestic sewage	Yes	No
(2) Industrial waste water (point source) discharges regulated under section 402 of the Clean Water Act	Yes	Yes
(3) Irrigation return flows	Yes	No
(4) Source, special nuclear, or by-product material as defined the Atomic Energy Act of 1954, as amended	Yes	Yes
(5) Materials subject to in-situ mining techniques which are not removed during the extraction process	Yes	No
(6) Pulping liquors that are reclaimed in pulping liquor recovery furnace and then reused in the pulping process, unless accumulated speculatively	Yes	Yes
(7) Spent sulfuric acid used to produce virgin sulfuric acid, unless it is accumulated speculatively	Yes	Yes

Continued…

Materials that are excluded (not "wastes") (§66261.4(a) of 22 CCR & §261.4(a) of 40 CFR)

Excluded Material	RCRA	Calif.
(8) Secondary materials that are reclaimed and returned to the original process or processes in which they were generated where they are reused in the production process [under certain provisions]	Yes	Yes
(9)(i) Spent wood preserving solutions that have been reclaimed and reused for their original intended purpose; and wastewaters from the wood preserving process that have been reclaimed and are reused to treat wood … etc.	Yes	No
(10) EPA Hazardous Waste Nos. K060, K087, K141, K142, K143, K144, K145, K147, and K148, and any wastes from the coke by-products process that are hazardous only because they exhibit the Toxicity Characteristic … etc.	Yes	No
etc.		

2. 22 §CCR 66261.4(b)

*Waste excluded under CFR 261.4(b), unless the waste is listed in Article 4.1 or exhibits Article 3 characteristic

- Infectious wastes (animal carcasses)
- Household waste
- Agricultural wastes used as fertilizers
- Fossil fuel combustion wastes
- Trivalent chromium wastes (leather tanning)
- Mining wastes
- Cement kiln dust
- Arsenic treated wood
- Used CFC refrigerants
- Used oil filters
- Used oil re-refining still bottoms used in asphalt products
- Landfill leachate or gas condensate
- Petroleum contaminated media and debris (D018 – D043)
- Reinjected groundwater from refinery cleanups

3. Recycling Exclusions

HSC §25143.2(b)

- Recyclable materials (RCRA & non-RCRA)
  - ingredients in industrial processes
  - substitutes for commercial products
  - returned to original process without being reclaimed onsite

HSC §25143.2(d)

- Recyclable materials (non-RCRA)
  - Conditions apply

4. Statutory Exclusion HSC §25143.8

- Cementitious materials
  - Effective January 1, 1996
  - Cement, cement kiln dust, clinker, clinker dust
  - Not required to be tested for solid corrosivity
  - If hazardous solely due to corrosivity for solids, excluded from classification as hazardous waste

4. Statutory Exclusions - HSC §25141.5 (b)(2)(B)

These substances are not hazardous wastes,
if only hazardous by acute oral toxicity criteria.

- Acetic acid
- Aluminum chloride
- Ammonium bromide
- Ammonium sulfate
- Anisole
- Boric acid
- Calcium fluoride
- Calcium formate
- Calcium propionate
- Cesium chloride
- Magnesium chloride
- Potassium chloride

Continued…

- Sodium bicarbonate
- Sodium borate decahydrate
- Sodium carbonate
- Sodium chloride
- Sodium iodide
- Sodium tetraborate

- Food flavoring oils
  - All spice oil
  - Ceylon cinnamon oil
  - Clarified slurry oil
  - Dill oils
  - Lauryl leaf oils

EXEMPTIONS

Statutory Exemptions - HSC §25143.12
(Operative January 1, 2002)

- Petroleum contaminated debris, <u>if meets all the following conditions</u> :
  - Consists of wood, paper, textiles, concrete rubble, metallic objects, solid manufactured objects
  - Not Federally regulated
  - Does not contain free liquids
  - Debris is not a container or tank that is subject to regulation as hazardous waste
  - Disposed in Class I or II landfill

Statutory Exemptions- HSC §25143.7

- Asbestos wastes
  - May be disposed in a landfill that is not Class I (Hazardous Waste Landfill)

Hazardous Waste Exemptions
22 CCR §66261.4 (c-g)

- Hazardous waste generated:
  - product or raw material storage tanks, vehicle, vessel, pipeline, manufacturing unit are EXEMPTED unless exits or unit ceases operation (within 90 days)
- Samples – subject to regulation as a waste after use as a sample ceases
- Treatability study samples for generator and labs
- Controlled substances

Hazardous Waste Exemptions
22 CCR §66261.7 (Containers)

- Contaminated containers
  - Exempt when “empty”

- Containers are empty when:
  - Pourable wastes no longer pour when container inverted
  - Nonpourable wastes are scraped out or otherwise removed

Hazardous Waste Exemptions
22 CCR § 66261.7 (Containers)

- Empty containers (exempted) must be managed:
  - 5 gallons or smaller – destroyed and disposed of
  - Larger than 5 gallons – reclaimed for scrap value, reconditioned, remanufactured, or refilled

- Aerosol containers if completely discharged of contents and propellant

Part 1: Hazardous Waste Determination Process

Step 1	Do I have a waste?
Step 2	Excluded or exempted?
Step 3	Listed? (Article 4, Article 5, Appendix X)
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Definition of Hazardous Waste

- 22 CCR §66261.3(a)(2)(A)–(D)

- A waste is a hazardous waste if it:
  - Is listed in article 4, article 4.1; or
  - Exhibits the characteristic of a hazardous waste

Definition of Hazardous Waste

- 22 CCR §66261.3(b)

- When does waste become a hazardous waste?
  - A waste becomes a hazardous waste when it first meets the listing or when it exhibits a characteristic

Definition of Hazardous Waste

- 22 CCR §66261.3(d)

- A waste is no longer a hazardous waste:
  - If the waste does not exhibit any of the characteristics of hazardous waste; or
  - In the case of a waste which is a listed (in article 4) waste, it has been delisted pursuant to 40 CFR sections 260.20 and 260.22

22 CCR Article 4: RCRA Lists

- Lists were created based on U.S. EPA criteria (40 CFR §261.11)
- A waste is compared to a list of wastes in regulations
- The source of the waste (i.e., the process that generated the waste) is as (if not more) important the waste's constituents
- Must meet all aspects of the listing for it to apply

Three Categories of Listed Waste

1. Non-specific sources (F-list)

2. Specific sources (K-list)

3. Discarded commercial chemical products, off-specification species, and spill residues (P,U)
    - Acute hazardous waste (P-list)
    - Toxic (U-list)

Non-Specific Sources (F-list)

- 22 CCR §66261.31

- Waste code: the letter “F” followed by a three-digit number (e.g., F001)
- Not dependent on industry or process that generates the waste
- Not dependent on constituents or their concentration present in the waste

Non-Specific Sources (F-list)

- 22 CCR §66261.31

- Spent solvents (F001 – F005)
- Electroplating and metal finishing operations (F006 – F012, F019)
- Dioxin bearing wastes (F020 – F023, F026 – F028)

Non-Specific Sources (F-list)

- 22 CCR §66261.31

- Chlorinated aliphatic hydrocarbon production wastes (F024, F025)
- Wood preserving wastes (F032, F034, and F035)
- Petroleum refining wastewater treatment sludges (F037 and F038)
- Multisource leachate (F039)

F- Listed Solvent

- Is a hazardous waste when it meets all of the following criteria:
  - The chemical must be used for its solvent properties, which dissolve or mobilize other constituents
  - The solvent must be spent
  - The solvent or solvent mixture must meet a specific, before-use concentration threshold.

Example – F Listed Wastes

- A solution that is 80% toluene prior to use is used to clean ink cartridges. What is the regulatory status of the used solution?

Example – F Listed Wastes

- A before use solvent mixture contains 80% ethyl acetate and 20% xylene? If its discarded is it an F003 listed waste?

- Note: Solvent mixtures containing F003 solvents are hazardous wastes under only two conditions:

1. The solvent mixture contains only F003 constituents (which are pure or technical grade).

2. The mixture contains one or more F003 constituents (at any concentration) **and** 10% or more of the other F-listed solvents before use.

(Hint….Ethyl acetate and xylene are both F003 solvents)

Example

- Used methylene chloride is reclaimed via distillation and reused onsite. What is the regulatory status of the residues generated from the recovery process?

Example

- A dry cleaner uses a 50% tetrachloroethylene mixture in its drying cleaning process. Is the spent mixture an F001 or F002 listed hazardous waste?

Specific Sources (K-list): 22 CCR §66261.32

- Waste codes with “K” followed by a three-digit number
- Dependent on the industry, waste source or process specified in the description
- Not dependent on constituents or their concentrations in the waste

Specific Sources (K-list): 22 CCR §66261.32

- Wood preservation
- Inorganic pigment
- Organic chemicals
- Inorganic chemicals
- Pesticides
- Explosives
- Petroleum refining
- Primary aluminum
- Secondary lead processing
- Ink formulation
- Coking (processing of coal to produce coke)
- Veterinary pharmaceuticals
- Iron and Steel

Example – F Listed Wastes

- A waste paint thinner contains 80% xylene, 9% toluene and 11% glycol. Is the waste an F003 waste?

- Note: Solvent mixtures containing F003 solvents are hazardous wastes under only two conditions:
- 1. the solvent mixtures contains only F003 constituents (which are pure or technical grade).
- 2. The mixture contains one or more F003 constituents (at any concentration) and 10% or more of the other F-listed solvents before use.

Discarded commercial chemical products, off-spec. species, and spill residues (P & U lists)

- 22 CCR §66261.33(e) and (f)

- Waste code with a “P” or “U” with a three-digit number (e.g. P001, U001)
- “P” wastes are acutely hazardous waste (H)
- “U” wastes are toxic hazardous waste (T)
- Most misunderstood of the RCRA listings

Discarded commercial chemical products, off-spec. species, and spill residues (P & U lists)

- 22 CCR §66261.33(e) and (f)

- To be listed:
  - The chemical must be unused and discarded
  - The chemical must be pure (i.e., the sole active ingredient in a formulation)
  - Cannot have been used or become spent
  - Cannot have been mixed with other chemicals/active ingredients to form a product

Example – U220 Toluene

- Unused paint, containing toluene (U220) is to be discarded. Is the discarded paint a U220 listed hazardous waste?

Example – U122 Formaldehyde

- Unused embalming fluid that contains formaldehyde and some colorants and perfumes is to be discarded.
    - What is the regulatory status of the discarded unused embalming fluid?

Example

- An unused pesticide containing 50% heptachlor (a P059 listed waste) and 50% toxaphene (a P123 listed waste) is to be discarded.
  - Is the pesticide a listed hazardous waste?

Article 4.1 – DTSC Listed Hazardous Waste

- Mercury containing wastes
  - M001: Mercury light switches in cars and cars with them prior to crushing, baling, shredding
  - M002: Other mercury switches in products, including appliances
  - M003: Mercury containing lamps and products with mercury lamps
  - M004: Mercury added novelties

What is Appendix X?

- It is a tool for generators

Appendix X

- List of 791 chemicals
- List of 66 common names or types of hazardous waste
- Characteristics of concern noted (X, C, I, R)

Appendix X

- List creates a “presumption”:
  - Wastes listed in Appendix X or containing a listed chemical presumed hazardous by characteristic
  - Can be classified as nonhazardous by testing or knowledge as with other wastes

Part 1: Hazardous Waste Determination Process

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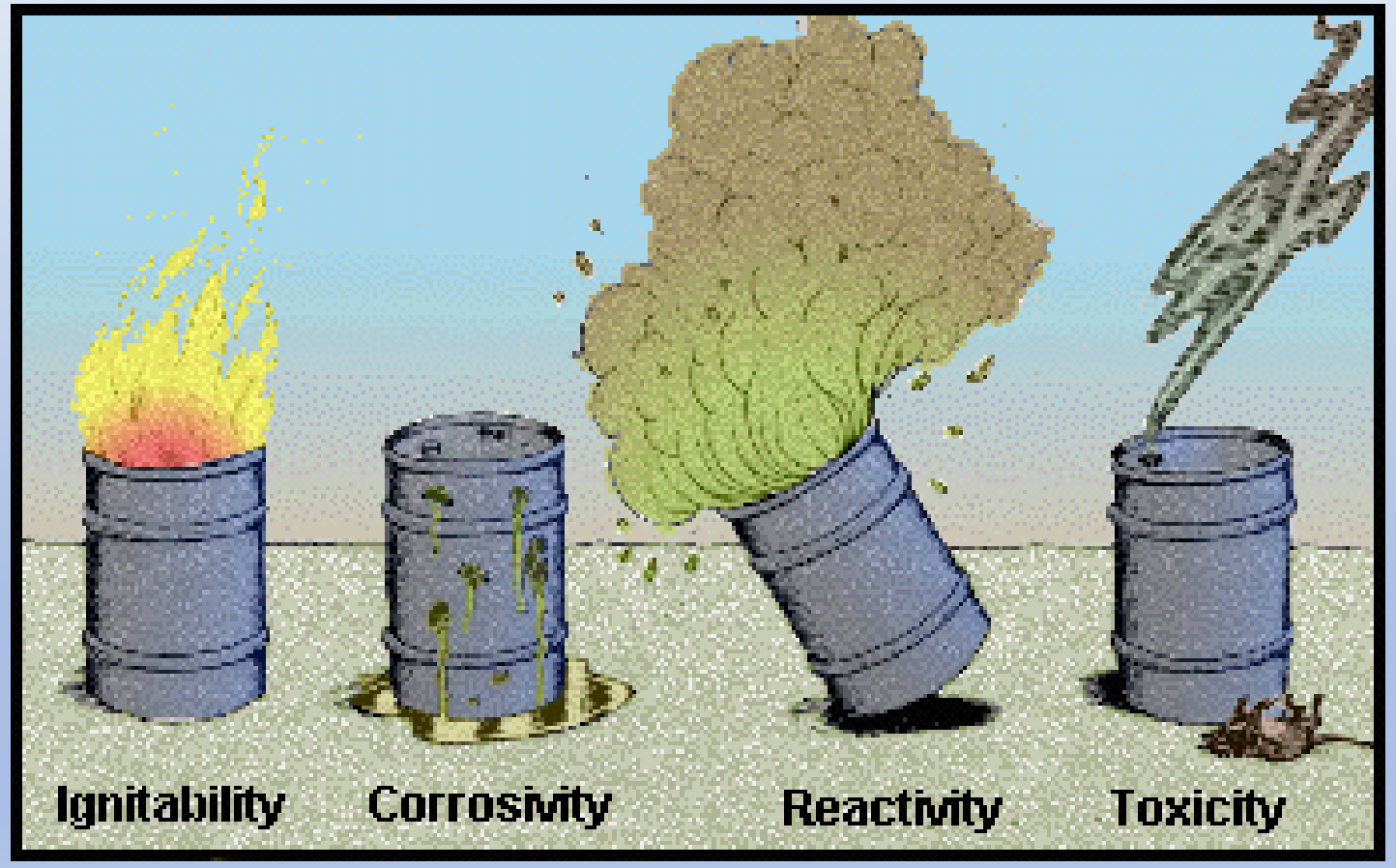
Four Characteristics



IGNITABILITY

Ignitable Wastes
22 CCR §66261.21

- Wastes that can readily catch fire and sustain combustion
- LIQUID: flashpoint ≤ 140°F (60°C)
    - Alcohol Exclusion (≤ 24% alcohol)
- NON-LIQUIDS: under STP, capable of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard
- Ignitable compressed gas
- Oxidizer
- D001

Ignitable Wastes
22 CCR §66261.21

- Flash point testing for liquids
  - SW-846 Method 1010A (Pensky Martens Closed Cup Tester)

- For nonliquids, more difficult
  - SW-846 Method 1030 to test rate of combustion (18 inches of waste in a line, ignite one end, time rate of burn)
  - No tests available to measure friction, absorption of moisture or spontaneous chemical changes

Example

- A waste mixture consisting of 90% water and 10% methanol has a flash point < 140°F.

What is the regulatory status of waste mixture?

Example

- Used rags containing toluene are stored in a drum. Toluene has a flash point of 39°F. Are the waste rags hazardous for ignitability?

CORROSIVITY

Corrosive Wastes
22 CCR §66261.22

- Acidic or Alkaline (basic) wastes that can readily damage materials (skin or containers) they contact

Corrosive Wastes
22 CCR §66261.22

- Measured by pH
- Measured by rate of steel corrosion
- Waste code D002

Corrosive Wastes
22 CCR §66261.22

- pH
  - AQUEOUS: pH $\leq$ 2 or $\geq$ 12.5
  - NONAQUEOUS: when mixed with an equal weight of water, has pH $\leq$ 2 or $\geq$ 12.5 (non-RCRA HW)

Corrosive Wastes
22 CCR §66261.22

- Steel corrosion rate
  - Liquid that corrodes steel at a rate greater than 6.35 mm per year
  - Not liquid, and, when mixed with an equal weight of water, corrodes steel at a rate greater than 6.35 mm per year (non-RCRA HW)

Example

- A sludge has a pH of < 2. Is it a D002 hazardous waste?

REACTIVITY

Characteristic of Reactivity
22 CCR §66261.23

- Explode or react violently when exposed to water or under normal handling conditions
- Create toxic fumes or gases when exposed to water or under common handling conditions
- Meets the criteria for classification as an explosive under Department of Transportation rules.

Characteristic of Reactivity
22 CCR §66261.23

For pure or relatively pure compounds which are wastes, a reactivity determination is relatively easy and straightforward

Mixtures pose a dilemma

Characteristic of Reactivity
22 CCR §66261.23

- In many cases, there are no test methods
- Generators to use their best knowledge
- Assumes that the dangers these wastes pose are well known to the few waste handlers who deal with them

Characteristic of Reactivity
22 CCR §66261.23

- DTSC limited to using only tests, procedures and thresholds established by U.S. EPA (HSC §25141.5)
- Therefore, unless DTSC adopts a new regulation, the reactivity characteristic should be applied as U.S. EPA would apply it

TOXICITY

Toxic Wastes

- Wastes that can deleteriously effect human health or the environment

Characteristic of Toxicity
22 CCR §66261.24

- Eight sections (or criteria) to this characteristic
- Waste can be toxic by any of these elements

Characteristic of Toxicity
22 CCR §66261.24

- Persistent and Bioaccumulative Toxic Substances (PBTs)
  - PBTs were considered public health threat and/or environmental hazard in the 1970s
  - Elements (a)(1) and (a)(2) of toxic characteristic

- Toxicity is where California really differs from U.S. EPA

Characteristic of Toxicity
22 CCR §66261.24 (a)(1) (TCLP)

- The federal toxicity characteristic is based upon a leach test called the TCLP or the “Toxicity Characteristic Leaching Procedure” (the old “EP Tox”)

- Simulates landfill disposal of a hazardous waste

Characteristic of Toxicity
22 CCR §66261.24 (a)(1) (TCLP)

- TCLP testing:
  - To determine if a waste exhibits the characteristic of toxicity by this element, samples of the waste are extracted using the TCLP
  - The extracts are analyzed and the lab (analytical) results are compared to the Regulatory Levels (RLs) or Regulatory Thresholds (RTs) in the table

Characteristic of Toxicity
22 CCR §66261.24 (a)(1) (TCLP)

- If the result, in milligrams of hazardous constituent per liter of extract, equals or exceeds the RL, the waste exhibits the characteristic of toxicity.
- In California, the TCLP is not applied to RCRA excluded or exempted wastes.

Federal Toxicity Characteristic
22 CCR §66261.24(a)(1)

- D005 Barium
- D018 Benzene
- D006 Cadmium
- D019 Carbon tetrachloride
- D020 Chlordane
- D021 Chlorobenzene
- D022 Chloroform
- D004 Arsenic
- D007 Chromium
- D023 o-Cresol
- D024 m-Cresol
- D025 p-Cresol
- D026 Cresol
- D016 2,4-D
- D027 1,4-Dichlorobenzene
- D028 1,2-Dichloroethane

Federal Toxicity Characteristic
22 CCR §66261.24 (a)(1)

- D029 1,1-Dichloroethylene
- D030 2,4-Dinitrotoluene
- D012 Endrin
- D031 Heptachlor
- D032 Hexachlorobenzene
- D033 Hexachlorobutadiene
- D034 Hexachloroethane
- D008 Lead
- D013 Lindane
- D009 Mercury
- D014 Methoxychlor
- D035 Methyl ethyl ketone
- D036 Nitrobenzene
- D037 Pentachlorophenol
- D038 Pyridine
- D010 Selenium
- D011 Silver
- D039 Tetrachloroethylene
- D015 Toxaphene
- D040 2,4,5-Trichlorophenol
- D042 2,4,6-Trichlorophenol
- D017 2,4,5-TP (Silvex)
- D043 Vinyl chloride

TCLP Example

- A waste sample is analyzed for chromium & cadmium using the TCLP. The analytical report states:
  - chromium --------- 4.8 mg/L
  - cadmium --------- 0.1 mg/L

(RT for chromium is 5.0 mg/L)
(RT for cadmium is 1.0 mg/L)

- Is the waste a TCLP hazardous waste?

Characteristic of Toxicity
22 CCR §66261.24 (a)(2)

- Subsection (a)(2) is unique to California's hazardous waste regulations in that we regulate:
- Inorganic constituents
  - RT for both total concentration and WET* soluble concentration
- Organic constituents
  - RT for both total concentration and WET * soluble concentration

*Waste Extraction Test: Soluble Threshold Limit Concentration = STLC

Total Threshold Limit Concentration = TTLC

Characteristic of Toxicity
22 CCR §66261.24 (a)(2)

- To determine if a waste exhibits the characteristic of toxicity by this element, samples of the waste are prepared for analysis of their ***total*** and ***extractable*** contents (TTLC and STLC)

Characteristic of Toxicity
22 CCR §66261.24 (a)(2)

- The digests (total) and extracts (WET) are analyzed and the results are compared to their respective regulatory limits [Tables in subsection (a)(2)].

Persistent and Bioaccumulative Toxic Substances
22 CCR §66261.24(a)(2)

- Toxic and hazardous if:
  - The extract content ≥ Soluble Threshold Limit Concentration (STLC) by the WET (mg/L),

    OR
  - The total content ≥ Total Threshold Limit Concentration (TTLC) by analysis for total concentration in waste (mg/kg)

Inorganic Constituents
22 CCR §66261.24(a)(2)(A)

- ❑Antimony
- ❑Arsenic
- ❑Asbestos
- ❑Barium
- ❑Beryllium
- ❑Cadmium
- ❑Chromium
- ❑Chromium VI
- ❑Cobalt
- ❑Copper
- ❑Fluoride Salts
- ❑Lead
- ❑Mercury
- ❑Molybdenum
- ❑Nickel
- ❑Selenium
- ❑Silver
- ❑Thallium
- ❑Vanadium
- ❑Zinc

Organic Constituents
22 CCR §66261.24(a)(2)(A)

- ❑Aldrin
- ❑Chlordane
- ❑DDT, DDE, DDD
- ❑2,4-Dichlorophenoxyacetic acid
- ❑Dieldren
- ❑Dioxin (2,3,7,8-TCDD)
- ❑Endrin
- ❑Heptachlor
- ❑Kepone
- ❑Organic Lead Compounds
- ❑Lindane
- ❑Methoxychlor
- ❑Mirex
- ❑Pentachlorophenol
- ❑PCBs
- ❑Toxaphene
- ❑Trichloroethylene
- ❑2,4,5-Trichloro-phenoxypropionic acid (Silvex)

Characteristic of Toxicity

TCLP

- Simulated landfill leachate
- Acetic acid extractant
- 18-hour extraction
- 8 inorganic constituents
- 23 organic constituents
- less aggressive for inorganic constituents

WET

- Simulated landfill leachate
- Citric acid extractant
- 48-hour extraction
- 19 inorganic constituents
- 18 organic constituents
- more aggressive for inorganic constituents, not necessary for organic compounds

Characteristic of Toxicity Comparing Total and WET or TCLP

- If a substance in a waste were 100% soluble (in the extractant), then the maximum possible extract concentration would be:
    - WET: 1/10 the total concentration
    - TCLP: 1/20 the total concentration

Example 1

- Total digest = 530 mg/kg lead concentration, the maximum soluble results would be
  - WET: 53 mg/L
  - TCLP: 26.5 mg/L

- Both federal and state soluble thresholds for lead are 5 mg/L

Example 2

- Total digest = 53.0 mg/kg lead concentration, the maximum soluble results would be
  - WET: 5.3 mg/L
  - TCLP: 2.65 mg/L

- Both federal and state soluble thresholds for lead are 5 mg/L

WET and TCLP (Minimum Total Concentrations)

- To proceed with the WET or TCLP (for a solid waste), the minimum total lead concentration (in the digest) needs to be
  - Total Pb concentration for WET : 50 mg/kg
  - Total Pb concentration for TCLP: 100 mg/kg

Acute Toxicity

- Oral Toxicity
- Dermal Toxicity
- Inhalation Toxicity
- Acute Aquatic Toxicity

Acute Toxicity

- In many cases, toxicity data is available for pure chemical compounds found in wastes

  (one reference = NIOSH's Registry of Toxic Effects of Chemical Substances [RTECS]):

  http://www.cdc.gov/niosh/rtecs/default.html

- Although not common, in theory a generator could perform an animal bioassay on its waste

Acute Oral Toxicity
22 CCR §66261.24(a)(3)

- Waste is hazardous if oral $LD_{50} < 2500$ mg/kg (HSC §25141.5)

22 CCR §66261.24(a)(3)

Acute oral LD_{50} (Definition)

The dose of a substance or mixture of substances, in mg of substance per kg of test animal body weight, which, when administered orally as a single dose, produces death within 14 days in half of a group of 10 or more laboratory white rats [200 to 300 g], which have fasted for 24 hours immediately prior to administration of the dose. (22 CCR §66260.10)

Statutory Exclusions - HSC §25141.5 (b)(2)(B)

These substances are <u>not hazardous</u> wastes
<u>if only hazardous by acute oral toxicity criteria</u>.

- Acetic acid
- Aluminum chloride
- Ammonium bromide
- Ammonium sulfate
- Anisole
- Boric acid
- Calcium fluoride
- Calcium formate
- Calcium propionate
- Cesium chloride
- Magnesium chloride
- Potassium chloride

Continued…

- sodium bicarbonate
- sodium borate
- decahydrate
- sodium carbonate
- sodium chloride
- sodium iodide
- sodium tetraborate

- <u>food flavoring oils:</u>

  allspice oil

  ceylon cinnamon oil

  clarified slurry oil

  dill oils

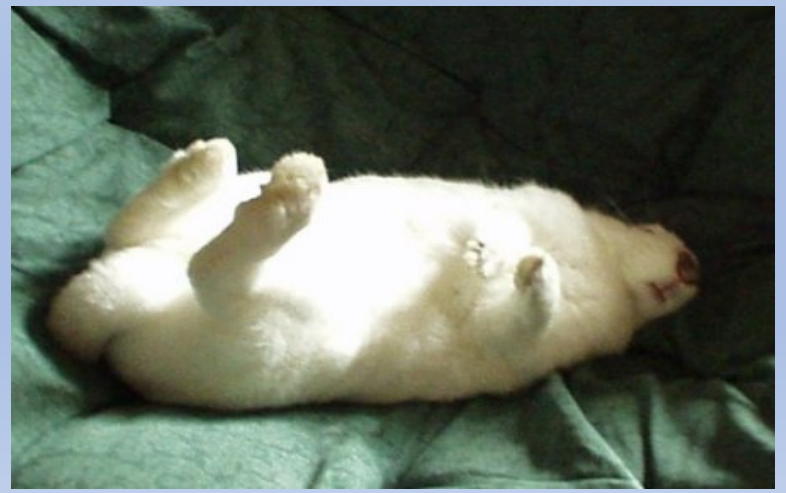
  lauryl leaf oils

Acute Dermal Toxicity
22 CCR §66261.24(a)(4)

- Waste is hazardous if dermal $LD_{50} < 4300$ mg/kg

Acute Dermal Toxicity
22 CCR §66261.24(a)(4)

- Acute dermal LD_{50}
  - dose of a substance or mixture of substances, in milligrams per kilogram of test animal body weight, which, when applied continuously to the bare skin for 24 hours, produces death within 14 days in half of a group of 10 or more rabbits.

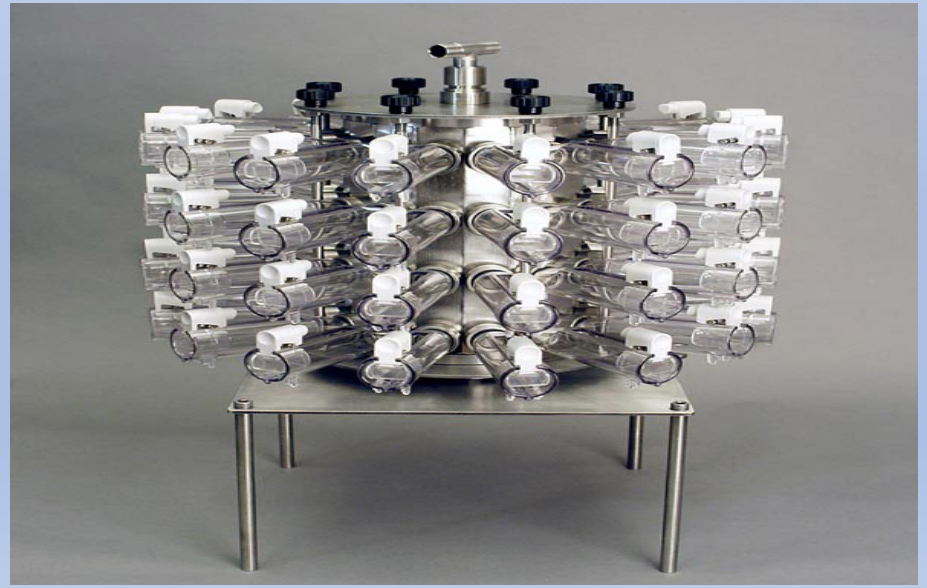


Acute Inhalation Toxicity
22 CCR §66261.24(a)(5)

- Waste is hazardous if inhalation $LC_{50} < 10{,}000$ ppm

Acute Inhalation Toxicity
22 CCR §66261.24(a)(5)

- Acute inhalation LC_{50}
  - concentration of a substance or mixture of substances in air, which when inhaled continuously for 8 hours by a group of 10 or more laboratory white rats produces death in half the group within 14 days.



Aquatic Toxicity
22 CCR §66261.24(a)(6)

- Also known as the “fish test”
- LC_{50} measured using:
  - fathead minnows (not flatheads!)
  - rainbow trout
  - golden shiners
- Hazardous if 96-hour $LC_{50} < 500$ mg/L

Calculated Inhalation Toxicity
22 CCR §66261.24(b)

- A waste mixture that contains one or more compounds that are acutely toxic (inhalation) can be shown to be nonhazardous
  - Measure headspace vapor concentration
  - Concentration in headspace must be higher than its LC_{50} or LC_{LO}

Calculated Inhalation Toxicity
22 CCR §66261.24(b)

The head space vapor of a waste is prepared according to SW-846 Method 5020

$$C_A = \frac{Q_A}{MW} \times \frac{29.8ml}{mmole} \times \frac{1}{2 \times 10^{-6} M^3}$$

- C (in parts per million) is the concentration of material A in head space vapor
- Q (in milligrams) is the quantity of material A in sampling syringe and MW (in milligrams per millimole) is the molecular weight of material A

Calculated Oral or Dermal Toxicity
22 CCR §66261.24(c)

- A waste mixture that contains one or more compounds that are acutely toxic (oral or dermal) can be calculated to be nonhazardous

- Calculated LD_{50} = $$\frac{100}{\sum_{x=1}^{n} \frac{\%A_x}{T_{A_x}}}$$

$\%A_x$: weight % of each component in the waste mixture
T_{A_X}: acute oral or dermal LD_{50} or LD_{LO} of each component

- Nonhazardous:
  - Calculated oral $LD_{50} > 2500mg/kg$
  - Calculated dermal $LD_{50} > 4300mg/kg$

Carcinogenicity
22 CCR §66261.24(a)(7)

- List of 16 carcinogenic substances
- Hazardous if present in a waste or material in single or combined concentration exceeding 0.001 percent (10 ppm)

Carcinogenic Substances

- 2-acetylaminofluorene
- acrylonitrile
- 4-aminodiphenyl
- benzidine
- bis(chloromethyl)ether
- Methyl chloromethyl ether
- 1,2-dibromo-3-chloropropane
- 3,3-dichlorobenzidine
- Dimethylaminoazo-benzene
- ethyleneimine
- alpha-naphthylamine
- beta-naphthylamine
- 4-nitrobiphenyl
- N-nitrosodimethylamine
- Beta-propiolactone
- vinyl chloride

Experience or Testing
22 CCR §66261.24(a)(8)

- Wastes shown through experience or testing to pose a hazard
- The criteria were not expected to capture all possible wastes that could be hazardous
- Only DTSC applied

Experience or Testing
22 CCR §66261.24(a)(8)

- DTSC is required to promulgate regulations if DTSC identifies a waste as hazardous using this section and has statewide application (HSC §25141.5)
  - Example: ethylene glycol (spent antifreeze)
  - Ethylene glycol was identified as a hazardous waste per (a)(8) in 1994, document was later rescinded

Is it a Characteristic Hazardous Waste?

How do I know?

- Consider characteristics one at a time
- Use test data and/or knowledge, SDSs, published literature, etc.

Common mistakes:

- Stopping at one characteristic
- Not taking/analyzing representative samples
- Running total digestion only

Different Rules for Characteristic and Listed Hazardous Wastes

- Mixture rule
- Derived-from rule
- Contained-in policy

Characteristic Wastes

- Mixture Rule - Characteristic Wastes
  22 CCR §66261.3(b)(4)

- Derived From Rule - Characteristic Wastes
  22 CCR §66261.3(c)

Mixture Rule - Characteristic Wastes
22 CCR §66261.3(b)(4)

- Wastes mixed with either a RCRA or a non-RCRA characteristic hazardous waste are hazardous waste <u>only if</u> the resulting mixture still exhibits a hazardous characteristic

- Intentional mixture to avoid regulation is a treatment, and requires authorization

Derived From Rule - Characteristic Wastes
22 CCR §66261.3(c)

- Wastes derived from the treatment, storage or disposal of either a RCRA or a non-RCRA characteristic hazardous waste are hazardous waste only if the resulting waste still exhibits a hazardous characteristic

Listed Wastes

- Mixture Rule - Listed Wastes
  22 CCR §66261.3(a)(2)(E) and (F)

- Derived From Rule - Listed Wastes
  22 CCR §66261.3(c)

Mixture rule – RCRA Listed Wastes

- 22 CCR §66261.3(a)(2)(E) and (F)

- Mixtures of wastes and RCRA listed hazardous wastes are listed hazardous wastes
    - Concentrations are irrelevant

Mixture rule – RCRA Listed Wastes

- 22 CCR §66261.3(a)(2)(E) and (F)

- Exceptions:
  - Waste has been delisted by US EPA
  - Wastes listed solely due to characteristics other than (T) or (H), and mixture does not exhibit a characteristic
  - Wastewaters containing de minimis concentrations of listed hazardous wastes discharged under the Clean Water Act provisions
  - Wastes containing minimal losses of P or U listed waste due to normal handling or minor leaks

Derived-From Rule- RCRA listed wastes

- 22 CCR §66261.3(c)
- Wastes generated from treatment, storage, disposal of listed hazardous waste are hazardous waste

Derived-From Rule- RCRA listed wastes

- Exceptions:
  - Wastes delisted by US EPA
  - Pickle liquor sludge
  - Biological treatment sludge (K156 and K157)

Derived-from Rule - Characteristic

- 22 CCR §66261.3(c)

- Wastes derived from the treatment, storage or disposal of characteristic hazardous waste are hazardous waste only if the resulting mixture still exhibits a characteristic

Example

- K001 sludge is shipped to a treatment, storage, disposal facility (TSDF) to be incinerated.

- What is the regulatory status of the ash generated from the incineration of the sludge?

Example

- Sludges generated from the treatment of wastewater at a metal finishing facility are determined to be F006 listed hazardous waste. A wastewater that is generated at the metal finishing facility doesn't exhibit a characteristic of a hazardous waste. The wastewater is sent to wastewater treatment facility where it is treated.
- What is the status of the sludge generated at the wastewater treatment facility?

California's Mixture Rule for M-listed Waste

- 22 CCR §66261.3(b)(4)

- Not like the RCRA listed waste mixture rule
- Is a hazardous waste only if it meets a characteristic of a hazardous waste (toxic, corrosive, ignitable, reactive)

RCRA Contained-In Policy

- Applies to contaminated media and debris

- Environmental media (water or soil) that contain listed hazardous wastes are hazardous wastes
  - Unless DTSC determines the listed waste is present at insignificant concentration (risk-based evaluation)

Example

- Technical grade 80% 2,4-dinitrotoluene
- Unused, but to be discarded
- 2,4-dinitrotoluene is listed as U105

    - Question: Is this a listed hazardous waste?

Example

- Product containing 5% p-chloroaniline and other active ingredients
- Product is unused and spilled on land
- P-chloroaniline is listed as P024

    - Question: Is the contaminated soil a listed hazardous waste?

Example

- Sole active ingredient is 5% p-chloroaniline (listed as P024)
- Unused, but spilled on the ground
  - Is the contaminated soil a listed hazardous waste?

- The contaminated soil is treated.
  - What is the regulatory status of the clean soil?
  - What is the regulatory status of the treatment residue?

Example

- Used acetone leaks from a hazardous waste container and contaminates the soil. The soil is excavated and will be disposed of.
  - What is the regulatory status of the soil?

Part 1: Hazardous Waste Determination Process

Step 1	Do I have a waste?
Step 2	Excluded or exempted?
Step 3	Listed? (Article 4, Article 5)
Step 4	Characteristic?

- Is the waste “used oil” or a material that contains “used oil”?

Used Oil

- A waste can be hazardous by being “used oil” or
- By being contaminated with or containing used oil
- Definition is in statute, not regulations
- Does not have to exhibit a characteristic

Example

- If a used oil filter is not drained of its used oil, what is the regulatory status of the used oil filter?

- If a rag or kitty litter is used to clean up an oil spill, what is the regulatory status of the material?

Part 2 – Hazardous Waste Categories

- 22 CCR Chapter 11, Article 5

Categories of Hazardous Waste

- 22 CCR Chapter 11, Article 5

- RCRA hazardous wastes
- Non-RCRA hazardous waste
  - Extremely hazardous waste
  - Hazardous wastes of concern
  - Special wastes
- Test Methods
- Waste Codes

Why does it matter?

Proper Classification of Hazardous Waste is Necessary:

- Land Disposal Restriction/Treatment standards
- Fees
  - Generator/ disposal
- Hazardous waste management requirements
  - Universal waste management requirements
- DTSC's discretionary authority
  - Variances, tiered permitting

RCRA Hazardous Waste

- 22 CCR §66261.110

- Not excluded from regulation under RCRA
  - Listed (P,U,F,K)
  - Ignitable
  - Corrosive (liquid)
  - Reactive
  - Toxic (using TCLP)
- Hazardous wastes are presumed to be RCRA hazardous waste unless determined otherwise

Non-RCRA Hazardous Wastes
22 CCR §66261.101

- M-listed
- Corrosive solid
- Toxic for anything except for federal toxicity [22 CCR §66261.24(a)(1)]
- Excluded under 40 CFR §261.4 and exhibits any of the Article 3 criteria
- Containers that are “RCRA-empty” but not “California-empty”

Acutely and Extremely Hazardous Wastes

- Hazardous wastes that if exposure were to occur, may likely result in death, disabling personal injury or serious illness
- More hazardous than ordinary hazardous wastes

Acutely and Extremely Hazardous Wastes

ACUTE HAZARDOUS WASTE

Acutely (Federal)

- "P" listed

EXTREMELY HAZARDOUS WASTE

Extremely (State)

- Criteria based
- Appendix X (asterisks)

Extremely Hazardous Waste Criteria

- 22 CCR §66261.110 and §66261.113

- Acute toxicity
- Carcinogenicity
- Experience or testing
- Water reactivity
- Persistent and Bioaccumulative substances

Special Waste

- 22 CCR §66261.120

- Subset of non-RCRA hazardous waste
- Typically used for large volume wastes
- Not self-implementing – a generator must apply to DTSC to receive special waste classification
- Eligible to be managed according to less stringent standards

Special Waste Criteria

- 22 CCR §66261.122

- Can be hazardous for inorganic constituents only
- Constituent concentration can exceed their respective TTLCs or STLCs
- WET-soluble concentrations (when expressed in mg/kg) cannot exceed its TTLC value

Special Waste Management

- 22 CCR §66261.126

- Waste can go into a class III landfill
- Landfills must have WDRs for special waste
- Landfill operator must have a variance from DTSC

Other Categories

- Universal Waste
  - Not in Article 5
  - Reduced regulations to encourage proper management
  - Reverts back to hazardous waste at the destination facility

- Scrap metal

Part 3 – Waste Classification Options

- CLASSIFICATION OF A WASTE AS HAZARDOUS OR NONHAZARDOUS [66260.200]
  - DTSC concurrence [66260.200(d)]
  - DTSC reclassification [66260.200(f)]
  - DTSC special waste [66261.124]

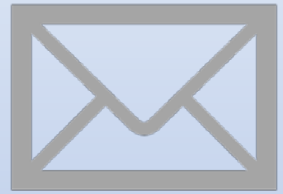
** **All DTSC determination are subject to fee for service!***

Questions?

Regulatory Assistance Office

(800) 728-6942

Email: RAO@dtsc.ca.gov



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