



Land Disposal Restrictions



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Introduction

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Land Disposal Restrictions (LDRs)




- **Hazardous and Solid Waste Amendments (HSWA)**
 - 1984
 - Prohibits land disposal of untreated waste
 - Prevents threats to human health and the environment
 - Mitigates future problems




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Code of Federal Regulations

- 40 CFR 268
- 22 CCR, Division 4.5, Chapter 18



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The LDR Prohibitions


- Disposal
 - Untreated hazardous waste
- Dilution
 - In lieu of proper treatment
- Storage
 - Indefinite storage in lieu of treatment



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Land Disposal

- Land disposal includes:
 - Landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, underground mine or cave, or concrete vault




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Management Method	# of Mngrs	Managed (Tons)	
* Total *	1,166	35,002,719	
DEEPWELL / UNDERGROUND INJECTION	40	24,277,273	69%
WASTEWATER TREATMENT	320	3,967,219	11%
ENERGY RECOVERY	70	1,469,824	4%
INCINERATION	130	1,174,764	3%
LANDFILL	55	1,138,596	3%
METALS RECOVERY	96	1,081,216	3%
FUEL BLENDING	103	656,168	5%
SLUDGE TRTMNT / STAB / ENCAP	88	653,778	
SOLVENTS RECOVERY	388	252,604	
OTHER RECOVERY	62	193,961	
OTHER TREATMENT	171	104,675	
LAND TREATMENT / APPLICATION	8	32,642	

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Applicability


- All Federal hazardous waste
- 6 categories of non-RCRA hazardous waste
 - Unless specifically excluded from 40 CFR 268
- Point of generation



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Exclusions

- Generators of ≤ 100 kg (1 kg acute)
- Waste pesticides disposed of by farmers
- Some de minimis losses of characteristic wastes to wastewaters
- Universal waste
 - Testing, tracking, recordkeeping, and storage



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LDR Steps

1. Identify all waste codes
2. Determine subcategory
3. Identify treatability group
4. Determine underlying hazardous constituents
5. Identify special LDR situations
6. Execute notifications/certifications




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Waste Code	Waste Description and Treatment/Regulatory Subcategory ¹	Regulated Hazardous Constituent		Wastewaters	Nonwastewaters
		Common Name	CAS ² Number	Concentration ³ in mg/L, or Technology Code ⁴	Concentration ³ in mg/kg unless noted as "mg/L TCLP"; or Technology Code ⁴
D006 ⁵	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for cadmium based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Cadmium	7440-43-9	0.69 and meet §268.48 standards ³	0.11 mg/L TCLP and meet §268.48 standards ³
	Cadmium Containing Batteries Subcategory (Note: This subcategory consists of nonwastewaters only).	Cadmium	7440-43-9	NA	RTHRM
	Radioactively contaminated cadmium containing batteries. (Note: This subcategory consists of nonwastewaters only)	Cadmium	7440-43-9	NA	Macroencapsulation in accordance with 40 CFR 268.45.



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Waste code	Waste description and treatment/Regulatory subcategory ¹	Regulated hazardous constituent		Wastewaters	Nonwastewaters
		Common name	CAS ² number	Concentration ³ in mg/L, or Technology Code ⁴	Concentration ³ in mg/kg unless noted as "mg/L TCLP"; or Technology Code ⁴
D006 ⁵	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for cadmium based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Cadmium	7440-43-9	0.69 and meet §268.48 standards ³	0.11 mg/L TCLP and meet §268.48 standards ³
	Cadmium Containing Batteries Subcategory. (Note: This subcategory consists of nonwastewaters only).	Cadmium	7440-43-9	NA	RTHRM
	Radioactively contaminated cadmium containing batteries. (Note: This subcategory consists of nonwastewaters only)	Cadmium	7440-43-9	NA	Macroencapsulation in accordance with 40 CFR 268.45.
D007 ⁵	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for chromium based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Chromium (Total)	7440-47-3	2.77 and meet §268.48 standards ³	0.60 mg/L TCLP and meet §268.48 standards ³

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Step 1

- Determine if you are managing restricted hazardous waste
 - At the point of generation
 - Identify ALL waste codes applicable to the waste
 - But all waste codes may not need treatment!?!?

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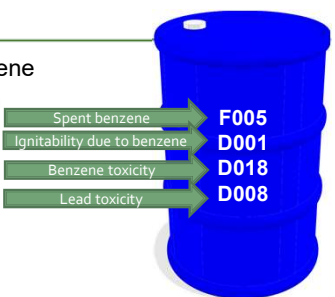

If your waste carries.....		
Listed only	Characteristic only	Both Listed and Characteristic
Treat all waste codes	Treat all waste codes	Treat all listed codes Treat characteristic codes if they have not already been treated for by the listed code

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Example

- Spent solvent benzene
- Lead contamination

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Example

➤ Which waste codes *must* be treated?

Spent benzene	F005
Ignitability due to benzene	D001
Benzene toxicity	D018
Lead toxicity	D008

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Example

➤ Which waste codes *must* be treated?

- Listed
- F005

Spent benzene	F005
Ignitability due to benzene	D001
Benzene toxicity	D018
Lead toxicity	D008

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Example

➤ F005 must be treated

➤ Which constituents cause the characteristics?

- D001?
- D018?
- D008?

Spent benzene	F005
Ignitability due to benzene	D001
Benzene toxicity	D018
Lead toxicity	D008

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Example

- F005 must be treated
- Which constituents cause the characteristics?
 - D001? **Benzene**
 - D018? **Benzene**
 - D008? **Lead**

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Example

- Which constituents cause the characteristics?
 - D001? **Benzene**
 - D018? **Benzene**
 - D008? **Lead**
- Does the listed code provide a treatment for the constituent causing the characteristics?

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Waste code	Waste description and treatment/Regulatory subcategory ¹	Regulated hazardous constituent		Wastewaters	Nonwastewaters
		Common name	CAS ² number	Concentration ³ in mg/L; or Technology Code ⁴	Concentration ⁵ in mg/kg unless noted as "mg/L TCLP"; or Technology Code ⁴
F001, F001, F002, F003, F004 and/or F005	F005 solvent wastes that contain any combination of one or more of the following spent solvents: acetone, benzene, n-butyl alcohol, carbon disulfide, carbon tetrachloride, chlorinated fluorocarbons, chlorobenzene, o-cresol, m-cresol, p-cresol, cyclohexanone, o-dichlorobenzene, 2-ethoxyethanol, ethyl acetate, ethyl benzene, ethyl ether, isobutyl alcohol, methanol, methylene chloride, methyl ethyl ketone, methyl isobutyl ketone, nitrobenzene, 2-nitropropane, pyridine, tetrachloroethylene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,2-trichloroethane	Acetone	67-64-1	0.28	160
		Benzene	71-43-2	0.14	10
		n-Butyl alcohol	71-36-3	5.6	2.6
		Carbon disulfide	75-15-0	3.8	NA
		Carbon tetrachloride	56-23-5	0.057	6.0
		Chlorobenzene	108-90-0	0.057	6.0
		o-Cresol	7	0.11	5.6
		m-Cresol (difficult to distinguish from p-cresol)	95-48-7	0.77	5.6
		p-Cresol (difficult to distinguish from m-cresol)	108-39-4	0.77	5.6
		Cresol-mixed isomers (Cresylic acid) (sum of o-, m-, and p-cresol concentrations)	106-44-5	0.88	11.2
			1319-77-3		

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Example

- Which constituents cause the characteristics?
 - ~~D001? Benzene~~ → Spent benzene → F005
 - ~~D018? Benzene~~
 - ~~D008? Lead~~ → Lead toxicity → D008
- Only F005 and D008 must be treated to satisfy LDR compliance

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Step 2 - Subcategory

- Some waste codes have multiple subcategories

D001	Ignitable Characteristic Wastes, except for the 621-21(a)(1) High TOC Subcategory	NA	NA	DEACT and meet §268.48 standard ² or RCBCS, or CMBS ³	DEACT and meet §268.48 standard ² or RCBCS, or CMBS ³
	High TOC Ignitable Characteristic Liquid Subcategory based on 40 CFR 261.21(a)(1) - Greater than or equal to 10% total organic carbon. (Note: This subcategory consists of nonwastewater only.)	NA	NA	NA	RCBCS, CMBS ³ , or POLYM
D002	Corrosive Characteristic Wastes	NA	NA	DEACT and meet §268.48 standard ²	DEACT and meet §268.48 standard ²
D002	Radioactive high level wastes generated during the reprocessing of fuel rods. (Note: This subcategory consists of nonwastewater only.)	Corrosivity (pH)	NA	NA	HUYT
D004		Toxicity	7440-39-2	NA	HUYT
D005		Barium	7440-39-3	NA	HUYT
D006		Cadmium	7440-43-9	NA	HUYT
D007		Chromium (Total)	7440-47-3	NA	HUYT
D008		Lead	7439-97-3	NA	HUYT
D009		Mercury	7439-97-4	NA	HUYT
D010		Selenium	7782-49-2	NA	HUYT
D011		Silver	7782-49-2	NA	HUYT
D007		Reactive Solids Subcategory based on 261.23(a)(5)	NA	NA	DEACT

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Step 3 - Treatability Group

Wastewater < 1% total organic carbons AND < 1% total suspended solids	Non-Wastewater ≥ 1% total organic carbons OR ≥ 1% total suspended solids
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Waste code	Waste description and treatment/Regulatory subcategory ¹	Regulated hazardous constituent		Wastewaters	Nonwastewaters
		Common name	CAS ² number	Concentration ³ in mg/L; or Technology Code ⁴	Concentration ³ in mg/kg unless noted as "mg/L TCLP"; or Technology Code ⁴

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Determine Treatment Standard

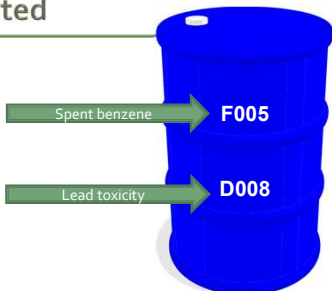
- Using the waste code, subcategory and treatability group, the treatment standard can be determined
 - “Code, constituent, category, column”



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Example - Revisited

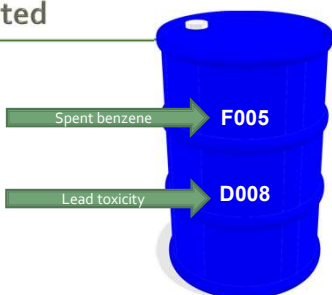
- F005 and D008
- Material contains:
 - 10% total organic carbons
- Wastewater or non-wastewater?



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Example - Revisited



- F005 and D008
- Material contains:
 - 10% total organic carbons
- Non-wastewater
 - ≥ 1% TOC



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Determine Treatment Standard



- Using the waste code, subcategory and treatability group, the treatment standard can be determined
 - "Code, constituent, category, column"
 - F005, 1, benzene, non-wastewater
 - D008, 1, lead, non-wastewater

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Determining Treatment Standard

- Three possible types of treatment
 - Reduction in total concentration (mg/L or mg/kg)
 - Reduction in leachable concentration (mg/l TCLP)
 - Technology code (ROGS, CMBST, POLYM)
 - Best demonstrable available technology (BDAT)

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Waste code	Waste description and treatment/Regulatory subcategory ¹	Regulated hazardous constituent		Wastewaters	Nonwastewaters
		Common name	CAS ² number	Concentration ³ in mg/L; or Technology Code ⁴	Concentration ⁵ in mg/kg unless noted as "mg/L TCLP"; or Technology Code ⁴
F001, F001, F002, F003, F004 and/or F002, F005 solvent wastes that contain any combination of one or more of the following spent solvents:	Acetone	67-64-1	0.28	160	
	Benzene	71-43-2	0.14	10	
	n-Butyl alcohol	71-36-3	5.6	2.6	
	Carbon disulfide	75-15-0	3.8	NA	
	Carbon tetrachloride	56-23-5	0.057	6.0	
	Chlorobenzene	108-90-0	0.057	6.0	
	o-Cresol	7	0.11	5.6	
	m-Cresol (difficult to distinguish from p-cresol)	95-48-7	0.77	5.6	
	p-Cresol (difficult to distinguish from m-cresol)	108-39-4	0.77	5.6	
	Cresol-mixed isomers (Cresylic acid) (sum of o-, m-, and p-cresol concentrations)	106-44-5	0.88	11.2	
	1,1,2-trichloroethane, 1,1,2-trichloro-1,2-difluoroethane	1319-77-3			

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Waste treatment/Regulatory code	Waste description and subcategory ¹	Regulated hazardous constituent		Wastewaters	Nonwastewaters
		Common name	CAS ² number	Concentration ³ in mg/L; or Technology Code ⁴	Concentration ⁵ in mg/kg unless noted as "mg/L TCLP"; or Technology Code ⁴
D008 ⁹	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for lead based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Lead	7439-92-1	0.69 and meet §268.48 standards ⁸	0.75 mg/L TCLP and meet §268.48 standards ⁸
	Lead Acid Batteries Subcategory (Note: This standard only applies to lead acid batteries that are identified as RCRA hazardous wastes and that are not excluded elsewhere from regulation under the land disposal restrictions of 40 CFR 268 or exempted under other EPA regulations (see 40 CFR 266.80). This subcategory consists of nonwastewaters only.)	Lead	7439-92-1	NA	RLEAD
	Radioactive Lead Solids	Lead	7439-	NA	MACRO

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Treatment Standard


- F005 – Benzene
 - 10 mg/kg
- D008 – Lead
 - 0.75 mg/L “and meet §268.48 standards”



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Step 4 – Underlying Hazardous Constituents



- *Underlying hazardous constituent* means any constituent listed in §268.48, Table UTS— Universal Treatment Standards, except fluoride, selenium, sulfides, vanadium, and zinc, which can reasonably be expected to be present at the point of generation of the hazardous waste at a concentration above the constituent-specific UTS treatment standards.



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UHCs in English

- Constituents expected to be in the waste
 - Not already treated for by a waste code
 - e.g., D008 for lead
 - Not regulated by a waste code
 - e.g., nickel






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Do I have UHCs?

1. Is there a reasonable expectation that there are constituents in your waste that have not been treated?
2. Are there any D waste codes requiring treatment?
3. Do you see the statement “§and meet 268.48 standards” in the treatment standard for the D code?

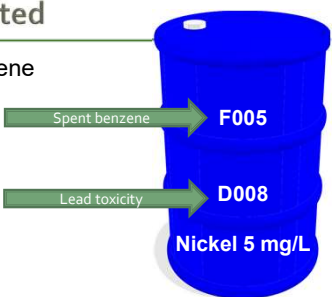

If yes to *all three* – Determine UHCs
 If no to *any* – Not required to determine UHCs

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Example - Revisited

- Spent solvent benzene
 - F005, D008
 - Nonwastewater
 - Contains nickel
- Is nickel a UHC?

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Do I have UHCs?

1. Is there a reasonable expectation that there are constituents in your waste that have not been treated?
2. Are there any D waste codes requiring treatment?
3. Do you see the statement “§and meet 268.48 standards” in the treatment standard for the D code?

If yes to *all three* – Determine UHCs
 If no to *any* – not required to determine UHCs



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Significant Codes: Foo5, Doo8

Waste code	Waste description and treatment/Regulatory subcategory ¹	Regulated hazardous constituent		Wastewaters	Nonwastewaters
		Common name	CAS ² number	Concentration ³ in mg/L or Technology Code ⁴	Concentration ⁵ in mg/kg unless noted as "mg/L TCLP"; or Technology Code ⁴
D008 ⁶	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for lead based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Lead	7439-92-1	0.69 and meet §268.48 standards ⁸	0.75 mg/L TCLP and meet §268.48 standards ⁵
	Lead Acid Batteries Subcategory (Note: This standard only applies to lead acid batteries that are identified as RCRA hazardous wastes and that are not excluded elsewhere from regulation under the land disposal restrictions of 40 CFR 268 or exempted under other EPA regulations (see 40 CFR 268.80). This subcategory consists of nonwastewaters only.)	Lead	7439-92-1	NA	RLEAD
	Radioactive Lead Solids	Lead	7439-	NA	MACRO



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UNIVERSAL TREATMENT STANDARDS
 [Note: NA means not applicable]

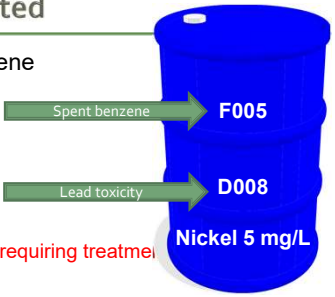
Regulated constituent common name	CAS ¹ number	Wastewater standard Concentration ² in mg/l	Nonwastewater standard Concentration ³ in mg/kg unless noted as "mg/l TCLP"
Fluoride ⁴	16984-48-8	35	NA
Lead	7439-92-1	0.69	0.75 mg/l TCLP
Mercury—Nonwastewater from Retort	7439-97-6	NA	0.20 mg/l TCLP
Mercury—All Others	7439-97-6	0.15	0.025 mg/l TCLP
Nickel	7440-02-0	3.98	11 mg/l TCLP
Selenium ⁷	7782-49-2	0.82	5.7 mg/l TCLP
Silver	7440-22-4	0.43	0.14 mg/l TCLP
Sulfide ⁵	18496-25-8	14	NA
Thallium	7440-28-0	1.4	0.20 mg/l TCLP
Tantalum ⁶	7440-62-2	4.3	



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Example - Revisited


- Spent solvent benzene
 - F005, D008
 - Nonwastewater
 - Contains nickel
- Is nickel a UHC?
 - Yes, nickel is a UHC requiring treatment



Spent benzene → F005

Lead toxicity → D008

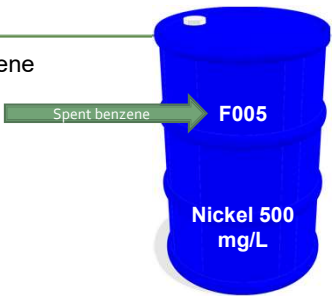
Nickel 5 mg/L



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Example 2

- Spent solvent benzene
 - F005
 - D018 and D001 get treated by the F005
 - Nonwastewater
 - Contains nickel
- Is nickel a UHC?



Spent benzene → F005

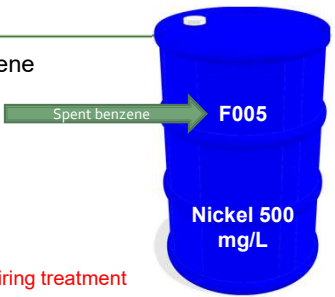
Nickel 500 mg/L



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Example 2

- Spent solvent benzene
 - F005
 - D018 and D001 get treated by the F005
 - Nonwastewater
 - Contains nickel
- Is nickel a UHC?
 - No; no D-codes requiring treatment



Spent benzene → F005



Nickel 500 mg/L



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Non-RCRA Hazardous Waste Prohibitions

- Metal-containing wastes
- Auto shredder waste
- Foundry sand
- Metal-containing fly ash, bottom ash, retort ash, or baghouse waste other than foundries
- Baghouse waste from foundries
- Asbestos-containing waste



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Non-RCRA Example

(1) Table I-A CCVE identifies the non-RCRA auto shredder wastes and the concentrations of their associated hazardous constituents which may not be exceeded by the extract of the waste or treatment residual for the allowable land disposal of such waste or residual.

TABLE I-A CCVE





Auto Shredder Wastes	Concentration (mg/l)
Cadmium	1.0
Cerium (IV) Compounds	5.0
Chromium (total)	560.0
Copper	25.0
Lead	50.0
Mercury	0.2
Nickel	20.0
Zinc	250.0

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Step 5 – Special LDR Situations



- Debris
 - A manufactured object; or plant or animal matter; or natural geologic material
- Soil
- Lab packs

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Step 6. LDR Notices and Certifications



- LDR notification [\[66268.7\(a\)\(2\)\]](#)
 - HW being sent off site for treatment at a TSDF
 - Typical and most common
- LDR notification to file [\[66268.7\(a\)\(7\)\]](#)
 - HW excluded from regulation subsequent to the point of generation due to a specific exclusion
 - e.g., excluded wastewater discharges

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LDR Notices and Certifications


- LDR notification [\[66268.9\]](#)
 - HW that no longer exhibits a characteristic subsequent to the point of generation and disposed on site; includes UHCs
 - e.g., absorbed spills

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LDR Notices and Certifications

- LDR certification [\[66268.7\(a\)\(3\)\]](#)
 - HW meets the treatment standard at the point of generation
- LDR certification [\[66268.7\(a\)\(5\)\]](#)
 - HW that is treated on site in containers and tanks to meet applicable LDRs and requires no further treatment at TSDF
 - Absorbed spills, elementary neutralization




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Lab Pack Certification



- Lab pack certification [66268.7(a)(9)]
 - Certification that no prohibited waste codes are in lab packs being sent for combustion




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Additional Documentation


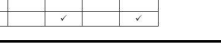
- Soil, debris may have additional notification and documentation requirements
- Generator knowledge and/or analytical for LDR determination

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Table 5-7 Generator Paperwork Requirements



Required Information	Applicable Paragraph at §66268.7			
	(a)(2)	(a)(3)	(a)(4)	(a)(9)
EPA Hazardous Waste Numbers and Manifest Number of first shipment	✓	✓	✓	✓
Statement: "This waste is not prohibited from land disposal."	✓	✓		
The waste is subject to the LDRs. The constituents of concern for F001-F005 and F039, and underlying hazardous constituents in RCRA characteristic wastes, unless the waste will be treated and monitored for all constituents. If all constituents will be treated and monitored, there is no need to put them all on the LDR notice.	✓	✓		
The notice must include the applicable wastewater/non-wastewater category (see Section 66260.10) and subdivisions made within a waste code based on waste-specific criteria (such as D003 reactive cyanide)	✓	✓		
Waste analysis data (when available)	✓	✓	✓	
Date the waste is subject to the prohibition			✓	
For hazardous debris, when treating with the alternative treatment technologies provided by Section 66268.45: the contaminants subject to treatment, as described in 66268.45(b), and an indication that these contaminants are being treated to comply with 66268.45.	✓		✓	
For contaminated soil subject to LDRs as provided in Section 66268.49(a), the constituents subject to treatment as described in 66268.49(d), and the following statement: "This contaminated soil [does/does not] contain listed hazardous waste and [does/does not] exhibit a characteristic of hazardous waste and [is subject to/ complies with] the soil treatment standards as provided by 66268.49(c) or the universal treatment standards"	✓	✓		
A certification is needed (see applicable section for exact wording)				

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Documentation



- Notifications, certifications, waste analysis, any other documentation [66268.8]
 - 3 years from date last sent off site

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Waste Analysis


- HW treated on site subsequent to the point of generation to meet all LDRs [268.7(a)(5)]
 - On site treatment

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Waste code	Waste description and treatment/Regulatory subcategory ¹	Regulated hazardous constituent		Wastewaters	Nonwastewaters
		Common name	CAS ² number	Concentration ³ in mg/L; or Technology Code ⁴	Concentration ⁵ in mg/kg unless noted as "mg/L TCLP"; or Technology Code ⁴
F001, F001, F002, F003, F004 and/or F002, F005 solvent wastes that contain any combination of one or more of the following spent solvents:	Acetone	67-64-1	0.28	160	
	Benzene	71-43-2	0.14	10	
	n-Butyl alcohol	71-36-3	5.6	2.6	
	Carbon disulfide	75-15-0	3.8	NA	
	Carbon tetrachloride	56-23-5	0.057	6.0	
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	p-Cresol (difficult to distinguish from m-cresol)	108-39-4	0.77	5.6	
	Cresol-mixed isomers (Cresylic acid) (sum of o-, m-, and p-cresol concentrations)	106-44-5	0.88	11.2	
	1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane	1319-77-3			

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Any Questions?

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