Appendix A
Waste Profile and Waste Certification Form

WASTE PROFILE

WASTE PROFILE

PART I

A. GENERAL INFORMATION

WASTE PROFILE NO. _____

1. GENERATOR NAME

2. FACILITY ADDRESS/LOCATION

3. 20 X LDR TCLP
Process Knowledge

4. WAG ID & Uniform Waste Stream

5. TECHNICAL CONTACT

6. TITLE

7. PHONE
( )

8. e-mail:

B. 1. NAME OF WASTE
2. USEPA/or/STATE WASTE CODE(S) _____
3. PROCESS GENERATING WASTE _____
4. PROJECTED ANNUAL VOLUME/UNITS _____ / _____ 5. MODE OF COLLECTION _____
6. IS THIS WASTE A DIOXIN LISTED WASTE AS DEFINED IN 40 CFR 261.31 ? _____
__ YES __ NO
7. IS THIS WASTE RESTRICTED FROM LAND DISPOSAL (40 CFR 268)? __ YES __ NO
HAS AN EXEMPTION BEEN GRANTED: __ YES __ NO
DOES THE WASTE MEET APPLICABLE TREATMENT STANDARDS? __ YES __ NO

PART II

1. MATERIAL CHARACTERIZATION

COLOR(required)
DENSITY _____ BTU/LB _____
TOTAL SOLIDS _____ ASH CONTENT _____
LAYERING: (required) __ MULTILAYERED __
BILAYERED __ SINGLE PHASE

2. RCRA CHARACTERISTICS

PHYSICAL STATE: __ SOLID __ LIQUID __ SEMI-SOLID
__ GAS __ OTHER

TREATMENT GROUP: __ WASTEWATER __ NON-WASTEWATER

__ IGNITABLE (D001)
FLASH POINT (F) _____
__ HIGH TOC (> 10%)
__ LOW TOC (< 10%)

__ REACTIVE (D003)
__ WATER REACTIVE
__ CYANIDE REACTIVE
__ SULFIDE REACTIVE

__ CORROSIVE (D002)
pH _____
__ CORRODES STEEL

__ TOXICITY CHARACTERISTIC
(SEE PART III)

3. CHEMICAL COMPOSITION (ppm or mg/L)

COPPER _____ PHENOLICS _____
NICKEL _____ TOTAL HALOGENS _____
ZINC _____ VOLATILE ORGANICS _____
CHROMIUM-HEX _____ PCBs _____
(OTHER) _____

NOTE: EXPLOSIVES, SHOCK-SENSITIVE, PYROPHORIC,, AND ETIOLOGICAL WASTE NORMALLY MAY NOT BE ACCEPTED BY THE SSA DESIGNEE WITHOUT SPECIFIC APPROVAL.

4. MATERIAL COMPOSITION

COMPONENT	CONCENTRATION	RANGE

TOTAL _____ 100%

5. SHIPPING INFORMATION

DOT HAZARDOUS MATERIAL? __ YES __ NO
PROPER SHIPPING NAME _____

HAZARD CLASS _____ U.N. OR N.A. NO. _____
ADDITIONAL DESCRIPTION _____
METHOD OF SHIPMENT __ BULK __ DRUM __
OTHER:
CERCLA REPORTABLE QUANTITY (RQ) _____
EMERGENCY RESPONSE GUIDE PAGE
DOT PUBLICATION 5800.4 PAGE NO._____
EDITION (YR)
SPECIAL HANDLING INFORMATION _____

Sample

6. GENERATOR INFORMATION

BASIS FOR INFORMATION

__ CHEMICAL ANALYSIS *(ATTACH RESULTS)*

__ USER *KNOWLEDGE (ATTACH SUPPORTING DOCUMENTS - Explain how and why these documents comply with RCRA requirements.*

I, _____, HEREBY CERTIFY THAT ALL INFORMATION SUBMITTED IN AND ALL ATTACHED
(Print or Type Name)
DOCUMENTS IS TO THE BEST OF MY KNOWLEDGE AN ACCURATE REPRESENTATION OF THE WASTE TURNED IN TO THE SSA.

ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.

SIGNATURE OF GENERATOR'S REPRESENTATIVE	**DATE**

7. WASTE ACCEPTANCE INTO ICDF landfill SSTF Evaporation Pond

SIGNATURE OF ICDF Complex DESIGNEE **Preliminary Acceptance**	**DATE**
SIGNATURE OF ICDF Complex DESIGNEE **Final Acceptance**	**DATE**

PART III

HAZARDOUS CHARACTERISTIC LIST

☐ Total Metals ☐ TCLP* ☐ Process Knowledge

CONTAMINANT	EPA HW No.	(mg/L)	CONTAMINANT	EPA HW No.	(mg/L)
__ ARSENIC	D004		__ HEXACHLORO-1,3,-BUTADIENE	D033	
__ BARIUM	D005		__ HEXACHLOROETHANE	D034	
__ BENZENE	D018		__ LEAD	D008	
__ CADMIUM	D006		__ LINDANE	D013	
__ CARBON TETRACHLORIDE	D019		__ MERCURY	D009	
__ CHLORDANE	D020		__ METHOXYCHLOR	D014	
__ CHLOROBENZENE	D021		__ METHYL ETHYL KETONE	D035	
__ CHLOROFORM	D022		__ NITROBENZENE	D036	
__ CHROMIUM	D007		__ PENTACHLOROPHENOL	D037	
__ O-CRESOL	D023		__ PYRIDINE	D038	
__ M-CRESOL	D024		__ SELENIUM	D010	
__ P-CRESOL	D025		__ SILVER	D011	
__ CRESOL	D026		__ TETRACHLOROETHYLENE	D039	
__ 2,4-D	D016		__ TOXOPHENE	D015	
__ 1,4-DICHLOROBENZENE	D027		__ TRICHLOROETHYLENE	D040	
__ 1,2-DICHLOROETHANE	D028		__ 2,4,5-TRICHLOROPHENOL	D041	
__ 1,1-DICHLOROETHYLENE	D029		__ 2,4,6-TRICHLOROPHENOL	D042	
__ 2,4-DINITROTOLUENE	D030		__ 2,45-TP (SILVEX)	D017	
__ ENDRIN	D012		__ VINYL CHLORIDE	D043	
__ HEPTACHLOR (AND ITS HYDROXIDE)	D031				
__ HEXACHLOROBENZENE	D032				

***TCLP data are required for waste streams where total metals exceed 20X the TCLP LDRs.**

All required analysis for this sheet must be attached prior to submittal.

Sample

PART IV
RADIOLOGICAL LIST

ISOTOPE	%	(pCi/g)	ISOTOPE	%	(pCi/g)
___ ^{3}H			___ ^{60}Co		
___ ^{7}Be			___ ^{60}Co act. metal[C]		
___ ^{10}Be			___ ^{63}Ni		
___ ^{14}C			___ ^{63}Ni act. metal[C]		
___ ^{14}C act. Metal[C]			___ ^{65}Zn		
___ ^{22}Na			___ ^{68}Ge		
___ ^{32}P			___ ^{75}Se		
___ ^{35}S			___ ^{79}Se		
___ ^{36}Cl			___ ^{82}Sr		
___ ^{40}K			___ ^{85}Kr		
___ ^{45}Ca			___ ^{85}Sr		
___ ^{46}Sc			___ ^{86}Rb		
___ ^{49}V			___ ^{88}Y		
___ ^{51}Cr			___ ^{89}Sr		
___ ^{54}Mn			___ ^{90}Sr–^{90}Y		
___ ^{55}Fe			___ ^{93}Mo		
___ ^{56}Co			___ ^{93m}Nb		
___ ^{57}Co			___ ^{93}Zr		
___ ^{58}Co			___ ^{94}Nb		
___ ^{59}Fe			___ ^{94}Nb act.[C]		
___ ^{59}Ni			___ ^{95}Nb		
___ ^{59}Ni act. Metal[C]			___ ^{207}Bi		
___ ^{95}Zr–^{95m}Nb			___ ^{210}Pb		
___ ^{99}Tc			___ ^{210}Po		
___ ^{103}Ru–^{103m}Rh			___ ^{226}Ra		
___ ^{106}Ru–^{106}Rh			___ ^{227}Ac		
___ ^{107}Pd			___ ^{228}Ra		
___ ^{108m}Ag			___ ^{228}Th		
___ ^{109}Cd			___ ^{229}Th		
___ ^{110m}Ag–^{110}Ag			___ ^{230}Th		
___ ^{113m}Cd			___ ^{231}Pa		
___ ^{113}Sn			___ ^{232}Th		
___ ^{119m}Sn			___ Total U		
___ ^{121m}Sn			___ ^{232}U		
___ ^{121}Te			___ ^{233}U		
___ ^{123}Te			___ ^{234}Th		
___ ^{124}Sb			___ ^{234}U		
___ ^{125}I			___ ^{235}U		
___ ^{126}Sn–^{126m}Sb			___ ^{236}Pu		
___ ^{125m}Te			___ ^{236}U		
___ ^{125}Sb			___ ^{237}Np[d]		
___ ^{127m}Te–^{127}Te			___ ^{238}Pu[d]		
___ ^{129}I			___ ^{238}U		
___ ^{129m}Te			___ ^{239}Pu[d]		
___ ^{131m}Xe					

sample

RADIOLOGICAL LIST (continued)

ISOTOPE	%	(pCi/g)	ISOTOPE	%	(pCi/g)
___ ^{133}Ba			___ $^{240}Pu^{d}$		
___ ^{134}Cs			___ $^{241}Am^{d}$		
___ ^{135}Cs			___ ^{241}Pu		
___ ^{137}Cs–^{137m}Ba			___ $^{242m}Am^{d}$		
___ ^{140}Ba			___ ^{242}Cm		
___ ^{141}Ce			___ $^{242}Pu^{d}$		
___ ^{144}Ce–^{144}Pr			___ $^{243}Am^{d}$		
___ ^{147}Nd			___ $^{243}Cm^{d}$		
___ ^{147}Pm			___ ^{244}Cm		
___ ^{147}Sm			___ $^{244}Pu^{d}$		
___ ^{150}Eu			___ $^{245}Cm^{d}$		
___ ^{151}Sm			___ $^{246}Cm^{d}$		
___ ^{152}Eu			___ $^{247}Bk^{d}$		
___ ^{152}Gd			___ $^{247}Cm^{d}$		
___ ^{153}Gd			___ $^{248}Cm^{d}$		
___ ^{154}Eu			___ $^{249}Cf^{d}$		
___ ^{155}Eu			___ ^{250}Cf		
___ ^{170}Tm			___ $^{250}Cm^{d}$		
___ ^{175}Hf			___ $^{251}Cf^{d}$		
___ ^{181}Hf			___ ^{252}Cf		
___ ^{182}Ta			___ ^{254}Es		
___ ^{185}W					
___ ^{187}Re					
___ ^{195}Au					
___ ^{203}Hg					
___ ^{204}Tl					

Sample

PART V

LABELING	Yes	No
1. Are containers marked with the waste generation date?		
2. Does container have CERCLA label?		
3. Does container have IWTS label?		
4. PCB Containing Waste (40 CFR 761.45)?		
Large PCB Mark (M_L) [for large containers] / Small PCB Mark (M_S) [used for small containers]		

PART VI

PACKAGING TYPE

Waste Type	55 Gallon Drum[a] Or other sized steel drums	Roll Off Containers[a]	Crosslink Polyethylene Tanks (storage) Or tanker truck (transport)		INEEL Wood Boxes[a] 2 x 4 x 8 ft 4 x 4 x 4 ft 4 x 4 x 8 ft
			VCT[c]	VOT[c]	
Hazardous	XX	XX	—	—	XX
RAD[b]	XX	XX	—	—	XX
RAD & Mixed RAD[b]	XX	XX	—	—	XX
Asbestos-TSCA	XX	XX	—	—	XX
Asbestos-TSCA/RAD Waste[b]	XX	XX	—	—	XX
Purge Water	—	—	XX	XX	—
Case-by-Case[d]	XX	XX	XX	XX	XX

a. Drums, roll-offs, and INEEL wood boxes will be lined with polyethylene liners (or supersacks).

b. Low-level radioactive waste shall be packaged for disposal in accordance with 10 CFR 61.56(a). The container must also be surveyed to ensure occupational exposures to radiation are < 500 mR/h at 1 meter for the exterior of the container. If the containers radiation level is > 500 mR/h then the container must be shielded by other containers within the SSA.

c. VCT (Vertical Closed Top) and VOT (Vertical Open Top) above ground tanks will meet or exceed ASTM D 1998-91, Type I: Tanks molded from crosslinkable polyethylene.

d. Wastes accepted on a case-by-case basis could require special container requirements. Therefore, the generator must verify proper containers with 49 CFR 101, Subpart C

NOTE: Other types of containers may be used if they have received approval prior to shipment.

Sample

WASTE CERTIFICATION FORM

Package identification number(s): _____

The undersigned certifies that, to the best of his/her knowledge, the waste identified above meets the waste acceptance criteria for the SSSTF. A complete and comprehensive copy of the laboratory analytical data is attached to the Waste Profile.

_____

Certification:

Name (print) _____

Signature _____

Date _____

Title _____

Phone: _____

Email: _____

Sample

Appendix B

Radiological Calculation Methods

Radiological Calculation Methods

A variety of radiological calculations are required to determine whether a waste can be stored at the INEEL SSA. The following sections describe the methodology for performing these calculations. For each calculation, the following assumptions shall be used:

- All major radionuclides in the waste, as defined in Section 2.3.1, must be considered in the calculations. If there is a major radionuclide in the waste that is not listed in Tables B-1 and B-2 (which will be modified as necessary), the generator must notify the SSA to calculate the applicable limits and conversion factors.

- If a daughter radionuclide has a half-life less than 10 days and the parent radionuclide has a half-life greater than the daughter, the activity of the daughter should not be considered in the calculations.

- Except for the NRC Class C calculation, the volume of the waste in each container should be used when limits are expressed in volume concentration (Section B.6 presents information regarding the Class C calculations).

B.1 Transuranic Waste Determination

Transuranic waste is radioactive waste containing more than 100 nanocuries (3700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for:

- High-level radioactive waste

- Waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations.

B.2 Calculation of Plutonium Equivalents

PU-239 equivalent activity of the following individual waste packages is in accordance with WIPP WAC (INEEL RCRA Permit):

- 5-gallon drums, 80 curies equivalent

- Standard waste box, 130 curies equivalent

- Standard waste box, ≤ 1800 curies equivalent

- Solidified/vitrified waste, ≤ 1800 curies equivalent

- INEEL Wood Boxes, measuring 2 × 4 × 8 ft.

- INEEL Wood Boxes, measuring 4 × 4 × 4 ft

- INEEL Wood Boxes, measuring 4 × 4 × 8 ft.

B.3 Calculation of Thermal Power

The thermal power of the waste in a container is calculated from the concentration of radionuclides in the waste and the heat of decay from Table B-1. The thermal power calculation is performed in the following steps:

1. The concentration of each radionuclide (expressed in curies per cubic meter) is multiplied by the heat of decay for that nuclide from Table B-1, yielding the heat of decay for each in units of watts per cubic meter.

2. Thermal power is the sum of the heat of decay of all radionuclides in the waste.

B.4 Category 1 Determination

Classification of waste as Category 1 or greater than Category 1 is a sum of fractions calculation, performed in the following steps:

1. The concentration of each nuclide (expressed in curies per cubic meter) is divided by its respective Category 1 limit (Table B-2).

2. The resulting values are added to form the sum of fractions.

3. If the sum of fractions is less than or equal to 1, the waste is Category 1. If the sum of fractions exceeds 1, the waste is greater than Category 1, and the Category 3 determination must be performed to classify the waste.

B.5 Category 3 Determination

Category 3 determination is performed in the same way as the Category 1 calculation, except that the Category 3 limits from Table B-2 are used as follows:

1. The concentration of each nuclide (expressed in curies per cubic meter) is divided by its respective Category 3 limit from Table B-2

2. The resulting values are added to form a sum of fractions

3. If the sum of fractions is less than or equal to 1, the waste is Category 3. If the sum of fractions exceeds 1, the waste is greater than Category 3.

B.6 Class C Determination

Class C determination shall be performed as specified in 10 CFR 61.55.

B.7 Interim Safety Basis Calculations For Low-Level Storage

The ISB calculations are performed in the following steps:

1. Determine the appropriate set of limits from Table B-2 (i.e., noncombustible containerized waste or combustible containerized waste)

2. Divide the concentration of each radionuclide by its respective limit

3. Add the resulting values to form a sum of fractions.

If the sum of fractions is less than or equal to 1, the waste lies within the ISB limits. If combustible waste exceeds the combustible waste limit, but does not exceed the noncombustible waste limit, the SSA acceptance organization can perform an evaluation to determine whether segregation or stabilization can be used to mitigate the combustibility hazard. The SSA will not accept noncombustible waste if the noncombustible waste limit is exceeded.

B.8. Mobile Radionuclide Reporting

This is a simple comparison of the concentration of each mobile radionuclide (3H, 14C, 36Cl, 79Se, 93Mo, 99Tc, 129I, 187Re, Total U, and 237Np) against its respective reporting value from Table B-2.

B.9. Calculating Dose-Equivalent Curies

Calculation of Dose Equivalent-Curies (DE-Ci) is a method of normalizing the exposure risk of various radionuclides. DE-Ci limits are established for certain TSD units as part of the safety basis. Calculation of the DE-Ci of a waste container is performed in the following steps:

1. Multiply the activity (in Ci) of each isotope in a given container by its respective DE-Ci correction factor from Table B-1.

2. Add the resulting values to obtain the total DE-Ci of the package.

Table B-1. Conversion factors for general radiological calculations.

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{3}H	4.5034 E+03	9.66 E+03	3.38 E-05	1.49 E-07
^{7}Be	5.3920 E+01	3.50 E+05	2.94 E-04	7.47 E-07
^{10}Be	5.8439 E+08	2.23 E-02	1.20 E-03	8.25 E-04
^{14}C	2.0928 E+06	4.46 E+00	2.93 E-04	4.86 E-06
^{22}Na	9.5032 E+02	6.25 E+03	8.71 E-03	1.78 E-05
^{32}P	1.4262 E+01	2.86 E+05	4.21 E-03	3.61 E-05
^{35}S	8.7510 E+01	4.26 E+04	2.88 E-04	5.76 E-06
^{36}Cl	1.0994 E+08	3.30 E-02	1.43 E-03	5.11 E-05
^{40}K	4.6641 E+11	7.00 E-06	3.33 E-03	2.87 E-05
^{45}Ca	1.6380 E+02	1.77 E+04	4.56 E-04	1.54 E-05
^{46}Sc	8.3790 E+01	3.39 E+04	1.26 E-02	6.90 E-05
^{49}V	3.3000 E+02	8.08 E+03	5.16 E-06	8.04 E-07
^{51}Cr	2.7702 E+01	9.24 E+04	1.93 E-04	7.78 E-07
^{54}Mn	3.1210 E+02	7.75 E+03	4.96 E-03	1.56 E-05

Table B-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{55}Fe	9.9711 E+02	2.38 E+03	9.66 E-06	6.25 E-05
^{56}Co	7.7270 E+01	3.02 E+04	2.02 E-02	9.22 E-05
^{57}Co	2.7179 E+02	8.43 E+03	7.42 E-04	2.11 E-05
^{58}Co	7.0820 E+01	3.12 E+04	4.91 E-03	2.53 E-05
^{59}Fe	4.4503 E+01	4.97 E+04	7.74 E-03	3.44 E-05
^{59}Ni	2.7758 E+07	7.97 E-02	1.36 E-05	3.08 E-06
^{60}Co	1.9253 E+03	1.13 E+03	1.54 E-02	5.09 E-04
^{63}Ni	3.6561 E+04	5.67 E+01	1.01 E-04	7.23 E-06
^{65}Zn	2.4426 E+02	8.22 E+03	3.38 E-03	4.75 E-05
^{68}Ge	2.7082 E+02	7.09 E+03	2.44 E-05	1.20 E-04
^{75}Se	1.1978 E+02	1.45 E+04	2.32 E-03	1.97 E-05
^{79}Se	2.3741 E+07	6.96 E-02	3.14 E-04	2.29 E-05
^{82}Sr	2.5550 E+01	6.23 E+04	4.65 E-05	1.43 E-04
^{85}Kr	3.9285 E+03	3.91 E+02	1.50 E-03	1.64 E-14
^{85}Sr	6.4840 E+01	2.37 E+04	3.07 E-03	1.17 E-05
^{86}Rb	1.8631 E+01	8.15 E+04	4.51 E-03	1.54 E-05
^{88}Y	1.0665 E+02	1.39 E+04	1.59 E-02	6.54 E-05
^{89}Sr	5.0530 E+01	2.90E+04	3.46 E-03	9.65 E-05
$^{90}Sr - ^{90}Y$*	1.0512 E+04	2.76 E+02	5.54 E-03	3.04E-03
^{93}Mo	1.4610 E+06	9.61 E-01	7.41 E-05	6.62 E-05
^{93m}Nb	5.8914 E+03	2.38 E+02	1.09 E-05	6.81 E-05
^{93}Zr	5.5882 E+08	2.51 E-03	1.24 E-04	7.74 E-04
^{94}Nb	7.4144 E+06	1.87 E-01	1.02 E-02	9.65 E-04
^{95}Nb	3.4975 E+01	3.93 E+05	4.68 E-03	1.35 E-05
$^{95}Zr-^{95m}Nb$*	6.4020 E+01	4.42 E+04	4.24 E-04	6.09 E-05
^{99}Tc	7.7103 E+07	1.71 E-02	5.04 E-04	1.93 E-05
$^{103}Ru-^{103m}Rh$*	3.6260 E+01	7.00 E+04	3.36 E-03	2.08 E-05
$^{106}Ru-^{106}Rh$*	3.7359 E+02	6.59 E+03	3.99 E-04	1.11E-03
^{107}Pd	2.3741 E+09	5.14 E-04	5.51 E-05	2.97 E-05
^{108m}Ag	4.6386 E+04	2.61 E+01	9.96 E-03	6.60 E-04
^{109}Cd	4.6260 E+02	2.59 E+03	1.54 E-04	2.66 E-04
$^{110m}Ag-^{110}Ag$*	2.4979 E+02	9.50 E+03	7.19 E-03	1.87 E-04
^{113m}Cd	5.1499 E+03	2.24 E+02	1.08 E-03	3.56 E-03
^{113}Sn	1.1509 E+02	1.00 E+04	1.66 E-03	2.48 E-05
^{119m}Sn	2.9310 E+02	3.74 E+03	6.78 E-05	1.45 E-05

Table B-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{121m}Sn	2.0088 E+04	5.37 E+01	6.59 E-05	2.68 E-05
^{121}Te	1.6780 E+01	6.43 E+04	3.42 E-03	4.43 E-06
^{123}Te	3.6524 E+15	2.91 E-10	1.29 E-03	2.45 E-05
^{124}Sb	6.0200 E+01	1.75 E+04	1.33 E-02	5.86 E-05
^{125}I	5.9408 E+01	1.76 E+04	2.51 E-04	5.62 E-05
^{125}Sb	1.0074 E+03	1.04 E+03	3.14 E-03	2.84 E-05
^{125m}Te	5.7400 E+01	1.82 E+04	2.13 E-04	1.69 E-05
^{126}Sb	1.2460 E+01	8.32 E+04	1.83 E-02	2.73 E-05
$^{126}Sn-^{126m}Sb$*	3.6524 E+07	5.68 E+02	1.23 E-02	2.31 E-04
$^{127m}Te-^{127}Te$*	1.0900 E+02	1.86 E+04	1.36 E-03	5.07 E-05
^{129}I	5.7343 E+09	1.77 E-04	3.93 E-04	4.04 E-04
^{129m}Te	3.3600 E+01	3.01 E+04	1.44 E-03	5.57 E-05
^{131m}Xe	1.1840 E+01	8.42 E+04	1.19 E-04	6.07 E-12
^{133}Ba	3.8423 E+03	2.56 E+02	2.39 E-03	1.81 E-05
^{134}Cs	7.5313 E+02	1.29 E+03	1.02 E-02	1.08 E-04
^{135}Cs	8.4006 E+08	1.15 E-03	3.32 E-04	1.06 E-05
$^{137}Cs-^{137m}Ba$*	1.0983 E+04	1.69 E+02	3.36 E-03	7.44 E-05
^{140}Ba	1.2752 E+01	7.31 E+04	2.72 E-03	8.70 E-06
^{141}Ce	3.2501 E+01	2.85 E+04	8.60 E-04	2.80 E-05
$^{144}Ce-^{144}Pr$*	2.8489 E+02	6.37 E+03	7.34 E-03	8.70 E-04
^{147}Nd	1.0980 E+01	8.09 E+04	2.22 E-03	1.59 E-05
^{147}Pm	9.5818 E+02	9.27 E+02	3.68 E-04	9.13 E-05
^{147}Sm	3.8716 E+13	2.29 E-08	1.37 E-02	1.74 E-01
^{150}Eu	1.3076 E+04	6.66 E+01	8.90 E-03	6.25 E-04
^{151}Sm	3.2872 E+04	2.63 E+01	7.41 E-04	6.98 E-05
^{152}Eu	4.9461 E+03	1.74 E+02	7.03 E-03	5.14 E-04
^{152}Gd	3.9446 E+16	2.18 E-11	1.31 E-02	5.67 E-01
^{153}Gd	2.4160 E+02	3.53 E+03	6.03 E-04	5.54 E-05
^{154}Eu	3.1385 E+03	2.70 E+02	8.77 E-03	6.66 E-04
^{155}Eu	1.7390 E+03	4.84 E+02	6.53 E-04	9.65 E-05
^{170}Tm	1.2860 E+02	5.97 E+03	1.90 E-03	6.12 E-05
^{175}Hf	7.0000 E+01	1.07 E+04	2.16 E-03	1.30 E-05
^{181}Hf	4.2390 E+01	1.70 E+04	3.85 E-03	3.59 E-05
^{182}Ta	1.1443 E+02	6.27 E+03	8.46 E-03	1.04 E-04
^{185}W	7.5100 E+01	9.40 E+03	7.53 E-04	1.75 E-06

Table B-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{187}Re	1.5888 E+13	4.39 E+08	3.91 E-06	1.26 E-07
^{195}Au	1.8609 E+02	3.60 E+03	5.10 E-04	3.01 E-05
^{203}Hg	4.6612 E+01	1.38 E+04	1.75 E-03	1.70 E-05
^{204}Tl	1.3806 E+03	4.64 E+02	1.38 E-03	5.60 E-06
^{207}Bi	1.1523 E+04	5.47 E+01	9.12 E-03	4.66 E-05
^{210}Pb	8.1449 E+03	7.63 E+01	6.62 E-05	3.16 E-02
^{210}Po	1.3838 E+02	4.49 E+03	3.26 E-02	2.18 E-02
^{226}Ra	5.8439 E+05	9.89 E+01	2.89 E-02	2.00 E-02
^{227}Ac	7.9524 E+03	7.23 E+01	1.46 E-03	4.00 E+00
^{228}Ra	2.1001 E+03	2.73 E+02	2.71 E-04	1.11 E-02
^{228}Th	6.9874 E+02	8.20 E+02	3.27 E-02	7.95 E-01
^{229}Th	2.6809 E+06	2.13 E-01	3.08 E-02	5.00 E+00
^{230}Th	2.7532 E+07	2.06 E-02	2.83 E-02	7.58 E-01
^{231}Pa	1.1965 E+07	4.72 E-02	3.08 E-02	2.99 E+00
^{232}Th	5.1317 E+12	1.10 E-07	2.42 E-02	3.81 E+00
^{232}U	2.5165 E+04	2.24 E+01	3.21 E-02	1.53 E+00
^{233}U	5.8147 E+07	9.64 E-03	2.91 E-02	3.15 E-01
^{234}Th	2.4100 E+01	2.32 E+04	1.49 E-04	8.16 E-05
^{234}U	8.9667 E+07	6.26 E-043	2.88 E-02	3.08 E-01
^{235}U	2.5706 E+11	2.16 E-06	2.86 E-02	2.86 E-01
^{236}Pu	1.0439 E+03	5.30 E+02	3.48 E-02	3.37 E-01
^{236}U	8.5540 E+09	6.47 E-05	2.71 E-02	2.92 E-01
^{237}Np	7.8162 E+08	7.05 E-04	2.96 E-02	1.25 E+00
^{238}Pu	3.2032 E+04	1.71 E+01	3.31 E-02	9.13 E-01
^{238}U	1.6319 E+12	3.36 E-07	2.53 E-02	2.75 E-01
^{239}Pu	8.8060 E+06	6.21 E-02	3.11 E-02	1.00 E+00
^{240}Pu	2.3971 E+06	2.28 E-01	3.10 E-02	1.00 E+00
^{241}Am	1.5786 E+05	3.44 E+00	3.33 E-02	1.03 E+00
^{241}Pu	5.2412 E+03	1.03 E+02	3.30 E-05	1.92 E-02
^{242m}Am	5.1499 E+04	1.05 E+01	2.37 E-04	9.91 E-01
^{242}Cm	1.6280 E+02	3.31 E+03	3.68 E-02	4.02 E-02
^{242}Pu	1.3634 E+08	3.96 E-03	2.93 E-02	9.56 E-01
^{243}Am	2.6918 E+06	2.00 E-01	3.22 E-02	1.02 E+00
^{243}Cm	1.0629 E+04	5.16 E+01	3.73 E-02	7.15 E-01
^{244}Cm	6.6109 E+03	8.09 E+01	3.50 E-02	5.77 E-01

Table B-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{244}Pu	2.9512 E+10	1.83 E-05	2.77 E-02	9.39 E-01
^{245}Cm	3.1046 E+06	1.72 E-01	3.40 E-02	1.06 E+00
^{246}Cm	1.7276 E+06	3.07 E-01	3.25 E-02	1.05 E+00
^{247}Bk	5.0403 E+05	1.05 E+00	3.56 E-02	1.34 E+00
^{247}Cm	5.6978 E+09	9.29 E-05	3.36 E-02	9.65 E-01
^{248}Cm	1.2418 E+08	4.24 E-03	3.06 E-02	3.85 E+00
^{249}Cf	1.2820 E+05	4.09 E+00	3.93 E-02	1.34 E+00
^{250}Cf	4.7774 E+03	1.09 E+02	3.63 E-02	6.10 E-01
^{250}Cm	3.2872 E+06	2.07 E-01	2.19 E-04	2.18 E+01
^{251}Cf	3.2799 E+05	1.59 E+00	3.74 E-02	1.37 E+00
^{252}Cf	9.6607 E+02	5.38 E+02	3.69 E-02	3.65 E-01
^{254}Es	2.7570 E+02	1.86 E+03	3.92 E-02	9.56 E-02

* When this parent-daughter pair are in secular equilibrium, only the activity of the parent nuclide should be considered in performing the calculations. E.g., if ^{90}Sr–^{90}Y are in secular equilibrium in the waste, the thermal power for both nuclides would be determined by multiplying the ^{90}Sr activity by the heat of the decay for the ^{90}Sr–^{90}Y pair.

Table B-2. Low-level radiological content limits.

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{3}H	4.4 E+00	9.9 E+04	NL	4.00 E+07	5.00 E+02
^{7}Be	NL	NL	NL	2.64 E+07	6.59 E+05
^{10}Be	NL	1.1 E+00	2.4 E+02	1.00 E+04	2.50 E+02
^{14}C	1.3 E-04	9.1 E-02	2.1 E+01	1.76 E+06	4.41 E+04
^{14}C act. metal[c]	1.3 E-04	9.1 E-01	2.1 E+02	1.76 E+06	4.41 E+04
^{22}Na	NL	NL	NL	4.29 E+05	1.07 E+04
^{32}P	NL	NL	NL	2.31 E+05	5.77 E+03
^{35}S	NL	NL	NL	1.46 E+06	3.66 E+04
^{36}Cl	3.1 E-05	6.4 E-05	1.4 E-01	1.70 E+05	4.17 E+03
^{40}K	NL	1.8 E-03	3.8 E-01	3.00 E+05	7.50 E+03
^{45}Ca	NL	NL	NL	5.45 E+05	1.36 E+04
^{46}Sc	NL	NL	NL	1.22 E+05	3.06 E+03
^{49}V	NL	NL	NL	1.05 E+07	2.63 E+05
^{51}Cr	NL	NL	NL	1.00 E+07	2.50 E+05
^{54}Mn	NL	NL	NL	5.22 E+05	1.30 E+04
^{55}Fe	NL	NL	NL	1.33 E+06	3.33 E+04
^{56}Co	NL	NL	NL	9.16 E+04	2.29 E+03
^{57}Co	NL	NL	NL	4.29 E+05	1.07 E+04
^{58}Co	NL	NL	NL	3.24 E+05	8.11 E+03
^{59}Fe	NL	NL	NL	2.35 E+05	5.88 E+03
^{59}Ni	NL	3.9 E+00	8.5 E+02	2.86 E+06	7.14 E+04
^{59}Ni act. metal[c]	NL	3.9 E+01	8.5 E+03	2.86 E+06	7.14 E+04
^{60}Co	NL	7.5 E+01	NL	1.82 E+04	4.55 E+02
^{60}Co act. metal[c]	NL	7.5 E+02	NL	1.82 E+04	4.55 E+02
^{63}Ni	NL	5.9 E+00	2.0 E+04	1.20 E+06	3.00 E+04
^{63}Ni act. metal[c]	NL	5.9 E+01	2.0 E+05	1.20 E+06	3.00 E+04
^{65}Zn	NL	NL	NL	1.97 E+05	4.92 E+03
^{68}Ge	NL	NL	NL	7.02 E+04	1.75 E+03
^{75}Se	NL	NL	NL	4.29 E+05	1.07 E+04
^{79}Se	3.4 E-05	5.1 E-01	1.1 E+02	3.87 E+05	9.68 E+03
^{82}Sr	NL	NL	NL	5.91 E+04	1.48 E+03
^{85}Kr	NL	NL	NL	2.11 E+09	2.63 E+04
^{85}Sr	NL	NL	NL	1.97 E+06	4.92 E+04
^{86}Rb	NL	NL	NL	5.45 E+05	1.36 E+04

Table B-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{88}Y	NL	NL	NL	1.29 E+05	3.24 E+03
^{89}Sr	NL	NL	NL	6.67 E+05	1.67 E+04
^{90}Sr–^{90}Y	NL	1.6 E-02	5.4 E+04	1.50 E+04	3.75 E+02
^{93}Mo	2.1 E-04	8.7 E-01	2.0 E+02	1.28 E+05	3.19 E+03
$93m_{Nb}$	NL	NL	NL	1.21 E+05	3.03 E+03
^{93}Zr	NL	2.50 E+00	5.40 E+02	4.62 E+03	1.15 E+02
^{94}Nb	NL	2.2 E-04	4.8 E-02	9.23 E+03	2.31 E+02
^{94}Nb act.[c]	NL	2.2 E-03	4.8 E-01	9.23 E+03	2.31 E+02
^{95}Nb	NL	NL	NL	5.71 E+05	1.43 E+04
95_{Zr}–$95m_{Nb}$	NL	NL	NL	9.23 E+04	2.31 E+03
^{99}Tc	2.1 E-04	2.3 E-02	5.0 E+00	4.00 E+05	1.00 E+04
^{103}Ru–^{103m}Rh	NL	NL	NL	3.87 E+05	9.68 E+03
^{106}Ru–^{106}Rh	NL	NL	NL	8.00 E+03	2.00 E+02
^{107}Pd	NL	1.5 E+01	3.3 E+03	2.86 E+05	7.14 E+03
^{108m}Ag	NL	NL	NL	2.15 E+04	5.39 E+02
^{109}Cd	NL	NL	NL	2.45 E+04	6.12 E+02
^{110m}Ag–^{110}Ag	NL	NL	NL	1.00 E+04	2.50 E+02
^{113m}Cd	NL	7.6 E-01	NL	1.79 E+03	4.48 E+01
^{113}Sn	NL	NL	NL	3.24 E+05	8.11 E+03
^{119m}Sn	NL	NL	NL	6.00 E+05	1.50 E+04
^{121m}Sn	NL	6.7 E-01	2.2 E+04	3.08 E+05	7.69 E+03
^{121}Te	NL	NL	NL	1.91 E+06	4.77 E+04
^{123}Te	NL	NL	NL	1.38 E+05	3.44 E+03
^{124}Sb	NL	NL	NL	1.38 E+05	3.45 E+03
^{125}I	NL	NL	NL	5.00 E+04	1.25 E+00
^{126}Sn–^{126m}Sb	NL	1.6 E-04	3.4 E-02	3.64 E+04	9.09 E+02
^{125m}Te	NL	NL	NL	2.18 E+06	5.45 E+04
^{125}Sb	NL	NL	NL	2.79 E+05	6.98 E+03
^{127m}Te–^{127}Te	NL	NL	NL	1.67 E+05	4.17 E+03
^{129}I	1.0 E-06	8.5 E-03	1.8 E+00	7.06 E+03	1.76 E-01
^{129m}Te	NL	NL	NL	1.56 E+05	3.90 E+03
^{131m}Xe	NL	NL	NL	7.50 E+08	9.38 E+03
^{133}Ba	NL	7.1 E-01	NL	4.62 E+05	1.15 E+04
^{134}Cs	NL	NL	NL	8.57 E+04	2.14 E+03

Table B-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{135}Cs	NL	1.6 E-01	3.5 E+01	8.03 E+05	2.00 E+04
^{137}Cs–^{137m}Ba	NL	5.5 E-03	1.2 E+04	1.20 E+05	3.00 E+03
^{140}Ba	NL	NL	NL	3.87 E+05	9.68 E+03
^{141}Ce	NL	NL	NL	4.14 E+05	1.03 E+04
^{144}Ce–^{144}Pr	NL	NL	NL	1.00 E+04	2.50 E+02
^{147}Nd	NL	NL	NL	5.45 E+05	1.36 E+04
^{147}Pm	NL	NL	NL	9.23 E+04	2.31 E+03
^{147}Sm	NL	1.7 E-02	3.7 E+00	2.86 E+01	7.14 E-01
^{150}Eu	NL	1.4 E-03	6.7 E+02	1.38 E+04	3.45 E+02
^{151}Sm	NL	4.6 E+01	2.1 E+05	7.06 E+04	1.76 E+03
^{152}Eu	NL	4.8 E-02	NL	1.74 E+04	4.35 E+02
^{152}Gd	NL	6.4 E-03	1.4 E+00	3.64 E+00	9.09 E-02
^{153}Gd	NL	NL	NL	1.09 E+05	2.73 E+03
^{154}Eu	NL	7.5 E-01	NL	1.32 E+04	3.30 E+02
^{155}Eu	NL	NL	NL	6.67 E+04	1.67 E+03
^{170}Tm	NL	NL	NL	1.38 E+05	3.46 E+03
^{175}Hf	NL	NL	NL	6.52 E+05	1.63 E+04
^{181}Hf	NL	NL	NL	1.23 E+05	3.07 E+03
^{182}Ta	NL	NL	NL	8.00 E+04	2.00 E+03
^{185}W	NL	NL	NL	4.62 E+06	1.15 E+05
^{187}Re	3.3 E-02	3.6 E+01	7.8 E+03	6.32 E+07	1.58 E+06
^{195}Au	NL	NL	NL	2.81 E+05	7.03 E+03
^{203}Hg	NL	NL	NL	5.00 E+05	1.25 E+04
^{204}Tl	NL	NL	NL	1.51 E+06	3.78 E+04
^{207}Bi	NL	TBD	TBD	1.82 E+05	4.54 E+03
^{210}Pb	NL	3.7 E-02	2.1 E+06	1.82 E+02	4.55 E+00
^{210}Po	NL	NL	NL	1.82 E+02	4.55 E+00
^{226}Ra	NL	1.7 E-04	4.3 E-02	4.44 E+02	1.11 E+01
^{227}Ac	NL	4.2 E-03	3.0 E+05	3.08 E-01	7.69 E-03
^{228}Ra	NL	1.7 E+01	NL	8.57 E+02	2.14 E+01
^{228}Th	NL	NL	NL	7.06 E+00	1.76 E-01
^{229}Th	NL	4.4 E-04	9.8 E-02	7.06 E-01	1.76 E-02
^{230}Th	NL	2.1 E-03	1.5 E-01	4.62 E+00	1.15 E-01
^{231}Pa	NL	1.4 E-04	3.0 E-02	1.09 E+00	2.73 E-02
^{232}Th	NL	1.1 E-04	2.3 E-02	8.57 E-01	2.14 E-02

Table B-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
Total U	1.4 E-05	NL	NL	NL	NL
^{232}U	See Total U	4.6 E-04	4.6 E+00	5.45 E+00	1.36 E-01
^{233}U	See Total U	7.4 E-03	9.7 E-01	2.67 E+01	6.67 E-01
^{234Th}	NL	NL	NL	1.00 E+05	2.50 E+03
^{234}U	See Total U	8.9 E-03	1.9 E+00	2.73 E+01	6.82 E-01
^{235}U	See Total U	2.8 E-03	5.0 E-01	2.93 E+01	7.32 E-01
^{236}Pu	NL	NL	NL	1.40 E+01	3.49 E-01
^{236}U	See Total U	9.5 E-03	2.0 E+00	2.86 E+01	7.14 E-01
$^{237}Np^{d}$	1.1 E-05	6.8 E-04	1.5 E-01	2.55 E+00	6.38 E-02
$^{238}Pu^{d}$	NL	4.7 E-03	2.4 E+01	5.22 E+00	1.30 E-01
^{238}U	See Total U	5.7 E-03	1.2 E+00	3.08 E+01	7.69 E-01
$^{239}Pu^{d}$	NL	1.9 E-03	4.2 E-01	4.62 E+00	1.15 E-01
$^{240}Pu^{d}$	NL	1.9 E-03	4.3 E-01	4.62 E+00	1.15 E-01
$^{241}Am^{d}$	NL	2.1 E-03	8.5 E-01	4.44 E+00	1.11 E-01
^{241}Pu	NL	6.4 E-02	2.5 E+01	2.35 E+02	5.88 E+00
$^{242m}Am^{d}$	NL	1.9 E-03	1.6 E+00	4.62 E+00	1.15 E-01
^{242}Cm	NL	NL	NL	2.03 E+02	5.08 E+00
$^{242}Pu^{d}$	NL	2.0 E-03	4.3 E-01	5.00 E+00	1.25 E-01
$^{243}Am^{d}$	NL	1.0 E-03	2.3 E-01	4.44 E+00	1.11 E-01
$^{243}Cm^{d}$	NL	1.8 E-02	3.4 E+02	6.67 E+00	1.67 E-01
^{244}Cm	NL	1.4 E-01	1.6 E+02	8.57 E+00	2.14 E-01
$^{244}Pu^{d}$	NL	6.1 E-04	1.3 E-01	5.00 E+00	1.25 E-01
$^{245}Cm^{d}$	NL	1.3 E-03	2.2 E-01	4.44 E+00	1.11 E-01
$^{246}Cm^{d}$	NL	1.8 E-03	4.2 E-01	4.29 E+00	1.07 E-01
$^{247}Bk^{d}$	NL	TBD	TBD	2.98 E+00	7.44 E-02
$^{247}Cm^{d}$	NL	5.6 E-04	1.2 E-01	4.80 E+00	1.20 E-01
$^{248}Cm^{d}$	NL	5.1 E-04	1.1 E-01	1.21 E+00	3.03 E-02
$^{249}Cf^{d}$	NL	TBD	TBD	2.96 E+00	7.41 E-02
^{250}Cf	NL	TBD	TBD	6.74 E+00	1.69 E-01
$^{250}Cm^{d}$	NL	TBD	TBD	2.13 E-01	5.33 E-03
$^{251}Cf^{d}$	NL	TBD	TBD	2.91 E+00	7.26 E-02

Table B-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{252}Cf	NL	NL	NL	1.43 E+01	3.57 E-01
^{254}Es	NL	NL	NL	5.22 E+01	1.30 E+00

Ci/m^3 = curies per cubic meter.

NL = no applicable limit for this isotope.

TBD = a limit is under development.

a. Noncombustible waste means containerized waste forms that show no evidence of combustion or decomposition on exposure to 538 °C (1,000 °F) for 10 minutes.

b. The combustible waste limit should be used for containerized waste forms that do not meet the definition of noncombustible waste.

c. Limit for isotope in activated metal.

d. TRU isotope (half-life >20 years).

Appendix C

Universal Treatment Standards

TABLE 1.—ALTERNATIVE TREATMENT STANDARDS FOR HAZARDOUS DEBRIS[1]—Continued

Technology description	Performance and/or design and operating standard	Contaminant restrictions[8]

[7]Thermal desorption is distinguished from Thermal Destruction in that the primary purpose of Thermal Desorption is to volatilize contaminants and to remove them from the treatment chamber for subsequent destruction or other treatment.

[8]The demonstration "Equivalent Technology" under § 268.42(b) must document that the technology treats contaminants subject to treatment to a level equivalent to that required by the performance and design and operating standards for other technologies in this table such that residual levels of hazardous contaminants will not pose a hazard to human health and the environment absent management controls.

[9]Any soil, waste, and other nondebris material that remains on the debris surface (or remains mixed with the debris) after treatment is considered a treatment residual that must be separated from the debris using, at a minimum, simple physical or mechanical means. Examples of simple physical or mechanical means are vibratory or trommel screening or water washing. The debris surface need not be cleaned to a "clean debris surface" as defined in note 3 when separating treated debris from residue; rather, the surface must be free of caked soil, waste, or other nondebris material. Treatment residuals are subject to the waste-specific treatment standards for the waste contaminating the debris.

[57 FR 37277, Aug. 18, 1992; 57 FR 39275, Aug. 28, 1992; 57 FR 41173, Sept. 9, 1992; 59 FR 48103, Sept. 19, 1994; 63 FR 28738, May 26, 1998]

§ 268.46 Alternative treatment standards based on HTMR.

For the treatment standards previously found in this section, refer to § 268.40.

[57 FR 37280, Aug. 18, 1992; 57 FR 39275, Aug. 28, 1992; 57 FR 41173, Sept. 9, 1992; 59 FR 48103, Sept. 19, 1994]

§ 268.48 Universal Treatment Standards

◆ RCRA—370 RDB—6692

(a) Table UTS identifies the hazardous constituents, along with the nonwastewater and wastewater treatment standard levels, that are used to regulate most prohibited hazardous wastes with numerical limits. For determining compliance with treatment standards for underlying hazardous constituents as defined in § 268.2(i), these treatment standards may not be exceeded. Compliance with these treatment standards is measured by an analysis of grab samples, unless otherwise noted in the following Table UTS.

UNIVERSAL TREATMENT STANDARDS

[Note: NA means not applicable.]

Regulated constituent common name	CAS[1] number	Wastewater standard	Nonwastewater standard
		Concentration in mg/l[2]	Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Organic Constituents			
Acenaphthylene	208-96-8	0.059	3.4
Acenaphthene	83-32-9	0.059	3.4
Acetone	67-64-1	0.28	160
Acetonitrile	75-05-8	5.6	38
Acetophenone	96-86-2	0.010	9.7
2-Acetylaminofluorene	53-96-3	0.059	140
Acrolein	107-02-8	0.29	NA
Acrylamide	79-06-1	19	23
Acrylonitrile	107-13-1	0.24	84
Aldicarb sulfone[6]	1646-88-4	0.056	0.28
Aldrin	309-00-2	0.021	0.066
4-Aminobiphenyl	92-67-1	0.13	NA
Aniline	62-53-3	0.81	14
Anthracene	120-12-7	0.059	3.4
Aramite	140-57-8	0.36	NA
alpha-BHC	319-84-6	0.00014	0.066
beta-BHC	319-85-7	0.00014	0.066

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UNIVERSAL TREATMENT STANDARDS—Continued

[Note: NA means not applicable.]

Regulated constituent common name	CAS[1] number	Wastewater standard	Nonwastewater standard
		Concentration in mg/l[2]	Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Organic Constituents—Continued			
delta-BHC	319-86-8	0.023	0.066
gamma-BHC	58-89-9	0.0017	0.066
Barban[6]	101-27-9	0.056	1.4
Bendiocarb[6]	22781-23-3	0.056	1.4
Benomyl[6]	17804-35-2	0.056	1.4
Benzene	71-43-2	0.14	10
Benz(a)anthracene	56-55-3	0.059	3.4
Benzal chloride	98-87-3	0.055	6.0
Benzo(b)fluoranthene (difficult to distinguish from benzo(k)fluoranthene)	205-99-2	0.11	6.8
Benzo(k)fluoranthene (difficult to distinguish from benzo(b)fluoranthene)	207-08-9	0.11	6.8
Benzo(g,h,i)perylene	191-24-2	0.0055	1.8
Benzo(a)pyrene	50-32-8	0.061	3.4
Bromodichloromethane	75-27-4	0.35	15
Bromomethane/Methyl bromide	74-83-9	0.11	15
4-Bromophenyl phenyl ether	101-55-3	0.055	15
n-Butyl alcohol	71-36-3	5.6	2.6
Butylate[6]	2008-41-5	0.042	1.4
Butyl benzyl phthalate	85-68-7	0.017	28
2-sec-Butyl-4,6-dinitrophenol/Dinoseb	88-85-7	0.066	2.5
Carbaryl[6]	63-25-2	0.006	0.14
Carbenzadim[6]	10605-21-7	0.056	1.4
Carbofuran[6]	1563-66-2	0.006	0.14
Carbofuran phenol[6]	1563-38-8	0.056	1.4
Carbon disulfide	75-15-0	3.8	4.8 mg/l TCLP
Carbon tetrachloride	56-23-5	0.057	6.0
Carbosulfan[6]	55285-14-8	0.028	1.4
Chlordane (alpha and gamma isomers)	57-74-9	0.0033	0.26
p-Chloroaniline	106-47-8	0.46	16
Chlorobenzene	108-90-7	0.057	6.0
Chlorobenzilate	510-15-6	0.10	NA
2-Chloro-1,3-butadiene	126-99-8	0.057	0.28
Chlorodibromomethane	124-48-1	0.057	15
Chloroethane	75-00-3	0.27	6.0
bis(2-Chloroethoxy)methane	111-91-1	0.036	7.2
bis(2-Chloroethyl)ether	111-44-4	0.033	6.0
Chloroform	67-66-3	0.046	6.0
bis(2-Chloroisopropyl)ether	39638-32-9	0.055	7.2
p-Chloro-m-cresol	59-50-7	0.018	14
2-Chloroethyl vinyl ether	110-75-8	0.062	NA
Chloromethane/Methyl chloride	74-87-3	0.19	30
2-Chloronaphthalene	91-58-7	0.055	5.6
2-Chlorophenol	95-57-8	0.044	5.7
3-Chloropropylene	107-05-1	0.036	30
Chrysene	218-01-9	0.059	3.4
o-Cresol	95-48-7	0.11	5.6

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UNIVERSAL TREATMENT STANDARDS—Continued

[Note: NA means not applicable.]

Regulated constituent common name	CAS[1] number	Wastewater standard	Nonwastewater standard
		Concentration in mg/l[2]	Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Organic Constituents—Continued			
m-Cresol (difficult to distinguish from p-cresol)	108-39-4	0.77	5.6
p-Cresol (difficult to distinguish from m-cresol)	106-44-5	0.77	5.6
m-Cumenyl methylcarbamate[6]	64-00-6	0.056	1.4
Cyclohexanone	108-94-1	0.36	0.75 mg/l TCLP
o,p'-DDD	53-19-0	0.023	0.087
p,p'-DDD	72-54-8	0.023	0.087
o,p'-DDE	3424-82-6	0.031	0.087
p,p'-DDE	72-55-9	0.031	0.087
o,p'-DDT	789-02-6	0.0039	0.087
p,p'-DDT	50-29-3	0.0039	0.087
Dibenz(a,h)anthracene	53-70-3	0.055	8.2
Dibenz(a,e)pyrene	192-65-4	0.061	NA
1,2-Dibromo-3-chloropropane	96-12-8	0.11	15
1,2-Dibromoethane/Ethylene dibromide	106-93-4	0.028	15
Dibromomethane	74-95-3	0.11	15
m-Dichlorobenzene	541-73-1	0.036	6.0
o-Dichlorobenzene	95-50-1	0.088	6.0
p-Dichlorobenzene	106-46-7	0.090	6.0
Dichlorodifluoromethane	75-71-8	0.23	7.2
1,1-Dichloroethane	75-34-3	0.059	6.0
1,2-Dichloroethane	107-06-2	0.21	6.0
1,1-Dichloroethylene	75-35-4	0.025	6.0
trans-1,2-Dichloroethylene	156-60-5	0.054	30
2,4-Dichlorophenol	120-83-2	0.044	14
2,6-Dichlorophenol	87-65-0	0.044	14
2,4-Dichlorophenoxyacetic acid/2,4-D	94-75-7	0.72	10
1,2-Dichloropropane	78-87-5	0.85	18
cis-1,3-Dichloropropylene	10061-01-5	0.036	18
trans-1,3-Dichloropropylene	10061-02-6	0.036	18
Dieldrin	60-57-1	0.017	0.13
Diethyl phthalate	84-66-2	0.20	28
p-Dimethylaminoazobenzene	60-11-7	0.13	NA
2-4-Dimethyl phenol	105-67-9	0.036	14
Dimethyl phthalate	131-11-3	0.047	28
Di-n-butyl phthalate	84-74-2	0.057	28
1,4-Dinitrobenzene	100-25-4	0.32	2.3
4,6-Dinitro-o-cresol	534-52-1	0.28	160
2,4-Dinitrophenol	51-28-5	0.12	160
2,4-Dinitrotoluene	121-14-2	0.32	140
2,6-Dinitrotoluene	606-20-2	0.55	28
Di-n-octyl phthalate	117-84-0	0.017	28
Di-n-propylnitrosamine	621-64-7	0.40	14
1,4-Dioxane	123-91-1	12.0	170
Diphenylamine (difficult to distinguish from diphenylnitrosamine)	122-39-4	0.92	13
Diphenylnitrosamine (difficult to distinguish from diphenylamine)	86-30-6	0.92	13

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UNIVERSAL TREATMENT STANDARDS—Continued

[Note: NA means not applicable.]

Regulated constituent common name	CAS[1] number	Wastewater standard	Nonwastewater standard
		Concentration in mg/l[2]	Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Organic Constituents—Continued			
1,2-Diphenylhydrazine	122-66-7	0.087	NA
Disulfoton	298-04-4	0.017	6.2
Dithiocarbamates (total)[6]	NA	0.028	28
Endosulfan I	959-98-8	0.023	0.066
Endosulfan II	33213-65-9	0.029	0.13
Endosulfan sulfate	1031-07-8	0.029	0.13
Endrin	72-20-8	0.0028	0.13
Endrin aldehyde	7421-93-4	0.025	0.13
EPTC[6]	759-94-4	0.042	1.4
Ethyl acetate	141-78-6	0.34	33
Ethyl benzene	100-41-4	0.057	10
Ethyl cyanide/Propanenitrile	107-12-0	0.24	360
Ethyl ether	60-29-7	0.12	160
bis(2-Ethylhexyl) phthalate	117-81-7	0.28	28
Ethyl methacrylate	97-63-2	0.14	160
Ethylene oxide	75-21-8	0.12	NA
Famphur	52-85-7	0.017	15
Fluoranthene	206-44-0	0.068	3.4
Fluorene	86-73-7	0.059	3.4
Formetanate hydrochloride[6]	23422-53-9	0.056	1.4
Heptachlor	76-44-8	0.0012	0.066
Heptachlor epoxide	1024-57-3	0.016	0.066
Hexachlorobenzene	118-74-1	0.055	10
Hexachlorobutadiene	87-68-3	0.055	5.6
Hexachlorocyclopentadiene	77-47-4	0.057	2.4
HxCDDs (All Hexachlorodibenzo-p-dioxins)	NA	0.000063	0.001
HxCDFs (All Hexachlorodibenzo-furans)	NA	0.000063	0.001
Hexachloroethane	67-72-1	0.055	30
Hexachloropropylene	1888-71-7	0.035	30
Indeno (1,2,3-c,d) pyrene	193-39-5	0.0055	3.4
Iodomethane	74-88-4	0.19	65
Isobutyl alcohol	78-83-1	5.6	170
Isodrin	465-73-6	0.021	0.066
Isosafrole	120-58-1	0.081	2.6
Kepone	143-50-0	0.0011	0.13
Methacrylonitrile	126-98-7	0.24	84
Methanol	67-56-1	5.6	0.75 mg/l TCLP
Methapyrilene	91-80-5	0.081	1.5
Methiocarb[6]	2032-65-7	0.056	1.4
Methomyl[6]	16752-77-5	0.028	0.14
Methoxychlor	72-43-5	0.25	0.18
3-Methylcholanthrene	56-49-5	0.0055	15
4,4-Methylene bis(2-chloroaniline)	101-14-4	0.50	30
Methylene chloride	75-09-2	0.089	30
Methyl ethyl ketone	78-93-3	0.28	36
Methyl isobutyl ketone	108-10-1	0.14	33
Methyl methacrylate	80-62-6	0.14	160

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UNIVERSAL TREATMENT STANDARDS—Continued

[Note: NA means not applicable.]

Regulated constituent common name	CAS[1] number	Wastewater standard	Nonwastewater standard
		Concentration in mg/l[2]	Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Organic Constituents—Continued			
Methyl methansulfonate	66-27-3	0.018	NA
Methyl parathion	298-00-0	0.014	4.6
Metolcarb[6]	1129-41-5	0.056	1.4
Mexacarbate[6]	315-18-4	0.056	1.4
Molinate[6]	2212-67-1	0.042	1.4
Naphthalene	91-20-3	0.059	5.6
2-Naphthylamine	91-59-8	0.52	NA
o-Nitroaniline	88-74-4	0.27	14
p-Nitroaniline	100-01-6	0.028	28
Nitrobenzene	98-95-3	0.068	14
5-Nitro-o-toluidine	99-55-8	0.32	28
o-Nitrophenol	88-75-5	0.028	13
p-Nitrophenol	100-02-7	0.12	29
N-Nitrosodiethylamine	55-18-5	0.40	28
N-Nitrosodimethylamine	62-75-9	0.40	2.3
N-Nitroso-di-n-butylamine	924-16-3	0.40	17
N-Nitrosomethylethylamine	10595-95-6	0.40	2.3
N-Nitrosomorpholine	59-89-2	0.40	2.3
N-Nitrosopiperidine	100-75-4	0.013	35
N-Nitrosopyrrolidine	930-55-2	0.013	35
Oxamyl[6]	23135-22-0	0.056	0.28
Parathion	56-38-2	0.014	4.6
Total PCBs (sum of all PCB isomers, or all Aroclors)	1336-36-3	0.10	10
Pebulate[6]	1114-71-2	0.042	1.4
Pentachlorobenzene	608-93-5	0.055	10
PeCDDs (All Pentachlorodibenzo-p-dioxins)	NA	0.000063	0.001
PeCDFs (All Pentachlorodibenzo-furans)	NA	0.000035	0.001
Pentachloroethane	76-01-7	0.055	6.0
Pentachloronitrobenzene	82-68-8	0.055	4.8
Pentachlorophenol	87-86-5	0.089	7.4
Phenacetin	62-44-2	0.081	16
Phenanthrene	85-01-8	0.059	5.6
Phenol	108-95-2	0.039	6.2
Phorate	298-02-2	0.021	4.6
Phthalic acid	100-21-0	0.055	28
Phthalic anhydride	85-44-9	0.055	28
Physostigmine[6]	57-47-6	0.056	1.4
Physostigmine salicylate[6]	57-64-7	0.056	1.4
Promecarb[6]	2631-37-0	0.056	1.4
Pronamide	23950-58-5	0.093	1.5
Propham[6]	122-42-9	0.056	1.4
Propoxur[6]	114-26-1	0.056	1.4
Prosulfocarb[6]	52888-80-9	0.042	1.4
Pyrene	129-00-0	0.067	8.2
Pyridine	110-86-1	0.014	16
Safrole	94-59-7	0.081	22
Silvex/2,4,5-TP	93-72-1	0.72	7.9

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UNIVERSAL TREATMENT STANDARDS—Continued

[Note: NA means not applicable.]

Regulated constituent common name	CAS[1] number	Wastewater standard	Nonwastewater standard
		Concentration in mg/l[2]	Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Organic Constituents—Continued			
1,2,4,5-Tetrachlorobenzene	95-94-3	0.055	14
TCDDs (All Tetrachlorodi-benzo-p-dioxins)	NA	0.000063	0.001
TCDFs (All Tetrachlorodibenzofurans)	NA	0.000063	0.001
1,1,1,2-Tetrachloroethane	630-20-6	0.057	6.0
1,1,2,2-Tetrachloroethane	79-34-5	0.057	6.0
Tetrachloroethylene	127-18-4	0.056	6.0
2,3,4,6-Tetrachlorophenol	58-90-2	0.030	7.4
Thiodicarb[6]	59669-26-0	0.019	1.4
Thiophanate-methyl[6]	23564-05-8	0.056	1.4
Toluene	108-88-3	0.080	10
Toxaphene	8001-35-2	0.0095	2.6
Triallate[6]	2303-17-5	0.042	1.4
Tribromomethane/Bromoform	75-25-2	0.63	15
2,4,6-Tribromophenol	118-79-6	0.035	7.4
1,2,4-Trichlorobenzene	120-82-1	0.055	19
1,1,1-Trichloroethane	71-55-6	0.054	6.0
1,1,2-Trichloroethane	79-00-5	0.054	6.0
Trichloroethylene	79-01-6	0.054	6.0
Trichloromonofluoromethane	75-69-4	0.020	30
2,4,5-Trichlorophenol	95-95-4	0.18	7.4
2,4,6-Trichlorophenol	88-06-2	0.035	7.4
2,4,5-Trichlorophenoxyacetic acid/2,4,5-T	93-76-5	0.72	7.9
1,2,3-Trichloropropane	96-18-4	0.85	30
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.057	30
Triethylamine[6]	101-44-8	0.081	1.5
tris-(2,3-Dibromopropyl) phosphate	126-72-7	0.11	0.10
Vernolate[6]	1929-77-7	0.042	1.4
Vinyl chloride	75-01-4	0.27	6.0
Xylenes-mixed isomers (sum of o-, m-, and p-xylene concentrations)	1330-20-7	0.32	30
Inorganic Constituents			
Antimony	7440-36-0	1.9	1.15 mg/l TCLP
Arsenic	7440-38-2	1.4	5.0 mg/l TCLP
Barium	7440-39-3	1.2	21 mg/l TCLP
Beryllium	7440-41-7	0.82	1.22 mg/l TCLP
Cadmium	7440-43-9	0.69	0.11 mg/l TCLP
Chromium (Total)	7440-47-3	2.77	0.60 mg/l TCLP
Cyanides (Total)[4]	57-12-5	1.2	590
Cyanides (Amenable)[4]	57-12-5	0.86	30
Fluoride[5]	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

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UNIVERSAL TREATMENT STANDARDS—Continued

[Note: NA means not applicable.]

Regulated constituent common name	CAS[1] number	Wastewater standard	Nonwastewater standard
		Concentration in mg/l[2]	Concentration in mg/kg[3] unless noted as "mg/l TCLP"
Inorganic Constituents—Continued			
Sulfide[5]	18496-25-8	14	NA
Thallium	7440-28-0	1.4	0.20 mg/l TCLP
Vanadium[5]	7440-62-2	4.3	1.6 mg/l TCLP
Zinc[5]	7440-66-6	2.61	4.3 mg/l TCLP

Footnotes to Universal Treatment Standards Table:

[1]CAS means Chemical Abstract Services. When the waste code and/or regulated constituents are described as a combination of a chemical with it's salts and/or esters, the CAS number is given for the parent compound only.

[2]Concentration standards for wastewaters are expressed in mg/l are based on analysis of composite samples.

[3]Except for Metals (EP or TCLP) and Cyanides (Total and Amenable) the nonwastewater treatment standards expressed as a concentration were established, in part, based upon incineration in units operated in accordance with the technical requirements of 40 *CFR* part 264, subpart O, or 40 *CFR* part 265, subpart O, or based upon combustion in fuel substitution units operating in accordance with applicable technical requirements. A facility may comply with these treatment standards according to provisions in 40 *CFR* 268.40(d). All concentration standards for nonwastewaters are based on analysis of grab samples.

[4]Both Cyanides (Total) and Cyanides (Amenable) for nonwastewaters are to be analyzed using Method 9010 or 9012, found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA Publication SW-846, as incorporated by reference in 40 *CFR* 260.11, with a sample size of 10 grams and a distillation time of one hour and 15 minutes.

[5]These constituents are not "underlying hazardous constituents" in characteristic wastes, according to the definition at § 268.2(i).

[6]Between August 26, 1998 and March 4, 1999, these constituents are not "underlying hazardous constituents" as defined in § 268.2(i) of this part.

[7]This constituent is not an underlying hazardous constituent as defined at §268.2(i) of this part because its UTS level is greater than its TC level, thus a treated selenium waste would always be characteristically hazardous, unless it is treated to below its characteristic level.

[59 FR 48103, Sept. 19, 1994; 60 FR 302, Jan. 3, 1995; 61 FR 15654, Apr. 8, 1996; 61 FR 33690, June 28, 1996; 61 FR 43931, Aug. 26, 1996; 62 FR 7596, Feb. 19, 1997; 62 FR 45572, Aug. 28, 1997; 63 FR 24626, May 4, 1998; 63 FR 28738, May 26, 1998; 63 FR 42581, Aug. 10, 1998; 63 FR 47417, Sept. 4, 1998; 64 FR 25417, May 11, 1999]

§ 268.49 Alternative LDR treatment standards for contaminated soil.

◆ OSWER—1891 RDB—6951

(a) Applicability. You must comply with LDRs prior to placing soil that exhibits a characteristic of hazardous waste, or exhibited a characteristic of hazardous waste at the time it was generated, into a land disposal unit. The following chart describes whether you must comply with LDRs prior to placing soil contaminated by listed hazardous waste into a land disposal unit:

If LDRs	And if LDRs	And if	Then you
Applied to the listed waste when it contaminated the soil*	Apply to the listed waste now	—	Must comply with LDRs
Didn't apply to the listed waste when it contaminated the soil*	Apply to the listed waste now	The soil is determined to contain the listed waste when the soil is first generated	Must comply with LDRs
Didn't apply to the listed waste when it contaminated the soil*	Apply to the listed waste now	The soil is determined not to contain the listed waste when the soil is first generated	Needn't comply with LDRs
Didn't apply to the listed waste when it contaminated the soil*	Don't apply to the listed waste now	—	Needn't comply with LDRs

*For dates of LDR applicability, see 40 *CFR* Part 268 Appendix VII. To determine the date any given listed hazardous waste contaminated any given volume of soil, use the last date any given listed hazardous waste was placed into any given land disposal unit or, in the case of an accidental spill, the date of the spill.

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(b) Prior to land disposal, contaminated soil identified by paragraph (a) of this section as needing to comply with LDRs must be treated according to the applicable treatment standards specified in paragraph (c) of this section or according to the Universal Treatment Standards specified in 40 *CFR* 268.48 applicable to the contaminating listed hazardous waste and/or the applicable characteristic of hazardous waste if the soil is characteristic. The treatment standards specified in paragraph (c) of this section and the Universal Treatment Standards may be modified through a treatment variance approved in accordance with 40 *CFR* 268.44.

(c) Treatment standards for contaminated soils. Prior to land disposal, contaminated soil identified by paragraph (a) of this section as needing to comply with LDRs must be treated according to all the standards specified in this paragraph or according to the Universal Treatment Standards specified in 40 *CFR* 268.48.

(1) All soils. Prior to land disposal, all constituents subject to treatment must be treated as follows:

(A) For non-metals except carbon disulfide, cyclohexanone, and methanol, treatment must achieve 90 percent reduction in total constituent concentrations, except as provided by paragraph (c)(1)(C) of this section.

(B) For metals and carbon disulfide, cyclohexanone, and methanol, treatment must achieve 90 percent reduction in constituent concentrations as measured in leachate from the treated media (tested according to the TCLP) or 90 percent reduction in total constituent concentrations (when a metal removal treatment technology is used), except as provided by paragraph (c)(1)(C)of this section.

(C) When treatment of any constituent subject to treatment to a 90 percent reduction standard would result in a concentration less than 10 times the Universal Treatment Standard for that constituent, treatment to achieve constituent concentrations less than 10 times the universal treatment standard is not required. Universal Treatment Standards are identified in 40 *CFR* 268.48 Table UTS.

(2) Soils that exhibit the characteristic of ignitability, corrosivity or reactivity. In addition to the treatment required by paragraph (c)(1) of this section, prior to land disposal, soils that exhibit the characteristic of ignitability, corrosivity, or reactivity must be treated to eliminate these characteristics.

(3) Soils that contain nonanalyzable constituents. In addition to the treatment requirements of paragraphs (c)(1) and (2) of this section, prior to land disposal, the following treatment is required for soils that contain nonanalyzable constituents:

(A) For soil that contains only analyzable and nonanalyzable organic constituents, treatment of the analyzable organic constituents to the levels specified in paragraphs (c)(1) and (2) of this section; or,

(B) For soil that contains only nonanalyzable constituents, treatment by the method(s) specified in § 268.42 for the waste contained in the soil.

(d) Constituents subject to treatment. When applying the soil treatment standards in paragraph (c) of this section, constituents subject to treatment are any constituents listed in 40 *CFR* 268.48, Table UTS—Universal Treatment Standards that are reasonably expected to be present in any given volume of contaminated soil, except fluoride, selenium, sulfides, vanadium and zinc, and are present at concentrations greater than ten times the universal treatment standard.

(e) Management of treatment residuals. Treatment residuals from treating contaminated soil identified by paragraph (a) of this section as needing to comply with LDRs must be managed as follows:

(1) Soil residuals are subject to the treatment standards of this section;

(2) Non-soil residuals are subject to:

(A) For soils contaminated by listed hazardous waste, the RCRA Subtitle C standards applicable to the listed hazardous waste; and

(B) For soils that exhibit a characteristic of hazardous waste, if the non-soil residual also exhibits a characteristic of hazardous waste, the treatment standards applicable to the characteristic hazardous waste.

[51 FR 40642, Nov. 7, 1986, as amended at 63 FR 28751, May 26, 1998; 64 FR 25417, May 11, 1999; 64 FR 56472, Oct. 20, 1999]

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