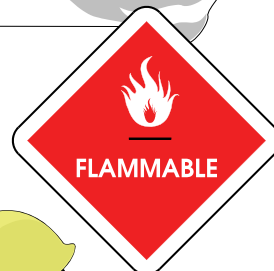
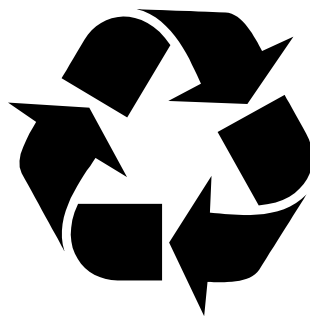


Hazardous Waste Determination and Classification Guidelines

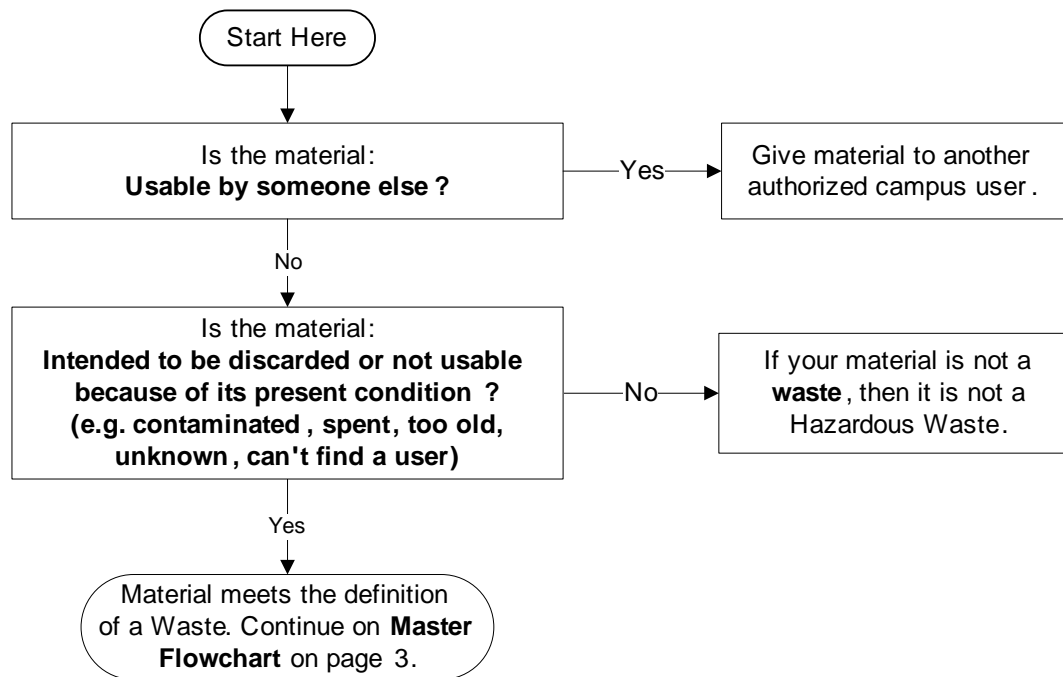


A publication of:
UC Santa Cruz
Environmental Health and Safety
February 2013 Revision

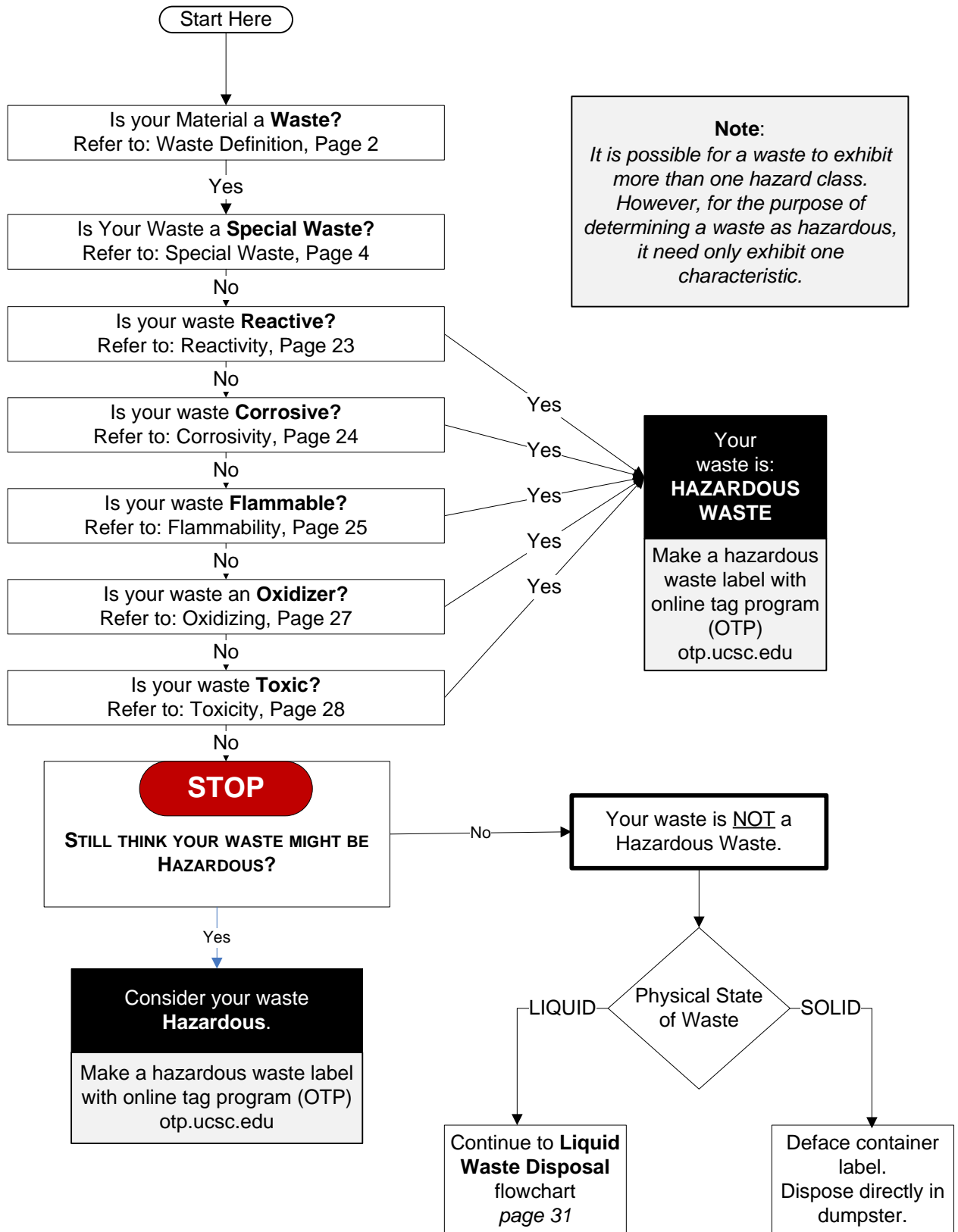
WASTE DEFINITION

The average cost for disposal is 7-10 times the purchase cost of a material; generators are strongly encouraged to find recycling alternatives.

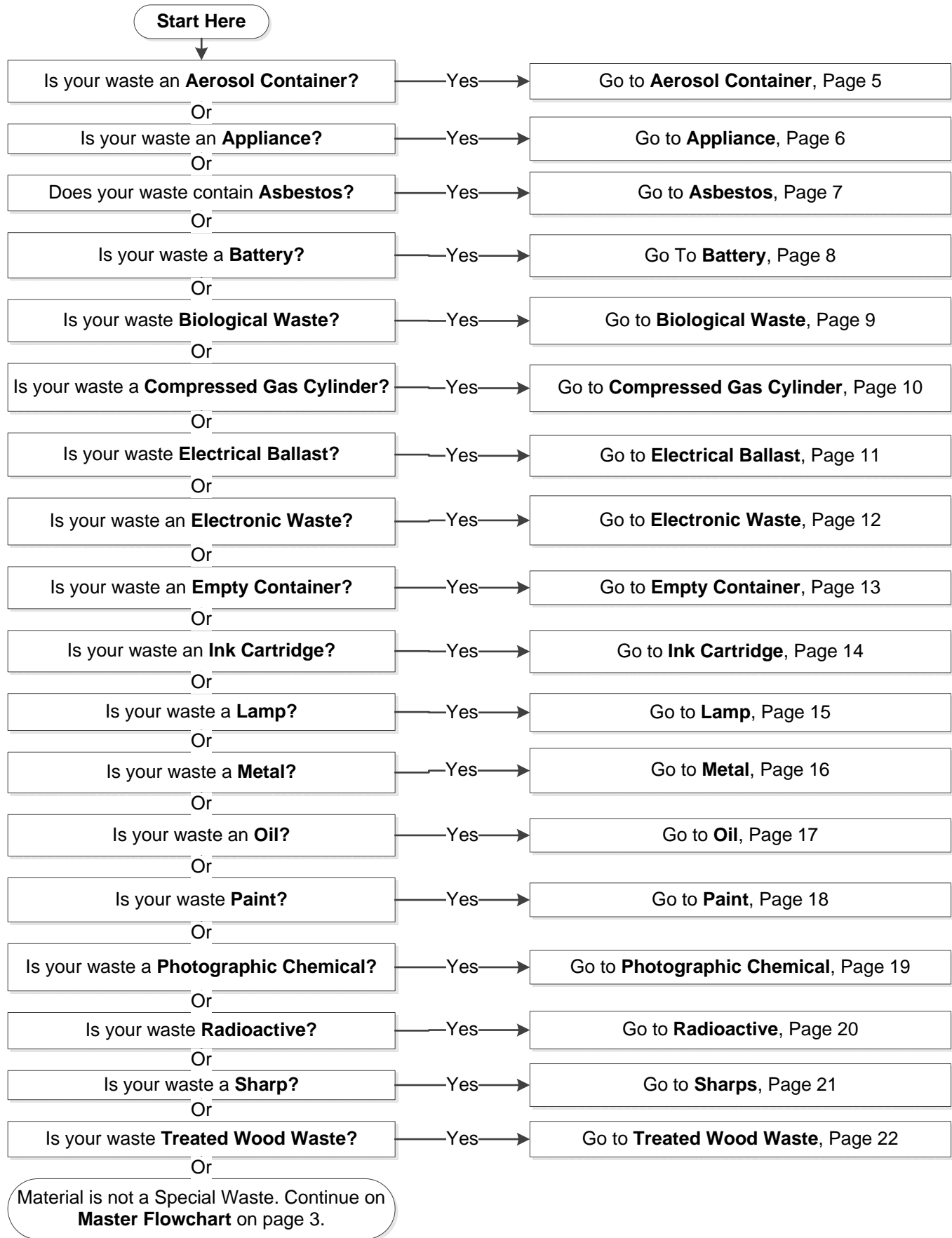
If you would like assistance with waste reduction alternatives, contact EHS (x9-3086 or x9-2553).



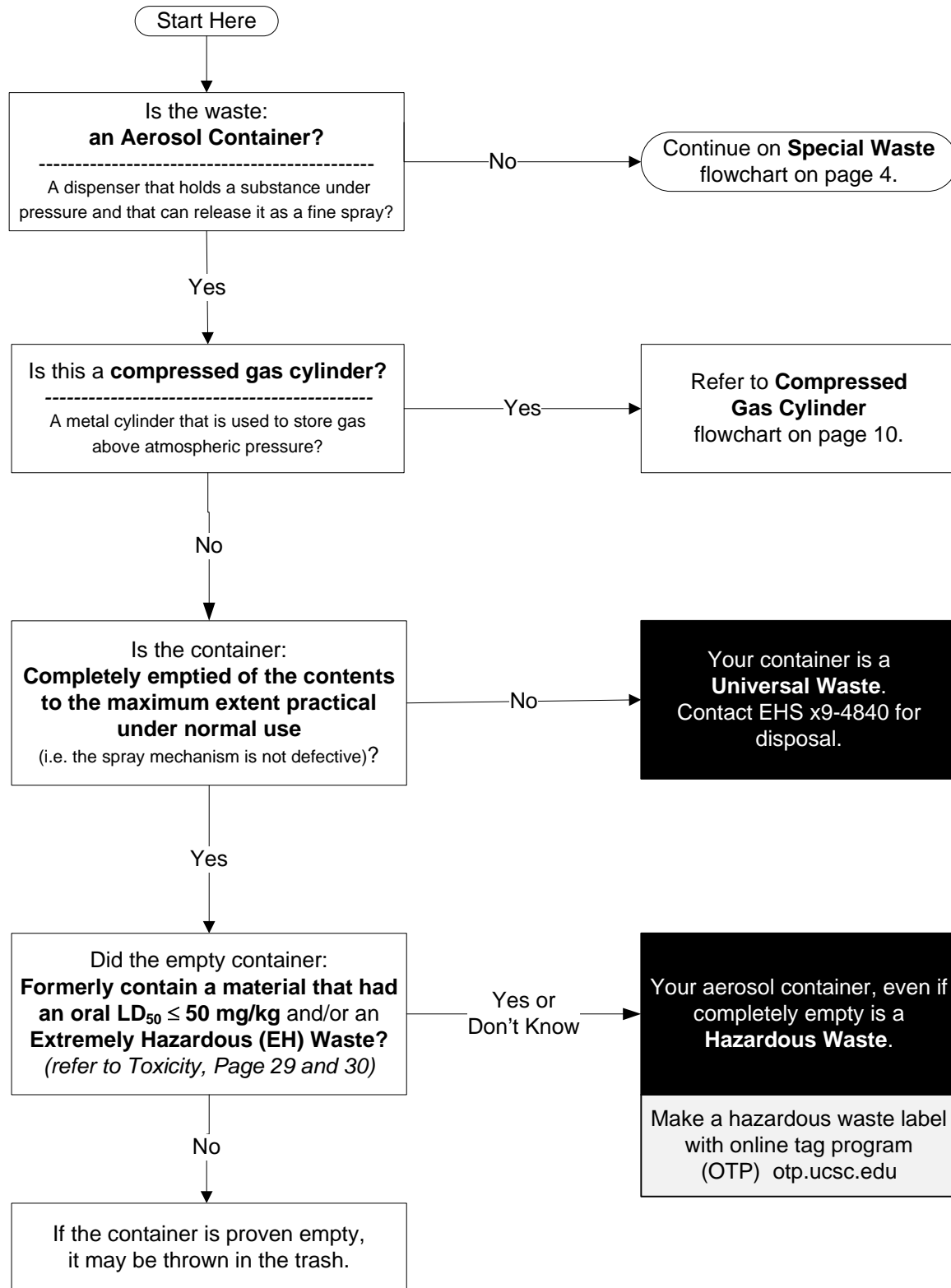
Master Flowchart



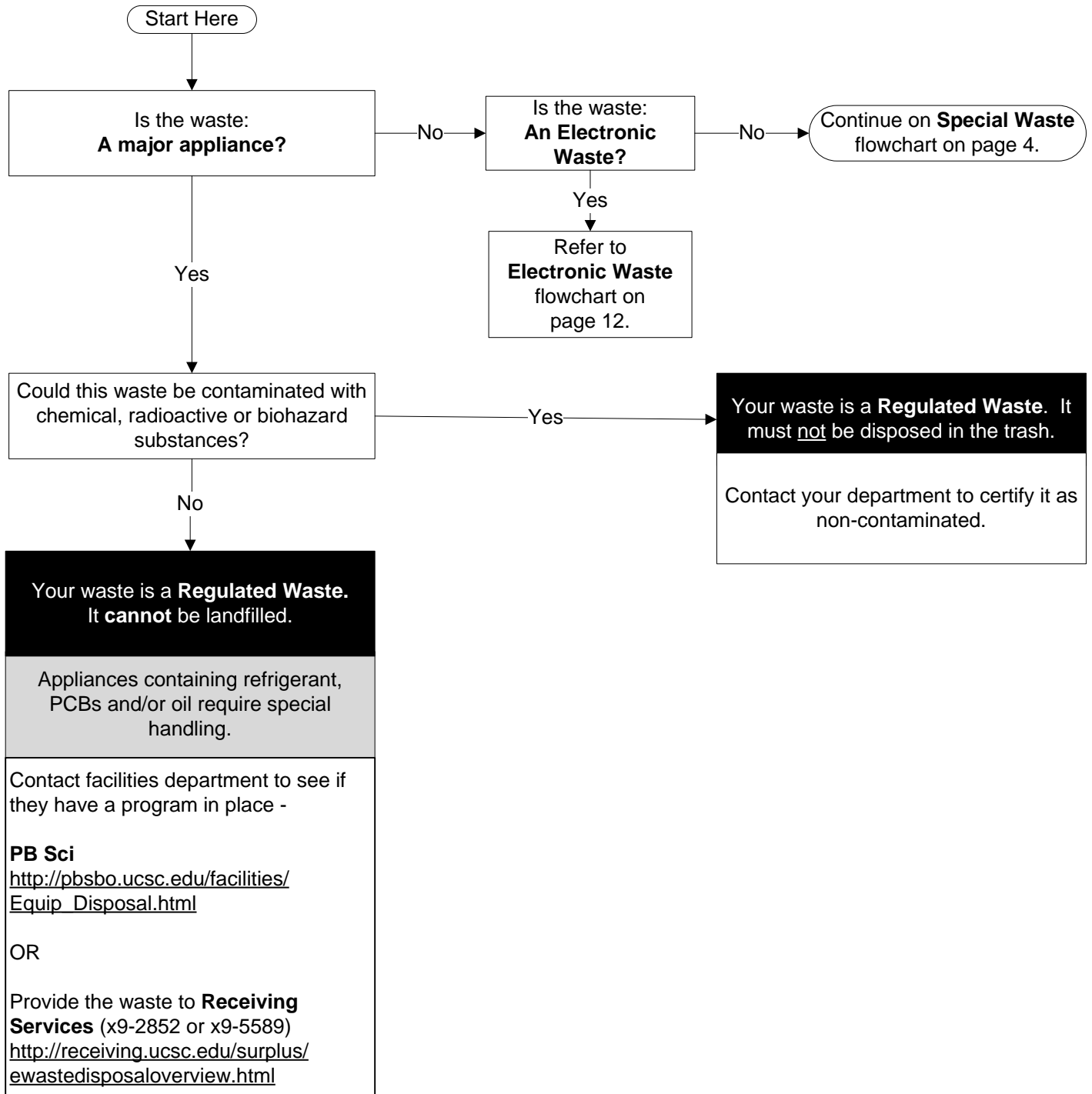
Special Waste



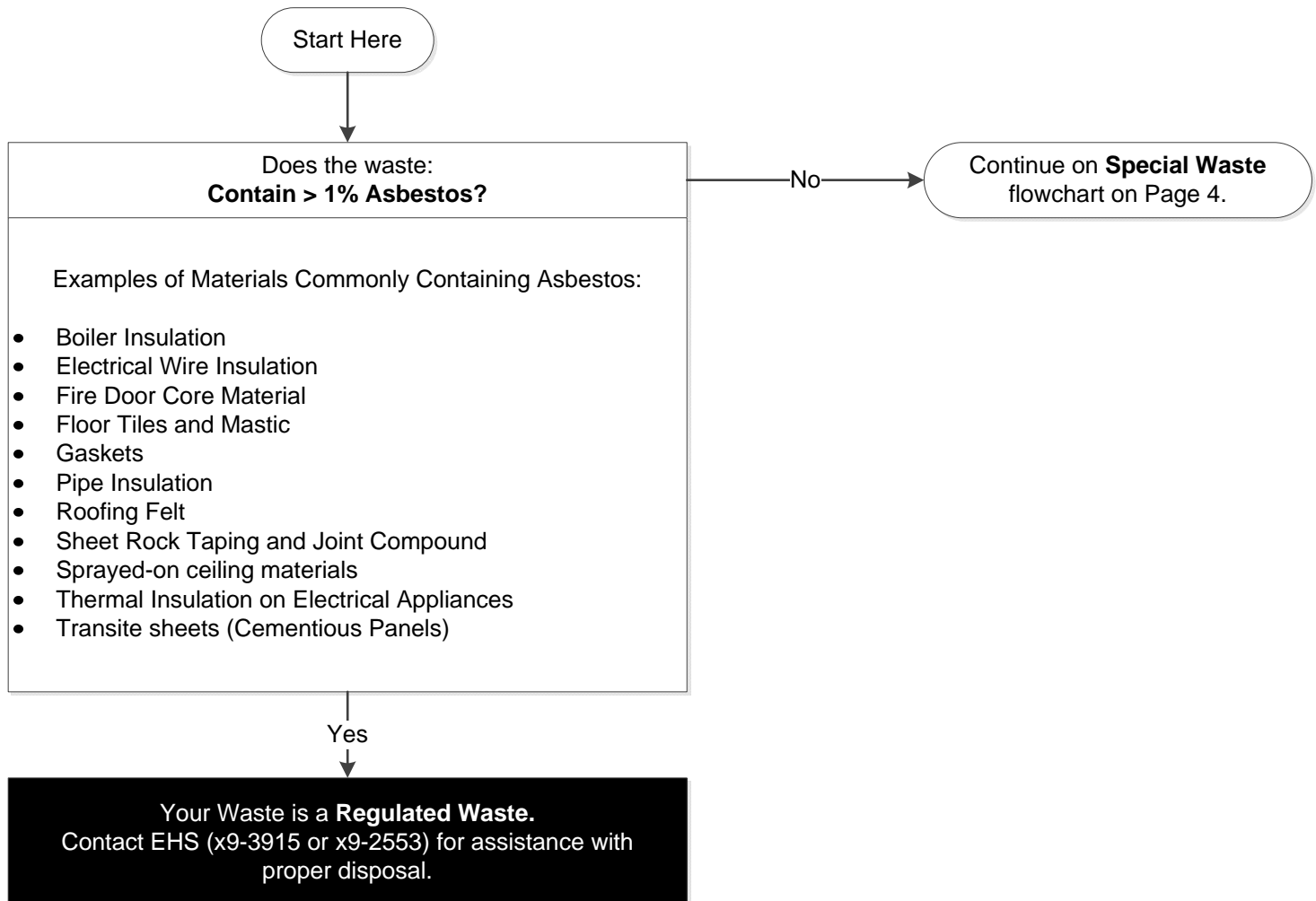
Aerosol Container



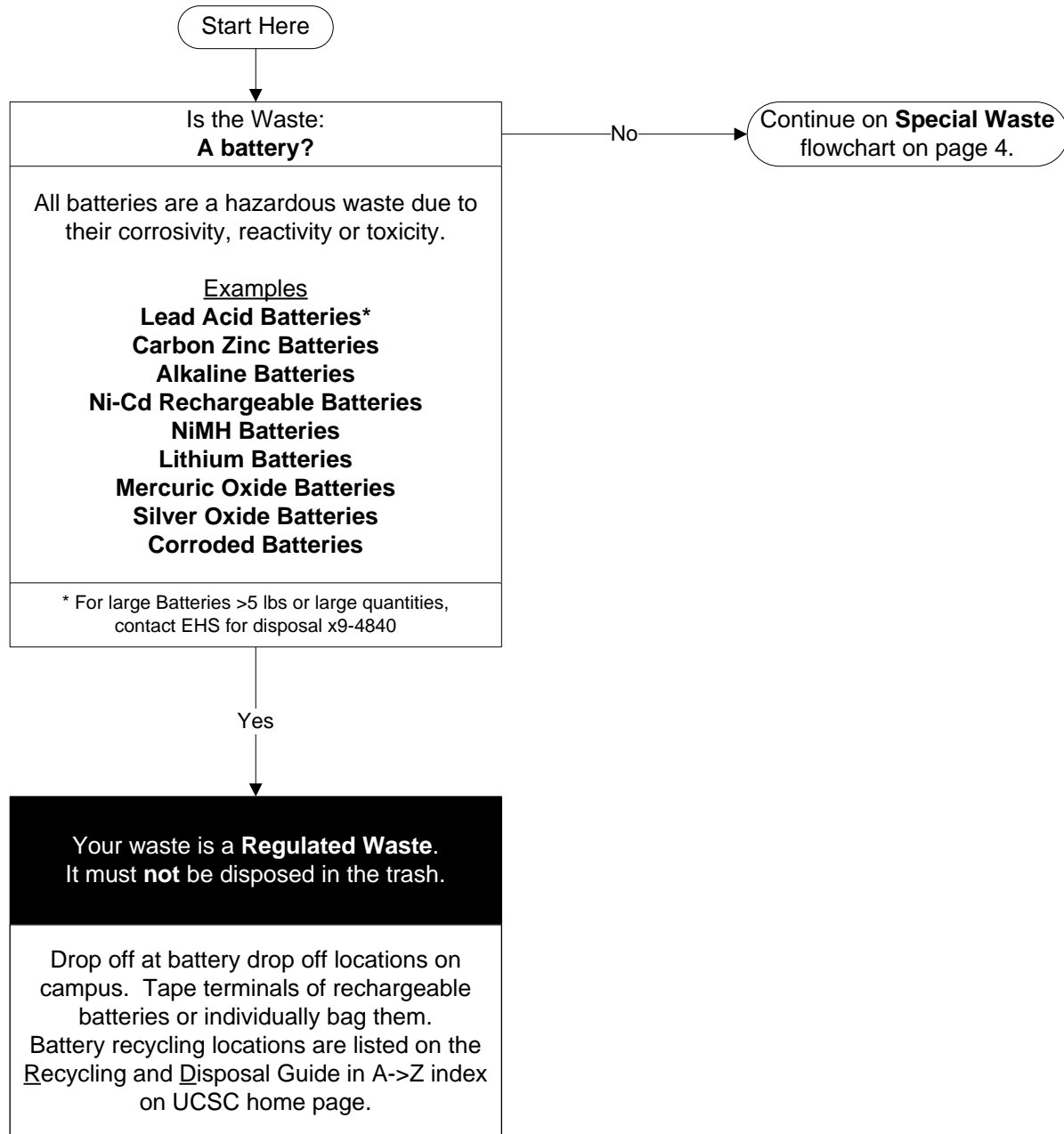
Appliance



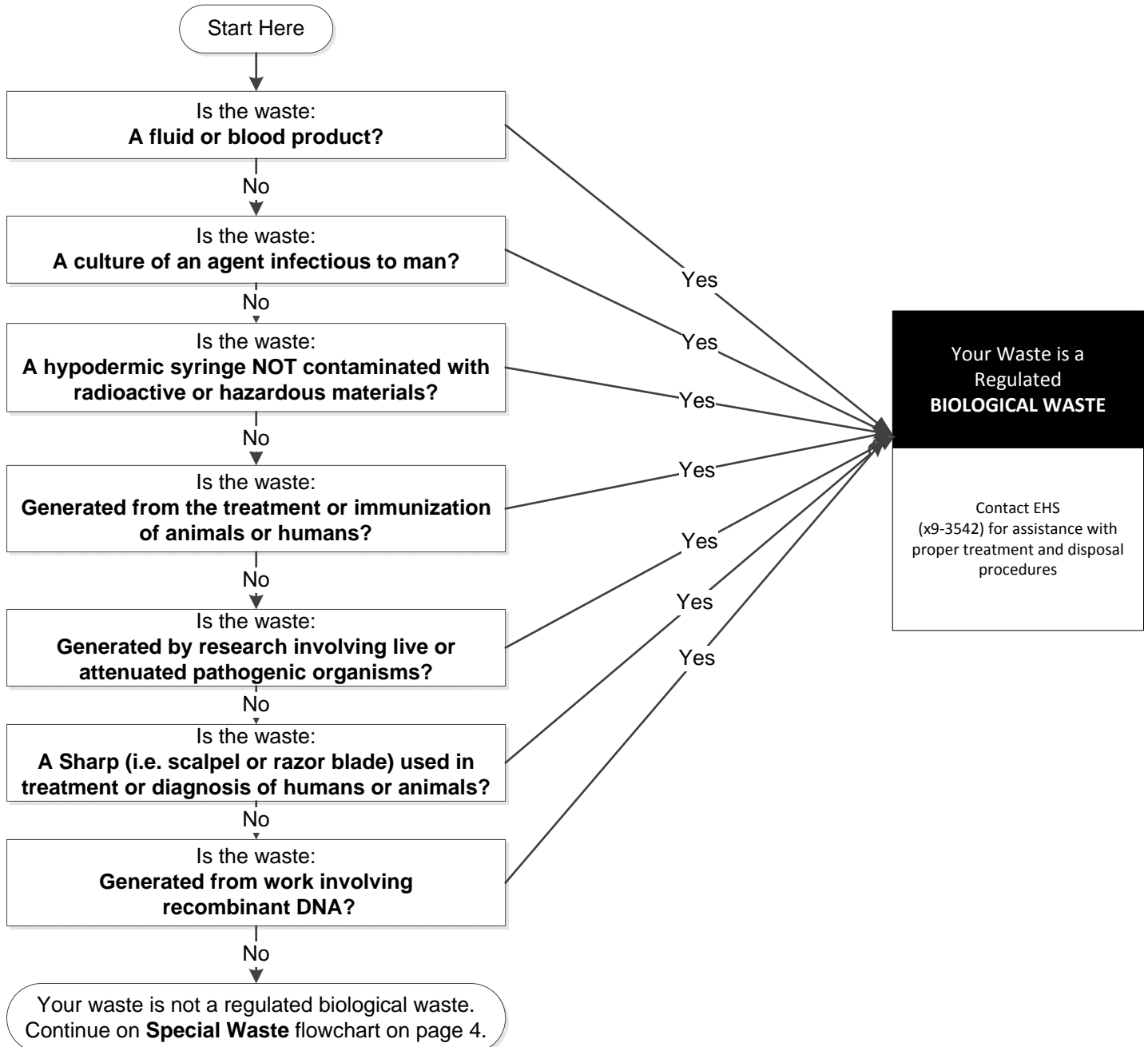
Asbestos



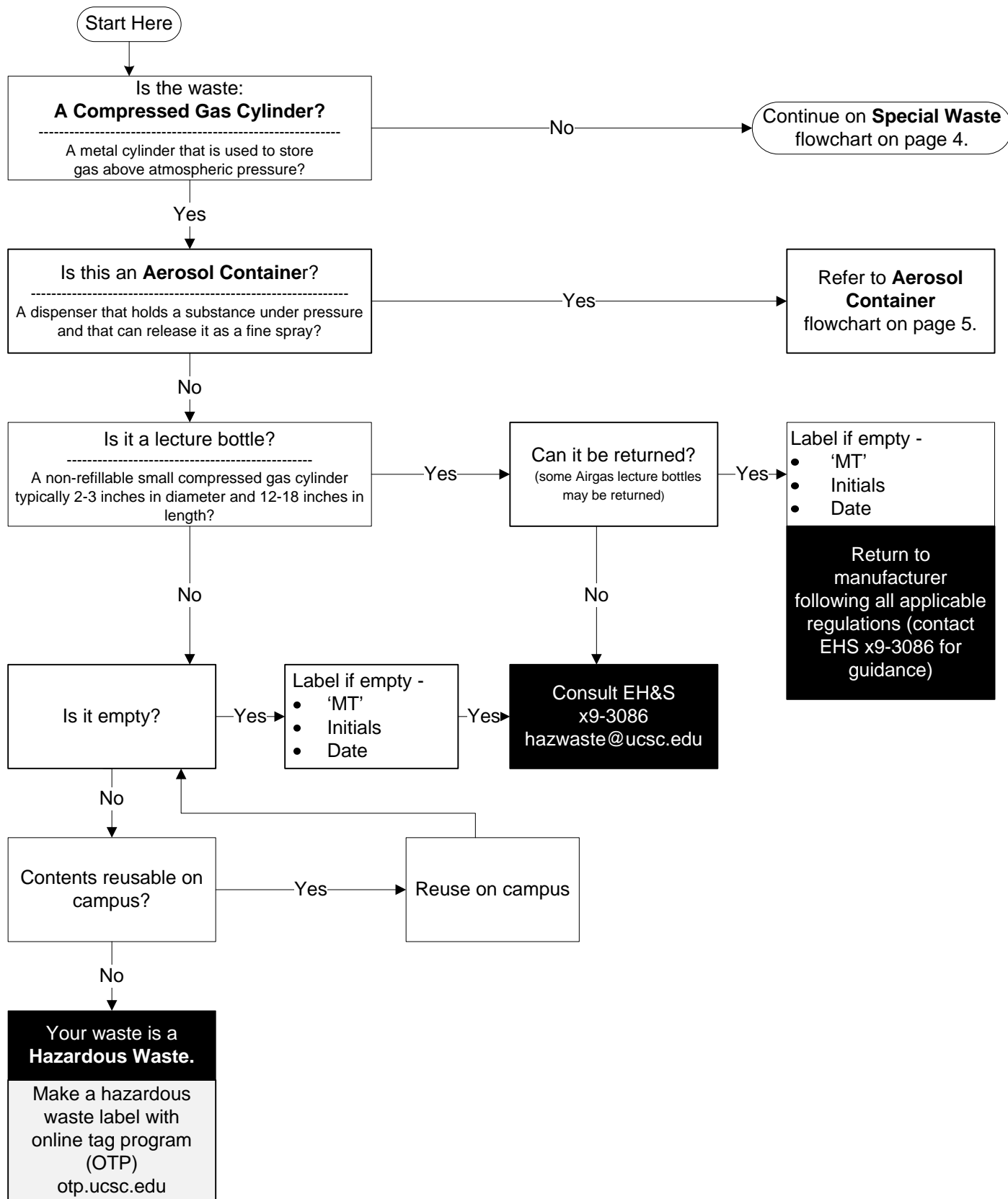
Battery



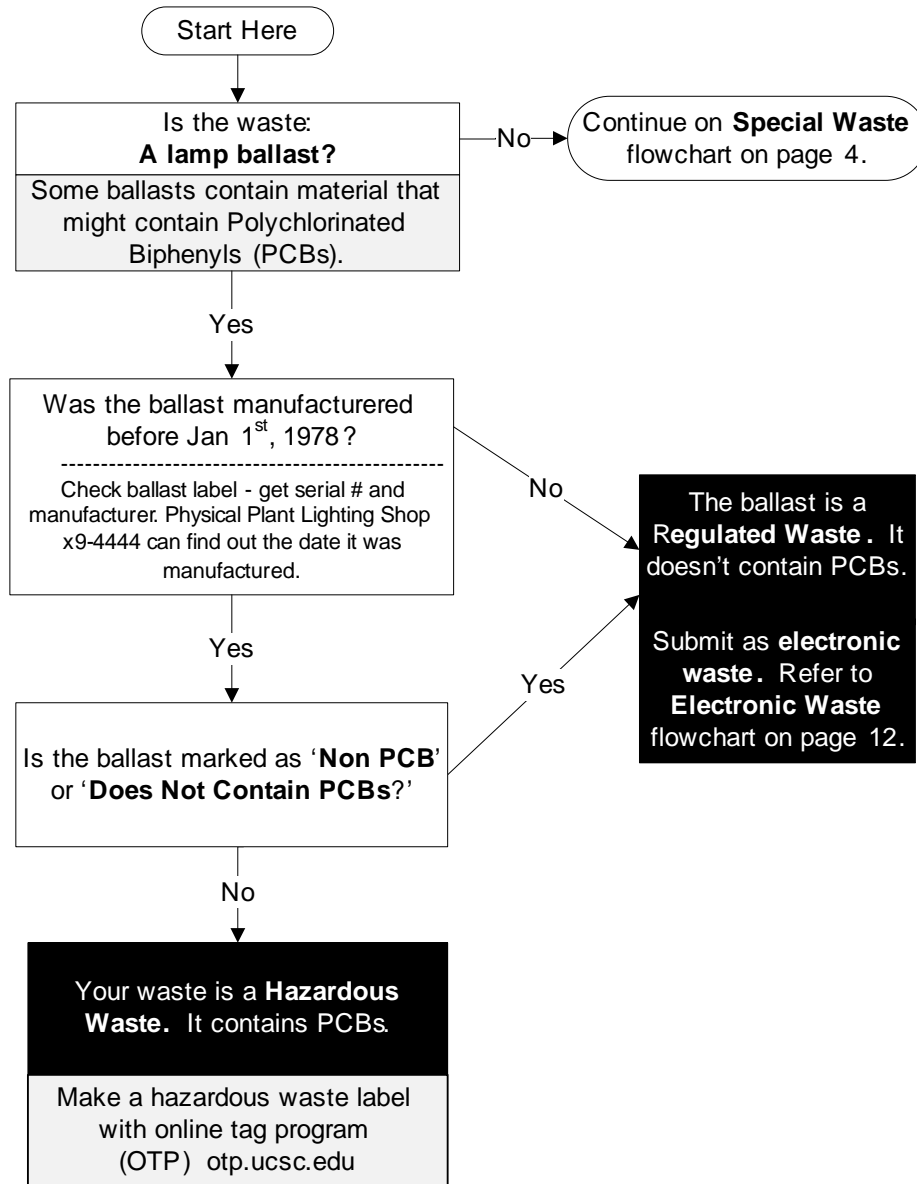
Biological Waste



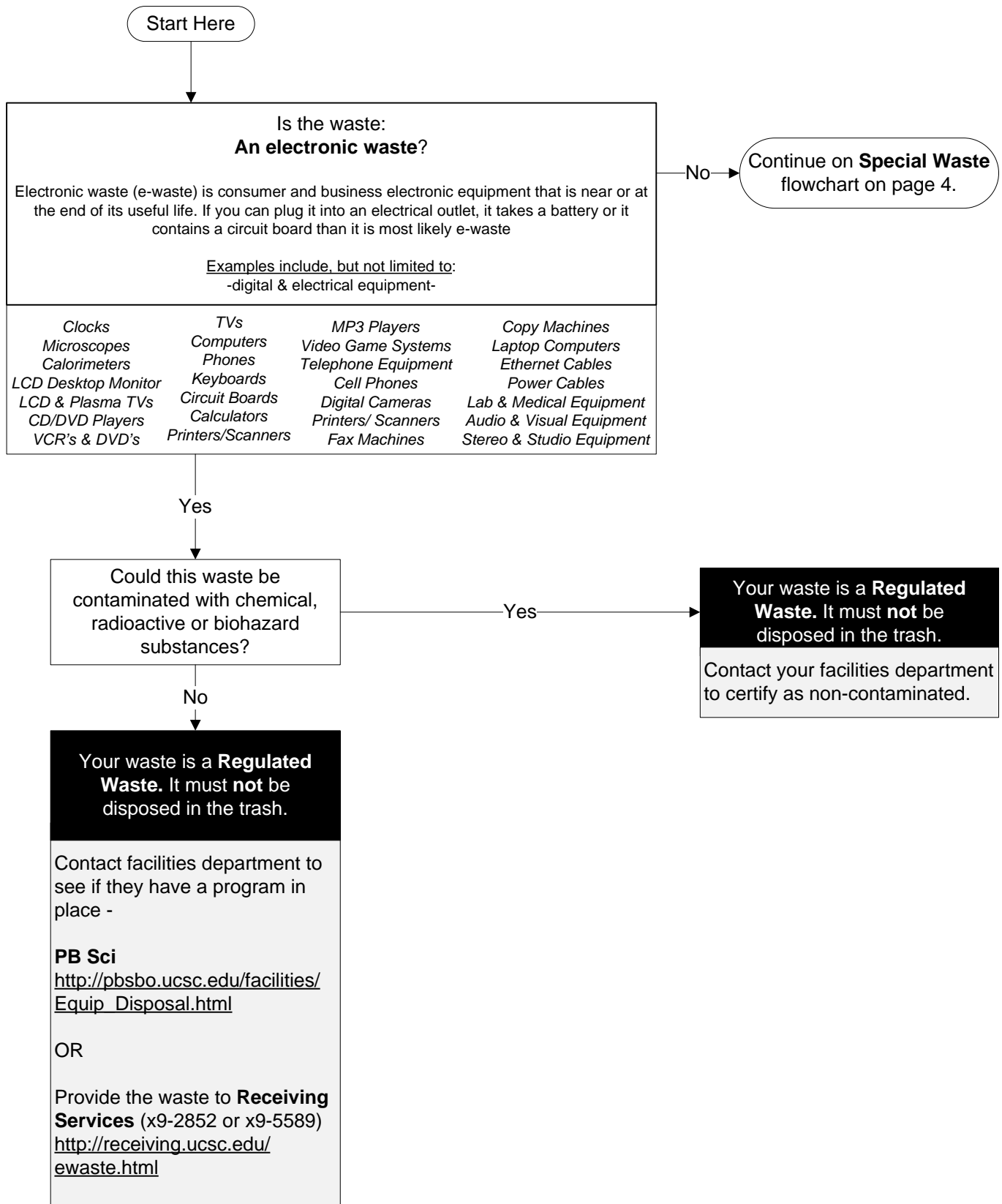
Compressed Gas Cylinder



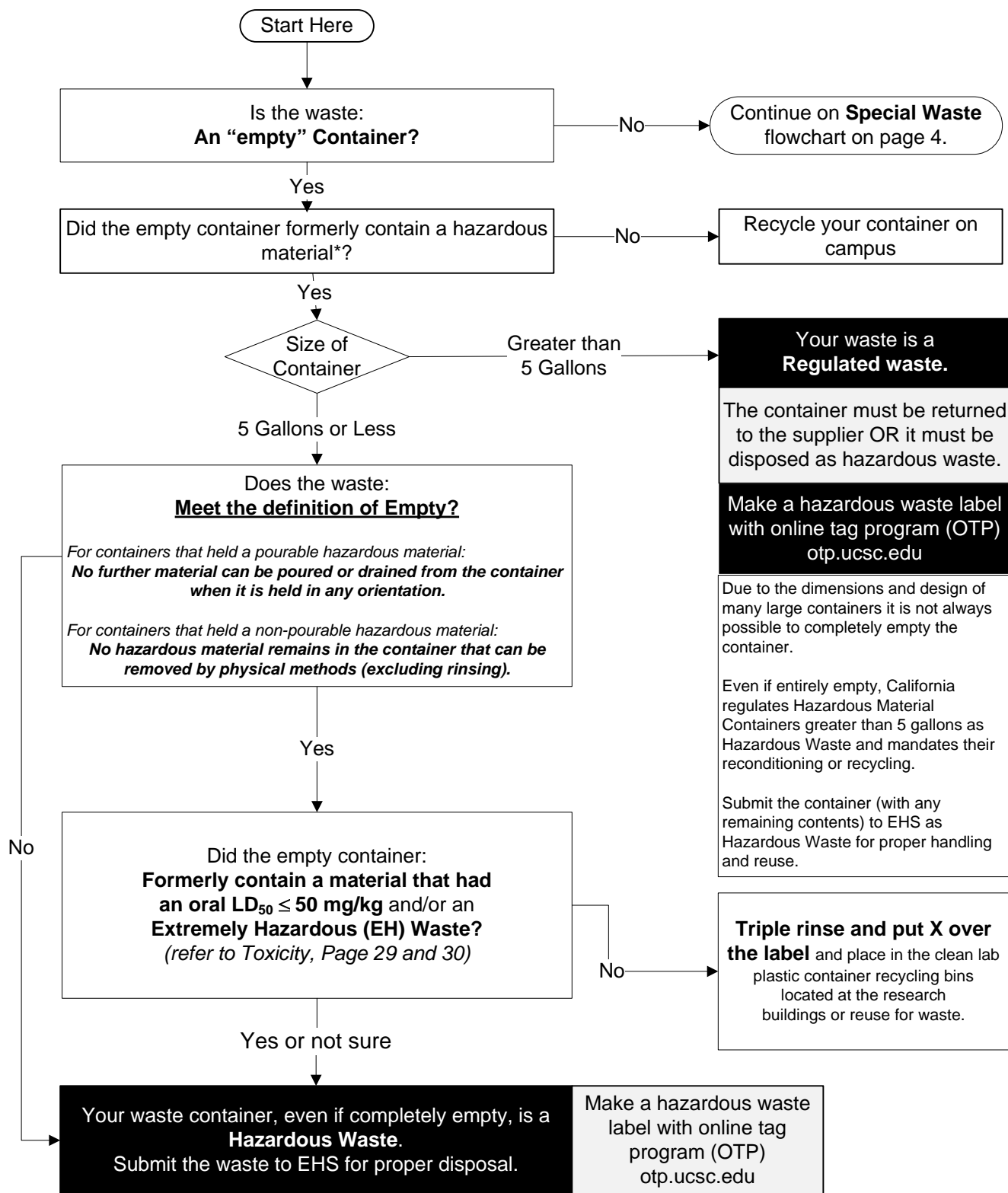
ELECTRICAL BALLAST



Electronic Waste

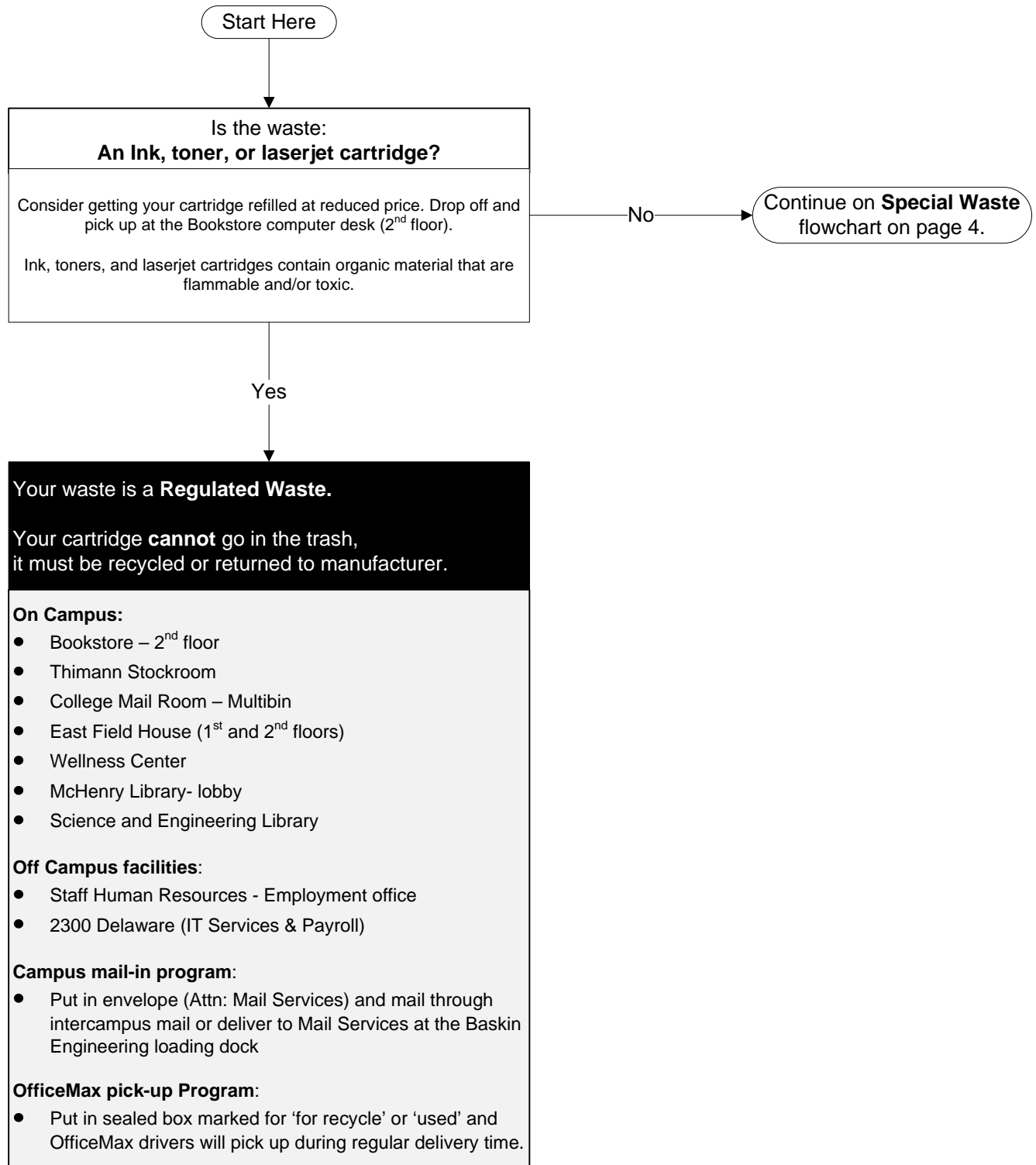


Empty Container

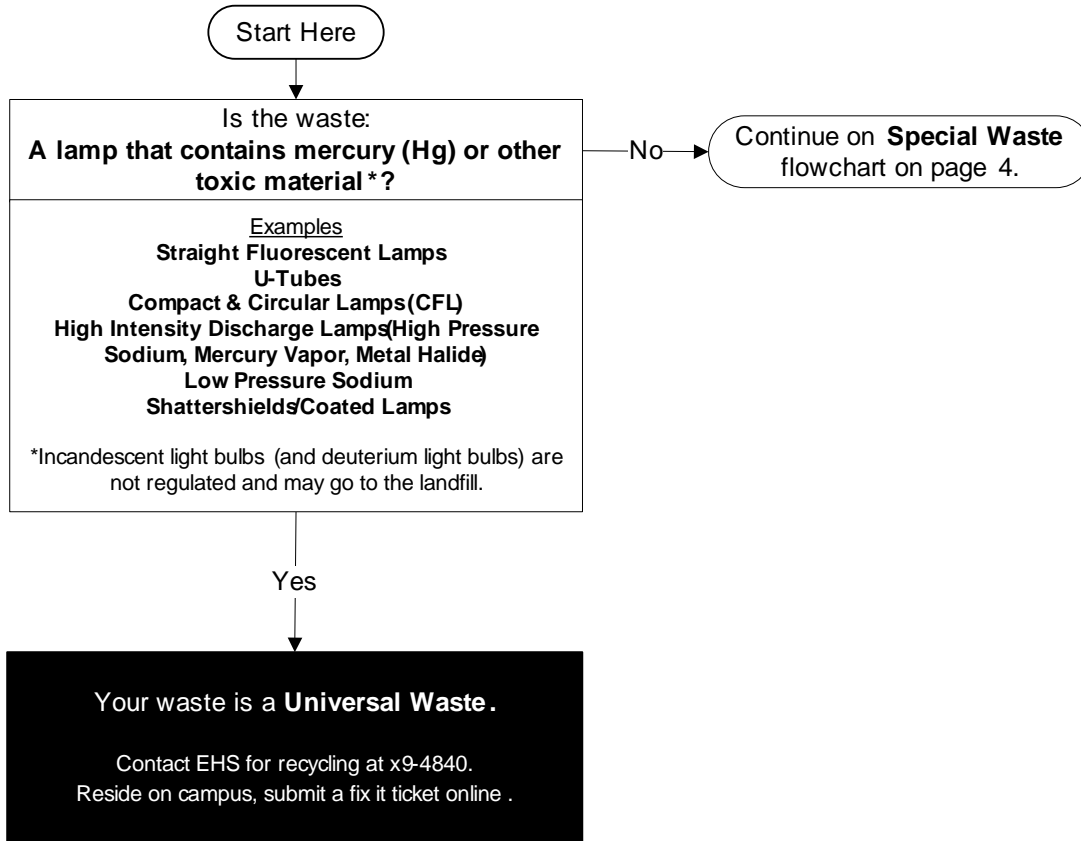


* Use Pages 23-30 of this Guide to assist in determining if the containers former contents were hazardous.

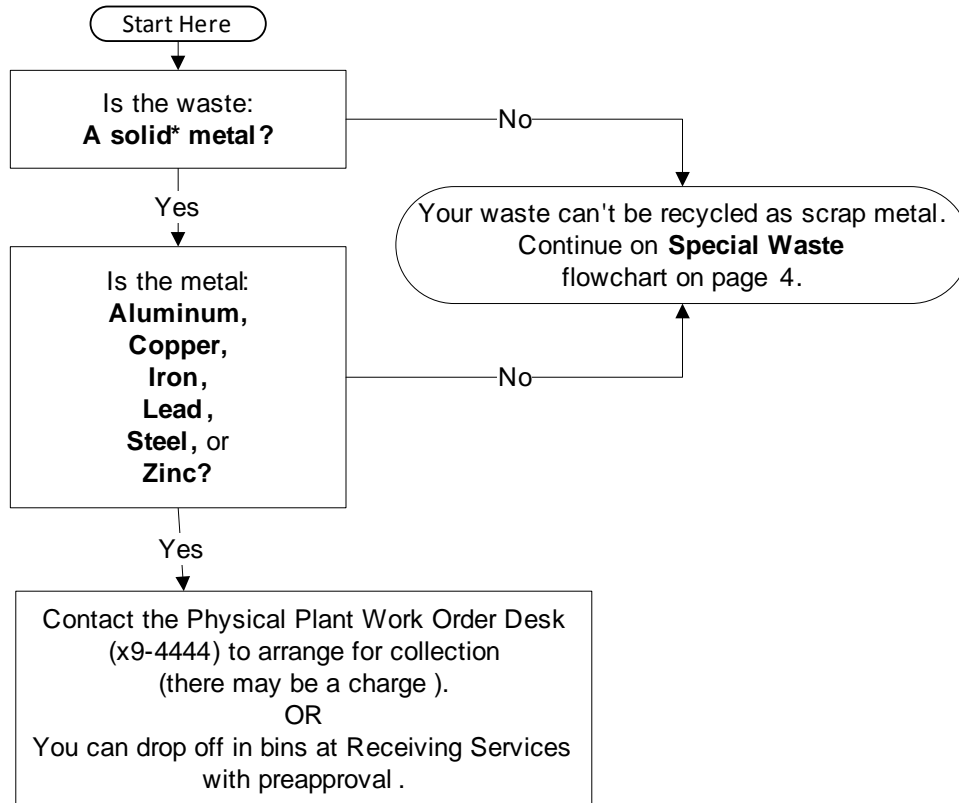
Ink & Toner Cartridge



Lamp

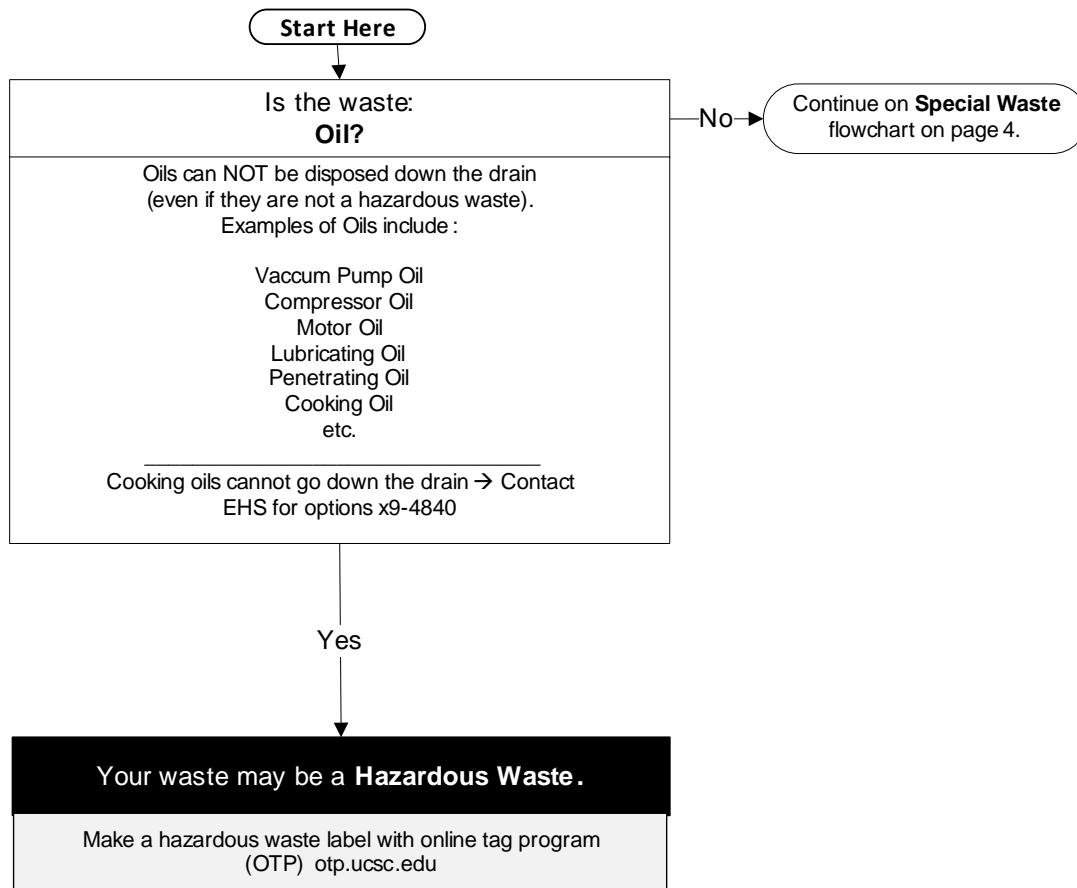


Metal

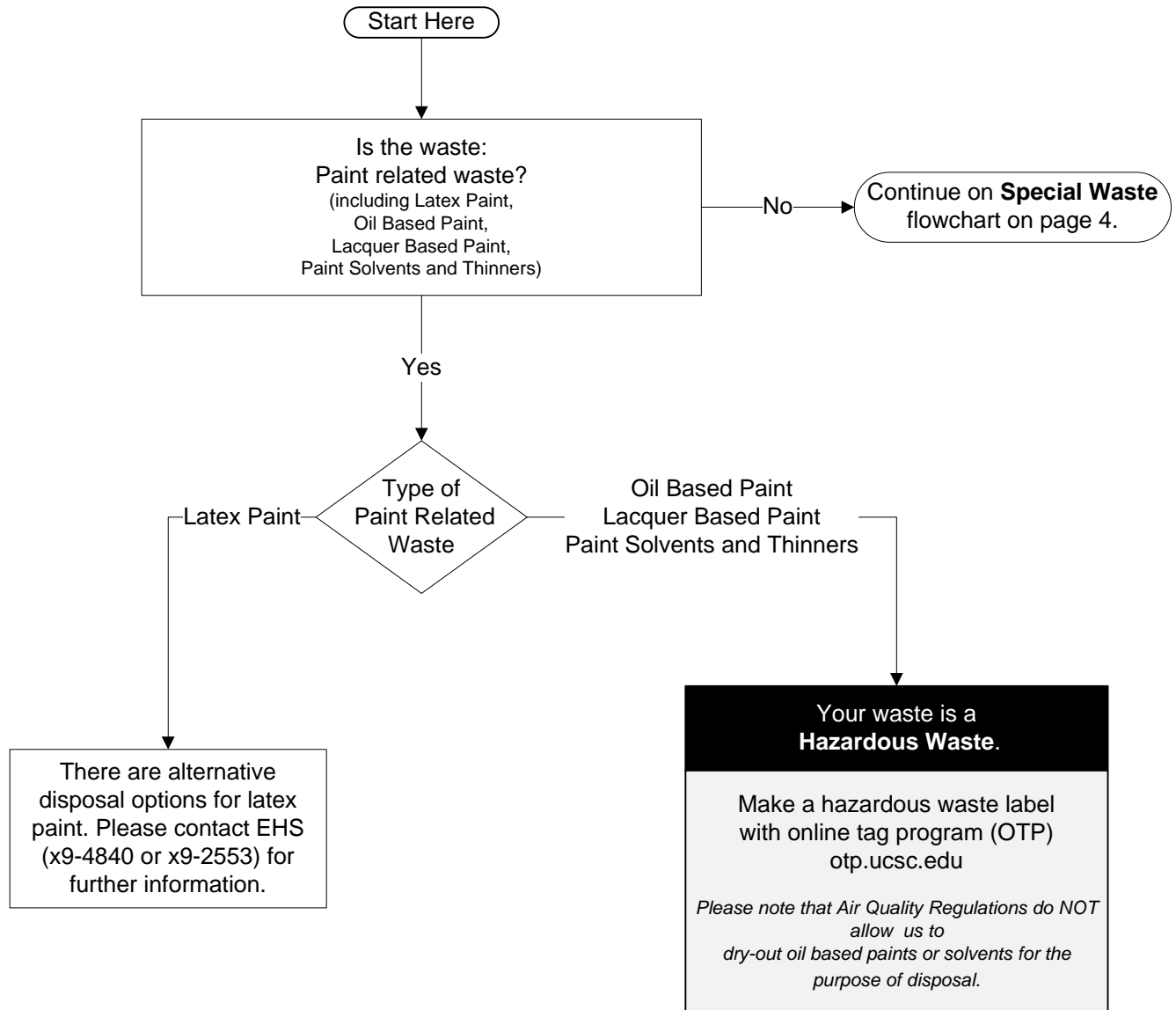


*If the elemental metals are in a friable, powdered, or finely divided state contact EHS x9-3086 or x9-3541 to see if your waste qualifies as a hazardous waste.

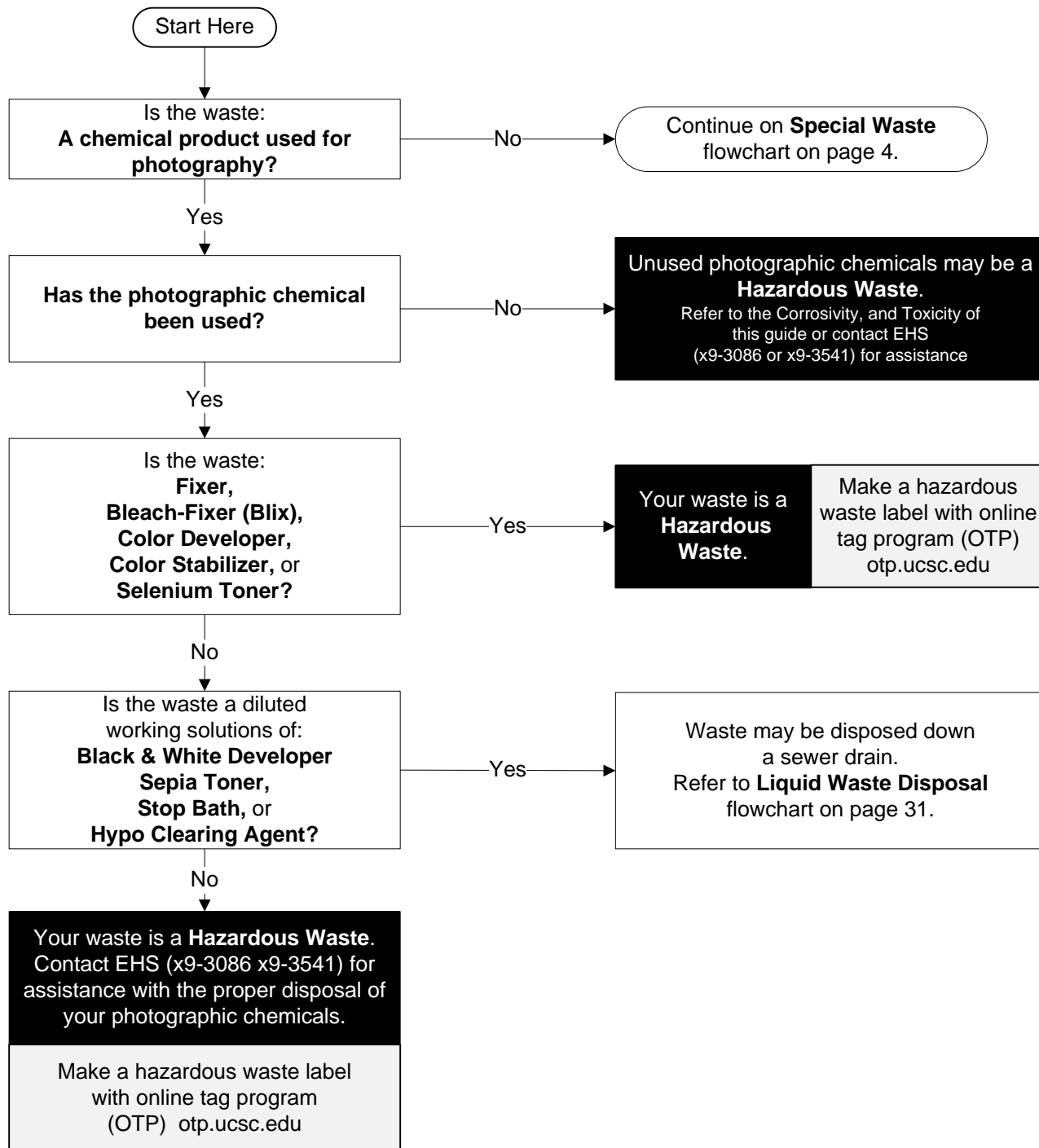
Oil



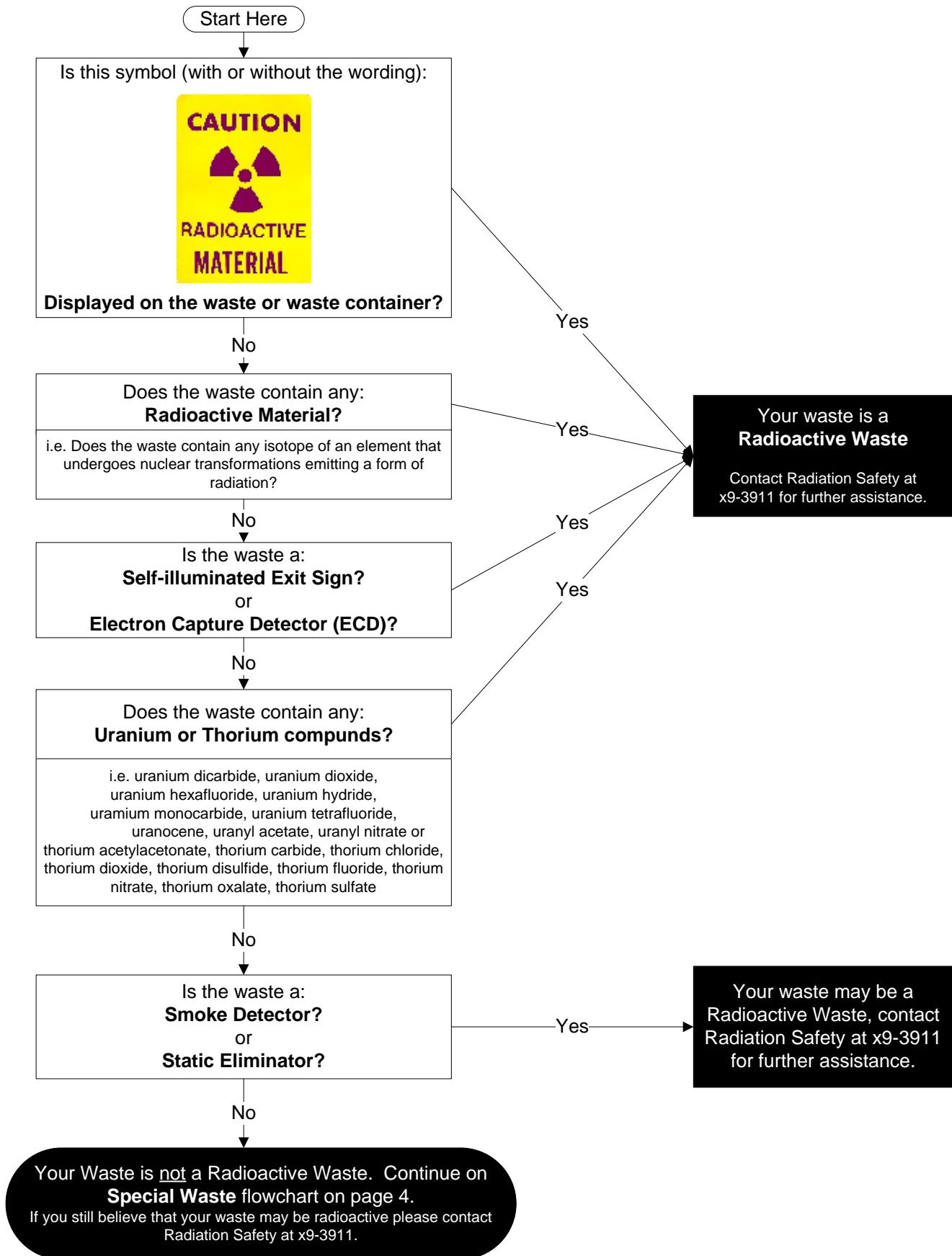
Paint



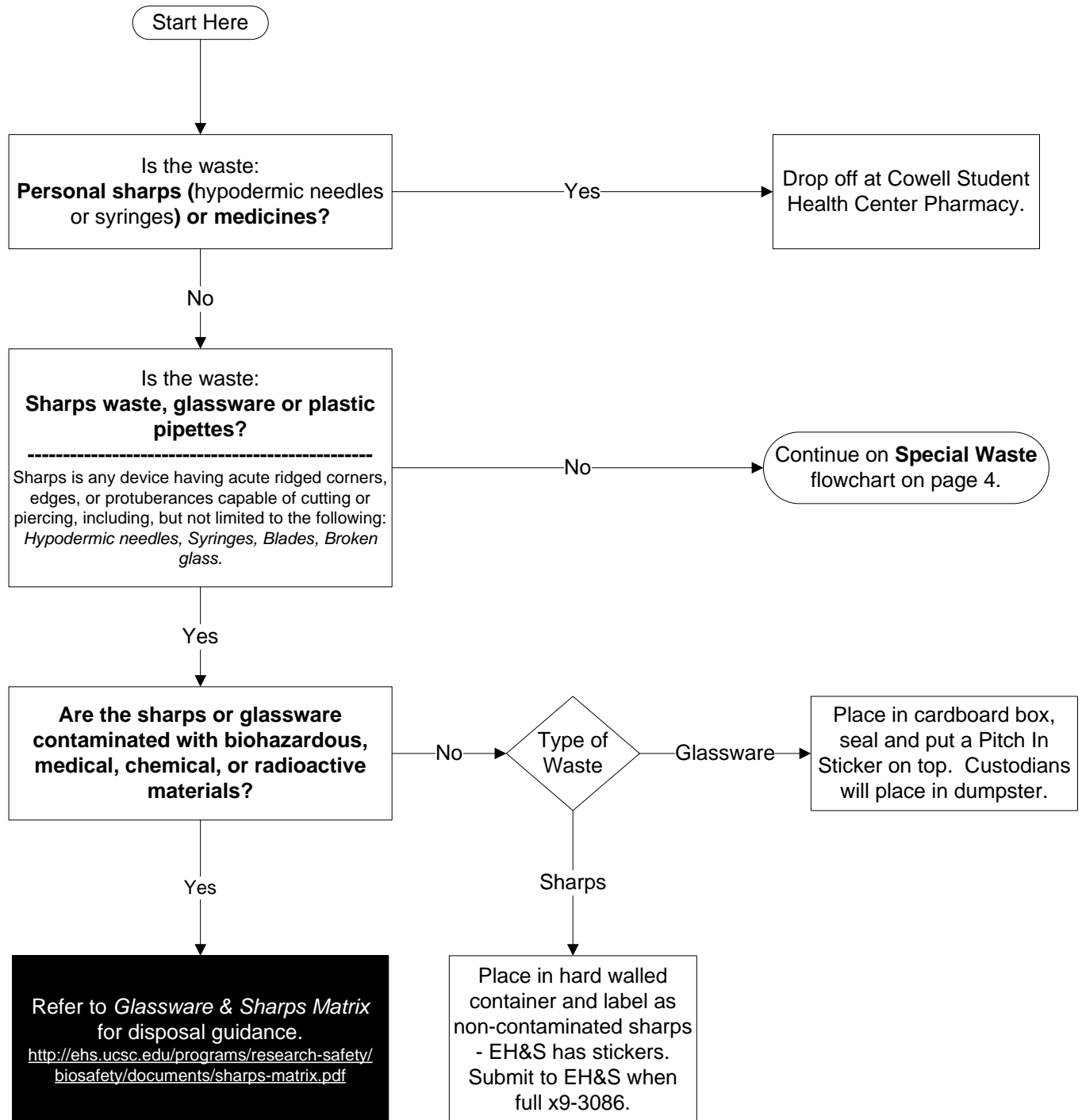
Photographic Chemical



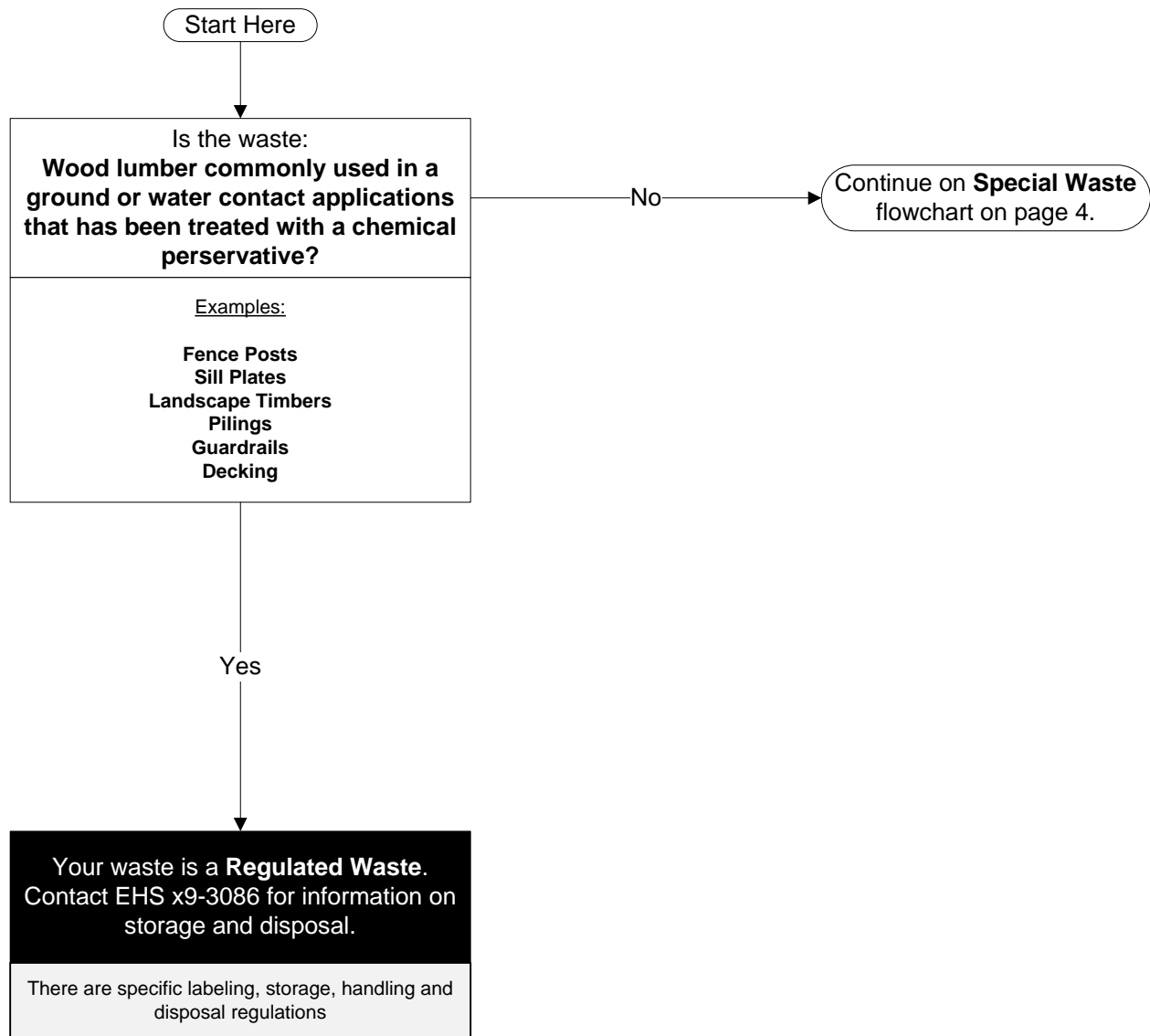
Radioactive Waste



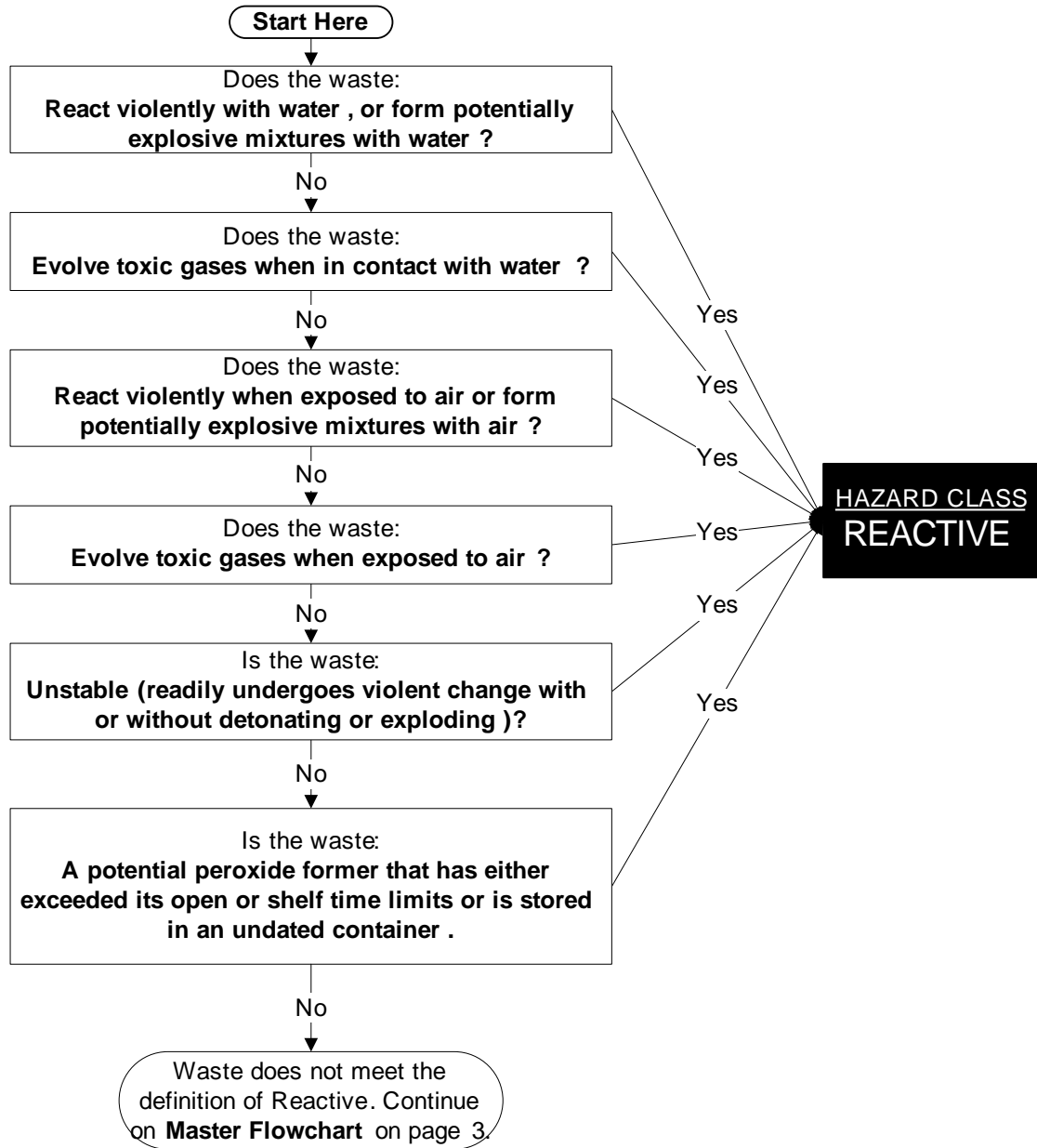
Sharps



Treated Wood Waste



REACTIVITY



CORROSIVITY

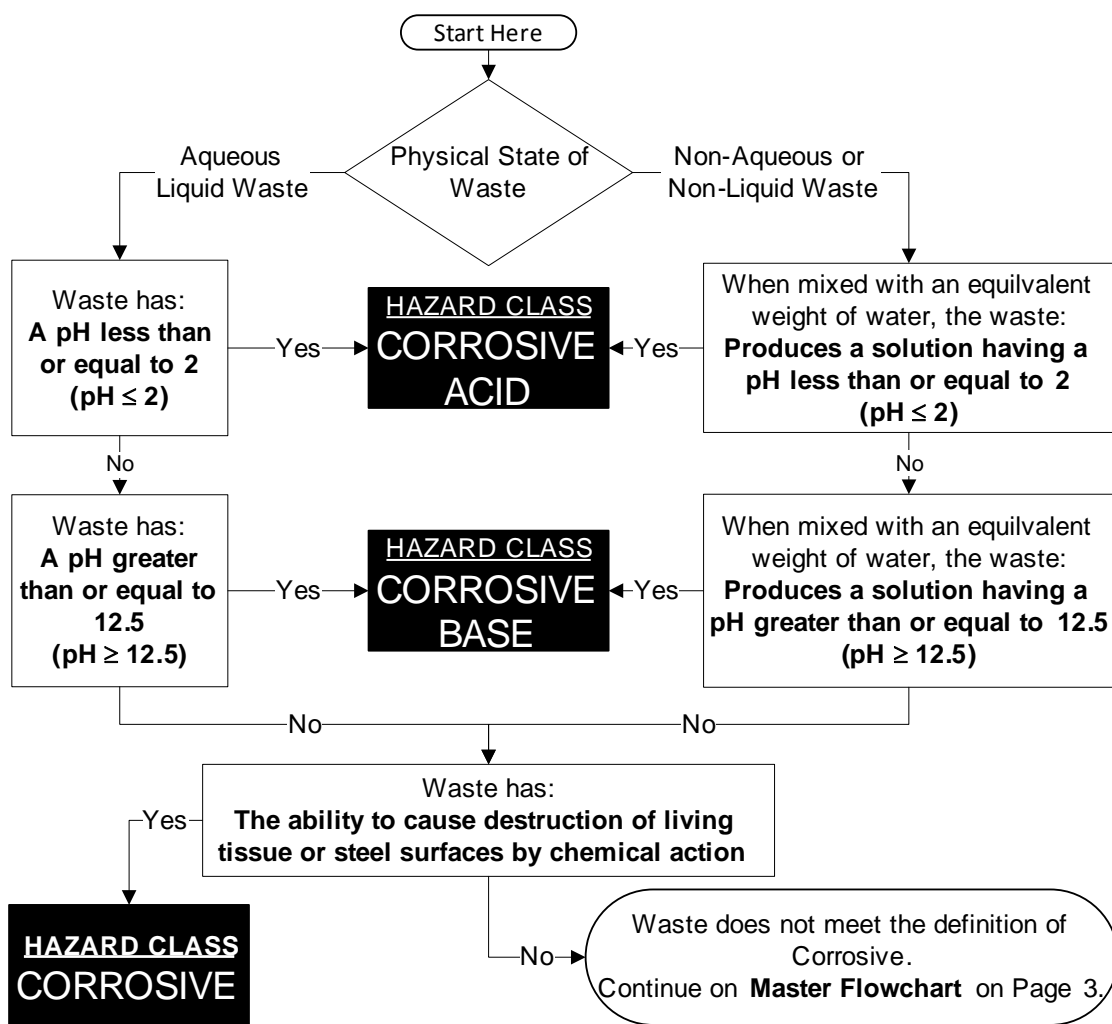
Characteristics

A liquid that:

- is aqueous and has a pH less than or equal to 2 (pH ≤ 2) or greater than or equal to 12.5 (pH ≥ 12.5), or
- corrodes steel, or
- causes destruction of living tissue

A non-aqueous or non-liquid waste that:

- when mixed with an equivalent weight of water, produces a solution having a pH less than or equal to 2 (pH ≤ 2) or greater than or equal to 12.5 (pH ≥ 12.5)
- when mixed with an equivalent weight of water, produces a liquid that corrodes steel



FLAMMABILITY

Characteristics

A flammable material is any material “which will ignite easily and burn rapidly.”

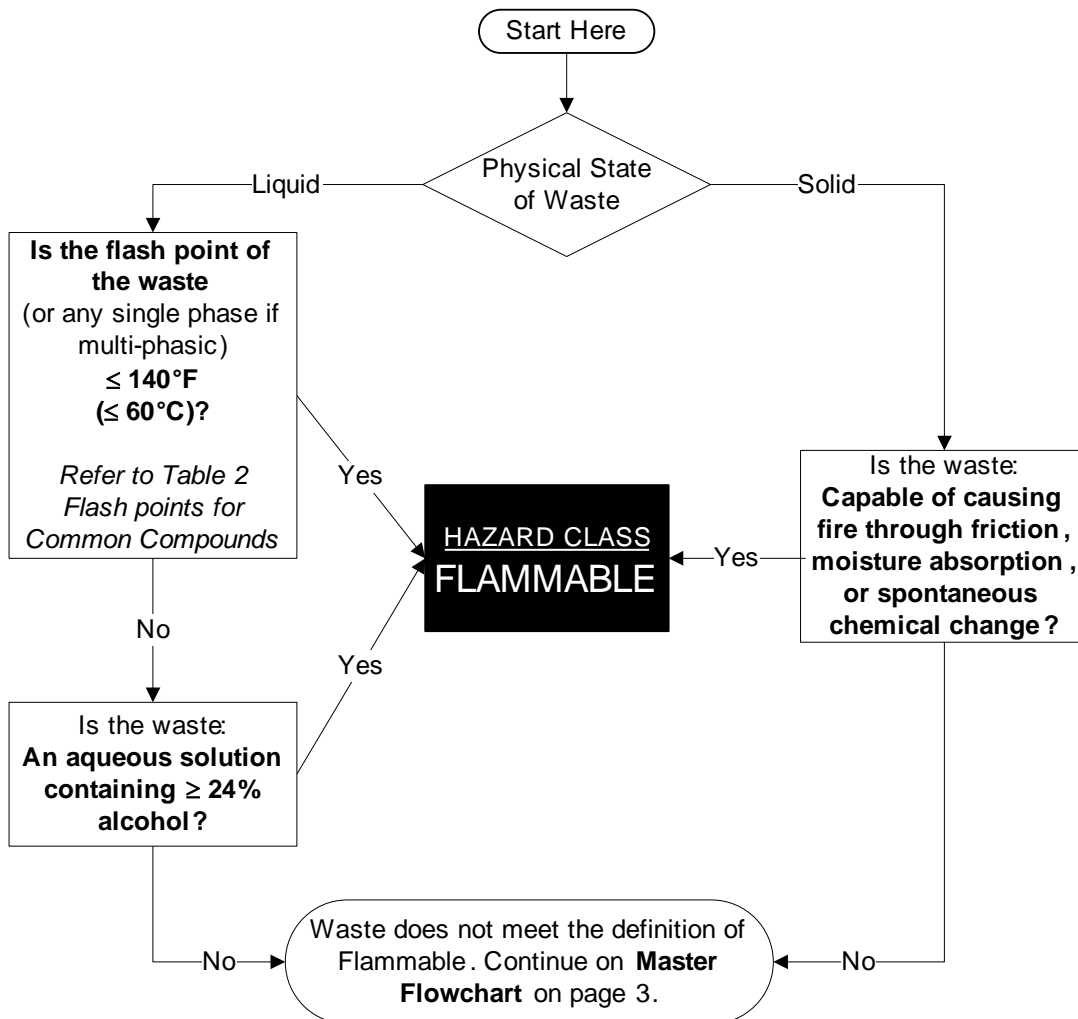


Table 2 FLASH POINTS FOR COMMON COMPOUNDS

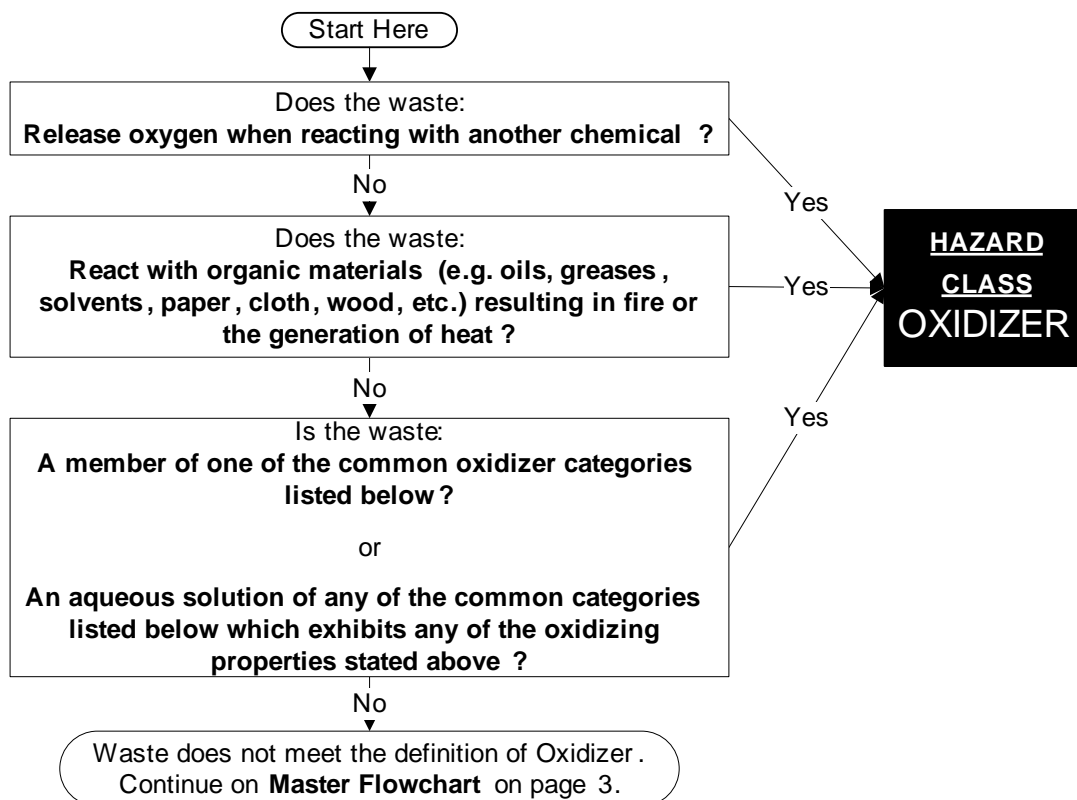
Chemical	° F	° C
Acetic Acid	103	39
Acetone	-4	-20
Acetonitrile	42	6
Acetyl acetone (2,4-pentanedione)	93	34
Benzene	12	-11
1-Butanol	98	37
2-Butanol (sec butanol)	75	24
tert-Butyl alcohol	52	11
Bromopropene (allyl bromide)	30	-1
Carbon disulfide	-22	-30
Carbon tetrachloride	N/A	
Chloroform	N/A	
Cyclohexane	-4	-20
1,2-Dichlorobenzene	150	66
1,2-Dichloroethylene	36	2
Diethylamine	-9	-23
DMF (dimethylformamide)	136	58
DMSO (dimethyl sulfoxide)	203	95
1,4-Dioxane	54	12
Ethanol - 30%, aqueous	85	29
Ethanol - 50%, aqueous	75	24
Ethanol - 95%, aqueous	63	17
Ethanol - 100%	55	13
Ethyl acetate	24	-4
Ethyl ether	-49	-45
Ethylene dichloride (1,2-dichloroethane)	56	13
Formalin	122	50
Hexane	-7	-22
Isopropanol	53	12
Isopropyl ether	-18	-28
MEK (methyl ethyl ketone)	156-170	69-77
Mercaptoethanol	165	74
Methylene chloride	N/A	N/A
Methanol	52	11
Morpholine	98	37
Mineral oil	380	193
Nitrobenzene	190	88
Nitromethane	95	35
p-Dioxane	54	12
Pentane	<-40	<-40
Petroleum ether	<0	<-18
Phenol	175	79
Piperidine	61	16
Propanol	74	23
Propylene carbonate	275	135
Pyridine	68	20
Sulfolane	350	177
THF (tetrahydrofuran)	6	-14
Toluene	40	4
Xylenes	81-90	27-32

Note: For dilute solutions and mono-phasic mixtures, consider the waste to be flammable if **ANY ONE COMPONENT**, in its pure form, has a flash point 140F (60C), unless you are confident that the mixture's flash point does not meet the criteria.

OXIDIZING

Definition

An oxidizing material is “any compound that spontaneously evolves oxygen either at room temperature or under slight heating. The term includes such chemicals as peroxides, chlorates, perchlorates, nitrates and permanganates. These can react vigorously at ambient temperatures when stored near or in contact with reducing materials such as organic compounds.”



Examples

SOLIDS

Bismuthates	Ferric chloride	Perborates
Bromates	Ferric trioxide	Perchlorates
Ferric sulfate	Ferricyanides	Periodic acid
Chlorates	Hypochlorites	Permanganates
Chlorites	Iodates	Permanganic acid
Chromates	Iodine	Peroxides
Chromium trioxide	Manganese dioxide	Persulfates
Dichromates	Nitrates	

LIQUIDS

Bromine	Hydrogen peroxide	Perchloric acid (pH > 2) *
Chromic acid (pH > 2) *	Nitric acid (pH > 2) *	Sulfuric acid (pH > 2) *

* Oxidizing mixtures having a pH ≤ 2 are classified as corrosive.

Sax and Lewis, Hawley's Condensed Chemical Dictionary 11th Edition, New York

TOXICITY

The determination of a waste as a hazardous waste due to its toxicity is a process that is complicated by many lists and many different criteria. In an attempt to provide guidelines that are relatively straightforward, only the lists and criteria of general applicability are summarized in these guidelines. Before determining that a questionable waste is not toxic, please check with EHS (x9-3086 or x9-3541) so we can look at the complete regulatory requirements.

Rule Of Thumb: If you're reluctant to eat, drink or wear your waste, California probably considers it to be a toxic hazardous waste.

Characteristics

Acute oral LD₅₀* < 2,500 mg/kg is a toxic hazardous waste (convention dictates the use of rat oral LD₅₀ information when available.)

Acute dermal LD₅₀* < 4,300 mg/kg is a toxic hazardous waste

Acute inhalation LC₅₀* < 10,000 parts per million as a gas or vapor is a toxic hazardous waste

Acute aquatic LC₅₀* < 500 mg/L is a toxic hazardous waste

*LD₅₀ \ LC₅₀ - The dose/concentration that has been determined to be lethal to 50% of the test population.

Calculating LD₅₀s

The LD₅₀ for a simple solution of a single toxic material can be calculated using the solution's dilution factor. A 10% solution of a toxic material (a 10-fold dilution) would have an LD₅₀ 10 times greater than the pure substance.

The LD₅₀ for a mixture of toxic materials can be calculated from the sum of the individual component LD₅₀s as weighed by each component's proportional abundance in the mixture. EHS (x9-3086 or x9-3541) can provide assistance in calculating LD₅₀s.

Example acute oral LD₅₀s (rat):

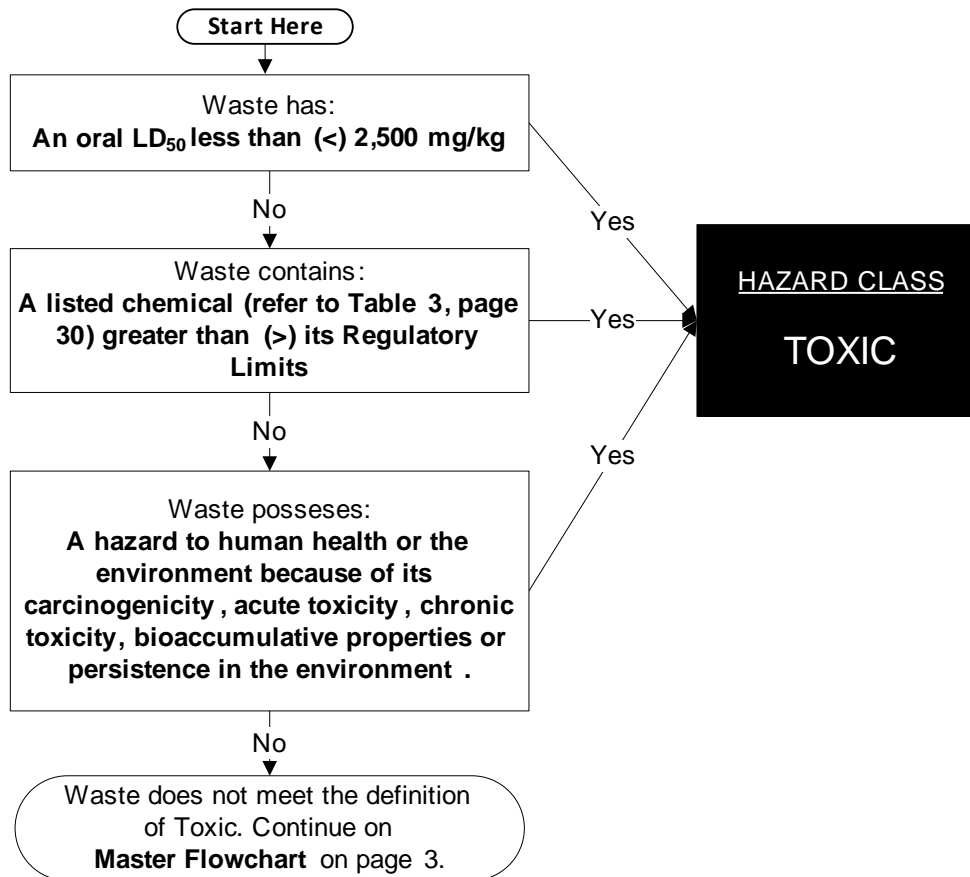
Example	LD ₅₀ (mg/kg)
Citric acid (solid)	3,000
10% Citric acid Soln.	30,000
Acetone	5,800
Benzoic acid	1,700
Caffeine	192

Toxic Constituent Assessment

The hazardous waste regulations include several lists of toxic constituents (or contaminants) and concentrations of these materials that would automatically make a waste a hazardous waste. Some lists include concentration limits for constituents in liquids or for the leachable portion of the constituent. Other lists include limits for the total portion of toxic constituent (soluble and insoluble).

Table 3 summarizes the more commonly encountered constituents and their established regulatory limits. Please keep in mind that this table is a non-inclusive summary and is meant to serve as a guideline in characterizing toxic waste, not as a definitive yardstick.

Toxicity Determination Flowchart



Extremely Hazardous (EH) / Acute Waste

Definition

Acute oral LD₅₀ \leq 50 mg/kg qualifies as a EH waste and/or

A waste or material that is extremely hazardous if human exposure may result in death, disabling personal injury or serious illness because of its carcinogenicity, high acute toxicity, chronic toxicity, bioaccumulative properties, or persistence in the environment.

If you are unsure if your waste qualifies as Extremely Hazardous or Acute, please contact EH&S x9-3086 or x9-3541 for guidance.

Accumulation Time

Quantities of up to a quart of extremely hazardous waste may be accumulated at one time. Once this threshold is reached the waste must be removed within 72 hours. Please submit your waste pickup request and email hazwaste@ucsc.edu for an immediate pickup.

Toxic Chemical Waste Non-Inclusive List Maximum Constituents Thresholds

Constituent	REGULATORY LIMITS *		
	Liquids	Solids	
	Concentration mg/L	Soluble Portion mg/Kg	Total Portion (soluble & insoluble) mg/Kg
Acrylonitrile	---	---	10
Antimony	15	15	500
Arsenic	5.0	5.0	500
Barium	100	100	10,000
Benzene	0.5	0.5	---
Benzidine	---	---	10
Beryllium	0.75	0.75	75
Cadmium	1.0	1.0	100
Carbon tetrachloride	0.5	0.5	---
Chlorobenzene	100	100	---
Chloroform	6.0	6.0	---
Chromium(VI)	5.0	5.0	500
Chromium(III)	5.0	5.0	2,500
Cobalt	80	80	8,000
Copper	25	25	2,500
Cresol (o,m,p,mix)	200	200	---
p Dichlorobenzene	7.5	7.5	---
1,2-Dichloroethane	0.5	0.5	---
1,1-Dichloroethylene	0.7	0.7	---
4-Dimethylaminoazobenzene (DAB)	---	---	10
2,4-Dinitrotoluene	0.13	0.13	---
Dioxin	0.001	0.001	0.01
Ethyleneimine	---	---	10
Fluoride salts	180	180	18,000
Lead	5.0	5.0	1,000
(organic lead compounds)	(5.0)	(5.0)	(13)
Mercury	0.2	0.2	20
Methyl ethyl ketone	200	200	---
Molybdenum	350	350	3,500
Naphthylamine	---	---	10
Nickel	20	20	2,000
Nitrobenzene	2	2	---
N-Nitrosodimethylamine (DMN)	---	---	10
Pentachlorophenol	1.7	1.7	17
Pesticides (varies)	0.1	0.1	1.0
Pyridine	5.0	5.0	---
Selenium	1.0	1.0	100
Silver	5.0	5.0	500
Tetrachloroethylene	0.7	0.7	---
Thallium	7.0	7.0	700
Trichloroethylene	0.5	0.5	2040
Vanadium	24	24	2,400
Zinc	250	250	5,000

* For compounds containing listed elements, concentration of the element (not the compound)
1 mg/kg = 1 ppm = 0.0001%

LIQUID WASTE DISPOSAL

