Government of **Western Australia**
Department of **Water and Environmental Regulation**

Landfill Waste Classification and Waste Definitions 1996 (as amended 2019)

Environmental Protection Act 1986

Department of Water and Environmental Regulation
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Department of Water and Environmental Regulation
Prime House, 8 Davidson Terrace
Joondalup Western Australia 6027
Locked Bag 10 Joondalup DC WA 6919

Phone: 08 6364 7000
Fax: 08 6364 7001
National Relay Service 13 36 77

dwer.wa.gov.au

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Foreword

This document provides guidance and criteria to be applied in determining the classification of wastes for acceptance to landfills licensed or registered in Western Australia in accordance with Part V Division 3 of the *Environmental Protection Act 1986*. More stringent waste acceptance criteria than those listed in this document may be imposed by landfill operators. Similarly, licence conditions may apply more stringent acceptance criteria as appropriate.

Where additional guidance is required, landfill operators should contact the relevant licensing officer using the contact information provided in the licence.

General information on regulation of waste and landfills can be obtained from the Department's Regulatory Services on 6364 7000 or in writing to:

Postal Address:

Locked Bag 10

JOONDALUP DC WA 6919

Use of the acceptance criteria in this document for burial of waste at landfill premises in no way predetermines the future development status of a landfill site following closure. Normal contaminated site management, development, and environmental approval processes still apply to closed landfills.

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1 Landfill classification and waste acceptance

Table 1 below lists the types and classes of landfill and the types of wastes each class of landfill can accept.

Table 1 Landfill classes and waste types

Landfill class	Common name	Waste types permitted for disposal
Class I (Prescribed Premises Category 63)	Inert Landfill	• Clean Fill • Inert Waste Type 1 • Uncontaminated fill • Neutralised acid sulfate soil (where authorised under an Environmental Protection Act licence). • Contaminated solid wastes meeting waste acceptance criteria specified for Class I landfills (where authorised under an Environmental Protection Act licence) • Inert Waste Type 2 (where authorised under an Environmental Protection Act licence) • Inert Waste Type 3 (where authorised under an Environmental Protection Act licence) • Special Wastes Type 1 and Type 3 (where authorised under an Environmental Protection Act licence)
Class II (Prescribed Premises Category 64 or 89)	Putrescible Landfill	• Clean Fill • Inert Waste Type 1 • Uncontaminated fill • Neutralised acid sulfate soil • Putrescible Wastes • Contaminated solid waste meeting waste acceptance criteria specified for Class II landfills (where authorised under an Environmental Protection Act licence) • Inert Waste Type 2 (where authorised under an Environmental Protection Act licence) • Special Wastes Type 1, Type 2 and Type 3* (where authorised under an Environmental Protection Act licence)
Class III (Prescribed Premises Category 64)	Putrescible Landfill	• Clean Fill • Inert Waste Type 1 • Uncontaminated fill • Neutralised acid sulfate soil • Putrescible Wastes • Contaminated solid waste meeting waste acceptance

Landfill class	Common name	Waste types permitted for disposal
		criteria specified for Class II or Class III landfills (where authorised under an Environmental Protection Act licence) • Inert Waste Type 2 (where authorised under an Environmental Protection Act licence) • Special Wastes Type 1, Type 2 and Type 3 (where authorised under an Environmental Protection Act licence)
Class IV (Prescribed Premises Category 65)	Secure Landfill	• Clean Fill • Inert Waste Type 1 • Uncontaminated fill • Neutralised acid sulfate soil • Contaminated solid waste meeting criteria specified for Class II, Class III or Class IV landfills (where authorised under an Environmental Protection Act licence) • Inert Wastes Type 2 (where authorised under an Environmental Protection Act licence) • Special Wastes Type 1, Type 2 and Type 3 (where authorised under an Environmental Protection Act licence)
Class V (Prescribed Premises Category 66)	Intractable Landfill	• Intractable and other wastes in accordance with the approvals for the site.

Note:

Materials used for rehabilitation and final landforming (including of Class I landfills) need not be waste. Rehabilitation of landfills should be conducted primarily with sand and loam to a depth generally not exceeding two metres and may use neutralised peat or acid sulfate soils or other organic matter to aid soil structure, but not as the main ingredients.

2 Definitions

acceptance criteria means the concentration and leachate criteria published in this document (these may be varied for individual landfills in accordance with specific licence conditions).

biodegradable means capable of being decomposed by the action of biological processes.

biosolids means the stabilised organic solids, produced by wastewater treatment processes, which in most cases can be beneficially used (also known as sewage sludge).

class I landfill means an unlined landfill designed to accept inert wastes for burial.

class II landfill means an unlined landfill designed to accept putrescible and inert wastes for burial.

class III landfill means a lined landfill, which may include leachate collection, designed to accept putrescible and inert wastes for burial.

class IV landfill means a double-lined landfill with leachate collection, designed to accept contaminated soils and sludges (including encapsulated wastes) for burial.

class V landfill means intractable landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled “Landfill Waste Classification and Waste Definitions 1996” published by the Chief Executive Officer and as amended from time to time) is accepted for burial.

clean fill means raw excavated natural material such as clay, gravel, sand, soil or rock fines that:

(a) has been excavated or removed from the earth in areas that have not been subject to potentially contaminating land uses[1] including industrial, commercial, mining or intensive agricultural activities; and

(b) has not been processed except for the purposes of:

i. achieving desired particle size distribution; and/or
ii. removing naturally occurring organic materials such as roots; and

(c) does not contain any acid sulfate soil; and

(d) does not contain any other type of waste.

clinical waste means waste generated by medical, nursing, dental, veterinary, pharmaceutical or other related activity which is poisonous or infectious; likely to cause injury to public health; or contains human tissue or body parts.

construction and demolition waste (C&D waste) means materials in the waste stream which arise from construction, refurbishment or demolition activities.

contaminant means a substance or object in contact or mixed with a material that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.

contaminated soil means soil that has a substance in it at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.

[1] Appendix B in the *Assessment and management of contaminated sites guidelines* (DER 2014)

controlled waste means waste types listed in Schedule 1 of the *Environmental Protection (Controlled Waste) Regulations 2004.*

encapsulation means the process of enclosing a waste within a secure container such as to render it acceptable for long-term disposal.

hazardous waste means the component of the waste stream which by its characteristics poses a threat or risk to public health, safety or the environment (includes substances which are toxic, infectious, mutagenic, carcinogenic, teratogenic, explosive, flammable, corrosive, oxidising and radioactive).

immobilisation means the process of fixing or locking up contaminants in a waste such as to render it suitable for long-term disposal.

inert waste type 1 means non-hazardous, non-biodegradable (half-life greater than two years) wastes containing contaminant concentrations less than Class I landfill acceptance criteria, but excluding paper and cardboard and materials that require treatment to render them inert (e.g. peat, acid sulfate soils).

inert waste type 2 means waste consisting of stable non-biodegradable organic materials such as tyres and plastics which require special management to reduce the potential for fires.

inert waste type 3 means waste material from licensed secondary waste treatment plants, subject to appropriate assessment and approval of that waste and the specified inert landfill.

intractable waste means waste whose toxicity or chemical or physical characteristics make it difficult to dispose of or treat safely, and is not suitable for disposal in Class I, II, III and IV landfill facilities (see Table 2).

leaching procedure means the procedures specified in AS 4439.3-1997 Wastes, Sediments and Contaminated Soils - Preparation of leachates - Bottle leaching procedures.

neutralised acid sulfate soil means neutralised acid sulfate soil treated in accordance with *Identification and investigation of acid sulfate soils and acidic landscapes* (DER, 2015) and *Treatment and management of soil and water in acid sulfate soil landscapes* (DER, 2015).

packaged waste means waste packed into discrete containers such as 205 L drums or bulka bags so that they meet any requirements under the *Explosives and Dangerous Goods Act 1988* and the *Environmental Protection Act 1986* for packaging, containment and labelling.

poisons means materials defined as poisons under the *Poisons Act 1964*.

practical quantitation limit means the lowest concentration that can be reproduced and measured in a laboratory in routine laboratory analyses irrespective of any interference caused by the presence of other substances, such as chemicals, during the analysis. The practical quantitation limit value of any analyte is significantly higher than its detection limit value.

radioactive means capable of giving off radiant energy in the form of particles or rays, as in alpha, beta and gamma rays at levels exceeding standards defined by the Radiological Council of Western Australia.

re-use means use of a product again for the same or a different purpose without further manufacture.

solid means a material that:

(a) has an angle of repose of greater than 5 degrees; and

(b) does not contain, or is not comprised of, any free liquids; and

(c) does not contain, or is not comprised of, any liquids that are capable of being released when the waste is transported;

(d) does not become free flowing at or below 60 degrees Celsius or when it is transported; and

(e) is generally capable of being moved by a spade at normal temperatures (i.e. is spadeable).

spadeable means a physical state of a material where the material behaves sufficiently like a solid (as described above) to be moved by a spade at normal outdoor temperatures.

special waste type 1 means waste which includes asbestos and asbestos cement products.

special waste type 2 means waste consisting of certain types of biomedical waste which are regarded as hazardous but which, with the use of specific management techniques, may be disposed of safely within specified classes of landfill.

special waste type 3 means solid waste, including soils and other solid wastes impacted by Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS).

storage means placement of material in one place for more than one day with the intention to relocate, reuse or dispose of the material within a time limit specified before commencement of such storage.

treatment means physical, chemical or biological processing of a waste for disposal or reuse.

uncontaminated fill means:

(a) inert waste type 1 (excluding asphalt and biosolids) that meets the requirements set out in Table 6, as determined by relevant sampling and testing carried out in accordance with the requirements set out in Table 7; and

(b) neutralised acid sulfate soil that meets the requirements for relevant metals, metalloids and sulfate set out in Table 6, as determined by relevant sampling and testing carried out in accordance with the requirements of Table 7.

3 Abbreviations

ADGC	Australian Dangerous Goods Code.
ADWG	Australian Drinking Water Guidelines 2004.
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure (as varied in 2013)
ASLP	Australian Standard Leaching Procedures - The procedures specified in AS 4439.3-1997 for assessing the leachability of wastes, sediments and contaminated soils.
I1, I2, I3	Inert waste Type 1, Type 2 or Type 3.
IWDF	Mount Walton East Intractable Waste Disposal Facility (Class V landfill).
NEPM	National Environment Protection (Assessment of Site Contamination) Measure (as made in 1999).
S1, S2, S3	Special waste Type 1, Type 2, or Type 3.
TCLP	Toxicity Characteristic Leaching Procedure.

For other definitions the reader is referred to the Australian/New Zealand Standard AS/NZS.

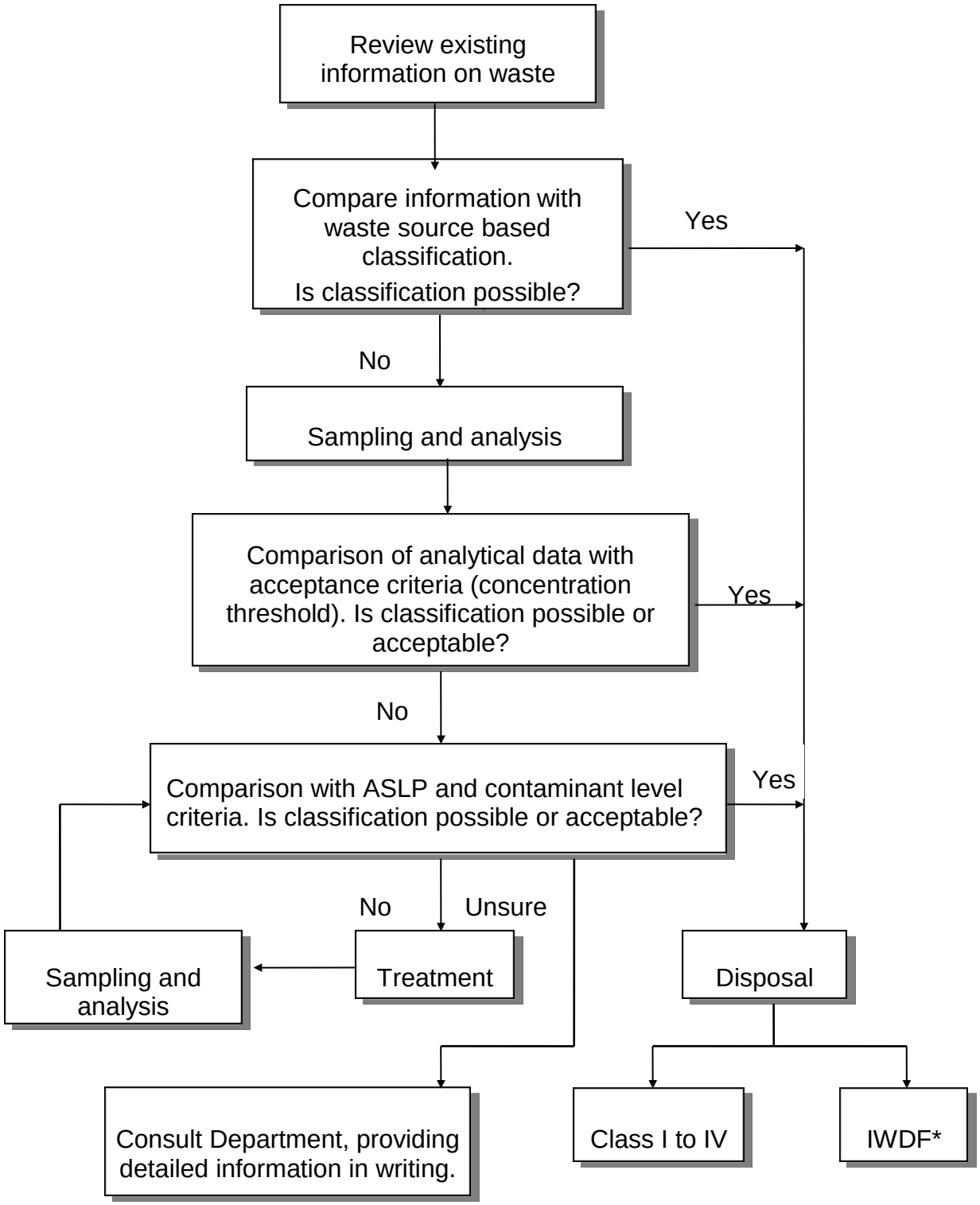
4 Classification of waste into waste types and landfills

The following process is summarised in Figure 1

Step 1 Ensure that an assessment needs to be done.	The broad classifications used in WA when assessing wastes for landfill disposal are described in Table 1 along with detailed examples of the specific waste types involved. If a waste can be classified according to Table 2, there is no requirement for more detailed assessment.
Step 2 Assess the waste.	If the waste cannot be classified in Step 1, based on an assessment of the waste source and characteristics, determine the concentration of relevant contaminants in the waste.
Step 3 Compare total concentration values with CT criteria in Table 3.	Compare the contaminant concentrations with the maximum contaminant threshold (CT) values in Table 3 and assign a classification for each contaminant. Provisionally classify the waste according to the highest category assigned to any contaminant. If this classification is satisfactory, dispose of the waste accordingly.
Step 4 Determine contaminant ASLP leachate concentrations.	If the classification in step 2 is not acceptable, or any contaminant concentration exceeds the relevant CT value, determine the ASLP leachate concentrations for all relevant contaminants.
Step 5 Compare total and leachate concentrations with CL and ASLP criteria in Table 4.	Compare the contaminant ASLP concentrations and total concentrations with the ASLP and concentration limit (CL) values in Table 4. Use Table 5 as a guide to interpretation of the data for each contaminant. Provisionally classify the waste in the highest category assigned to any contaminant. If this classification is satisfactory, dispose of the waste accordingly.
Step 6 Test the immobilised waste against the ASLP criteria in Table 4.	If the classification in step 4 is unacceptable, apply some form of immobilisation to the waste, then, after further leachate testing, apply the ASLP criteria only, to determine the appropriate waste classification as set out in step 5. Encapsulated waste need not be further tested, but approval of the encapsulation method must be obtained from the Department. Note that separate approval is not required for disposal of immobilised waste, but it must be disposed of as follows: • Immobilised or encapsulated Class V waste – to Class IV landfill • Immobilised or encapsulated Class IV waste – to Class III landfill • Immobilised Class III waste – to Class II landfill

For organic and inorganic chemical contaminants not listed in the tables, contact the Department for assessment/disposal requirements. The Department should also be consulted about uncertainties in steps 5 and 6 above.

Figure 1 Management of solid waste



* Disposal at the IWDF is only permitted if no alternative is available and is subject to EPA approval.

Table 2 Waste types

Table 2a Inert waste

Waste type	Description
Clean fill	• Raw excavated natural material such as clay, gravel, sand, soil or rock fines that has been excavated or removed from the earth in areas that have not been subject to potentially contaminating land uses including industrial, commercial, mining or intensive agricultural activities.
Inert	Wastes that are largely non-biodegradable, non-flammable and not chemically reactive. Inert wastes are subdivided into three separate classes: • Inert waste type 1 - as listed below and contains contaminants in concentrations less than the specified criteria. • Inert waste type 2 - consisting of non-biodegradable organic materials such as tyres and plastics, which are flammable and require special management to reduce the potential for fires. • Inert waste type 3 - material from licensed secondary waste treatment plants, subject to appropriate assessment and approval of that waste and the specified landfill.
	Examples of inert waste type 1: • Raw excavated natural material such as clay, gravel, sand, soil or rock fines (excluding contaminated soils); • Rocks/soils arising from the excavation of a site (excluding contaminated soils) which has been previously developed or used; • Building and demolition waste (e.g. bricks, concrete and associated unavoidable small quantities of paper, plastics, glass, metal and timber[1] that should be recovered), being material resulting from the demolition, erection, construction, refurbishment or alteration of buildings or from the construction, repair or alteration of infrastructure-type development such as roads, bridges, dams, tunnels, railways, and airports, and which is not mixed with any other type of waste (specifically green and food waste), and does not contain any asbestos or PFAS. • Asphalt waste (e.g. resulting from road construction and waterproofing works). • Biosolids categorised for unrestricted use. • Casting sand (that does not contain leachable components which would require disposal in a higher class of landfill). • Blasting sand or garnet (excluding that used for stripping tributyl tin-containing paints). **Examples of inert waste type 2:** • Used, rejected or unwanted tyres (including shredded tyres or tyre pieces).
Notes	1. Treated timber such as copper chrome arsenate (CCA), high temperature creosote (HTC), pigment emulsified creosote (PEC) and light organic solvent preservative (LSOP) treated timber are to be excluded from the waste.

Table 2b Putrescible

Waste type	Description
Putrescible	Component of the waste stream likely to become putrid - including wastes that contain organic materials such as food wastes or wastes of animal or vegetable origin, which readily bio-degrade within the environment of a landfill.
	Examples of putrescible waste: • Municipal waste, consisting of: - household domestic waste that is set aside for kerb-side collection or delivered by the householder directly to the waste facility; or - other types of domestic waste (e.g. domestic clean-up, furniture and residential garden waste, grass sods); or - local council generated waste (e.g. waste from street sweeping, litter bins and parks); or - commercial waste generated from food preparation premises, supermarkets etc). • Food waste • Biosolids other than those categorised for unrestricted use. • Sewage treatment plant grits and screenings. • Animal manures and carcasses. • Office and packaging waste (eg paper, cardboard, plastics, wood) that is not mixed with any other type of waste. • Cleaned pesticide, biocide, herbicide or fungicide containers[2]. • Drained and mechanically crushed oil filters, and rags and oil absorbent materials (not containing free liquids) from automotive workshops. • Disposable nappies, incontinence pads and sanitary napkins (not otherwise classified as biomedical wastes due to the presence of infectious material). • Vegetative waste generated from commercial, public and residential sources, agriculture or horticulture. • Non-chemical waste generated from manufacturing and services (including timber, paper, plastics, thermosets and composites.
Notes:	2. The cleaning method used should be as good as or better than the triple-rinsing method developed by AVCARE (Phone: (02) 6230 6399, Facsimile: (02) 6230 6355, web site: www.croplifeaustralia.org.au/). 3. Acid sulfate soils may only be accepted at landfills if they have been treated to neutralise acid-forming potential in accordance with the Department of Environment Regulation documents *Identification and investigation of acid sulfate soils and acidic landscapes* and *Treatment and Management of soil and water in acid sulfate soil landscapes* prior to disposal. Soils being disposed of from areas with known acid-sulfate soil potential should be checked for acidity before disposal.

Table 2c Hazardous and intractable waste

Waste type	Description
Hazardous	Component of the waste stream which by its characteristics poses a threat or risk to public health, safety or the environment (includes substances which are toxic, infectious, mutagenic, carcinogenic, teratogenic, explosive, flammable, corrosive, oxidising and radioactive. Hazardous wastes are generally unsuitable for landfill disposal and should only be accepted within landfills after appropriate treatment and/or in accordance with specific licence conditions or with specific, written approval from the Chief Executive Officer.
	Examples of hazardous waste: • Wastes that meet the criteria for assessment as dangerous goods under the *Australian Code for the Transport of Dangerous Goods by Road and Rail*, and categorised as one of the following: explosives; gases (compressed, liquefied or dissolved under pressure); flammable liquids; substances liable to spontaneous combustion (excluding organic waste, and all physical forms of carbon such as activated carbon and graphite); substances which on contact with water emit flammable gases; oxidising agents and organic peroxides; toxic substances; corrosive substances. • Biomedical and related wastes. • Pharmaceuticals and poisons, being waste generated by activities carried out for business or other commercial purposes and that consists of pharmaceutical or other chemical substances specified as poisons in the *Standard for the Uniform Scheduling of Medicines and Poisons No. 16 (2017).* • Quarantine waste.
Intractable	Waste that is a management problem by virtue of its toxicity or chemical or physical characteristics which make it difficult to dispose of or treat safely and is not suitable for disposal in a Class I, II, III or IV landfill. Provided there is no practical alternative destruction or treatment technology, these are disposed of in Class V facilities[4].
	Examples of intractable waste: • Radioactive wastes (disposal must be approved by the Radiological Council of Western Australia). • Significantly contaminated soils, industrial sludges, some spent catalyst wastes.
Notes:	4. The Mount Walton East Intractable Waste Disposal Facility is currently the only available Class V disposal site in Western Australia. Before disposal to the facility is approved, it is necessary to demonstrate to the Environmental Protection Authority that there are no practically available destruction, disposal or management technologies in Australia such that the site is maintained as a facility of last resort.

Table 2d Special waste

Waste types	Description
Special	Includes asbestos wastes, certain types of biomedical wastes and PFAS impacted wastes that are regarded as hazardous or potentially hazardous but which, with special management techniques, may be disposed of safely within specified classes of landfill. • Special Waste Type 1 – Asbestos Wastes • Special Waste Type 2 – Biomedical Wastes • Special Waste Type 3 – PFAS Impacted Solid Wastes
	Examples of Special Waste Type 1: • Stabilised asbestos waste in bonded matrix (e.g. asbestos cement sheeting). • Asbestos fibre and dust waste (e.g. dust resulting from the removal of thermal or acoustic insulating materials or from processes involving asbestos material, and dust from ventilation collection systems). **Examples of Special Waste Type 2:** • Biomedical waste which does not require incineration and which is approved for supervised burial. **Examples of Special Waste Type 3:** • PFAS-containing solid waste e.g. soil/sediment, timber, asphalt, concrete, equipment

Table 3 Contaminant threshold (CT) values for waste not requiring a leach test

Contaminant[1]	Maximum values of total concentration for classification without the requirements to assess leachability[2,3]			
	CT1 (mg/kg) Class I	CT2 (mg/kg) Class II	CT3 (mg/kg) Class III	CT4 (mg/kg) Class IV
Metals and metalloids				
Arsenic	14	14	140	1,400
Beryllium	2	2	20	200
Cadmium	0.4	0.4	4	40
Chromium (Hexavalent)	10	10	100	1,000
Lead	2	2	20	200
Mercury	0.2	0.2	2	20
Molybdenum	10	10	100	1,000
Nickel	4	4	40	400
Selenium	2	2	20	200
Silver	20	20	200	2,000
Other Inorganic Species				
Cyanide (amenable)[4]	7	7	70	700
Cyanide (total)	16	16	160	1,600
Fluoride	300	300	3,000	30,000
Non-Chlorinated Organics				
Benzene	0.2	0.2	2	20
Cresols (total)	400	400	4,000	40,000
2,4-D	0.02	0.02	0.2	2
Ethylbenzene	60	60	600	6,000
Petroleum hydrocarbons	N/A	N/A	N/A	N/A
Phenol (total, non-halogenated)	28.8	28.8	288	2,880
Polycyclic aromatic hydrocarbons (total)	N/A	N/A	N/A	N/A
Styrene (vinyl benzene)	6	6	60	600
Toluene	160	160	1,600	16,000
Xylenes (total)	120	120	1,200	12,000
Chlorinated Organics[5]				
Organochlorine pesticides, polychlorinated biphenyls etc.	N/A	N/A	N/A	N/A
Other metals[6]	% by weight	% by weight	% by weight	% by weight
Aluminium , barium, boron, cobalt, copper, manganese, vanadium and zinc	5	5	10	20

Contaminant[1]	Maximum values of total concentration for classification without the requirements to assess leachability[2,3]			
	CT1 (mg/kg) Class I	CT2 (mg/kg) Class II	CT3 (mg/kg) Class III	CT4 (mg/kg) Class IV

Notes:

1. For organic and inorganic chemical contaminants not listed in Table 3 contact the Department for assessment / disposal advice.
2. Contaminant Threshold (CT) values based on 2004 Australian Drinking Water Guidelines (20 x ASLP criteria – uncorrected for practical quantitation limit).
3. N/A means no Contaminant Threshold applicable, however, the criteria in Table 4 apply.
4. Analysis for cyanide (amenable) is the established method to assess the potentially leachable cyanide. Other methods may be considered by the Department if it can be demonstrated that these methods yield the same information.
5. OCP scheduled wastes, polycyclic aromatic hydrocarbons and polychlorinated biphenyls are assessed by using concentration criteria (CL values - Table 4). No leaching analysis is required.
6. For waste containing significant quantities of these metals preference should be given to recovery and recycling rather than disposal.

Table 4 Leachable concentration (ASLP[1]) and concentration limit (CL[2]) values for waste classification

Contaminant	Class 1		Class 2		Class 3		Class 4	
	Leachable Concentration ASLP1 (mg/L)	Concentration Limit CL1 (mg/kg)	Leachable Concentration ASLP2 (mg/L)	Concentration Limit CL2 (mg/kg)	Leachable Concentration ASLP3 (mg/L)	Concentration Limit CL3 (mg/kg)	Leachable Concentration ASLP4 (mg/L)	Concentration Limit CL4 (mg/kg)
Metals								
Arsenic[3]	0.5	500	0.5	500	5	5,000	50	20,000
Beryllium[3,4]	0.1	100	0.1	100	1	1,000	10	4,000
Cadmium[3]	0.1	100	0.1	100	1	1,000	10	4,000
Chromium (hexavalent)	0.5	500	0.5	500	5	5,000	50	2,000
Lead	0.1	1,500	0.1	1500	1	15,000	10	60,000
Mercury	0.01	75	0.01	75	0.1	750	1	3,000
Molybdenum[4,5]	0.5	1,000	0.5	1,000	5	10,000	50	40,000
Nickel	0.2	3,000	0.2	3000	2	30,000	20	120,000
Selenium[3,5]	0.5	50	0.5	50	5	500	50	2,000
Silver[5]	1	180	1	180	10	1,800	100	7,200
Aluminium, barium, boron, cobalt, copper, manganese, vanadium and zinc	N/A	5% by weight	N/A	5% by weight	N/A	10% by weight	N/A	20% by weight
Other inorganic species								
Cyanide (amenable)[4]	0.35	1,250	0.35	1,250	3.5	12,500	35	50,000
Cyanide (total)	0.8	2,500	0.8	2,500	8	25,000	80	100,000
Fluoride[5]	15	10,000	15	10,000	150	100,000	1500	400,000

Contaminant	Class 1		Class 2		Class 3		Class 4	
	Leachable Concentration ASLP1 (mg/L)	Concentration Limit CL1 (mg/kg)	Leachable Concentration ASLP2 (mg/L)	Concentration Limit CL2 (mg/kg)	Leachable Concentration ASLP3 (mg/L)	Concentration Limit CL3 (mg/kg)	Leachable Concentration ASLP4 (mg/L)	Concentration Limit CL4 (mg/kg)
Non-chlorinated organics								
Benzene	0.01	18	0.01	18	0.1	180	1	720
Cresol (total)[4,5]	20	7,200	20	7,200	200	72,000	2,000	288,000
Ethylbenzene[5]	3	1080	3	1080	30	10,800	300	N/A
C_6-C_9 petroleum hydrocarbons[6]	N/A	2,800	N/A	2,800	N/A	28,000	N/A	112,000
>C_{16}-C_{35} petroleum hydrocarbons(aromatics)	N/A	450	N/A	450	N/A	4,500	N/A	18,000
>C_{16}-C_{35} petroleum hydrocarbons (aliphatics)	N/A	28,000	N/A	28,000	N/A	280,000	N/A	N/A
Phenols (total, non-chlorinated)	1.44	42,500	1.44	42,500	14.4	425,000	144	N/A
PAHs (total)	N/A	100	N/A	100	N/A	1,000	N/A	4,000
Benzo(a)pyrene	0.0001	5	0.0001	5	0.001	50	0.01	200
Styrene[5]	0.3	108	0.3	108	3	1,080	30	4,320
Toluene[5]	8	518	8	518	80	5,180	800	N/A
Xylenes (total)[5]	6	1800	6	1800	60	18,000	600	N/A
Chlorinated Organics								
2,4-D[5]	0.3	360	0.3	360	3	1,440	30	5,760
OCP scheduled wastes[8]	N/A	50	N/A	50	N/A	50	N/A	50
Other solvents	N/A	50	N/A	50	N/A	500	N/A	2,000
Polychlorinated biphenyls[9]	N/A	50	N/A	50	N/A	50	N/A	50

Notes:

1. ASLP values determined as follows: Class I = 10 x Australian Drinking Water Health Guideline (ADWG 2004) value; Class II = Class I; Class III = 10 x Class I; Class IV = 100 x Class I.
2. CL values determined as follows: Class I = NEPM HIL F for commercial/industrial land; Class II = Class I; Class III = 10 x Class I; Class IV = 40 x Class I.
3. ASLP1 and ASLP2 values = practical quantitation limit instead of figure derived from ADWG (2004).
4. ASLP values derived from *Waste Classification Guidelines Part 1 Classifying Waste (NSW Department of Environment and Climate Change, 2008 revised 2009*) (Class I = SCC1). This value may be divided by 10 to take into account the sandy WA coastal plain soils". (Class I = SCC1)
5. CL values derived from Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes (NSW EPA, 1999) (Class I = SCC1)
6. CL values = one tenth limit for C_{15}->C_{35} limits consistent with previous Landfill Waste Classifications and Waste Definitions 1996.
7. Applies to soil contaminated with organochlorine pesticides consistent with Organochlorine Pesticides Waste Management Plan (ANZECC, 1999).
8. CL values consistent with Organochlorine Pesticides Waste Management Plan (ANZECC, 1999). Note that waste containing < 50 mg/kg is not classified as scheduled wastes for the purposes of this plan.
9. CL values consistent with Polychlorinated Biphenyls Management Plan (ANZECC, 1996).

N/A No applicable value, please contact the Department for clarification on a case by case basis.

Table 5 Summary of criteria for chemical contaminants in waste classification

Landfill class	Acceptance criteria[1,2,3,4,5]	Comments
Inert (Class I)	1. Concentration ≤ CT1	ASLP test not required.
	2. ASLP ≤ ASLP1 and concentration > CT1, ≤ CL1	Leaching solution to be used is water.
	3. ASLP ≤ ASLP1 and concentration > CL1	After immobilisation[6].
Putrescible (Class II)	1. Concentration ≤ CT2	ASLP test not required.
	2. ASLP ≤ ASLP2 and concentration > CT2, ≤ CL2	ASLP required
	3. ASLP ≤ ASLP2 and concentration > CL2	After immobilisation[6].
Putrescible (Class III)	1. Concentration ≤ CT3	ASLP test not required.
	2. ASLP ≤ASLP3 and concentration > CT3, ≤ CL3	ASLP required
	3. ASLP ≤ ASLP3 and concentration >CL3	After immobilisation[6] or encapsulation.
Secure (Class IV)	1. Concentration ≤ CT4	ASLP test not required.
	2. ASLP ≤ ASLP4 and concentration > CT4, ≤ CL4	ASLP required. Leaching solution to be specified in site licence.
	4. ASLP ≤ ASLP4 and concentration > CL4	After immobilisation[6] or encapsulation.
Intractable (Class V)[7]	1. ASLP > ASLP4	Store or treat waste as appropriate.
	2. ASLP ≤ ASLP4 and concentration > CL4	Store or treat waste as appropriate.

Notes:

1. The values CT1- 4 refer to concentration threshold criteria specified in Table 3.
2. The values ASLP1 - 4 refer to leachability criteria (ASLP) specified in Table 4.
3. The values CL1-4 refer to the concentration limit (CL) values specified in Table 4.
4. The acceptance criteria specified in Tables 3 and 4 apply to each toxic contaminant present in the waste.
5. The ASLP and concentration values refer to the test values determined on the basis of sampling and analysis in accordance with approved sampling procedures (typically the mean of the sample distribution plus 1 standard deviation).
6. In certain cases, the Department will require specific conditions, such as the segregation of immobilised waste from all other types of waste in a monofill or a monocell, in order to achieve a greater margin of safety against possible failure of the immobilisation in the future.
7. Disposal of wastes to the Mount Walton East Intractable Waste Facility is subject to approval by the Environmental Protection Authority.

5 Uncontaminated fill

Table 6 Maximum concentrations (thresholds) of relevant chemical substances and limits of relevant physical attributes for uncontaminated fill

Parameter	Maximum Concentration[1] mg/kg, dry weight	Leaching test[1] ASLP, µg/L
Metals and metalloids		
Antimony	20	3
Arsenic	100	10
Barium	500	-
Beryllium	4	-
Cadmium	1	0.2
Chromium III	160	3
Chromium VI	1	1
Cobalt	50	1
Copper	50	2
Lead	300	3
Manganese	500	500
Mercury (inorganic)	0.5	0.05
Molybdenum	10	50
Nickel	10	10
Selenium	1	5
Silver	20	0.05
Thallium	1	0.03
Tin (inorganic)	50	-
Uranium	25	0.5
Vanadium	130	-
Zinc	120	10
Other inorganics		
Asbestos[2]	10[2]	-
Sulfate	2,500	-
Cyanides	5 complexed (weak acid dissociable) 1 free	5 as CN
Ammonia as N	-	350
Fluoride	400	120
Total nitrogen	-	2000
Total phosphorus	-	200

Parameter	Maximum Concentration[1] mg/kg, dry weight	Leaching test[1] ASLP, µg/L
Organic compounds		
Benzene	0.5	1
Toluene	85	25
Ethyl benzene	55	5
Xylene (total)	40	20 sum
Total recoverable hydrocarbons (C_6-C_{10})[3, 4]	45	-
Total recoverable hydrocarbons (>C_{10}-C_{16})[3]	110	-
Total recoverable hydrocarbons (>C_{16}-C_{34})[3]	300	-
Total recoverable hydrocarbons (>C_{34}-C_{40})[3]	2800	-
Naphthalene	3	15
Benzo[a]pyrene	1	0.01
Carcinogenic polycyclic aromatic hydrocarbons (PAHs) as B(a)P TEQ (8 species)	3	-
Total PAHs[5] (16 species)	300	-
Phenol	1	50
Cresols	-	2 (sum)
PCBs	1	-
Pesticides		
Aldrin	-	0.001
Dieldrin	-	0.01
DDT+DDD+DDE	3	0.006 DDT 0.0005 DDE
Other pesticides	-	< ADWG[6] and < WQG[7]
Physical attributes		
pH (pH units)[8]	5.5 – 8.5	-

Notes:

General – all thresholds consider ecological and human toxicity

1. Refer AS 4439 using reagent water. Both total concentration and leaching analyses are required to assess the quality of the fill material unless no value is included in Table 6 (indicated by '-').
2. Restrictions apply to the sale and supply of any asbestos and asbestos cement material other than for disposal. The maximum concentration is based on the product specification for recycled products in the Guidelines for managing asbestos at construction and demolition waste recycling facilities (DEC 2012 and as updated from time to time). The concentration indicated is equivalent to 0.001% asbestos weight for weight as specified in the guideline. The inspection, sampling and testing of fill material must be completed by a person who is competent in assessing the fill in the manner indicated by the guideline.
3. Thresholds for total recoverable hydrocarbons are applicable to petrogenic hydrocarbons (such as from petrol, diesel, crude oil, etc.). Additional analytical

methods, such as silica gel clean-up and chromatographic interpretation, may be applied to differentiate between petrogenic and biogenic hydrocarbon sources. Refer to Schedule B3 of National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM).

4. Threshold applies to 'F1' fraction, comprising total recoverable hydrocarbons (C_6-C_{10}) not including the sum of BTEX (benzene, toluene, ethylbenzene, xylenes). Refer to Schedule B1 of the ASC NEPM.
5. Carcinogenic PAHs (as B(a)P TEQ): is based on the eight carcinogenic polycyclic aromatic hydrocarbons (PAHs) listed below and their potency relative to benzo(a)pyrene. The B(a)P toxicity equivalence quotient (TEQ) is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P Total Equivalent Factor (TEF), given below, and summing these products.

PAH species	TEF	PAH species	TEF
Benzo(a)anthracene	0.1	Benzo(g,h,i)perylene	0.01
Benzo(a)pyrene	1	Chrysene	0.01
Benzo(b+j)fluoranthene	0.1	Dibenz(a,h)anthracene	1
Benzo(k)fluoranthene	0.1	Indeno(1,2,3-c,d)pyrene	0.1

6. Australian Drinking Water Guidelines (2011 as updated). The relevant compounds to be tested should be guided by the source of the fill material (site history).
7. Default guideline values for toxicants as specified in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018 and as updated).
8. Waste acid sulfate soils can be treated/neutralised before comparison against the thresholds.

Table 7 The minimum sampling and testing standards for uncontaminated fill

Activity	Minimum requirements
Sampling	Method 3.1 or Method 3.2 in the Australian Standard 1141 Methods for sampling and testing aggregates. Sampling of soil stockpiles should be consistent with the methodology described in Section 7.5 of Schedule B2 (Guideline on Site Characterisation) of the *National Environment Protection (Assessment of Site Contamination) Measure* (ASC NEPM). Depending on the source of the material being characterised, it may be possible to use relevant site characterisation data for *in situ* soils (such as in a detailed site investigation report) provided that this was carried out in accordance with the ASC NEPM and that, since sampling, the characterised material has not been subject to any potentially contaminating land uses including industrial, commercial, mining or intensive agricultural activities. Further information on characterisation of soils based on the 95% Upper Confidence Limit (average) [95%UCL_{avg}] for the soil (including worked examples) is provided in *"Industrial Waste Resource Guidelines (7), Sampling and Analysis; Soil Sampling*", *EPA Victoria, 2010*. http://www.epa.vic.gov.au/business-and-industry/guidelines/waste-guidance/industrial-waste-resource-guidelines.
Testing	The laboratory should hold National Association of Testing Authorities, Australia (NATA) accreditation for the testing undertaken. Analytical methods adopted should be consistent with those specified in Schedule B3 of the ASC NEPM. Substances to be tested should be determined based on land use history of the site of origin. Refer to Appendix B (Potentially contaminating industries, activities and land uses) in the *Assessment and management of contaminated sites* (DER 2014, and as updated from time to time). If no value for a potential contaminant is included in Table 6, and the substance is indicated for testing on consideration of the site history, then it is not appropriate to consider material from the site for classification as uncontaminated fill.

6 Sampling solid waste and interpretation of results

Assessment of bulk waste stockpiles

This section outlines the recommended sampling strategy to be employed in assessing waste composition where other information is not available. Alternative sampling strategies (e.g. core sampling, composite sampling) may be employed where these provide equivalent levels of information to enable the appropriate class of landfill to be determined. Equally, for industrial process wastes, information may be available which precludes the necessity for detailed testing of wastes once they have been stockpiled or packaged (i.e. where the characteristics of the waste are not likely to change once stockpiled or packaged), or for repeated testing of well- characterised wastes. The recommended sampling strategy referred to in this section does not apply to uncontaminated fill (refer Table 7).

Documentation that should be made available to a landfill operator to verify that waste has been assessed in accordance with the following guidelines should include:

- A description of the sampling methodology - showing that it is consistent with these guidelines.
- Copies of original laboratory analysis data - showing that samples have been analysed by an appropriately accredited laboratory, using appropriate methods and detection limits, and that data has not been used selectively.
- Where appropriate, information showing that a waste is of consistent quality such that it does not require ongoing high-frequency testing.

Bulk Waste Categories

Bulk wastes (>5 m^3) occur in a wide variety of combinations and configurations, both in-situ and a stockpiles. The following rules have been derived primarily for use on stockpile wastes, but the same statistical treatment can be applied to in-situ soils provided the soil is segregated into broadly homogeneous blocks, with each block sampled as a separate “stockpile”.

Where this approach is inappropriate, suitable sampling methodologies that can be used are outlined in the following publications:

- National Environmental Protection Measure on the Assessment of Site Contamination. Guideline 2. Data Collection, Sample Design and Reporting. December 1999.
- Australian Standard AS 4482.1—1997, Guide to the Sampling and Investigation of Potentially Contaminated Soil. Part 1: Non-volatile and Semi-volatile Compounds.

The primary approach is used to categorise waste based on quantities using the following classifications:

1. Minor quantities - less than 100 m^3;
2. Medium quantities - more than 100 m^3 and less than 5,000 m^3; and
3. Large quantities - more than 5,000 m^3.

With respect to information about wastes, the determination of whether or not there is reliable and representative process data should be determined in consultation with the Department. Typically this will apply to a fixed process from which the variations of concentrations of contaminants in the waste are likely to be relatively small and the expected contaminant concentrations easily meet the relevant acceptance criteria.

Minor quantities (<100 m^3)

Approach

The steps in the management of minor quantities are shown in Figure 2.

Samples

If reliable and representative information is available from process data then only one confirmatory sample may be required (qualitative assessment). Typically this will apply to a fixed process from which the variations of concentrations of contaminants in the waste are likely to be relatively small and the expected contaminant concentrations easily meet the relevant acceptance criteria. Otherwise, three samples are required (quantitative assessment).

The sample locations should be biased towards locations where there is visual and/or olfactory evidence of contamination (judgemental sampling).

The waste owner also has the option of assessment according to the procedures for medium quantities using four or more samples.

Comparison with Criteria

The results of the analyses are compared with the relevant landfill acceptance criteria value(s) or the relevant reuse acceptance criteria value(s) (CT or CL as appropriate). If all results for a contaminant are below the relevant criteria value(s) the material can be disposed of or reused as appropriate.

If one or more of the results are above the criterion value for a contaminant, but the value of the mean plus one standard deviation of the test results is below the relevant criterion, then the material can be disposed of or reused.

However, if the results do not satisfy either of these conditions, the available options are:

- disposal of the waste to the appropriate class of landfill;
- treatment of material so that it is suitable for disposal to a lower class of landfill or reused; or
- more detailed assessment using six samples as described for medium quantities.

Medium quantities (100 m^3 to 5,000 m^3) and large quantities (>5,000 m^3)

Approach

The steps in management of medium quantities are shown on the decision diagram presented as Figure 3, while that for large quantities is shown in Figure 4. The assessment may be undertaken by either a qualitative or quantitative approach depending on the available in formation on contaminant concentrations. The number of samples is, however, based mainly on the volume of waste.

Samples

For medium quantities, if reliable and representative information is available from process data then six confirmatory samples are required, regardless of the volume (qualitative assessment

Note that sampling conducted to characterise waste for disposal will generally not provide adequate information for contaminated sites assessment purposes.

Alternatively the number of samples depends on the volume of waste according to the following schedule:

Volume (m^3)	Number of Samples
100 to 200	4
200 to 500	6
500 to 1,000	8
1,000 to 2,000	11
2,000 to 3,000	15
3,000 to 4,000	18
4,000 to 5,000	20
5,000 to 10,000	24
> 10,000	24 plus 4 for each additional 10,000 m^3

Sample locations should be biased towards locations where there is visual and/or olfactory evidence of contamination (judgmental sampling). Procedures for selection of random samples are described by the AS4482.2- 1999 Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 2: Volatile Substances.

Comparison with criteria

The results of the analyses are compared with the relevant landfill acceptance criteria values or the relevant reuse acceptance criteria value(s).

If all results for a contaminant are below the relevant criteria value(s) the material can be disposed of or reused.

If one or more of the results are above the criterion for a contaminant, but the value of the mean plus one standard deviation of the test results is below the relevant criterion, then the material can be disposed of or reused.

However, if the results do not satisfy either of these criteria, the options available are:

- disposal of the material to the appropriate class of landfill;
- treatment of material so that it is suitable for disposal to a lower class of landfill or reuse; or
- more detailed assessment using the procedures described for large quantities.

Packaged wastes

Typically packaged waste is contained in 205 L drums. This guideline applies to all containers up to 5 m^3 in capacity.

The most common situations relevant to packaged wastes are:

- Case 1. Source or composition of the wastes not known;
- Case 2. Source of waste is known (for example, waste from a particular process for which there is information available on the process and the likely composition of the waste) but there is no analytical data available on the actual contents of the containers; and
- Case 3. Source of waste is known and reliable analytical information is available on the waste composition (for example, a continuing process for which it can be shown that there is little variation in the composition of the waste owing to the nature of the process).

The following section presents the minimum sampling requirements for packaged wastes and the corresponding methods for comparison with acceptance criteria.

Case 1. No knowledge of source or composition

If neither the source nor the composition of a packaged waste is known, at least the following sampling frequency is required (see Figure 5):

Number of containers	Sampling requirements	Value to be compared with waste classification criteria
1 to 3	Three per container. One top third, one middle third, and one bottom third from each container.	Mean of sample analyses.
more than 3	Three containers selected randomly and sampled as for 1 to 3 containers above. One sample from each other container, with depth selected randomly.	Mean of analyses plus one standard deviation.

Case 2. Source known, likely composition known, no analytical data on packaged waste

For the second category, samples shall be taken according to the following schedule:

Number of containers	Sampling requirements	Value to be compared with waste classification criteria
1 to 3	One per container. Sampling depth selected randomly.	All analyses to be below criteria.
3 to 6	Three containers selected randomly and one sample taken from each at a depth selected randomly. One sample from one of the remaining containers, with container and depth selected randomly.	
> 6	Three containers selected randomly and one sample taken from each at a depth selected randomly. One sample from each set of three (or part thereof) remaining containers, with containers and depths selected randomly.	

Case 3. Source known, analytical data available on process

The third category addresses specific situations where there is a high level of knowledge of the waste producing processes such that only relatively low levels of waste sampling may be required.

The level of sampling will depend mainly on the:

- type and levels of contaminants;
- number of containers;
- type and reliability of the process;
- level of management and technical control on the process; and
- toxicity of contaminants involved.

In such situations the analytical data can be compared with the relevant landfill criteria to determine the appropriate landfill class.

Figure 2 Assessment of minor quantities (<100m3)

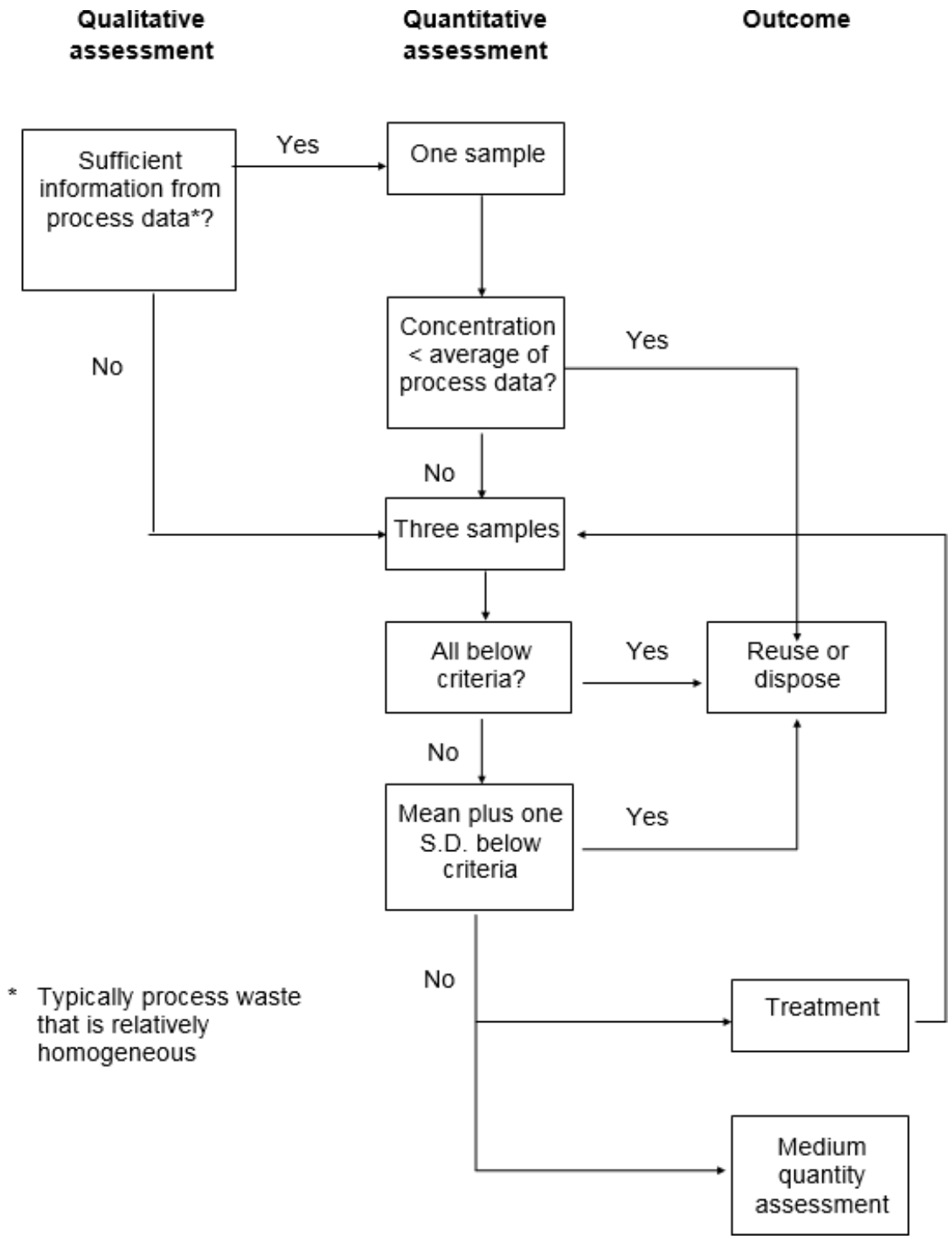
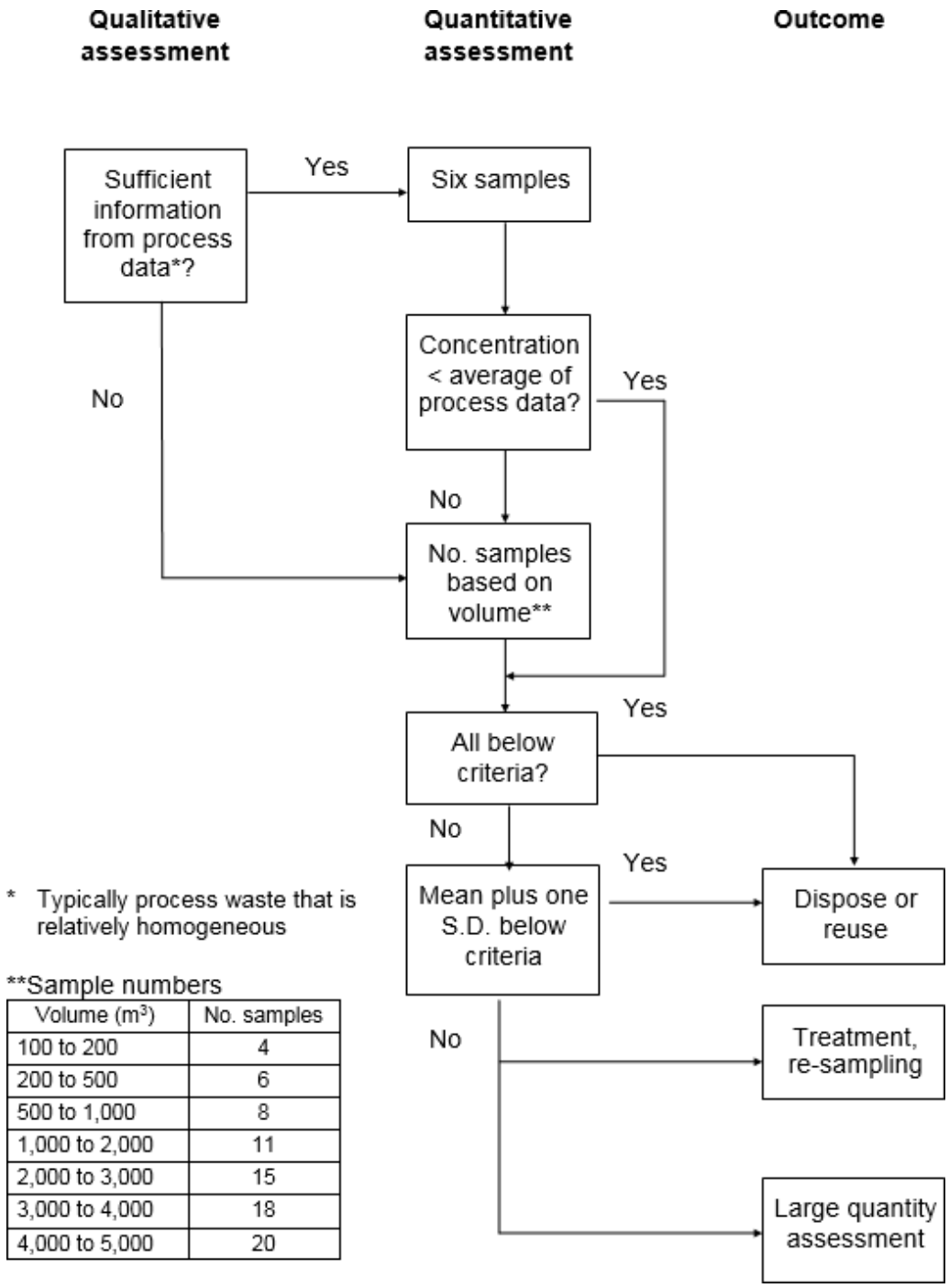


Figure 3 Assessment of medium quantities (<5,000m3)



Volume (m^3)	No. samples
100 to 200	4
200 to 500	6
500 to 1,000	8
1,000 to 2,000	11
2,000 to 3,000	15
3,000 to 4,000	18
4,000 to 5,000	20

Figure 4 Assessment of large quantities (>5000m^3)

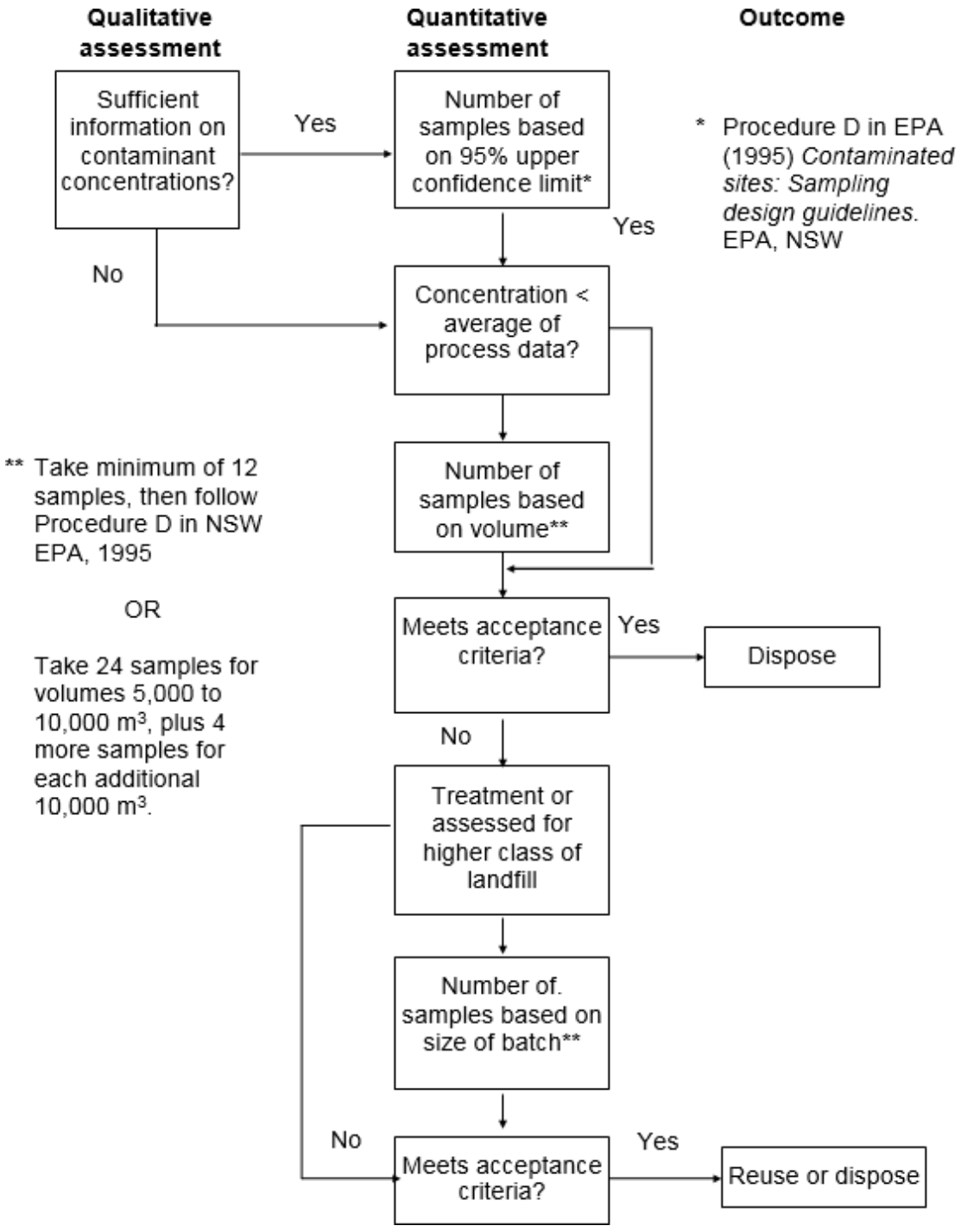


Figure 5 Management of packaged solid waste