



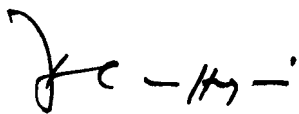
**Landfill Waste
Classification and
Waste Definitions 1996
(As amended)**

WESTERN AUSTRALIA
DEPARTMENT OF ENVIRONMENT

Landfill Waste Classification and
Waste Definitions
1996
(As amended)

This document provides definitions for the classification of landfills and wastes in Western Australia and supersedes all previous versions and amendments.

Published by the Director General, Department of Environment on 1 July, 2005 pursuant to items 63, 64, 65 and 66 in Schedule 1, Part 1 of the *Environmental Protection Regulations 1987, as amended*.



D Carew-Hopkins
A/DIRECTOR GENERAL

FOREWORD

This document is intended to provide 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 of the *Environmental Protection Act 1986*. More stringent waste acceptance criteria than those listed in this document may be imposed by landfill operators. Similarly, Department of Environment (DoE) 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. Alternatively, advice may be sought from licensing officers at the following locations:

Kwinana-Peel

165 Gilmore Avenue
KWINANA WA 6167
PO Box 454
KWINANA WA 6167
Phone: (08) 9411 1777
Fax: (08) 9419 5897

South West

35-39 McCombe Road
BUNBURY WA 6230
PO Box 261
BUNBURY WA 6231
Phone: (08) 9726 4111
Fax: (08) 9726 4100

Midwest Gascoyne

81 Forest Street
GERALDTON WA 6530
PO Box 73
GERALDTON WA 6531
Phone: (08) 9964 5978
Fax: (08) 9964 5983

Swan Goldfields Agricultural

7 Ellam Street
VICTORIA PARK WA 6100

Phone: (08) 6250 8000
Fax: (08) 9250 8050

North West

Lot 980 Cherratta Road
KARRATHA WA 6714
PO Box 836
KARRATHA WA 6714
Phone: (08) 9144 2000
Fax: (08) 9144 2610

South Coast

5 Bevan Street
ALBANY WA 6330
PO Box 525
ALBANY WA 6331
Phone (08) 9842 5760
Fax: (08) 9842 1204

General information on waste and landfill licensing policy can be obtained from the DoE's Environmental Regulation Branch on 9222 7031. Advice on waste management policy can be obtained from the DoE's Waste Management Branch on 9278 0926.

Use of the acceptance criteria in this document for filling of landfills 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.

LANDFILL CLASSES AND THE WASTES THEY ACCEPT

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	<ul style="list-style-type: none"> • Clean Fill • Type 1 Inert Waste • Contaminated solid wastes meeting waste acceptance criteria specified for Class I landfills (possibly with specific licence conditions) • Type 2 Inert Waste (with specific licence conditions) • Type 3 Inert Waste (subject to DEP approval) • Type 1 Special Waste
Class II (Prescribed Premises Category 64 or 89)	Putrescible Landfill	<ul style="list-style-type: none"> • Clean Fill • Type 1 Inert Waste • Putrescible Wastes • Contaminated solid waste meeting waste acceptance criteria specified for Class II landfills (possibly with specific licence conditions) • Type 2 Inert Wastes (with specific licence conditions) • Type 1 and Type 2 Special Wastes (for registered sites as approved under the Controlled Waste Regulations)
Class III (Prescribed Premises Category 64)	Putrescible Landfill	<ul style="list-style-type: none"> • Clean Fill • Type 1 Inert Waste; • Putrescible Wastes; • Contaminated solid waste meeting waste acceptance criteria specified for Class II or Class III landfills (possibly with specific licence conditions) • Type 2 Inert Wastes (with specific licence conditions) • Type 1 and Type 2 Special Wastes
Class IV (Prescribed Premises Category 65)	Secure Landfill	<ul style="list-style-type: none"> • Clean Fill • Type 1 Inert Waste; • Contaminated solid waste meeting criteria specified for Class II, Class III or Class IV landfills (possibly with specific licence conditions) • Type 2 Inert Wastes (with specific licence conditions) • Type 1 and Type 2 Special Wastes
Class V (Prescribed Premises Category 66)	Intractable Landfill	<ul style="list-style-type: none"> • Intractable and other wastes in accordance with the approvals for the site.

Note: Materials used for rehabilitation and final landforming (including Class I landfills) need not be wastes, and may include clean fill and soil mixes incorporating mulches, grass sods, peat and biosolids. Rehabilitation of landfills should be conducted primarily with sand and loam to a depth generally not exceeding two metres and may involve the use of neutralised peat or acid sulfate soils or other organic matter to aid soil structure, but not as the main ingredients.

DEFINITIONS

WASTES

Clinical Waste	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.
Biosolids	The stabilised organic solids, produced by wastewater treatment processes, which in most cases can be beneficially used (also known as sewage sludge).
Clean fill	Material that will have no harmful effects on the environment and which consists of rocks or soil arising from the excavation of undisturbed material. For material not from a clean excavation, it must be validated to have contaminants below relevant ecological investigation levels (as defined in the document Assessment Levels for Soil, Sediment and Water, Department of Environment, 2003).
Construction and Demolition Waste	Materials in the waste stream which arise from construction, refurbishment or demolition activities.
Controlled waste	Waste types listed in Schedule 1 of <i>the Environmental Protection (Controlled Waste) Regulations 2004</i> .
Cytotoxic Waste	Waste consisting of cytotoxic drugs, material contaminated with cytotoxic drugs or residues, or preparations containing cytotoxic material.
Hazardous Waste	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).
Inert Waste Type 1	Non-hazardous, non-biodegradable (half-life greater than 2 years) wastes containing contaminant concentrations less than Class I landfill acceptance criteria but excluding paper and cardboard (paper and cardboard are biodegradable materials and are therefore considered as putrescible waste), or materials that require treatment to render them inert (e.g. peat, acid sulfate soils).
Inert Waste Type 2	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	Waste material from DEP licensed secondary waste treatment plants, subject to appropriate assessment and approval of that waste and the specified inert landfill.
Intractable Waste	Waste which 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 Class I, II, III and IV landfill facilities (see Table 2).
Packaged Waste	Waste packed into discrete containers such as 205 L drums or bulka bags so that they meet any requirements under the <i>Explosives and Dangerous Goods Act 1988</i> and the <i>Environmental Protection Act 1986</i> for packaging, containment and labelling.
Putrescible	Component of the waste stream likely to become putrid.
Poisons	Materials defined as poisons under the <i>Poisons Act 1964</i> .

Radioactive	Waste which gives off or is 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.
Solid	Material that: <ul style="list-style-type: none"> (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).
Solid Waste	Waste which meets the definition of a solid.
Special Waste Type 1	Waste which includes asbestos and asbestos cement products.
Special Waste Type 2	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.
Waste	For the purpose of these guidelines waste may mean one or more of the following: <ul style="list-style-type: none"> • any substance that is discarded, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment; • any discarded, rejected, unwanted, surplus or abandoned substance; • any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, reprocessing, recovery, or purification by a separate operation from that which produced the substance; • any substance described in regulations under the <i>Environmental Protection Act 1986</i> as waste.

TECHNICAL TERMS

Acceptance Criteria	Refers to the concentration and leachate criteria published in this document (these may be varied for individual landfills in accordance with specific licence conditions).
Biodegradable	Capable of being decomposed by the action of biological processes.
Class I landfill	An un-lined landfill designed to accept inert wastes.
Class II landfill	An un-lined landfill designed to accept putrescible and inert wastes.
Class III landfill	A lined landfill, which may include leachate collection, designed to accept putrescible and inert wastes.
Class IV landfill	A double-lined landfill with leachate collection, designed to accept contaminated soils and sludges (including encapsulated wastes).
Class V landfill	The Mount Walton East Intractable Waste Disposal Facility.
Contaminant	Substance or object in contact or mixed with a material that poses a risk of harm to human health or the environment.
Contaminated Soil	Soil that contains chemical substances or wastes at concentrations above background levels that present, or have the potential to present, a risk of harm to human health or the environment.

Disposal	Final stage in the management of the waste stream.
Encapsulation	The process of enclosing a waste within a secure container such as to render it acceptable for long-term disposal.
Flammable	Materials that are readily combustible.
Immobilisation	The process of fixing or locking up contaminants in a waste such as to render it suitable for long-term disposal.
Landfill	A site used for disposal of solid material (i.e. is spadeable) by burial in the ground that is licensed as a landfill under the <i>Environmental Protection Act 1986</i> .
Leaching Procedure	Procedures specified in AS 4439.3-1997 Wastes, Sediments and Contaminated Soils - Preparation of leachates - Bottle leaching procedures.
Practical quantitation limit	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.
Reuse	Use of a product again for the same or a different purpose without further manufacture.
Spadeable	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.
Storage	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	Physical, chemical or biological processing of a waste for disposal or reuse.

ABBREVIATIONS

ADGC	Australian Dangerous Goods Code.
ADWG	Australian Drinking Water Guidelines 1996.
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	Type 1, Type 2 or Type 3 inert waste.
IWDF	Mount Walton East Intractable Waste Disposal Facility (Class V landfill).
NEPM	National Environmental Protection Measure on the Assessment of Site Contamination.
S1, S2, S3	Type 1, Type 2, or Type 3 Special waste.
TCLP	Toxicity Characteristic Leaching Procedure.

For other definitions the reader is referred to the Australian/New Zealand Standard AS/NZS 3831:1998, Waste Management - Glossary of Terms.

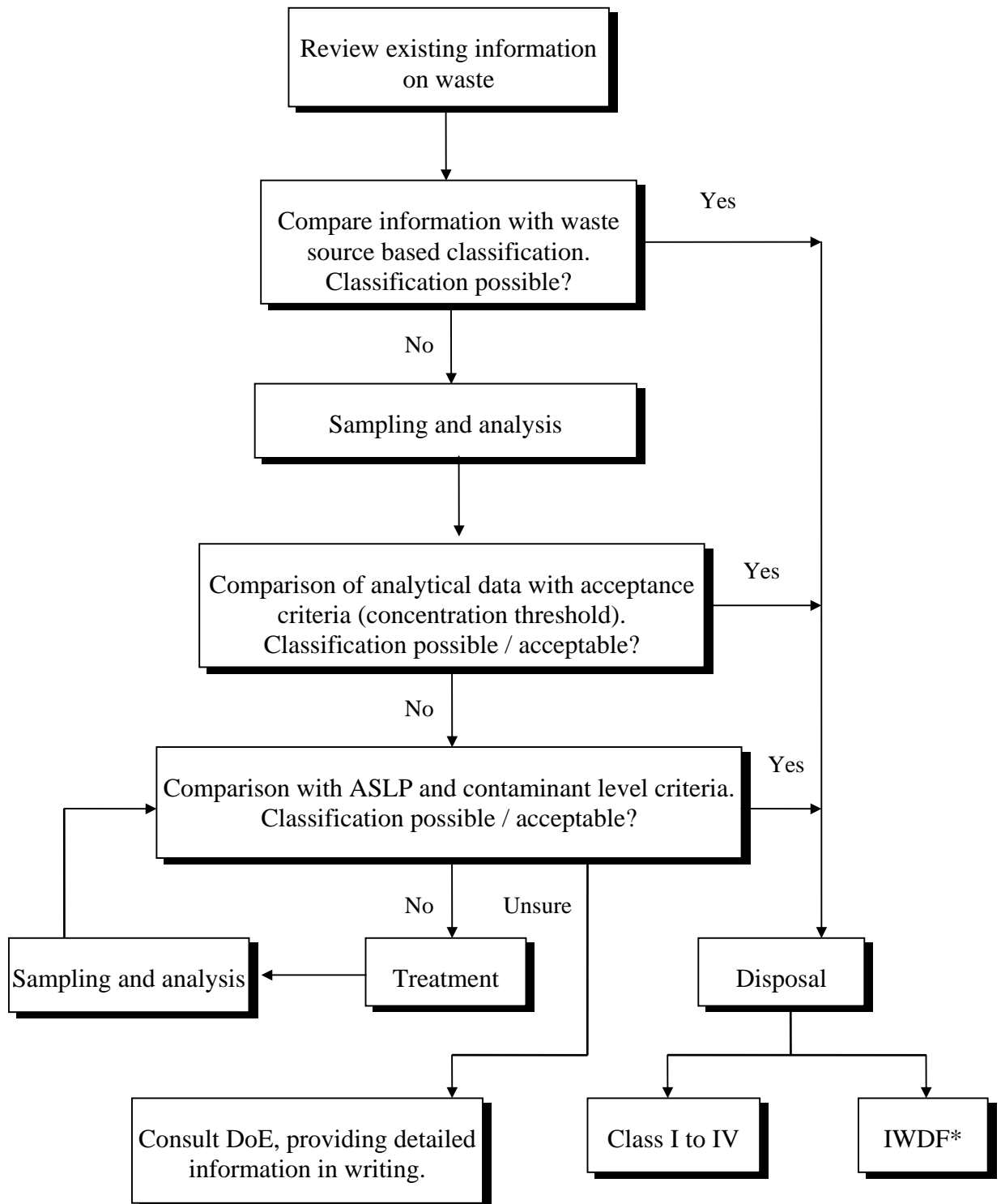
CLASSIFICATION OF WASTE INTO WASTE TYPES AND LANDFILLS

The following process is summarised in Figure 1.

Step 1 Ensure that an assessment needs to be done	The broad classifications used in Western Australia 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	<p>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.</p> <p>Encapsulated waste need not be further tested, but approval of the encapsulation method must be obtained from the DoE. Note that separate DoE approval is not required for disposal of immobilised waste, but it must be disposed of as follows:</p> <ul style="list-style-type: none">• 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 DoE for assessment/disposal requirements. The DoE should also be consulted about uncertainties in steps 5 and 6 above.

Figure 1 Management of solid waste disposal



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

Table 2 Waste types

Table 2a Clean fill and inert waste

WASTE TYPE	DESCRIPTION
Clean Fill	Material that will have no harmful effects on the environment and which consists of rocks or soil arising from the excavation of undisturbed material.
	<p>Examples: Virgin excavated natural material (e.g. clay, gravel, sand, soil and rock), or such material that is mixed with:</p> <ul style="list-style-type: none"> • waste that has been excavated from areas that are not contaminated as a result of industrial, commercial, mining or agricultural activities, with manufactured chemicals, and does not contain sulfidic ores or soils (e.g. acid-sulfate soils and peats), or • materials not from a “clean excavation” that have been validated to meet relevant ecological investigation levels.
Inert	<p>Wastes that are largely non-biodegradable, non-flammable and not chemically reactive. Inert wastes are subdivided into three separate classes:</p> <ul style="list-style-type: none"> • Type 1 - Inert Wastes are as listed below and contain contaminants in concentrations less than the specified criteria. • Type 2 - Wastes consisting of non-biodegradable organic materials such as tyres and plastics, which are flammable and require special management to reduce the potential for fires. • Type 3 - Waste material from DEP licensed secondary waste treatment plants, subject to appropriate assessment and approval of that waste and the specified landfill.
	<p>Examples of Type 1 inert wastes:</p> <ul style="list-style-type: none"> • Building and demolition waste (e.g. bricks, concrete and associated unavoidable small quantities of paper, plastics, glass, metal and timber¹ 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. • 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 (including that used for stripping tributyl tin-containing paints). <p>Examples of Type 2 inert wastes: Used, rejected or unwanted tyres (including shredded tyres or tyre pieces).</p>
Notes:	1. Includes treated timber such as copper chrome arsenate (CCA), high temperature creosote (HTC), pigment emulsified creosote (PEC) and light organic solvent preservative (LSOP) treated timber.

Table 2b Putrescible waste

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.
	<p>Examples:</p> <ul style="list-style-type: none"> • Municipal waste, consisting of: <ul style="list-style-type: none"> * 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 (e.g. paper, cardboard, plastics, wood) that is not mixed with any other type of waste. • Cleaned pesticide, biocide, herbicide or fungicide containers². • 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:	<p>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.avcare.org.au).</p> <p>3. Acid sulfate soils may only be accepted at Class II, III or IV landfills if they have been treated to neutralise acid-forming potential in accordance with the Department of Environment document <i>Treatment and Management of Acid Sulfate Soils</i> prior to disposal.</p> <p>Soils being disposed of from areas with known acid-sulfate soil potential should be checked for acidity before disposal.</p>

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 Director, Environmental Management Division.

WASTE TYPE	DESCRIPTION
	<p>Examples:</p> <ul style="list-style-type: none"> • Wastes that meet the criteria for assessment as dangerous goods under the <i>Australian Code of Practice for the Transport of Dangerous Goods by Road and Rail</i>, 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 <i>Standard for the Uniform Scheduling of Drugs and Poisons No. 13 (1998)</i>. • Quarantine waste.
Intractable	<p>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 facilities⁴.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Radioactive wastes (disposal must be approved by the Radiological Council of Western Australia). • Significantly contaminated soils, industrial sludges, some spent catalyst wastes.
Notes:	<p>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.</p>

Table 2d Special waste

WASTE TYPE	DESCRIPTION
Special	<p>Includes asbestos wastes and certain types of biomedical wastes that are regarded as hazardous but which, with special management techniques, may be disposed of safely within specified classes of landfill.</p> <ul style="list-style-type: none"> • Type 1 Special Waste - Asbestos Wastes • Type 2 Special Waste – Biomedical Wastes
	<p>Examples of Type 1 Special Waste:</p> <ul style="list-style-type: none"> • 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). <p>Examples of Type 2 Special Waste:</p> <ul style="list-style-type: none"> • Biomedical waste which does not require incineration and which is approved for supervised burial.

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				
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	2880
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 Organics⁵				
Organochlorine pesticides, polychlorinated biphenyls etc.	N/A	N/A	N/A	N/A
Other metals⁶				
Aluminium, barium, boron, cobalt, copper, manganese, vanadium and zinc	% by weight	% by weight	% by weight	% by weight
	5	5	10	20

- Notes:
1. For organic and inorganic chemical contaminants not listed in Table 3 contact the DoE for assessment / disposal advice.
 2. Contaminant Threshold (CT) values based on 1996 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 DoE 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 (ASLP¹) and concentration limit (CL²) values for waste classification

Contaminant	Leachable Concentration ASLP1 (mg/L) Class I	Concentration Limit CL1 (mg/L) Class I	Leachable Concentration ASLP2 (mg/L) Class II	Concentration Limit CL2 (mg/L) Class II	Leachable Concentration ASLP3 (mg/L) Class III	Concentration Limit CL3 (mg/kg) Class III	Leachable Concentration ASLP4 (mg/L) Class IV	Concentration Limit CL4 (mg/kg) Class IV
Metals								
Arsenic ³	0.5	500	0.5	500	0.7	5,000	7	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	0.2	1,000	2	4,000
Chromium (hexavalent)	0.5	500	0.5	500	5	500	50	2,000
Lead	0.5	1,500	0.5	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	0.5	50	0.5	50	1	500	10	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
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	4,320	300	17,280

Contaminant	Leachable Concentration ASLP1 (mg/L) Class I	Concentration Limit CL1 (mg/L) Class I	Leachable Concentration ASLP2 (mg/L) Class II	Concentration Limit CL2 (mg/L) Class II	Leachable Concentration ASLP3 (mg/L) Class III	Concentration Limit CL3 (mg/kg) Class III	Leachable Concentration ASLP4 (mg/L) Class IV	Concentration Limit CL4 (mg/kg) Class IV
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 ₁₀ ->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 ^{3,5}	0.3	108	0.3	108	3	1,080	30	4,320
Toluene ⁵	8	158	8	158	80	1,580	800	6,320
Xylenes (total) ⁵	6	100	6	100	60	1,000	600	4,000
Chlorinated Organics								
Aldrin + dieldrin ⁷	0.003	50	0.003	50	0.03	500	0.3	2,000
Chlordane ⁷	0.01	250	0.01	250	0.1	2,500	1	10,000
2,4-D ⁵	0.3	360	0.3	360	3	1,440	30	5,760
DDT + DDD + DDE ⁷	0.2	1,000	0.2	1,000	2	10,000	20	40,000
Heptachlor ⁷	0.003	50	0.003	50	0.03	500	0.3	2,000
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) 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 = Contaminated Sites Management Series assessment levels for soil (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.
 4. ASLP values derived from Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes (NSW EPA, 1999) (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 Not applicable.

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 \leq CT1	ASLP test not required.
	2. ASLP \leq ASLP1 and concentration $>$ CT1, \leq CL1	Leaching Solution to be used is water.
	3. ASLP \leq ASLP1 and concentration $>$ CL1	After immobilisation ⁶ .
Putrescible (Class II)		
	1. Concentration \leq CT2	ASLP test not required.
	2. ASLP \leq ASLP2 and concentration $>$ CT2, \leq CL2	ASLP required.
	3. ASLP \leq ASLP2 and concentration $>$ CL2	After immobilisation ⁶ .
Putrescible (Class III)		
	1. Concentration \leq CT3	ASLP test not required.
	2. ASLP \leq ASLP3 and concentration $>$ CT3, \leq CL3	ASLP required
	3. ASLP \leq ASLP3 and concentration $>$ CL3	After immobilisation ⁶ or encapsulation.
Secure (Class IV)		
	1. Concentration \leq CT4	ASLP test not required.
	2. ASLP \leq ASLP4 and concentration $>$ CT4, \leq CL4	ASLP required. Leaching solution to be specified in site licence.
	3. ASLP \leq ASLP4 and concentration $>$ CL4	After immobilisation ⁶ or encapsulation.
Intractable (Class V)⁷		
	1. ASLP $>$ ASLP4	Store or treat waste as appropriate.
	2. ASLP \leq 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 DoE approved sampling procedures (typically the mean of the sample distribution plus 1 standard deviation).
 6. In certain cases, the DoE 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.

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..

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.

Waste Categories

Bulk wastes (>5 m³) 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.
- Contaminated Sites Sampling Design Guidelines, NSW EPA, 1995.
- 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 m³;
2. Medium quantities - more than 100 m³ and less than 5,000 m³; and
3. Large quantities - more than 5,000 m³.

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 DoE. 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 m³)

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 as appropriate.

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 reuse;
- or
- more detailed assessment using six samples as described for medium quantities.

Medium quantities (100 m³ to 5,000 m³) and large quantities (>5,000 m³)

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 information 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).

For large quantities, Procedure A (Contaminated Sites Sampling Design Guidelines, NSW EPA, 1995) may be used where adequate information is available, or Procedure B where this is not the case.

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 (judgemental sampling). Procedures for selection of random samples are described by the USEPA (Methods for Evaluating the Attainment of Cleanup Standards. Volume 1: soils and soil Media. EPA 230/02-89-042, USEPA, 1989).

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 as appropriate.

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 as appropriate.

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 m³ 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	<ul style="list-style-type: none"> • Three per container. • One top third, one middle third, and one bottom third from each container. 	Mean of sample analyses.
more than 3	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • One per container. • Sampling depth selected randomly. 	All analyses to be below criteria.
3 to 6	<ul style="list-style-type: none"> • 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. 	Mean of analyses.
> 6	<ul style="list-style-type: none"> • Three containers selected randomly and one sample taken from each at a depth selected randomly. 	Mean of analyses.

Number of Containers	Sampling Requirements	Value to be compared with waste classification criteria
	<ul style="list-style-type: none"> • 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.

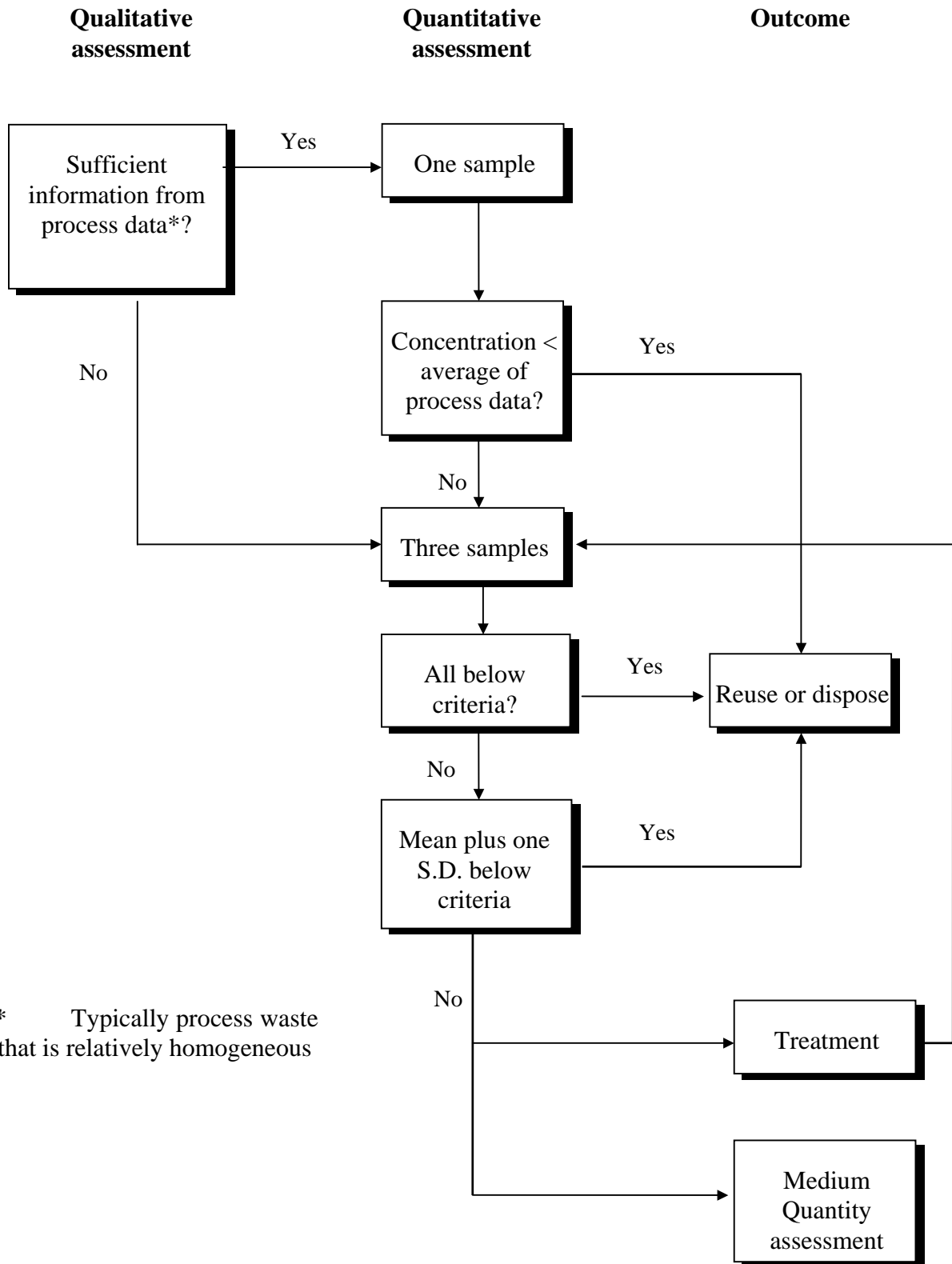
The level of sampling will depend mainly on the:

- 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.

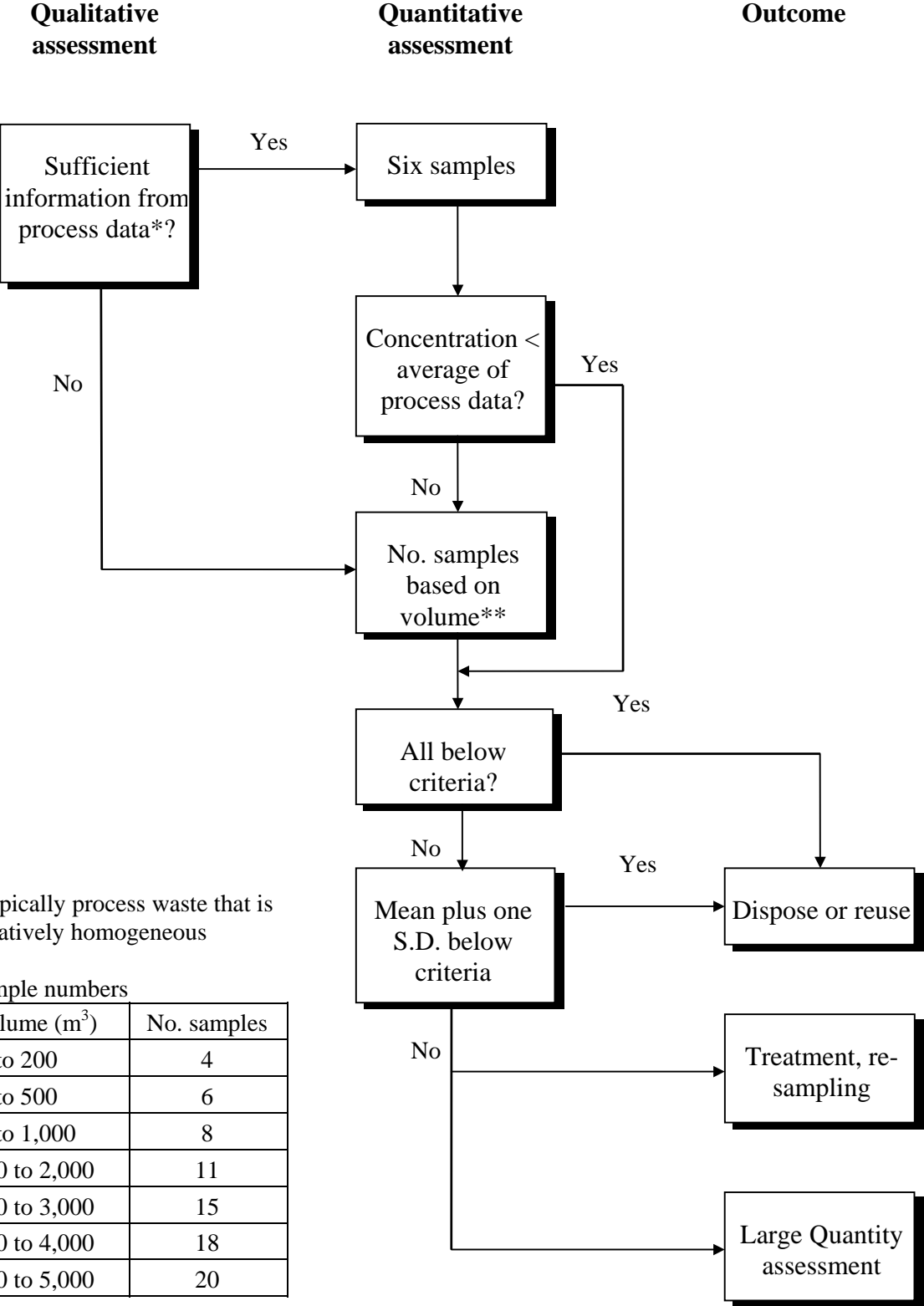
ASSESSMENT OF MINOR QUANTITIES (<100 m³)

Figure 2



ASSESSMENT OF MEDIUM QUANTITIES (>100 m³, <5,000m³)

Figure 3



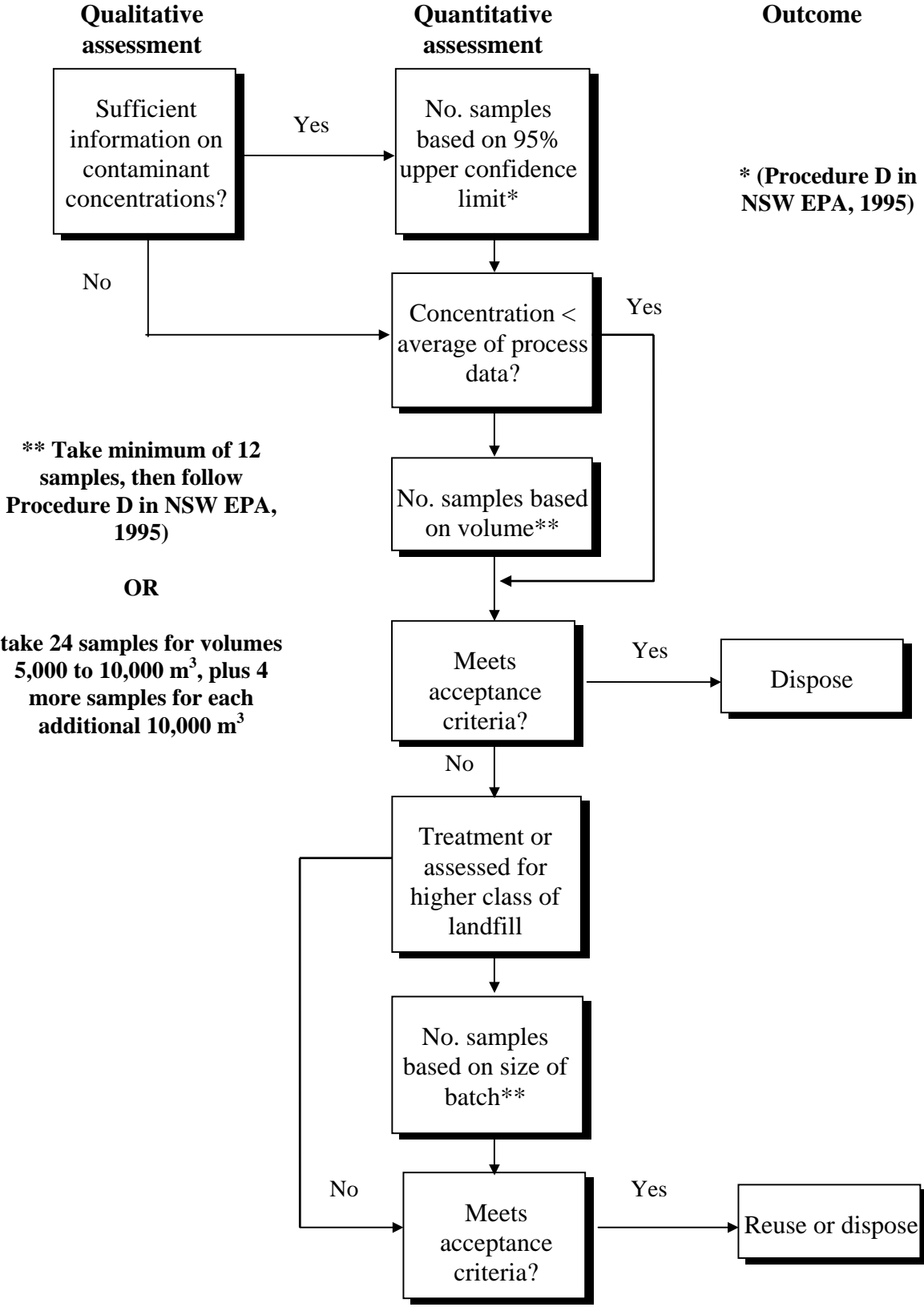
* Typically process waste that is relatively homogeneous

**Sample numbers

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

ASSESSMENT OF LARGE QUANTITIES (>5,000 m³)

Figure 4



MANAGEMENT OF PACKAGED SOLID WASTE

Figure 5

CASE 1

Source of waste unknown
No analytical data on waste

Less than 3 packages

3 or more packages

