

Draft Guidelines
on the Duty to Report Contamination
under the *Contaminated Land
Management Act 1997*

This report was prepared by the Contaminated Site Section of the Specialised Regulation Branch.

Limitations

These guidelines should be used in conjunction with other relevant guidelines made or approved by the Department of Environment and Climate Change NSW under section 105 of the *Contaminated Land Management Act 1997* when assessing and managing contaminated land.

These guidelines do not include occupational health and safety procedures. The NSW WorkCover Authority should be consulted on such procedures. Appropriate action must be taken to manage any potential hazard and adequately protect the health of any workers on, or occupiers of, the site.

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Preface

This document replaces the former *Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report*, published in 1999. This document has been prepared in light of the amendments to the *Contaminated Land Management Act 1997* ('CLM Act') by the *Contaminated Land Management Amendment Act 2008* ('CLM Amendment Act 2008').

Various other guidelines, which may be updated from time to time, are referred to throughout this document. Where a reference guideline that is made or endorsed by the Department of Environment and Climate Change (DECC) under section 105 of the CLM Act is updated, the relevant reference(s) in this document should be read as if they are part of the endorsed updated version.

The Environment Protection Authority is part of the DECC and exercises certain statutory functions and powers under the CLM Act. In these guidelines, references to DECC should be read as referring to the Environment Protection Authority. It is the latter, rather than DECC, that has powers and functions under the CLM Act.

1 Introduction

1.1 Background

Land contamination has the potential to arise from a range of industrial and other activities. The impacts of some activities are only temporary, whereas others have the risk of leaving a lasting legacy. In some instances, particularly when the land use has involved hazardous substances, that legacy may be threatening to humans or the environment, or it may affect the current or future use of the land.

Not all contamination will affect the land in such a way that it cannot be used productively for industrial, commercial, agricultural, residential or other purposes. To provide for effective management of contaminated land, it is necessary to distinguish situations where Department of Environment and Climate Change (DECC) regulation is required to protect humans or the environment from those where it is not required.

The *Contaminated Land Management Act 1997* (CLM Act) establishes a legal framework that gives DECC powers to regulate the assessment and remediation of sites where contamination is significant and warrants DECC's regulation. Where DECC's regulation is not needed, the planning process will determine the appropriate use of sites in the future.

1.2 About these guidelines

These guidelines are made under section 105 of the CLM Act. They provide information on two key aspects of the duty to report contamination under the CLM Act. Section 2 of these guidelines sets out the duty of landowners and persons who have responsibility for the contamination to report to DECC. This includes a range of considerations for those who encounter land contamination and how to proceed where there is uncertainty. Section 3 of these guidelines outlines how DECC assesses and determines whether or not contamination is significant enough to require regulation.

1.3 Contaminated Land Management Act

The general objective of the CLM Act is to establish a process for investigating and, where appropriate, remediating land that DECC has reason to believe is contaminated, where that contamination is considered significant enough to warrant regulation under the CLM Act.

The particular objectives of the CLM Act are to:

- set out accountabilities for managing contamination if DECC considers the contamination is significant enough to require regulation
- set out the role of DECC in the assessment of contamination and the supervision of the investigation, remediation and management of contaminated sites
- provide for the accreditation of site auditors of contaminated land to ensure appropriate standards of auditing in the management of contaminated land
- ensure that contaminated land is managed with regard to the principles of ecologically sustainable development.

A number of amendments to the CLM Act are scheduled to commence on 1 June 2009. The CLM Act specifies that DECC can take certain actions where it has reason to believe that land is contaminated and that the contamination is significant enough to warrant regulation under Part 3 Division 2 of the CLM Act. Reference to 'significant

risk of harm' has been removed, as the term is no longer a concept for triggering regulatory action by, or reporting of certain contaminated sites to, DECC.

2 Duty to report contamination

2.1 The duty to report

Under section 60 of the CLM Act, a person whose activities have contaminated land or a landowner whose land has been contaminated are required to notify DECC when they become aware of the contamination.

Such a person is required to notify DECC of contamination in any of the following circumstances:

- the level of the contaminant in, or on, soil exceeds a level of contamination set out in these Guidelines with respect to a current or approved use of the land, and people have been, or foreseeably will be, exposed to the contaminant, OR
- the contamination meets a criterion prescribed by the regulations, OR
- the contaminant has entered, or will foreseeably enter, neighbouring land, the atmosphere, groundwater or surface water, and the contamination exceeds, or will foreseeably exceed, a level of contamination set out in these Guidelines and will foreseeably continue to remain above that level.

Section 2.3 provides more information on the notification triggers and how they should be used in determining whether the contamination should be reported to DECC.

A person is considered to be aware of the contamination if they ought reasonably to have been aware of the contamination. This will depend on:

- the person's abilities, experience, qualifications and training
- whether the person could have reasonably sought advice that would have made them aware of the contamination
- the circumstances of the contamination.

Those who are experienced and qualified, have an awareness of potential contaminated sites, or possess the resources to identify and manage them are considered to be reasonably aware.

Although the duty to report contamination applies to certain persons in specific circumstances, as described above, any person at any time can report suspected contamination to DECC by calling the Environment Line on 131 555.

2.2 Determining whether to report

To assess whether the contamination of a site should be reported, a review of the site activities and history, and a site inspection to look for indicators of contamination, should be undertaken. There may also be a need for a further, more detailed investigation. Figure 1 shows the decision process that can be used by a site owner or a responsible person in assessing whether to report under section 60 of the CLM Act. Box 1 is a checklist for site owners or responsible persons to report contamination to DECC.

2.2.1 Indicators of contamination

A review of the site activities and history provides a starting point to determine whether current or past use may have contributed to contamination of the site. This includes consideration of whether the site or adjacent sites may be associated with potentially contaminating activities, complaints about pollution or illegal dumping of wastes, and whether there are gaps in, or doubts about, the site history.

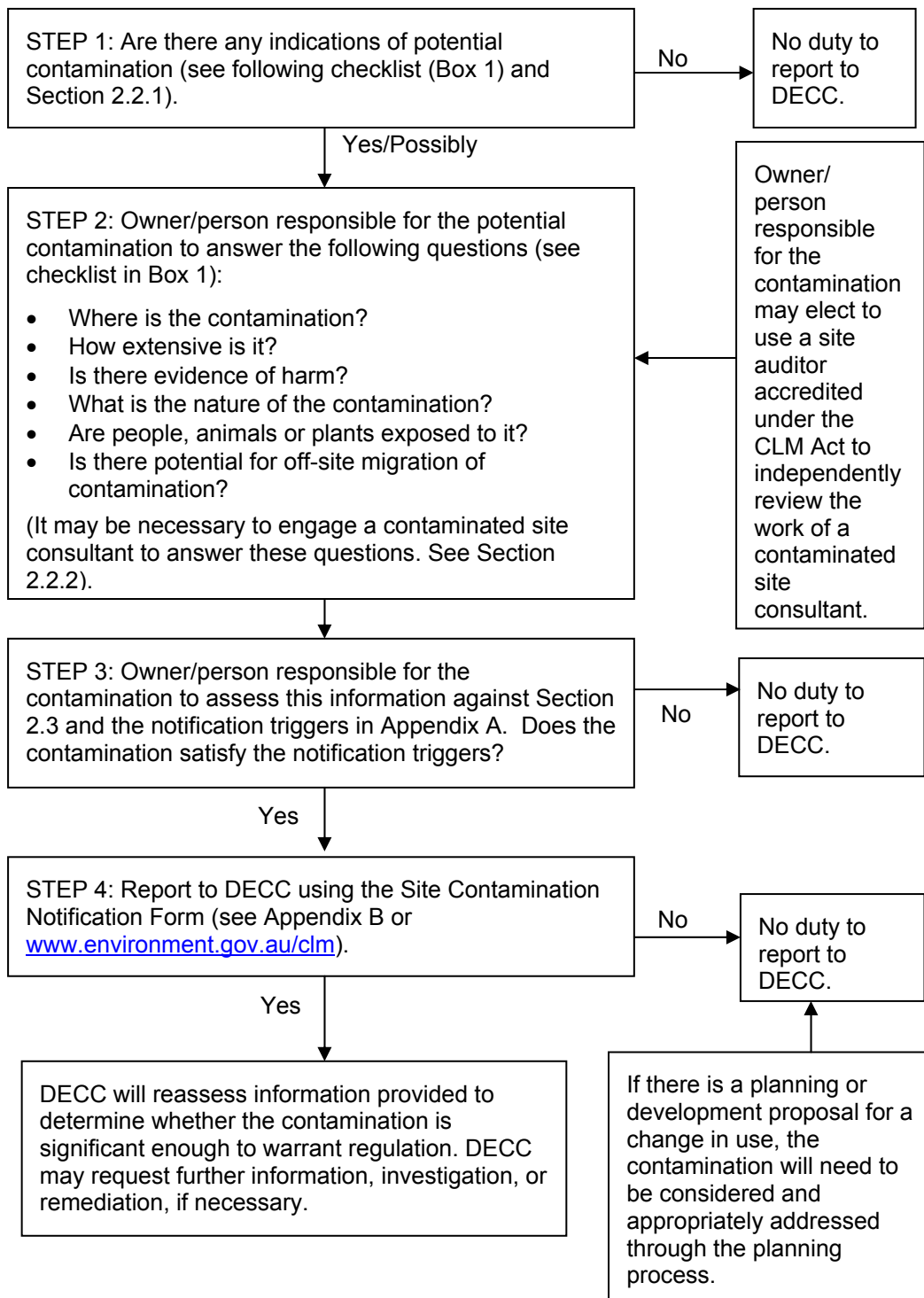


Figure 1: A decision process for use by site owners or responsible persons considering reporting contamination to DECC. Note that there may also be reporting duties required by other legislation (for example, the *Protection of the Environment Operations Act 1997* and *Dangerous Goods* legislation).

An inspection of the site and its surrounds may provide physical indicators of contamination or harm. Examples of indicators of contamination are:

- Case(s) of a biologically plausible illness or health impairment among people who have had exposure to a particular contaminated site
- the presence of chemicals either on, or in, surface water or groundwater at the site (for example, abnormal colouration of the water, odours emanating from the water)
- visible signs of toxic responses to contaminants in flora and fauna (for example, unusual numbers of birds dying on or near the site, abnormal domestic animal or wildlife behaviour, dead vegetation within, or adjacent to, areas of otherwise normal growth)
- the finding of liquid or solid chemicals or chemical wastes on or in the soil during site works
- unusual odours emanating from the soil
- entry of chemicals into on- or off-site service trenches
- the presence of discarded explosive materials on site
- the presence of dangerous goods on site
- the presence of illegal and/or uncontrolled landfills on site
- evidence of off-site migration of contaminants into adjacent or nearby environments (for example, migration to residential areas, creeks, rivers, wetlands, sediments or groundwater).

Note that this list is not exhaustive, and there may be additional indicators that are relevant to some sites.

In some cases the indicators themselves will provide enough evidence to conclude that the contamination should be reported to DECC. In those cases where the indicators suggest that contamination is present but there is uncertainty as to whether the contamination should be reported to the DECC, further investigation may be needed.

2.2.2 Further investigation of land

Where further investigation of the land is necessary to determine whether contamination should be reported to DECC, the investigation should:

- give details of all past and present activities that potentially contaminated the land and the adjacent areas, including groundwater, surface water, sediments
- identify potential contamination types
- assess the site condition
- assess the nature and extent of the contamination
- assess any harm that has been, or is being, caused by the contamination
- assess the possible exposure routes and exposed populations and the nature of any risk presented by the contamination.

Box 1: Checklist for use by site owners and persons responsible for contamination to report contamination to DECC

STEP 1: Indications of possible contamination

Owner/ person responsible for the potential contamination to review site history and record and to undertake a site inspection to check whether:

- the site or adjacent sites may be associated with potential contaminating activities
- the site or adjacent sites may be associated with complaints about pollution or illegal dumping of wastes
- there are gaps or doubts about the site history
- there are any chemical or physical indicators of contamination as per Section 2.2.1.

If the answers to all of the above are 'No', reporting to DECC is not required under section 60 of the CLM Act.

STEP 2: Assessing the site

Once the indicators of contamination have been identified, check that:

- a comprehensive site assessment has been conducted
- site assessment and reporting follow *Contaminated Sites: Guidelines for Consultants Reporting for Contaminated Sites* (EPA NSW 1997).
- the checklist for Exposure Assessment in Appendix VII of *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme* 2nd edition (DEC 2006) has been addressed.
- any evidence of, or potential for, migration of contaminants from the site and its adjacent sites has been appropriately addressed.
- results of the assessment are assessed against the notification requirements in Section 2.3 and Appendix A.

If a contaminated land consultant is engaged to clarify the level of contamination, check that:

- the consultant has appropriate qualifications and is experienced in contaminated site assessment and remediation (refer to [Where to find a consultant?](#) on the DECC website for further information).
- the consultant has a good understanding of the CLM Act, in particular the reporting obligations under section 60 of the CLM Act.

A suitably qualified and experienced environmental consultant should be engaged to do the assessment. The consultant should use the publication: *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA 1997) as a basis for conducting the investigation and preparing a report. Other guidelines made or approved under section 105 of the CLM Act should also be considered, including the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 1999) which provides a national framework for consistency and practical guidance for the assessment of contaminated sites.

The result of this investigation should be an evaluation of the nature, level and extent of contamination, appropriate uses of the site and adjacent sites, potential routes of exposure to humans and the environment, and a conclusion as to whether or not the contamination should be reported in consideration of Section 2.3.

Where there are uncertainties resulting from the consultant's report, there may be a need to obtain further information or advice. Consideration could also be given to engaging an accredited site auditor to review the consultant's report and resolve any uncertainties.

The CLM Act provides for the accreditation of site auditors to provide independent reviews of the assessment and remediation work of contaminated land consultants and specifies the use of a site auditor when a statutory site audit is required under:

- the CLM Act
- the *Environmental Planning and Assessment Act 1979*, including requirement imposed by a planning instrument or development consent
- any other Act.

Auditors may be used in other circumstances at the discretion of the person(s) initiating a site investigation.

2.3 Notification triggers

A landowner or a person whose activities have contaminated land is required to notify DECC that the land is contaminated if a substance contaminating the land (a 'contaminant') is present at levels above any of those specified by these Guidelines and if certain other factors are met (see below).

2.3.1 Onsite soil contamination

For the purposes of s. 60(3)(b) of the CLM Act, notification of contamination in soil on the land is required if:

EITHER:

- the 95% upper confidence limit on the arithmetic average concentration¹ of a contaminant in, or on, soil on the land is equal to, or above, the concentration specified for that contaminant in Table I in Appendix A with respect to a current or approved use of the land, OR
- The concentration of a contaminant in an individual soil sample from the land is equal to, or above, the concentration specified for that contaminant in Table II in Appendix A with respect to a current or approved use of the land

AND

- a person has been, or foreseeably will be, exposed to the contaminant or any by-product of the contaminant.

2.3.2 Offsite soil contamination

For the purposes of s. 60(3)(a) of the CLM Act, notification of contamination in, or on, soil on neighbouring land is required if:

- the contaminant has entered neighbouring land

¹ Refer to the *Sampling Design Guidelines* (NSW EPA 1995) for determining the 95% upper confidence limit on the arithmetic average concentration.

AND

- either:
 - the 95% upper confidence limit on the arithmetic average concentration of a contaminant in, or on, soil on the neighbouring land is above the concentration specified for that contaminant in Table I in Appendix A with respect to the relevant current or approved use of the neighbouring land, OR
 - the concentration of a contaminant in an individual soil sample from the neighbouring land is above the concentration specified for that contaminant in Table II in Appendix A with respect to the relevant current or approved use of the neighbouring land,

AND

- the concentration of the contaminant in, or on, the soil on the neighbouring land will foreseeably continue to remain above the specified concentration.

2.3.3 *Foreseeable contamination of neighbouring land*

For the purposes of s. 60(3)(a) of the CLM Act, notification of foreseeable contamination of neighbouring land is required if:

- the contaminant will foreseeably enter neighbouring land,

AND

- the concentration of the contaminant in the neighbouring land will foreseeably be above the concentration specified for that contaminant in all tables in Appendix A.

AND

- the concentration of the contaminant on the neighbouring land will foreseeably continue to remain above the specified concentration.

2.3.4 *Groundwater*

For the purposes of s 60(3)(a) of the CLM Act, notification of actual or foreseeable contamination of groundwater is required if:

- the contaminant has entered, or will foreseeably enter, groundwater

AND

- the concentration of the contaminant in the groundwater is, or will foreseeably be, above the concentration specified for that contaminant in Table III or Table IV in Appendix A

AND

- the concentration of the contaminant in the groundwater will foreseeably continue to remain above the specified concentration.

Separate-phase contamination of groundwater (i.e. immiscible organic-phase liquid), if found, requires notification regardless of the concentration in the groundwater.

2.3.5 *Surface water or groundwater discharging into surface water*

In the cases of:

- surface water, or
- groundwater discharging into a surface water body or other receptors within a 500-metre radius of the boundary of the contaminant source,

notification of actual or foreseeable contamination is required for the purposes of s. 60(3)(a) of the CLM Act if:

- the contaminant has entered, or will foreseeably enter, the surface water or groundwater

AND

- the concentration of the contaminant in the surface water or groundwater is, or will foreseeably be, above the concentration specified for that contaminant in Table V in Appendix A,

AND

- the concentration of the contaminant in the surface water or groundwater will foreseeably continue to remain above the specified concentration.

2.3.6 Foreseeable movement of contaminants

The movement of contaminants through different media, such as surface and subsurface soils, groundwater, surface water, sediments, biota and air, will vary depending on site-specific factors. These factors include, amongst others, the soil stratigraphy, depth to groundwater, and the direction and rate of groundwater or surface water flow. To determine the potential movement of contaminants through various media, a sufficient number of samples should be collected to verify the extent of contamination and the results of the sampling compared with the relevant tables in these Guidelines. Where media have not been sampled, the potential movement of contaminants at levels above the trigger values should be assumed, except where negligible amounts of the contaminants have been released into the environment.

2.4 Other contaminants

In cases where there are no levels specified for any particular contaminants in any environmental media, other reputable regulatory criteria may be used as a reference. Alternatively, a site-specific risk assessment should be considered. Detailed site-specific human health or ecological risk assessments can be both complex and costly, and these considerations will guide decisions as to the level of assessment required.

The duty to notify is not intended to capture the notification of widespread diffuse urban pollution that is not attributed to a specific industrial, commercial or agricultural activity.

2.5 Form of report

The CLM Act requires notification to be given in a form approved by DECC. A copy of the approved form is contained in Appendix B. Any supporting information related to the contamination should be attached in, for example, consultants' reports.

2.6 Failure to report

A person who is required to notify contamination to DECC but fails to do so may be subject to prosecution. If the person is convicted, the CLM Act provides for a maximum penalty of:

- 1,500 penalty units (currently \$165,000), with a further penalty of 700 penalty units (currently \$77,000) for each day the offences continues, in the case of a corporation, or

- 700 penalty units (currently \$77,000), with a further penalty of 300 penalty units (currently \$33,000) for each day the offence continues, in the case of an individual.

3 DECC regulatory actions

3.1 Evaluation of the significance of the contamination

When DECC receives a report under section 60 of the CLM Act, it will assess the information, and any other relevant information to which it has access, to determine whether the contamination is significant enough to warrant regulation. The matters that DECC must consider before declaring land to be significantly contaminated land are listed in section 12 of the CLM Act and are described in Section 3.2 of these Guidelines.

DECC has a general obligation under section 8 of the CLM Act to respond within a reasonable time to a person who has furnished information about actual or possible contamination of land, and to record what it has done and the reasons for doing it.

The information provided by a person in complying with the duty to report under section 60 of the CLM Act is not admissible as evidence in any proceedings against that person for an offence under any environment protection legislation administered by DECC (except for proceedings for an offence under s. 60 of the CLM Act).

3.2 Contamination significant enough to warrant regulation

The CLM Act has defined a process that DECC must follow before declaring land to be significantly contaminated land. In determining whether land is contaminated and whether that contamination is significant enough to warrant regulation, DECC must take into account:

- (a) whether the substances have already caused harm or are likely to cause harm (for example, in the form of toxic effects on plant or animal life)
- (b) whether the substances are toxic, persistent or bioaccumulative, or are present in large quantities or in high concentrations, or occur in combinations
- (c) whether there are exposure pathways available to the substances (that is, the routes whereby the substance may proceed from the source of the contamination to human beings or into the environment)
- (d) whether the uses to which the land (and any land adjoining it) is currently being put are such as to increase the risk of harm from the substance (for example, using the land for the purposes of child care, dwellings or domestic food production)
- (e) whether the approved uses of the land and land adjoining it are such as to increase the risk of harm from the substances
- (f) whether the substances have migrated, or are likely to migrate, from the land, either because of the nature of the land or the substances
- (g) any relevant guidelines.

The CLM Act does not define the nature or level of contamination that requires regulation, as this is determined on a case-by-case basis. Determining whether or not contamination is significant enough to warrant regulation involves many considerations, including the type, nature, quantity and concentration of contaminants, how they manifest themselves, the characteristics they display and the nature of their impacts in a particular medium. It also involves broader considerations, such as the current use of the land, who might be exposed to the contaminants under that use, and whether they will be exposed.

Hypothetical examples of sites where contamination may or may not be considered to be significant enough to require regulation are outlined in Appendix C.

3.3 Sites warranting regulation

Once DECC determines that it has reason to believe that the land is contaminated and the contamination is significant enough to warrant regulation, it may take any of a number of actions under Part 3 of the CLM Act. These actions could include:

- declaring the land to be 'Significantly Contaminated Land'
- issuing Management Orders to require site assessment, remediation and/or monitoring
- agreeing to voluntary management proposals from interested parties to manage the land voluntarily (section 17 of the CLM Act)
- liaising and negotiating with landowners or land occupiers on appropriate solutions
- undertaking educational programs, public awareness programs and other measures to minimise the environmental and health implications of contamination (section 104 of the CLM Act)
- issuing a clean-up or prevention notice under the *Protection of the Environment Operations Act 1997*, regardless whether or not the DECC is the appropriate regulatory authority.

In addition to the regulatory actions, and in the public interest, the Minister may enter into offset arrangements with a person responsible for contamination of land. Under such arrangements, the person provides help (other than direct monetary help) to communities affected by the contamination (section 111A of the CLM Act).

The actions taken by DECC will depend on the nature of the site, the use to which it is put, the nature of the risk identified by DECC and the management options available for addressing the risk. DECC's primary goal in relation to managing contaminated land where the contamination is significant enough to warrant regulation is to ensure a reduction in the risk posed by the contamination, such that the existing land use may continue or the use for which there is a current approval may proceed.

3.4 Where regulation is not warranted

In some circumstances a site may be contaminated but DECC may consider that the contamination is not significant enough to warrant regulation. A site may contain contaminants at levels above the triggers, but in view of the limited exposure pathways available the contamination will not be considered significant enough to warrant regulation.

Where DECC considers that a contaminated site does not warrant regulation under the CLM Act, the contamination issue should be addressed by the proponent and the planning consent authority as part of the development approval process. If the existing land use is proposed to be changed, the planning authority may require the site to be remediated to a level suitable for the proposed new use. Councils may also consider regulating the contamination, where warranted, under the *Protection of the Environment Operations Act 1997*.

References

ANZECC & ARMCANZ 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Paper No. 4, October 2000

NEPC 1999, *National Environment Protection (Assessment of Site Contamination) Measure 1999*, National Environment Protection Council, Canberra

NHMRC & NRMCC 2004, *Guidelines for Drinking Water Quality in Australia*, National Health and Medical Research Council and Natural Resource Management Ministerial Council, Canberra

NSW EPA 1994, *Contaminated Sites: Guidelines for Assessing Service Station Sites*, NSW Environment Protection Authority, Sydney.

NSW EPA 1995, *Contaminated Sites: Sampling Design Guidelines*, NSW Environment Protection Authority, Sydney.

NSW DEC 2006, *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition)*, NSW Department of Environment and Conservation, Sydney.

Appendix A: Notification triggers

Table I: Triggers for notification of soil contamination, based on the 95% upper confidence limit of the arithmetic average concentration of a contaminant in soil¹

Substance	Current or approved use of the land			
	Residential with gardens and accessible soil (home-grown produce contributing <10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools, primary schools, townhouses, villas	Residential with minimal access to soil, including high-rise apartments and flats	Parks, recreational open space, playing fields, including secondary schools	Commercial or industrial
Metals and metaloids				
Arsenic (total)	100	400	200	500
Beryllium	20	80	40	100
Cadmium	20	80	40	100
Chromium (III) ⁴	12%	48%	24%	60%
Chromium (VI)	100	400	200	500
Cobalt	100	400	200	500
Copper	1,000	4,000	2,000	5,000
Lead	300	1,200	600	1,500
Manganese	1,500	6,000	3,000	7,500
Methyl mercury	10	40	20	50
Mercury (inorganic)	15	60	30	75
Nickel	600	2,400	600	3,000
Zinc	7,000	28,000	14,000	35,000
Organics				
Aldrin + dieldrin	10	40	20	50
Chlordane	50	200	100	250
DDT + DDD + DDE	200	800	400	1,000
Heptachlor	10	40	20	50
PAHs (total)	20	80	40	100
Benzo(a)pyrene	1	4	2	5
Phenol	8,500	34,000	17,000	42,500
PCBs (total)	10	40	20	50
Petroleum hydrocarbon components				
Benzene ²	1	1	1	1
Toluene ²	130	130	130	130
Ethyl benzene ²	50	50	50	50
Total xylene ²	25	25	25	25
> C16–C35 (aromatics)	90	360	180	450
> C16–C35 (aliphatics)	5,600	22,400	11,200	28,000
> C35 (aliphatics)	56,000	224,000	112,000	280,000

Table I *continued*: Triggers for notification of soil contamination, based on the 95% upper confidence limit of the arithmetic average concentration of a contaminant in soil¹

Substance	Current or approved use of the land			
	Residential with gardens and accessible soil (home-grown produce contributing <10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools, primary schools, townhouses, villas	Residential with minimal access to soil, including high-rise apartments and flats	Parks, recreational open space, playing fields, including secondary schools	Commercial or industrial
Others				
Boron	3,000	12,000	6,000	15,000
Cyanides (complex)	500	2,000	1,000	2,500
Cyanides (free)	250	1,000	500	1,250

¹ All concentrations are in mg/kg unless otherwise indicated.

² Threshold concentrations from Guidelines for Assessing Service Station Sites (NSW EPA 1994)

Table II: Triggers for notification of soil contamination: individual soil sample¹

Substance	Current or approved use of the land			
	Residential with gardens and accessible soil (home-grown produce contributing <10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools, primary schools, townhouses, villas	Residential with minimal access to soil, including high-rise apartments and flats	Parks, recreational open space, playing fields, including secondary schools	Commercial or industrial
Metals and metalloids				
Arsenic (total)	250	1,000	500	1,250
Beryllium	50	200	100	250
Cadmium	50	200	100	250
Chromium (III) ³	30%	60%	60%	60%
Chromium (VI)	250	1,000	500	1,250
Cobalt	250	1,000	500	1,250
Copper	2,500	10,000	5,000	12,500
Lead	750	3,000	1,500	3,750
Manganese	3,750	15,000	7,500	18,750
Methyl mercury	25	100	50	125
Mercury (inorganic)	38	150	75	188
Nickel	1,500	6,000	1,500	7,500
Zinc	17,500	70,000	35,000	87,500
Organics				
Aldrin + dieldrin	25	100	50	125
Chlordane	125	500	250	625
DDT + DDD + DDE	500	2,000	1,000	2,500
Heptachlor	25	100	50	125
PAHs (total)	50	200	100	250
Benzo(a)pyrene	2.5	10	5	12.5
Phenol	21,250	85,000	42,500	106,250
PCBs (total)	25	100	50	125
Petroleum hydrocarbon components				
Benzene ²	2.5	2.5	2.5	2.5
Toluene ²	325	325	325	325
Ethyl benzene ²	125	125	125	125
Total xylene ²	62.5	62.5	62.5	62.5
> C16–C35 (aromatics)	225	900	450	1,125
> C16–C35 (aliphatics)	14,000	56,000	28,000	70,000
> C35 (aliphatics)	140,000	560,000	280,000	700,000

Table II *continued*: Triggers for notification of soil contamination: individual soil sample¹

Substance	Current or approved use of the land			
	Residential with gardens and accessible soil (home-grown produce contributing <10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools, primary schools, townhouses, villas	Residential with minimal access to soil, including high-rise apartments and flats	Parks, recreational open space, playing fields, including secondary schools	Commercial or industrial
Others				
Boron	7,500	30,000	15,000	37,500
Cyanides (complex)	1,250	5,000	2,500	6,250
Cyanides (free)	625	2,500	1,250	3,125

¹ All concentrations are in mg/kg unless otherwise indicated.

² Threshold concentrations from Guidelines for Assessing Service Station Sites (NSW EPA 1994)

³ Values are based on those in Table I multiplied by 2.5, except in the case of Chromium (III).

Table III: Trigger values for groundwater

Substance	Trigger value
Acrylamide	0.0002
Aluminium (acid soluble)	a
Ammonia (as NH ₃)	a
Antimony	0.003
Arsenic	0.007
Asbestos	a
Barium	0.7
Benzene	0.001
Beryllium	a
Boron	4
Bromate	0.02
Cadmium	0.002
Carbon tetrachloride	0.003
Chloramine – see monochloramine	
Chlorate	a
Chlorinated furanones	a
Chlorine	5
Chlorine dioxide	1
Chlorite	0.3
Chloroacetic acids	
chloroacetic acid	0.15
dichloroacetic acid	0.1
trichloroacetic acid	0.1
Chlorobenzene	0.3
Chloroketones	
1,1-dichloropropanone	a
1,3-dichloropropanone	a
1,1,1-trichloropropanone	a
1,1,3-trichloropropanone	a
Chlorophenols	
2-chlorophenol	0.3
2,4-dichlorophenol	0.2
2,4,6-trichlorophenol	0.02

Substance	Trigger value
Chloropicrin	a
Chromium (as Cr(VI))	0.05
Copper	2
Cyanide	0.08
Cyanogen chloride (as cyanide)	0.08
Dichlorobenzenes	
1,2-dichlorobenzene	1.5
1,3-dichlorobenzene	a
1,4-dichlorobenzene	0.04
Dichloroethanes	
1,1-dichloroethane	a
1,2-dichloroethane	0.003
Dichloroethenes	
1,1-dichloroethene	0.03
1,2-dichloroethene	0.06
Dichloromethane (methylene chloride)	0.004
Epichlorohydrin	0.0005b
Ethylbenzene	0.3
Ethylenediamine tetraacetic acid (EDTA)	0.25
Fluoride	1.5
Formaldehyde	0.5
Haloacetonitriles	
dichloroacetonitrile	a
trichloroacetonitrile	a
dibromoacetonitrile	a
bromochloroacetonitrile	a
Hexachlorobutadiene	0.0007
Iron	a
Iodine	a
Iodide	0.1
Lead	0.01
Manganese	0.5
Hydrogen sulfide	a
Mercury	0.001
Molybdenum	0.05

Substance	Trigger value
Monochloramine	3
Nickel	0.02
Nitrate (as nitrate)	50
Nitrite (as nitrite)	3
Nitrilotriacetic acid	0.2
Organotins	
dialkyltins	a
tributyltin oxide	0.001
Plasticisers	
di(2-ethylhexyl) phthalate	0.01
di(2-ethylhexyl) adipate	a
Polycyclic aromatic hydrocarbons (PAHs)	
Benzo-(a)-pyrene	0.00001 (10 ng/L)
Selenium	0.01
Silver	0.1
Sodium	c
Styrene	0.03
Sulfate	500
Tetrachloroethene	0.05
Tin	c
Toluene	0.8
Trichloroethylene	a
Trichloroacetaldehyde (chloral hydrate)	0.02
Trichlorobenzenes (total)	0.03
1,1,1-Trichloroethane	a
Trihalomethanes (THMs) (Total)	0.25
Turbidity	a
Uranium	0.02
Vinyl chloride	0.0003
Xylene	0.6
Zinc	a

Notes:

All values are in mg/L unless otherwise stated.

a – Insufficient data to set a guideline value based on health considerations.

b – The guideline value is below the limit of determination. Improved analytical procedures are required for this compound.

c – No health-based guideline value is considered necessary.

Reference: *Guidelines for Drinking Water Quality in Australia* (NHMRC & NRMCC 2004)

Table III: Trigger values for ground water

Pesticide	Trigger value
Acephate	0.01
Aldicarb	0.001
Aldrin ^a (and dieldrin)	0.0003
Ametryn	0.05
Amitrole ^a	0.01
Asulam	0.05
Atrazine ^a	0.04
Azinphos-methyl	0.003
Benomyl	0.1
Bentazone	0.03
Bioresmethrin	0.1
Bromacil	0.3
Bromophos-ethyl	0.01
Bromoxynil	0.03
Carbaryl	0.03
Carbendazim	0.1
Carbofuran	0.01
Carbophenothion	0.0005
Carboxin	0.3
Chlordane ^a	0.001
Chlorfenvinphos	0.005
Chlorothalonil	0.03
Chloroxuron	0.01
Chlorpyrifos ^a	0.01
Chlorsulfuron	0.1
Clopyralid ^a	1
2,4-D ^a	0.03
DDT ^a	0.02
Diazinon	0.003
Dicamba	0.1
Dichlobenil	0.01
Dichlorvos	0.001
Diclofop-methyl	0.005
Dicofol	0.003
Dieldrin ^a (see aldrin)	0.0003
Difenzoquat	0.1
Dimethoate	0.05
Diphenamid	0.3

Pesticide	Trigger value
Diquat ^a	0.005
Disulfoton	0.003
Diuron ^a	0.03
DPA (2,2-DPA)	0.5
EDB	0.001
Endosulfan ^a	0.03
Endothal	0.1
EPTC	0.03
Ethion	0.003
Ethoprophos	0.001
Etridiazole	0.1
Fenamiphos	0.0003
Fenarimol	0.03
Fenchlorphos	0.03
Fenitrothion	0.01
Fenoprop	0.01
Fensulfothion	0.01
Fenvalerate	0.05
Flamprop-methyl	0.003
Fluometuron	0.05
Formothion	0.05
Fosamine ^a	0.03
Glyphosate	1
Heptachlor ^a	0.0003
Hexaflurate	0.03
Hexazinone ^a	0.3
Lindane ^a	0.02
Maldison	0.05
Methidathion	0.03
Methiocarb	0.005
Methomyl	0.03
Methoxychlor	0.3
Metribuzin	0.05
Metolachlor	0.3
Metsulfuron-methyl	0.03
Mevinphos	0.005
Molinate ^a	0.005
Monocrotophos	0.001

Pesticide	Trigger value
Napropamide	1
Nitralin	0.5
Norflurazon	0.05
Oryzalin	0.3
Oxamyl	0.1
Paraquat ^a	0.03
Parathion	0.01
Parathion methyl	0.1
Pebulate	0.03
Pendimethalin	0.3
Pentachlorophenol	0.01
Permethrin	0.1
Picloram ^a	0.3
Piperonyl butoxide	0.1
Pirimicarb	0.005
Pirimiphos-ethyl	0.0005
Pirimiphos-methyl	0.05
Profenofos	0.0003
Promecarb	0.03
Propachlor	0.05
Propanil	0.5
Propargite	0.05
Propazine	0.05
Propiconazole ^a	0.1
Propyzamide	0.3
Pyrazophos	0.03
Quintozene	0.03
Simazine	0.02
Sulprofos	0.01
2,4,5-T	0.1
Silvex (see Fenoprop)	
Temephos ^a	0.3
Terbacil	0.03
Terbufos	0.0005
Terbutryn	0.3
Tetrachlorvinphos	0.1
Thiobencarb	0.03
Thiometon	0.003

Pesticide	Trigger value
Thiophanate	0.005
Thiram	0.003
Triadimefon	0.002
Trichlorfon	0.005
Triclopyr ^a	0.01
Trifluralin	0.05
Vernolate	0.03

Notes:

All values are mg/L unless otherwise stated.

Trigger value - Based on 10% of acceptable daily intake.

a – These pesticides have either been detected on occasions in Australian drinking water or their likely use would indicate that they may occasionally be detected.

Routine monitoring for pesticides is not required unless potential exists for contamination of water supplies.

Reference: *Guidelines for Drinking Water Quality in Australia* (NHMRC & NRMCC 2004)

Table IV: Trigger values for fresh water. Ecosystem value = 95% species protection

Chemical	Ecosystem value
METALS AND METALLOIDS	
Aluminium pH >6.5	55
Aluminium pH <6.5	ID
Antimony	ID
Arsenic (As III)	24
Arsenic (AsV)	13
Beryllium	ID
Bismuth	ID
Boron	370c
Cadmium H	0.2
Chromium (Cr III) H	ID
Chromium (CrVI)	1.0c
Cobalt	ID
Copper H	1.4
Gallium	ID
Iron	ID
Lanthanum	ID
Lead H	3.4
Manganese	1900c
Mercury (inorganic) B	0.6
Mercury (methyl)	ID
Molybdenum	ID
Nickel H	11
Selenium (total) B	11
Selenium (SeIV) B	ID
Silver	0.05
Thallium	ID
Tin (inorganic, SnIV)	ID
Tributyltin (as µg/L Sn)	ID

Chemical	Ecosystem value
Uranium	ID
Vanadium	ID
Zinc H	8.0c
NON-METALLIC INORGANICS	
Ammonia D	900c
Chlorine E	3
Cyanide F	7
Nitrate J	700
Hydrogen sulfide G	1
ORGANIC ALCOHOLS	
Ethanol	1400
Ethylene glycol	ID
Isopropyl alcohol	ID
CHLORINATED ALKANES	
Chloromethanes	ID
Dichloromethane	ID
Chloroform	ID
Carbon tetrachloride	ID
Chloroethanes	
1,2-dichloroethane	ID
1,1,1-trichloroethane	ID
1,1,2-trichloroethane	6500
1,1,2,2-tetrachloroethane	ID
Pentachloroethane	ID
Hexachloroethane B	360
Chloropropanes	
1,1-dichloropropane	ID
1,2-dichloropropane	ID

Chemical	Ecosystem value
1,3-dichloropropane	ID
CHLORINATED ALKENES	
Chloroethylene	ID
1,1-dichloroethylene	ID
1,1,2-trichloroethylene	ID
1,1,2,2-tetrachloroethylene	ID
3-chloropropene	ID
1,3-dichloropropene	ID
ANILINES	
Aniline	250A
2,4-dichloroaniline	7
2,5-dichloroaniline	ID
3,4-dichloroaniline	3
3,5-dichloroaniline	ID
Benzidine	ID
Dichlorobenzidine	ID
AROMATIC HYDROCARBONS	
Benzene	950
Toluene	ID
Ethylbenzene	ID
o-xylene	350
m-xylene	ID
p-xylene	200
m+p-xylene	ID
Cumene	ID
Polycyclic aromatic hydrocarbons	
Naphthalene	16
Anthracene B	ID

Chemical	Ecosystem value
Phenanthrene B	ID
Fluoranthene B	ID
Benzo(a)pyrene B	ID
Nitrobenzenes	
Nitrobenzene	550
1,2-dinitrobenzene	ID
1,3-dinitrobenzene	ID
1,4-dinitrobenzene	ID
1,3,5-trinitrobenzene	ID
1-methoxy-2-nitrobenzene	ID
1-methoxy-4-nitrobenzene	ID
1-chloro-2-nitrobenzene	ID
1-chloro-3-nitrobenzene	ID
1-chloro-4-nitrobenzene	ID
1-chloro-2,4-dinitrobenzene	ID
1,2-dichloro-3-nitrobenzene	ID
1,3-dichloro-5-nitrobenzene	ID
1,4-dichloro-2-nitrobenzene	ID
2,4-dichloro-2-nitrobenzene	ID
1,2,4,5-tetrachloro-3-nitrobenzene	ID
1,5-dichloro-2,4-dinitrobenzene	ID
1,3,5-trichloro-2,4-dinitrobenzene	ID

Table IV: Trigger values for fresh water *continued*. Ecosystem value = 95% species protection

Chemical	Ecosystem value
1-fluoro-4-nitrobenzene	ID
Nitrotoluenes	
2-nitrotoluene	ID
3-nitrotoluene	ID
4-nitrotoluene	ID
2,3-dinitrotoluene	ID
2,4-dinitrotoluene	65 C
2,4,6-trinitrotoluene	140
1,2-dimethyl-3-nitrobenzene	ID
1,2-dimethyl-4-nitrobenzene	ID
4-chloro-3-nitrotoluene	ID
Chlorobenzenes and chloronaphthalenes	
Monochlorobenzene	ID
1,2-dichlorobenzene	160
1,3-dichlorobenzene	260
1,4-dichlorobenzene	60
1,2,3-trichlorobenzene B	10
1,2,4-trichlorobenzene B	170 C
1,3,5-trichlorobenzene B	ID
1,2,3,4-tetrachlorobenzene B	ID
1,2,3,5-tetrachlorobenzene B	ID
1,2,4,5-tetrachlorobenzene B	ID
Pentachlorobenzene B	ID

Chemical	Ecosystem value
Hexachlorobenzene B	ID
1-chloronaphthalene	ID
Polychlorinated biphenyls (PCBs) and dioxins	
Capacitor 21 B	ID
Aroclor 1016 B	ID
Aroclor 1221 B	ID
Aroclor 1232 B	ID
Aroclor 1242 B	0.6
Aroclor 1248 B	ID
Aroclor 1254 B	0.03
Aroclor 1260 B	ID
Aroclor 1262 B	ID
Aroclor 1268 B	ID
2,3,4'-trichlorobiphenyl B	ID
4,4'-dichlorobiphenyl B	ID
2,2',4,5,5'-pentachloro-1,1'-biphenyl B	ID
2,4,6,2',4',6'-hexachlorobiphenyl B	ID
Total PCBs B	ID
2,3,7,8-TCDD B	ID
PHENOLS and XYLENOLS	
Phenol	320
2,4-dimethylphenol	ID
Nonylphenol	ID
2-chlorophenol T	490 C
3-chlorophenol T	ID
4-chlorophenol T	220

Chemical	Ecosystem value
2,3-dichlorophenol T	ID
2,4-dichlorophenol T	160 C
2,5-dichlorophenol T	ID
2,6-dichlorophenol T	ID
3,4-dichlorophenol T	ID
3,5-dichlorophenol T	ID
2,3,4-trichlorophenol T	ID
2,3,5-trichlorophenol T	ID
2,3,6-trichlorophenol T	ID
2,4,5-trichlorophenol T,B	ID
2,4,6-trichlorophenol T,B	20
2,3,4,5-tetrachlorophenol T,B	ID
2,3,4,6-tetrachlorophenol T,B	20
2,3,5,6-tetrachlorophenol T,B	ID
Pentachlorophenol T,B	10
Nitrophenols	
2-nitrophenol	ID
3-nitrophenol	ID
4-nitrophenol	ID
2,4-dinitrophenol	45
2,4,6-trinitrophenol	ID
ORGANIC SULFUR COMPOUNDS	
Carbon disulfide	ID
Isopropyl disulfide	ID
n-propyl sulfide	ID
Propyl disulfide	ID

Chemical	Ecosystem value
Tert-butyl sulfide	ID
Phenyl disulfide	ID
Bis(dimethylthiocarbamyl)sulfide	ID
Bis(diethylthiocarbamyl)disulfide	ID
2-methoxy-4H-1,3,2-benzodioxaphosphorium-2-sulfide	ID
Xanthates	
Potassium amyl xanthate	ID
Potassium ethyl xanthate	ID
Potassium hexyl xanthate	ID
Potassium isopropyl xanthate	ID
Sodium ethyl xanthate	ID
Sodium isobutyl xanthate	ID
Sodium isopropyl xanthate	ID
Sodium sec-butyl xanthate	ID
PHTHALATES	
Dimethylphthalate	3700
Diethylphthalate	1000
Dibutylphthalate B	26
Di(2-ethylhexyl)phthalate B	ID
MISCELLANEOUS INDUSTRIAL CHEMICALS	
Acetonitrile	ID

Table IV: Trigger values for fresh water *continued*. Ecosystem value = 95% species protection

Chemical	Ecosystem value
Acrylonitrile	ID
Poly(acrylonitrile-co-butadiene-co-styrene)	530
Dimethylformamide	ID
1,2-diphenylhydrazine	ID
Diphenylnitrosamine	ID
Hexachlorobutadiene	ID
Hexachlorocyclopentadiene	ID
Isophorone	ID
ORGANOCHLORINE PESTICIDES	
Aldrin B	ID
Chlordane B	0.08
DDE B	ID
DDT B	0.01
Dicofol B	ID
Dieldrin B	ID
Endosulfan B	0.2 A
Endosulfan alpha B	ID
Endosulfan beta B	ID
Endrin B	0.02
Heptachlor B	0.09
Lindane	0.2
Methoxychlor B	ID
Mirex B	ID
Toxaphene B	0.2
ORGANO-PHOSPHORUS PESTICIDES	
Azinphos methyl	0.02
Chlorpyrifos B	0.01
Demeton	ID

Chemical	Ecosystem value
Demeton-S-methyl	ID
Diazinon	0.01
Dimethoate	0.15
Fenitrothion	0.2
Malathion	0.05
Parathion	0.004
Profenofos B	ID
Temephos B	ID
CARBAMATES AND OTHER PESTICIDES	
Carbofuran	1.2 A
Methomyl	3.5
S-methoprene	ID
PYRETHROIDS	
Deltamethrin	ID
Esfenvalerate	0.001*
HERBICIDES AND FUNGICIDES	
Bipyridilium herbicides	
Diquat	1.4
Paraquat	ID
Phenoxyacetic acid herbicides	
MCPA	ID
2,4-D	280
2,4,5-T	36
Sulfonylurea herbicides	
Bensulfuron	ID
Metsulfuron	ID

Chemical	Ecosystem value
Thiocarbamate herbicides	
Molinate	3.4
Thiobencarb	2.8
Thiram	0.2
Triazine herbicides	
Amitrole	ID
Atrazine	13
Hexazinone	ID
Simazine	3.2
Urea herbicides	
Diuron	ID
Tebuthiuron	2.2
Miscellaneous herbicides	
Acrolein	ID
Bromacil	ID
Glyphosate	1200
Imazethapyr	ID
loxynil	ID
Metolachlor	ID
Sethoxydim	ID
Trifluralin B	4.4
GENERIC GROUPS OF CHEMICALS	
Surfactants	
Linear alkylbenzene sulfonates (LAS)	280
Alcohol ethoxylated sulfate (AES)	650
Alcohol ethoxylated surfactants (AE)	140
Oils and petroleum hydrocarbons	ID
Oil spill dispersants	
BP 1100X	ID

Chemical	Ecosystem value
Corexit 7664	ID
Corexit 8667	ID
Corexit 9527	ID
Corexit 9550	ID

Notes:

* = *High reliability* figure for esfenvalerate derived from mesocosm NOEC data (no alternative protection levels available).

A = Figure may not protect key test species from acute toxicity (and chronic) – check Section 8.3.7 of the Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000) for spread of data and its significance. 'A' indicates that trigger value > acute toxicity figure; trigger value should be <1/3 of acute figure (Section 8.3.4.4 of the ANZECC Guidelines).

B = Chemicals for which possible bioaccumulation and secondary poisoning effects should be considered (see Sections 8.3.3.4 and 8.3.5.7 of the ANZECC Guidelines).

C = Figure may not protect key test species from chronic toxicity (this refers to experimental chronic figures or geometric mean for species) – check Section 8.3.7 of the ANZECC Guidelines for spread of data and its significance.

ID = Insufficient data to derive a reliable trigger value. Users advised to check if a low reliability value or an ECL is given in Section 8.3.7 of the ANZECC Guidelines for Fresh and Marine Water Quality.

Reference: *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ 2000).

Table V: Trigger values for marine water. Ecosystem value = 95% species protection

Chemical	Ecosystem value
METALS AND METALLOIDS	
Aluminium pH >6.5	ID
Aluminium pH <6.5	ID
Antimony	ID
Arsenic (As III)	ID
Arsenic (AsV)	ID
Beryllium	ID
Bismuth	ID
Boron	ID
Cadmium H	5.5 B, C
Chromium (Cr III) H	27.4
Chromium (CrVI)	4.4
Cobalt	1
Copper H	1.3
Gallium	ID
Iron	ID
Lanthanum	ID
Lead H	4.4
Manganese	ID
Mercury (inorganic) B	0.4 C
Mercury (methyl)	ID
Molybdenum	ID
Nickel H	70 C
Selenium (Total) B	ID
Selenium (SeIV) B	ID
Silver	1.4
Thallium	ID
Tin (inorganic, SnIV)	ID
Tributyltin (as µg/L Sn)	0.006 C
Uranium	ID

Chemical	Ecosystem value
Vanadium	100
Zinc H	15 C
NON-METALLIC INORGANICS	
Ammonia D	910
Chlorine E	ID
Cyanide F	4
Nitrate J	ID
Hydrogen sulfide G	ID
ORGANIC ALCOHOLS	
Ethanol	ID
Ethylene glycol	ID
Isopropyl alcohol	ID
CHLORINATED ALKANES	
Chloromethanes	
Dichloromethane	ID
Chloroform	ID
Carbon tetrachloride	ID
Chloroethanes	
1,2-dichloroethane	ID
1,1,1-trichloroethane	ID
1,1,2-trichloroethane	ID
1,1,2,2-tetrachloroethane	ID
Pentachloroethane	ID
Hexachloroethane B	ID
Chloropropanes	
1,1-dichloropropane	ID
1,2-dichloropropane	ID
1,3-dichloropropane	ID

Chemical	Ecosystem value
CHLORINATED ALKENES	
Chloroethylene	ID
1,1-dichloroethylene	ID
1,1,2-trichloroethylene	ID
1,1,2,2-tetrachloroethylene	ID
3-chloropropene	ID
1,3-dichloropropene	ID
ANILINES	
Aniline	ID
2,4-dichloroaniline	ID
2,5-dichloroaniline	ID
3,4-dichloroaniline	150
3,5-dichloroaniline	ID
Benzidine	ID
Dichlorobenzidine	ID
AROMATIC HYDROCARBONS	
Benzene	700 C
Toluene	ID
Ethylbenzene	ID
o-xylene	ID
m-xylene	ID
p-xylene	ID
m+p-xylene	ID
Cumene	ID
Polycyclic aromatic hydrocarbons	
Naphthalene	70 C
Anthracene B	ID
Phenanthrene B	ID
Fluoranthene B	ID

Chemical	Ecosystem value
Benzo(a)pyrene B	ID
Nitrobenzenes	
Nitrobenzene	ID
1,2-dinitrobenzene	ID
1,3-dinitrobenzene	ID
1,4-dinitrobenzene	ID
1,3,5-trinitrobenzene	ID
1-methoxy-2-nitrobenzene	ID
1-methoxy-4-nitrobenzene	ID
1-chloro-2-nitrobenzene	ID
1-chloro-3-nitrobenzene	ID
1-chloro-4-nitrobenzene	ID
1-chloro-2,4-dinitrobenzene	ID
1,2-dichloro-3-nitrobenzene	ID
1,3-dichloro-5-nitrobenzene	ID
1,4-dichloro-2-nitrobenzene	ID
2,4-dichloro-2-nitrobenzene	ID
1,2,4,5-tetrachloro-3-nitrobenzene	ID
1,5-dichloro-2,4-dinitrobenzene	ID
1,3,5-trichloro-2,4-dinitrobenzene	ID
1-fluoro-4-nitrobenzene	ID

Table V: Trigger values for marine water *continued*. Ecosystem value = 95% species protection

Chemical	Ecosystem value
Nitrotoluenes	
2-nitrotoluene	ID
3-nitrotoluene	ID
4-nitrotoluene	ID
2,3-dinitrotoluene	ID
2,4-dinitrotoluene	ID
2,4,6-trinitrotoluene	ID
1,2-dimethyl-3-nitrobenzene	ID
1,2-dimethyl-4-nitrobenzene	ID
4-chloro-3-nitrotoluene	ID
Chlorobenzenes and chloronaphthalenes	
Monochlorobenzene	ID
1,2-dichlorobenzene	ID
1,3-dichlorobenzene	ID
1,4-dichlorobenzene	ID
1,2,3-trichlorobenzene B	ID
1,2,4-trichlorobenzene B	80
1,3,5-trichlorobenzene B	ID
1,2,3,4-tetrachlorobenzene B	ID
1,2,3,5-tetrachlorobenzene B	ID
1,2,4,5-tetrachlorobenzene B	ID
Pentachlorobenzene B	ID
Hexachlorobenzene B	ID

Chemical	Ecosystem value
1-chloronaphthalene	ID
Polychlorinated biphenyls (PCBs) and dioxins	
Capacitor 21 B	ID
Aroclor 1016 B	ID
Aroclor 1221 B	ID
Aroclor 1232 B	ID
Aroclor 1242 B	ID
Aroclor 1248 B	ID
Aroclor 1254 B	ID
Aroclor 1260 B	ID
Aroclor 1262 B	ID
Aroclor 1268 B	ID
2,3,4'-trichlorobiphenyl B	ID
4,4'-dichlorobiphenyl B	ID
2,2',4,5,5'-pentachloro-1,1'-biphenyl B	ID
2,4,6,2',4',6'-hexachlorobiphenyl B	ID
Total PCBs B	ID
2,3,7,8-TCDD B	ID
PHENOLS and XYLENOLS	
Phenol	400
2,4-dimethylphenol	ID
Nonylphenol	ID
2-chlorophenol T	ID
3-chlorophenol T	ID
4-chlorophenol T	ID

Chemical	Ecosystem value
2,3-dichlorophenol T	ID
2,4-dichlorophenol T	ID
2,5-dichlorophenol T	ID
2,6-dichlorophenol T	ID
3,4-dichlorophenol T	ID
3,5-dichlorophenol T	ID
2,3,4-trichlorophenol T	ID
2,3,5-trichlorophenol T	ID
2,3,6-trichlorophenol T	ID
2,4,5-trichlorophenol T,B	ID
2,4,6-trichlorophenol T,B	ID
2,3,4,5-tetrachlorophenol T,B	ID
2,3,4,6-tetrachlorophenol T,B	ID
2,3,5,6-tetrachlorophenol T,B	ID
Pentachlorophenol T,B	22
Nitrophenols	
2-nitrophenol	ID
3-nitrophenol	ID
4-nitrophenol	ID
2,4-dinitrophenol	ID
2,4,6-trinitrophenol	ID
ORGANIC SULFUR COMPOUNDS	
Carbon disulfide	ID
Isopropyl disulfide	ID
n-propyl sulfide	ID

Chemical	Ecosystem value
Propyl disulfide	ID
Tert-butyl sulfide	ID
Phenyl disulfide	ID
Bis(dimethylthiocarbamyl) sulfide	ID
Bis(diethylthiocarbamyl) disulfide	ID
2-methoxy-4H-1,3,2-benzodioxaphosphorium-2-sulfide	ID
Xanthates	
Potassium amyl xanthate	ID
Potassium ethyl xanthate	ID
Potassium hexyl xanthate	ID
Potassium isopropyl xanthate	ID
Sodium ethyl xanthate	ID
Sodium isobutyl xanthate	ID
Sodium isopropyl xanthate	ID
Sodium sec-butyl xanthate	ID
PHthalates	
Dimethylphthalate	ID
Diethylphthalate	ID
Dibutylphthalate B	ID
Di(2-ethylhexyl) phthalate B	ID
MISCELLANEOUS INDUSTRIAL CHEMICALS	
Acetonitrile	ID
Acrylonitrile	ID

Table V: Trigger values for marine water *continued*. Ecosystem value = 95% species protection

Chemical	Ecosystem value
Poly(acrylonitrile-co-butadiene-costyrene)	250
Dimethylformamide	ID
1,2-diphenylhydrazine	ID
Diphenylnitrosamine	ID
Hexachlorobutadiene	ID
Hexachlorocyclopent a-diene	ID
Isophorone	ID
ORGANOCHLORINE PESTICIDES	
Aldrin B	ID
Chlordane B	ID
DDE B	ID
DDT B	ID
Dicofol B	ID
Dieldrin B	ID
Endosulfan B	0.1
Endosulfan alpha B	ID
Endosulfan beta B	ID
Endrin B	0.008
Heptachlor B	ID
Lindane	ID
Methoxychlor B	ID
Mirex B	ID
Toxaphene B	ID
ORGANOPHOSPHORUS PESTICIDES	
Azinphos methyl	ID
Chlorpyrifos B	0.009
Demeton	ID

Chemical	Ecosystem value
Demeton-S-methyl	ID
Diazinon	ID
Dimethoate	ID
Fenitrothion	ID
Malathion	ID
Parathion	ID
Profenofos B	ID
Temephos B	0.05
CARBAMATE AND OTHER PESTICIDES	
Carbofuran	ID
Methomyl	ID
S-methoprene	ID
PYRETHROIDS	
Deltamethrin	ID
Esfenvalerate	ID
HERBICIDES AND FUNGICIDES	
Bipyridilium herbicides	
Diquat	ID
Paraquat	ID
Phenoxyacetic acid herbicides	
MCPA	ID
2,4-D	ID
2,4,5-T	ID
Sulfonylurea herbicides	
Bensulfuron	ID
Metsulfuron	ID
Thiocarbamate herbicides	
Molinate	ID
Thiobencarb	ID

Chemical	Ecosystem value
Thiram	ID
Triazine herbicides	
Amitrole	ID
Atrazine	ID
Hexazinone	ID
Simazine	ID
Urea herbicides	
Diuron	ID
Tebuthiuron	ID
Miscellaneous herbicides	
Acrolein	ID
Bromacil	ID
Glyphosate	ID
Imazethapyr	ID
Ioxynil	ID
Metolachlor	ID
Sethoxydim	ID
Trifluralin B	ID
GENERIC GROUPS OF CHEMICALS	
Surfactants	
Linear alkylbenzene sulfonates (LAS)	ID
Alcohol ethoxylated sulfate (AES)	ID
Alcohol ethoxylated surfactants (AE)	ID
Oils and petroleum hydrocarbons	ID
Oil spill dispersants	
BP 1100X	ID
Corexit 7664	ID
Corexit 8667	ID

Chemical	Ecosystem value
Corexit 9527	1100
Corexit 9550	ID


Notes:

B = Chemicals for which possible bioaccumulation and secondary poisoning effects should be considered (see Sections 8.3.3.4 and 8.3.5.7 of the ANZECC Guidelines).

C = Figure may not protect key test species from chronic toxicity (this refers to experimental chronic figures or geometric mean for species) – check Section 8.3.7 of the ANZECC Guidelines for spread of data and its significance. **ID** = Insufficient data to derive a reliable trigger value. Users advised to check if a low reliability value or an ECL is given in Section 8.3.7 of the ANZECC Guidelines.

Reference: *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ 2000)

Appendix B: Site contamination notification form

Contaminated Land Notification Form		Department of Environment & Climate Change NSW	
Section 60 of the <i>Contaminated Land Management Act 1997</i>			
This form should be completed by: (a) a person who becomes aware that the person(s) activities in, on or under land have contaminated the land, or (b) an owner of land who becomes aware that the land has been contaminated (whether before or during the owner's ownership of the land).			
1. Where to send completed forms		IMPORTANT TYPE OR PRINT	
Contaminated Sites Department of Environment and Climate Change PO Box A290 SYDNEY SOUTH NSW 1232			
2. Reporter details			
Name:		Telephone Number (business hours):	
		Fax Number (business hours):	
Address:		I am:	
		<input type="checkbox"/> the owner of the site <input type="checkbox"/> the person whose activities have contaminated the land	
3. Site details			
Site or establishment name (if appropriate):		Street address:	
Lot and DP number:		Local Government Area:	
Owner(s):		Occupier(s):	
4. Cause of contamination			
Previous/present activities that caused or could have caused the contamination (where known):			

5. Contamination			
Contaminants of concern:		Source of information on contamination:	
6. What aspects of the environment are affected?		7. Who/what is potentially at risk?	
Tick all that apply:		Tick all that apply:	
<input type="checkbox"/> Air		<input type="checkbox"/> Residents	
<input type="checkbox"/> Groundwater		<input type="checkbox"/> Workers on commercial/ industrial sites	
<input type="checkbox"/> Surface water		<input type="checkbox"/> School/kindergarten children	
<input type="checkbox"/> Sediments		<input type="checkbox"/> Threatened species	
<input type="checkbox"/> Soil		<input type="checkbox"/> Aquatic life	
<input type="checkbox"/> Stormwater		<input type="checkbox"/> Plants	
<input type="checkbox"/> Drinking water catchment		<input type="checkbox"/> Animals	
<input type="checkbox"/> Wetlands		<input type="checkbox"/> Other: (Please specify)	
<input type="checkbox"/> Other: (Please specify)		_____	
_____		_____	

8. Are any other sites affected or at risk?		
<p>Tick appropriate box:</p> <p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes</p> <p>If 'yes' is ticked, indicate which of the matters listed in items 6 and 7 apply to other sites and where those sites are located:</p>		
9. Additional pages attached		
<p>If you have attached additional pages to this notification, indicate the number of pages below. When the notification is certified, the person/s who certify the notification must initial each page attached.</p> <p style="text-align: right;">Number of pages attached: _____</p>		
10. Certification (in the case of a notice lodged by a corporation or a body corporate)		
<p>I/We declare that the information in this form and any accompanying documents is not false or misleading in any material particular.</p>		
<p>Name:</p> <p>Position:</p> <p>Signature:</p> <p>Date:</p>	<p>Name:</p> <p>Position:</p> <p>Signature:</p> <p>Date:</p>	<p>COMMON SEAL AFFIXED IN ACCORDANCE WITH ANY RELEVANT LAWS</p>
11. Signature (in the case of a notice lodged by one or more individuals)		
<p>I/We declare that the information in this form and any accompanying documents is not false or misleading in any material particular.</p>		
<p>Name:</p> <p>Signature:</p> <p>Date:</p>	<p>Name:</p> <p>Signature:</p> <p>Date:</p>	
<p>If the notification is made by one or more individuals, the form must be signed by each individual concerned.</p> <p>If the notification is made by a company, the form must be signed:</p> <ul style="list-style-type: none"> • by affixing the common seal of the company in accordance with the <i>Corporations Act 2001</i>, or • by two directors, or • by a director and a company secretary, or • if a proprietary company that has a sole director who is also the sole company secretary – by that director. <p>If the notification is made by a body corporate, the form must be signed in accordance with any applicable laws.</p> <p>If the notification is made by a local council, the form must be signed:</p> <ul style="list-style-type: none"> • by the general manager in accordance with s. 377 of the <i>Local Government Act 1993</i> ('LG Act'), or • by affixing the seal of the council in a manner authorised under the LG Act. <p>If the notification is made by a public authority other than a local council, the form must be signed:</p> <ul style="list-style-type: none"> • by the chief executive officer of the public authority, or • by a person delegated to sign on the public authority's behalf in accordance with its legislation. (Please note: a copy of the relevant instrument of delegation must be attached to this form.) 		

Appendix C: Assessing sites to determine whether contamination is significant enough to warrant regulation – worked examples

The following are hypothetical examples of sites that DECC may or may not have reason to believe are contaminated. It must be determined whether this contamination is significant enough to warrant regulation under Part 3 Division 2 of the *Contaminated Land Management Act 1997*.

Example 1

Five drums of a mixture of semi-volatile chemicals have spilled onto the soil at an industrial site. The site is situated within a large heavy industrial area, and the soil is a heavy clay. The terrain of the site is flat. The nearest houses are 100 m away, and the nearest creek/watercourse is 120 m away. The groundwater at the site is found to be 20 m below the surface. The site is fenced with security and has strict rules on occupational health and safety.

Soil samples collected demonstrate that the levels of chemicals X, Y and Z are above the relevant thresholds in the soil to a depth of 0.3 m; no further contamination is found below this depth. The groundwater is found to be unaffected by the chemicals of concern. Off-site migration and contamination through stormwater are unlikely, because the site is flat and there are measures in place to stop contaminated stormwater runoff from the site.

DECC assessment

DECC would not consider the contamination of this site to be significant enough to warrant regulation. Although the concentrations of all chemicals are slightly above relevant threshold levels, there is no evidence of, or potential for, offsite migration of contamination. There are no routes of exposure of humans or the environment. The site is still suitable for its current use.

Example 2

DECC receives an inquiry from a farmer's son who has only recently inherited the management of the farm from his father. He is aware from the section 149 certificate under the *Environmental Planning and Assessment Act 1979* that the site has been used for cattle tick dipping.

He has found a report in his father's old records that soil samples collected from the dip demonstrated elevated levels of arsenic and DDT (arsenic 1600 to 7220 mg/kg and DDT 1525 to 3100 mg/kg).

The same records show that the groundwater is at a depth of 5 metres. The site continues to be used as a cattle-tick dip site and is secured with a fence designed to deter public entry. The site is well grassed and the terrain is flat. There are no waterways nearby.

DECC assessment

DECC would not consider the contamination of this site to be significant enough to warrant regulation. Although the site has elevated levels of contamination, there is:

- no evidence of adverse impact on the environment or people
- no public access to the contaminated area

- no evidence of off-site migration and no potential for off-site migration
- no risk of pollution of waterways.

Example 3

Soils at an operating service station are found to be contaminated with petroleum products. The site is located 100 metres from a tidal creek. The soil in the vicinity of the site is sandy.

Leaking underground tanks were removed and replaced 2 years ago. Groundwater on site is between 0.5 and 1.5 metres below the surface and is found to be contaminated with petroleum product. Groundwater samples are collected from on-site and off-site locations. On-site wells show total petroleum hydrocarbon (TPH) concentrations ranging from 7000 to 20,000 µg/L, and benzene, toluene, ethylbenzene and xylene (BTEX) ranging from not-detected to 25,000 µg/L. Off-site wells have TPH concentrations ranging from not detected to 10,000 µg/L and BTEX concentrations from not detected to 8000 µg/L. Water samples from the creek show elevated concentrations of TPHs and BTEX.

DECC assessment

DECC would consider the contamination of this site to be significant enough to warrant regulation, for the following reasons:

Toxicity – human effects. Benzene has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 carcinogen (i.e. a known human carcinogen). IARC has classified both toluene and xylene as Group 3 (i.e. substances that cannot be classified owing to lack of data). Ethyl benzene has not been classified.

Toxicity – environmental effects. *Benzene:* The 95% protection-level trigger value (i.e. 95% of species expected to be protected) for benzene in slightly to moderately disturbed freshwater ecosystems is 950 µg/L (ANZECC & ARMCANZ 2000). *Ethyl benzene:* Trigger values recommended for fish species in slightly to moderately disturbed freshwater ecosystems range from 4.2 to 210 µg/L, and in marine water from 4.3 to 360 µg/L (ANZECC & ARMCANZ 2000). *Toluene:* Trigger values recommended for fish species in slightly to moderately disturbed freshwater ecosystems range from 6.3 to 1180 µg/L, and in marine water from 6.4 to 90 µg/L (ANZECC & ARMCANZ 2000).

Persistence. BTEX and TPHs are generally not regarded as persistent in the open environment. However, benzene is relatively persistent in groundwater.

Bioaccumulative. Ethyl benzene has an octanol–water partitioning coefficient of 3.15; m-xylene and p-xylene have octanol–water partitioning coefficients of 3.20 and 3.15, respectively. Therefore, these compounds are regarded as having the potential to bioaccumulate.

The physico-chemical properties of benzene, toluene and o-xylene do not indicate that these compounds have the potential to bioaccumulate.

Off-site migration of contamination. There is evidence of off-site migration of contamination through groundwater; this migration has the potential to continue unchecked, given the sandy nature of the soil.

Suitability for current or approved use. The off-site migration of contamination has affected the groundwater and the creek, which are considered to be sensitive environments. Therefore, the site is not considered to be suitable for current or approved use.

Example 4

An industrial site, currently used for welding, steel fabrication and vehicle smash repair, is situated within a large industrial area. The site was used as a tannery for a substantial period in the past; this use has caused major site contamination. The northern side of the site is adjacent to a river. On the riverbank, soil is found to contain elevated levels of arsenic (As) ranging from 2000 to 11,500 mg/kg and chromium (Cr) III ranging from 12,000 to 185,000 mg/kg. Groundwater samples collected along the riverbank also contain elevated levels of chromium III. Sampling of the creek, however, does not indicate elevated levels of arsenic or chromium.

DECC assessment

DECC would consider the contamination of this site to be significant enough to warrant regulation, for the following reasons:

Toxicity – human effects. Arsenic is classified as Group 1 under the IARC classification (i.e. it is a known human carcinogen).

Chromium III is classified as Group 3 under the IARC classification (i.e. substances that cannot be classified owing to lack of data).

Toxicity – environmental effects. The As (total) phytotoxicity-based (i.e. toxicity to plants) investigation criterion for soil is 20 mg/kg (NSW DEC 2006). The As (III+) 95% protection-level trigger value for slightly to moderately disturbed freshwater ecosystems is 24 µg/L (ANZECC & ARMCANZ 2000). The As (V+) 95% protection-level trigger value for slightly to moderately disturbed freshwater ecosystems is 13 µg/L (ANZECC & ARMCANZ 2000).

The Cr (III+) phytotoxicity-based investigation criterion for soil is 400 mg/kg (NSW EPA 1998). Cr (III+) chronic toxicity occurs in freshwater from 66 µg/L (ANZECC 2000).

Persistence. Both arsenic and chromium are elements and are persistent in the environment.

Bioaccumulative. Arsenic is not considered bioaccumulative. Chromium can bioaccumulate in aquatic organisms by factors of between 100 and 1000 (ANZECC & ARMCANZ 2000).

Off-site migration of contamination. There is evidence of chromium migration off this site through groundwater, and there is potential for both arsenic and chromium to migrate off site through soil erosion to the river.

Suitability of the site for its current or approved use. The site is not considered to be suitable for its current use. The Human Health Investigation Level (NSW DEC 2006) of arsenic for an industrial site is 500 mg/kg, and the levels detected were well above this. Moreover, groundwater samples collected along the riverbank contained elevated levels of chromium III.