

Table 5-A - Soil Investigation Levels (mg/kg)

Substances	Health Investigation Levels (HILs)						Ecological Investigation Levels (EILs)		Background Ranges ⁶
	A ¹	B ²	C ³	D	E	F	REIL ⁴	Interim Urban ⁵	
METALS/METALLOIDS									
Arsenic (total)	100			400	200	500		20	1 - 50
Barium								300	100 - 3000
Beryllium	20			80	40	100			
Cadmium	20			80	40	100		3	1
Chromium (III)	12%			48%	24%	60%		400	
Chromium (VI)	100			400	200	500		1	
Chromium (Total) ^{*7}									5 - 1000
Cobalt	100			400	200	500			1 - 40
Copper	1000			4000	2000	5000		100	2 - 100
Lead	300			1200	600	1500		600	2 - 200
Manganese	1500			6000	3000	7500		500	850
Methyl mercury	10			40	20	50			
Mercury (inorganic)	15			60	30	75		1	0.03
Nickel	600			2400	600	3000		60	5 - 500
Vanadium								50	20 - 500
Zinc	7000			28000	14000	35000		200	10 - 300
ORGANICS									
Aldrin + Dieldrin	10			40	20	50			
Chlordane	50			200	100	250			
DDT + DDD + DDE	200			800	400	1000			
Heptachlor	10			40	20	50			
Polycyclic aromatic hydrocarbons (PAHs)	20			80	40	100			
Benzo(a)pyrene	1			4	2	5			
Phenol	8500			34000	17000	42500			
PCBs (Total)	10			40	20	50			
Petroleum Hydrocarbon Components (constituents):									
• >C16 - C35 Aromatics ⁸	90			360	180	450			
• >C16 - C35 Aliphatics	5600			22400	11200	28000			
• >C35 Aliphatics	56000			224000	112000	280000			
OTHER									
Boron	3000			12000	6000	15000			
Cyanides (Complexed)	500			2000	1000	2500			
Cyanides (free)	250			1000	500	1250			
Phosphorus								2000	
Sulfur								600	
Sulfate ⁹								2000	

¹ Human exposure settings based on land use have been established for HILs (see Taylor and Langley 1998). These are:

- A. 'Standard' residential with garden/accessible soil (home-grown produce contributing less than 10% of vegetable and fruit intake; no poultry): this category includes children's day-care centres, kindergartens, preschools and primary schools.
- B. Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake) and/or poultry providing any egg or poultry meat dietary intake.
- C. Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake); poultry excluded.
- D. Residential with minimal opportunities for soil access: includes dwellings with fully and permanently paved yard space such as high-rise apartments and flats.
- E. Parks, recreational open space and playing fields: includes secondary schools.
- F. Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites.

² Site and contaminant specific: on site sampling is the preferred approach for estimating poultry and plant uptake. Exposure estimates may then be compared to the relevant ADIs, PTWIs and GDs.

³ Site and contaminant specific: on site sampling is the preferred approach for estimating plant uptake. Exposure estimates may then be compared to the relevant ADIs, PTWIs and GDs.

⁴ These will be developed for regional areas by jurisdictions as required.

⁵ Interim EILs for the urban setting are based on considerations of phytotoxicity, ANZECC B levels, and soil survey data from urban residential properties in four Australian capital cities.

⁶ Background ranges, where HILs or EILs are set, are taken from the Field Geologist's Manual, compiled by D A Berkman, Third Edition 1989. Publisher - The Australasian Institute of Mining & Metallurgy. This publication contains information on a more extensive list of soil elements than is included in this Table. Another source of information is Contaminated Sites Monograph No. 4: Trace Element Concentrations in Soils from Rural & Urban Areas of Australia, 1995. South Australian Health Commission.

⁷ Valence state not distinguished - expected as Cr (III).

⁸ The carbon number is an 'equivalent carbon number' based on a method that standardises according to boiling point. It is a method used by some analytical laboratories to report carbon numbers for chemicals evaluated on a boiling point GC column.

⁹ For protection of built structures.

Table 5-B
Groundwater Investigation Levels

SETTING ¹⁰	Aquatic Ecosystems ¹¹		Drinking Water	Agricultural ⁹	
	Marine Waters µg/L	Fresh Waters µg/L	Health ¹⁰ / Aesthetic ¹¹ mg/L	Irrigation (mg/L)	Livestock (mg/L)
METALS/METALLOIDS					
Aluminium		<5 (if pH <6.5) <100 (if pH >6.5)	(0.2)	5.0	5.0
Antimony		30	0.003		
Arsenic (total)	50.0	50	0.007	0.1	0.5
Barium			0.7		
Beryllium		4		0.1	0.1
Boron			0.3	0.5-6.0	5.0
Cadmium	2.0	0.2-2.0	0.002	0.01	0.01
Chromium (Total)	50.0	10		1.0	
Chromium (VI)			0.05	0.1	1.0
Cobalt				0.05	1.0
Copper	5.0	2.0-5.0	2.0 (1.0)	0.2	0.5
Iron		1000	(0.3)	1.0	
Lead	5.0	1.0-5.0	0.01	0.2	0.1
Lithium				2.5	
Manganese			0.5 (0.1)	2.0	
Mercury (total)	0.1	0.1	0.001	0.002	0.002
Molybdenum			0.05	0.01	0.01
Nickel	15.0	15.0-150.0	0.02	0.02	1.0
Selenium	70.0	5.0	0.01	0.02	0.02
Silver	1.0	0.1	0.1		
Thallium	20.0	4.0			
Tin (tributyltin)	0.002	0.008			
Vanadium				0.1	0.1
Zinc	50.0	5.0-50.0	(3.0)	2.0	20.0
ORGANICS					
1,2-dichloroethane			0.003		
Benzo(a)pyrene			0.00001		
Carbon tetrachloride			0.003		
Chlorobenzene			0.3 (0.01)		
Dichloromethane (methylene chloride)			0.004		
Ethylbenzene			0.3 (0.003)		
Ethylenediamine tetracetic acid (EDTA)			0.25		
Hexachlorobutadiene	0.3	0.1	0.0007		

¹⁰ Levels for recreational and industrial uses have not been set. For guidance on Recreational levels, see NHMRC/ARMCANZ, 1996. For recreational uses, toxic substances should, in general, not exceed the concentrations given for drinking water. For guidance on Industrial levels, see ANZECC, 1992. Industrial settings include: generic processes, hydro-electric power generation, textiles, chemical and allied industries, food and beverage, iron and steel, tanning and leather, pulp and paper, petroleum.

¹¹ Taken from Australian Water Quality Guidelines for Fresh and Marine Waters (AWQG) (ANZECC 1992)

SETTING ¹⁰	Aquatic Ecosystems ¹¹		Drinking Water	Agricultural ⁹	
	Marine Waters µg/L	Fresh Waters µg/L	Health ¹⁰ / Aesthetic ¹¹ mg/L	Irrigation (mg/L)	Livestock (mg/L)
ORGANICS (cont.)					
Monocyclic aromatic compounds					
Benzene	300.0	300.0	0.001		
Chlorinated benzenes		0.007-15.0 ¹²			
Chlorinated phenols	0.2-8.0	0.05-18.0 ¹³	0.04-1.5		
Phenol	50.0	50.0			
Toluene		300.0	0.8 (0.025)		
Xylene			0.6 (0.02)		
Pesticides	Footnote ¹⁴	Footnote ¹⁵	Footnote ¹⁶		See guidelines for raw water for drinking water supply (AWQG, ANZECC 1992)
Aldrin	10.0 ng/L	10.0 ng/L	0.0003		
Chlordane	4.0 ng/L	4.0 ng/L	0.001		
DDT	1.0 ng/L	1.0 ng/L	0.02		
Dieldrin	2.0 ng/L	2.0 ng/L	0.0003		
Heptachlor	10.0 ng/L	10.0 ng/L	0.0003		
Phthalate esters					
di-n-butylphthalate		4.0			
di(2-ethylhexyl)phthalate		0.6			
other phthalate esters		0.2			
Polyaromatic hydrocarbons					
Polychlorinated biphenyls	0.004	0.001			
Polycyclic aromatic hydrocarbons	3.0	3.0			
Styrene (vinylbenzene)			0.03 (0.004)		
Tetrachloroethene			0.05		
Trichlorobenzenes (total)			0.03 (0.005)		
Vinyl chloride			0.0003		
OTHER					
Calcium					1,000.0
Chloride			(250.0)	30.0 700.0 ¹⁷	
Cyanide	5	0.005	0.08		
Fluoride			1.5	1.0	2.0
Nitrate-N			50.0		30.0
Nitrite-N			3.0		10.0
AESTHETIC PARAMETERS					
Colour and clarity	< 10% change in euphotic depth	< 10% change in euphotic depth			

¹² See table 2.8, p.2-49 AWQG (ANZECC 1992) for further information¹³ See table 2.9, p.2-50 AWQG (ANZECC 1992) for further information¹⁴ See table 2.10 also, p.2-55 (ANZECC 1992) for further information¹⁵ See table 2.10 also, p.2-55 (ANZECC 1992) for further information¹⁶ See table on p32 (Guidelines for Pesticides), p32 (NHMRC/ARMCANZ 1996)¹⁷ Maximum chloride concentration should be set according to the sensitivity of the crop. For further information. (See Tables 5.1, 5.2, 5.3, 5.4, ANZECC 1992)