



Australian Government

Department of the Environment  
and Water Resources

# Lead and compounds

## Rank 11 of 90 substances

The National Pollutant Inventory (NPI) provides information on the types and quantities of substances being emitted into the Australian environment, and holds data on reported sources of lead and compounds emissions in Australia.

This fact sheet provides information about lead and compounds. It describes how you might be exposed to this substance, how exposure might affect you and the environment, its common uses, and its physical and chemical properties.

For more information on the terms used in this fact sheet, see the glossary on the NPI web site:  
[http://www.npi.gov.au/epg/npi/contextual\\_info/glossary.html](http://www.npi.gov.au/epg/npi/contextual_info/glossary.html)

### Health effects

#### What effect might lead and compounds have on my health?

Lead can affect almost every organ and system in the body. Lead toxicity mostly affects the nervous system. Exposure to lead may also cause paralysis in fingers, wrists or ankles. Lead exposure can also cause small increases in blood pressure and may cause anaemia, malnutrition, abdominal pain and colic. High levels of lead can severely damage the brain and kidneys in adults and may cause death.

In pregnant women, exposure to high levels of lead may cause miscarriage. In men, exposure may affect sperm production. Lead can affect a child's mental and physical growth. Unborn children can be exposed through their mothers. Harmful effects include premature birth, smaller babies, decreased mental ability in the infant, learning difficulties and reduced growth in young children. Some effects may persist beyond childhood.

#### How might lead and compounds enter my body?

Lead can enter the body by inhalation or ingestion.

#### How might I be exposed to lead and compounds?

Exposure to lead can occur by breathing air or drinking water that contains lead. Water pipes in some older buildings may contain lead solder. Lead based paints deteriorate leaving lead in the dust that can be inhaled. Children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

You may be exposed to lead as a result of your work where lead is used or engaging in hobbies where lead dust may be used, such as working with stained glass.

#### What are the lead and compounds health guidelines?

##### Workplace exposure

Currently, the eight-hour time weighted average (TWA) exposure limits are 0.15 milligrams tetramethyl lead per cubic metre of air, 0.1 milligram tetraethyl lead per cubic metre of air, 0.15 milligrams lead arsenate per cubic metre of air, 0.15 milligrams of lead (inorganic dusts and fumes) per cubic metre of air and 0.05 milligrams of lead chromate per cubic metre of air. Consult your state or territory occupational health and safety agency for current sources of information.

fact sheet





Australian Government

Department of the Environment  
and Water Resources

# fact sheet

## Lead and compounds

### Australian drinking water guidelines

In 2004, the National Health and Medical Research Council (NHMRC) and the National Resource Management Ministerial Council (NRMMC) established the following guideline for acceptable water quality:

Based on health considerations, the concentration should not exceed 0.01 milligrams of lead per litre of drinking water.

### Environmental effects

#### What effect might lead and compounds have on the environment?

Lead occurs naturally in the environment. Lead itself does not decompose, however lead compounds are changed by sunlight, air and water. Lead usually adheres to the soil. Movement to groundwater will depend on the type of lead compound and characteristics of the soil. Over time, lead accumulates in living tissues (a process called bioaccumulation) and is persistent in water.

As with humans, exposure to lead can lead to death of animals, birds or fish and death or low growth rate in plants. In soft water, lead is highly poisonous to plants, birds or land animals, long term effects on animal life are shortened lifespan, reproductive problems, lower fertility and changes in appearance or behavior. As lead bioaccumulates, it is expected that fish tissues will contain lead from polluted waters.

#### How might lead and compounds enter the environment?

Lead occurs naturally in the earth's crust. It is also found in combined form in several minerals: galena, anglesite, pyromorphite and mimetite.

Lead may be released as particles into the atmosphere or as dissolved compounds in water. Lead is also released from natural sources such as windblown dusts and forest fires.

Lead usually attaches to particles of organic matter, clay, soil or sand.

#### Where in the environment do lead and compounds end up?

Lead, as the element, does not break down in the environment. Lead compounds are affected by sunlight, air or water. If released to the air from industry or from burning fossil fuels or waste, lead may remain airborne for approximately 10 days. Most lead released to air, water, sediment, and soil strongly attaches to other particles, and may remain there for many years.

#### What are the lead and compounds environmental guidelines?

The following ambient air quality standards were established a maximum of 0.50 micrograms of lead per cubic metre of air, averaged over one year, no exceedances allowed. Lead sampling must be carried out for a period of 24 hours at least every sixth day. Measurement of lead must be carried out on Total Suspended Particles (TSP) or its equivalent.

In 2000, the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) established trigger levels of 1.0-9.4 micrograms of lead per litre of fresh water and 2.2-12 micrograms of lead per litre of marine water.

### Common uses

Lead is used in the production of batteries, ammunition, metal products (solder, pipes, fishing weights, electronics and alloys with other metals) and devices to shield X-rays. Tetraethyl lead is used to make other lead compounds (tetra-alkyl lead) and was used in leaded fuels. Lead compounds are used in the





Australian Government

Department of the Environment  
and Water Resources

# fact sheet

## Lead and compounds

manufacturing of electronic parts, plastics, rubbers and metals. Lead is used in pigments, dyes, paints and coatings. Lead compounds are used in the manufacture of matches, ammunition, fireworks, explosives, pottery glazes, ceramics, brake shoes, flame retardants for plastics and as catalysts for industrial production and epoxy curing agents.

### Sources

#### Industry sources

Mining and metal manufacturing are the largest sources of lead emissions in Australia. Water supply, sewerage and draining surfaces, oil and gas extraction and electricity supply can also emit lead. Lead is also emitted as a result of coal mining, cement, lime, plaster and concrete product manufacture, ceramic product manufacturing, transport equipment manufacturing, iron and steel manufacturing, petroleum and coal product manufacturing. Other manufacturing industries where lead may be used include: beverages and malt, paper and paper products, glass and glass products, fabricated and structural metal products, motor vehicles and parts, wood products, ceramic products, food and beverage products, textile, yarn and woven fabrics.

#### Diffuse sources

Paved roads, windblown dust, burning fuels or wildfires, solid and liquid fuel combustion, lawn mowing and barbeques (from burning fuel) are all capable of causing emissions of lead.

#### Natural sources

Lead and compounds occurs naturally in the earth's crust in rocks and soil.

#### Transport sources

Lead emissions may be present from the vehicle exhaust of cars, aeroplanes, railway operations and from recreational and commercial shipping or boating.

#### Consumer products that may contain lead and compounds

Lead and compounds are used in a range of applications. Lead is used in the production of batteries, ammunition, metal products (solder and pipes) and devices to shield X-rays. Lead was present in petroleum, paints and ceramic products, caulking and pipe solder, however due to health concerns, it is now prohibited to include lead in these products.

### Comparison to other substances

#### NPI rank

Currently, the NPI considers 90 substances for reporting purposes.

Lead and compounds was ranked 11 of the 90 substances (rank 1 being the highest perceived risk). The total hazard score taking into account both human health and environmental criteria is 3.2 (on a scale of 0-6).

Factors taken into account to obtain this ranking and these scores include the extent of the material's toxic or poisonous nature, the measure of its ability to remain active in the environment and whether it accumulates in living organisms. It does not take into account exposure to the substance.

For further information about the ranking process, please see our Technical Advisory Panel report: <http://www.npi.gov.au/publications/tap/pubs/npi-tap-report.pdf>





Australian Government

Department of the Environment and Water Resources

# fact sheet

## Lead and compounds

### Lead and compounds

Total hazard score: 3.2

NPI Rank: 11

### Arsenic and compounds

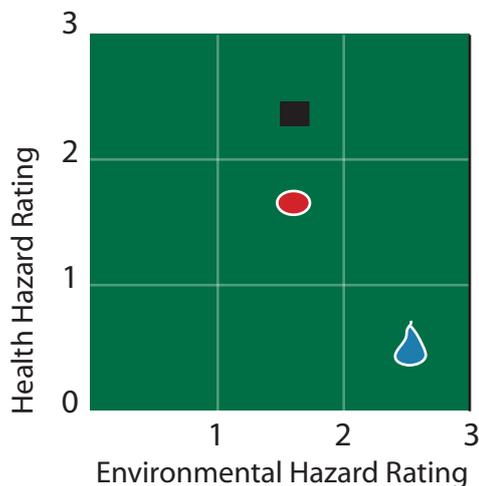
Total hazard score: 4.0

NPI Rank: 10

### Total phosphorus (in solution)

Total hazard score: 3.0

NPI Rank: 27



## Physical and chemical properties

<b>Substance name</b>	Lead
<b>CAS number</b>	7439-72-1
<b>Molecular formula</b>	Pb

### Physical properties

Lead: a soft bluish-white silvery grey metallic solid. It tarnishes on exposure to air. It is very soft and malleable, easily melted, cast, rolled and extruded.

Melting point (°C): 327.43

Density (water = 1): 11.34

Boiling point (°C): 1740

### Chemical properties

Lead can be attacked by pure water and weak organic acids in the presence of oxygen. It is resistant to tap water, hydrofluoric acid, brine and solvents. Lead reacts with hot nitric acid, boiling sulfuric or hydrochloric acids.

Lead compounds: the physical and chemical properties of lead compounds are varied. Specific properties may be found in the references listed at the end of this fact sheet.

## Sources used in preparing this factsheet

- Agency for Toxic Substances and Disease Registry (ASTDR), ToxFAQs: Lead, accessed February 2007.
- Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000), Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, The Guidelines, accessed June 2007.
- Merck and Co. 2006, Merck Index, 14th Edition, USA.
- National Health and Medical Research Council (NHMRC) and the National Resource Management Ministerial Council (NRMMC) (2004), Australian Drinking Water Guidelines 6, accessed February 2007.
- National Pollutant Inventory (1999), Contextual Information.
- Office of the Australian Safety and Compensation Council, Exposure Standards: Lead, accessed February 2007.
- Technical Advisory Panel 1999, Final Report to the National Environment Protection Council.

Other information that may be useful in understanding some of the issues surrounding the NPI can be found on our web site: <http://www.npi.gov.au/index.html>.

