



Background Information & Glossary

for Teachers



Formation Of Broken Hill and History Of Mining

Broken Hill was founded in 1883 by boundary rider Charles Rasp, who was patrolling the Mount Gipps station fences when he discovered what he thought was tin on an isolated 'broken hill', but the samples proved to be silver and lead. The orebody they came from proved to be the largest and richest deposits of silver, lead and zinc in the world – now known as the Line of Lode.

Rasp and his fellow station hands David James and James Poole pegged out the original mining lease in September 1883. These and four other men - George McCulloch, Philip Charley, George Urquhart and George Lind – now known as the Syndicate of Seven, formed the first mining company in Broken Hill in 1885, Broken Hill Proprietary Company Limited (BHP).

By 1915 BHP had realised that its ore reserves were limited and begun to diversify into steel production. Mining at the BHP mines at Broken Hill ceased 28 February 1939. BHP was not the only mining operation at Broken Hill though, and from this time mining continued at the southern and northern ends of the Line of Lode.

Up until the 1940s, mining was done by hand tools with high labor usage rates and included horse-drawn carts underground. The advent of diesel-powered mining equipment in the late 1940s and the move toward mechanised underground mining resulted in less labor used per tonne of ore recovered, and the mine workforce declined significantly.

Low metal prices into the 1990s led to the failure of the remaining mining lease operator Pasminco. Perilya Limited purchased the lease in June 2002, and with the recent resurgence in metal prices as well as increased production and new estimates on the life of existing ore reserves - based on exploration works - both Perilya and CBH Resources (RaspMine / old BHP lease), have plans to expand their operations and are profitable businesses – employing more than 500 locals in mining operations. The mining industry generated over \$400 million in 2012, this accounted for almost half of the city's gross regional product.

Broken Hill itself was listed on the National Heritage List in 2015 and remains Australia's longest running mining town. After more than 130 years of mining in Broken Hill, the 7.5km-long, 1.6km-deep Line of Lode - which runs through the town bisecting Broken Hill and South Broken Hill - has yielded over 300 million tonnes of ore. This is enough to fill more than 1,500 Sydney Opera House concert halls and generated over \$100 billion.

Mine Safety Over The Years

For most of Broken Hill's mining history, it has been a very dangerous profession. In the late 1800s, safety in the mines was the sole responsibility of the workers themselves. As a result, miners put up with terrible conditions, toiling away by lamplight with hammer and chisel, and being exposed to toxic levels of lead dust and fumes. Many died of miners' phthisis or lead poisoning. Accidents were common and often resulted in death; over the years, more than 800 miners have lost their lives on the job. Today, their legacy is commemorated at the Miners Memorial that stands on top of the Line of Lode.

This memorial is a telling reminder of why Broken Hill pioneered a culture of trade unionism, including the introduction of the 35-hour working week and the defeat of conscription in Australia. In 1890, almost every worker on the Line of Lode belonged to a union like the giant Amalgamated Miners' Association, once one of the most powerful unions in Australia. Massive attempts were made to improve working conditions, including a large strike in 1892.

The conditions that led to these events were a far cry from today's modern, safety-first mining methods, including: personal protective equipment; stringent workplace health and safety practices; the use of high-tech extraction machines and huge dump trucks; and cement-lined underground roads.

Local mining companies are now also bound by strict license regulations regarding their operations including managing, monitoring and reporting on their dust emissions.

Why Is There A Lead Problem In Broken Hill?

Lead is a metal that has been mined in Broken Hill since 1883. Our dry climate means that lead dust from past and present mining activities has been deposited and accumulated across the Broken Hill environment over 130 years. Lead can be found in the dust, dirt, and soil in and around homes and buildings and on public land – like parks, schools and playgrounds.

Lead can also be found in old lead paint, especially in homes and buildings built before the 1970's. This can be dangerous if it is in disrepair or starts to break down – for example when it chips off around windows and doors. Old paint can flake off in large pieces or break down into smaller chips or dust. These dangers increase during renovations when old paint is disturbed or removed from walls and other surfaces in and around homes and buildings. Children should stay away from flaking and chipping old lead paint and tell an adult immediately.

How Does Lead Get Into Our Body?

Ingestion (through our mouth via hand-to-mouth activities) is the main way that lead gets into our bodies in Broken Hill. Inhalation (when we breathe) and absorption (through our skin) are significantly less likely as the lead particles are usually too big – lead particles must be very fine or fumes to get into our body this way. Inhalation and absorption are most likely for people who work with lead – that's why they wear personal protective equipment and have stringent workplace, health and safety practices

98% Ingestion

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- ▶ Dirty hands
 - ▶ Rainwater from tanks
 - ▶ Unwashed food
 - ▶ Unwashed toys
 - ▶ Household dust
 - ▶ Dust, dirt and soil
 - ▶ Old flaking and chipping lead paint
 - ▶ Old lead paint dust

1% Inhalation

- 
- ▶ Household dust
 - ▶ Dust, dirt and soil
 - ▶ Old lead paint fumes
 - ▶ Old lead paint dust

1% Absorption

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- ▶ Through dirty hands, skin and hair
 - ▶ From mother's blood across the placenta to an unborn baby

Health Effects

Lead does not belong in the human body. When it gets into our bodies, it builds up and makes us sick. Lead can be harmful to people of all ages, but the risk is highest for unborn babies, infants and young children (under five years of age). Lead can harm kids' brain development, which may cause behaviour and learning problems that can last a lifetime.

- Pregnant women pass lead to their unborn babies through their blood. In pregnant women, high levels of exposure may cause decreased birth weight or miscarriage.
- Small children are more likely than adults and older children to swallow small amounts of lead, as they put things in their mouths, touch and crawl on dusty surfaces indoors and outdoors, and touch their mouths more often.
- Children also absorb a higher proportion of lead than adults as their bodies and brains are growing and changing constantly.
- If adults and children swallow the same amount of lead, about five times more is absorbed into the body by children.

Once in the lungs or stomach, lead is absorbed into the bloodstream and is distributed to the liver, kidneys, lungs, brain, spleen, muscles, and heart, and can be stored in bones and teeth. Lead that has been stored in bones and teeth can be released many years after exposure.

Health effects as a result of lead exposure differ greatly between individuals. Things such as a person's age, the amount of lead the person is exposed to, whether the exposure is over a short-term or a longer period, and the presence of other health conditions, will influence the individual symptoms or health effects. For example, an adult exposed to lead in the workplace over several years may show different symptoms and health effects than a child exposed over a short period, even if both have the same blood lead level detected on a blood test.

In Broken Hill, free annual blood lead tests are offered to all children under five years of age. In the test, the child's finger is pricked with a needle to get a very small blood sample. If a child has a blood lead level of five micrograms of lead per decilitre of blood or above, it means the child has been exposed to levels of lead that are above normal background environmental lead exposure. Help will be offered by local health services to identify the sources of lead exposure and try to reduce it. People who work on mine sites in Broken Hill regularly have their blood lead levels tested by their employer to ensure they are not being exposed to lead in the workplace above acceptable levels.

Top tips to be LeadSmart to reduce lead exposure and prevent lead harm

1. 98% of lead gets into our body through hand to mouth activities. This means regular handwashing is the best way to keep lead out of our bodies. Kids should always wash their hands after playing outside or playing with pets, and before eating.
2. Eating a healthy diet means your body will absorb less lead. A healthy diet has lots of iron, vitamin C and calcium.

Iron

- Meats such as beef, lamb, pork and kangaroo
- Poultry such as chicken and turkey
- Fish such as sardines, salmon and tuna
- Wholegrain bread
- Iron rich breakfast cereals
- Baked beans, dried peas, beans, lentils
- Green leafy vegetables
- Dried fruit, eggs and peanut butter.

Vitamin C

- Eating foods high in vitamin C at the same time as iron rich foods helps your body absorb more iron
- Foods high in vitamin C include:
 - Citrus and tropical fruits
 - Berries
 - Vegetables

Calcium

Dairy foods are the best sources of calcium. Everyone needs two or three serves of dairy every day. Low fat dairy foods are best for anyone over the age of two.

One serve of calcium is:

- A cup of milk or calcium enriched soy milk
- A small tub of yoghurt
- Two slices of cheese

3. Regular, small, healthy snacks are important – a belly full of healthy food protects kids from lead harm.
4. Breakfast is the most important meal of the day. A child who doesn't eat breakfast can absorb up to seven times more lead than a child who does eat breakfast.
5. Leave shoes, work boots and work clothes outside, as they may have come into contact with lead dust in dirt and soil
6. Rainwater from water tanks looks and smells like clean water but can still contain lead that has landed on roofs and in gutters. Avoid drinking it or using it to prepare or cook food.
7. Dust, dirt and bare soil are the biggest sources of lead exposure for kids outside. Cover these areas by planting grass or adding mulch, bark or astroturf. A sandpit that can be covered when not in use is a great LeadSmart play area for kids.
8. Old paint can be very high in lead. If children see old flaking or chipped paint in and around their home they should tell an adult immediately. This risk should be removed or repaired as safely and as quickly as possible.

For more tips on how to be LeadSmart in and around homes and across the Broken Hill community, visit the [CleanSmart](#), [StartSmart](#), [BuildSmart](#), [LiveSmart](#), [WorkSmart](#) and [EatSmart](#) pages of the [LeadSmart](#) website.

Term	Definition	Term	Definition
Mining	The activity of digging something out of the earth.	Excavation	The activity of hollowing out areas underground to prepare for mining.
Ore	A naturally occurring rock material that contains important / economically viable metals that can be extracted from the earth through mining.	Extraction	The activity of removing a material from the ground.
Line of Lode	A 7.5-kilometre-long, 1.5-kilometre-deep lead-zinc-silver ore deposit in the ground that dissects Broken Hill. It is where mining companies have been operating since the commencement of Broken Hill in 1883. The Line of Lode Miners' Memorial and Visitors Centre situated in the middle of the Line of Lode is the location of the first "broken hill" discovered by Charles Rasp and the site of the first open cut mine.	Stopes	Underground areas which are excavated ready for mining.
Lead	A naturally occurring metal that is found in the earth's crust as ore. Lead is toxic – it does not belong in the human body. Lead is found in the Line of Lode ore deposit that has been mined in Broken Hill since 1883.	Flotation	The process where ground up lead ore is mixed with air, water and chemicals to become lead concentrate.
Zinc	A naturally occurring metal that is found in the earth's crust as ore. Zinc is not a poison, in fact it is called an "essential trace element" as small amounts are essential for human health. Zinc is found in the Line of Lode ore deposit that has been mined in Broken Hill since 1883.	Concentrate / concentrated ore	The material remaining after the ore has been through flotation and separated from the waste rock and dirt.
Silver	A naturally occurring precious metal that is found in the earth's crust as ore. Silver is non-toxic. Silver is found in the Line of Lode ore deposit that has been mined in Broken Hill since 1883.	Smelter	A place for the production of lead and other metals- where lead concentrate / concentrated lead ore is treated through heating and melting to get the metal from the ore.

Term	Definition	Term	Definition
Lead dust	Tiny pieces of lead resulting from mining operations or when old lead-based paint is flaking or chipping or disturbed during renovations. It travels in the air and is deposited in dust, dirt and soil in and around homes and across Broken Hill.	Molten lead	The liquid version of lead metal.
Exposure	Having no protection from something harmful.	Ingot	A bar-shaped, solid block of lead.
Ingestion	Where a substance enters our body through our mouths.	Strategies	Ways you can protect yourself from lead harm.
Inhalation	When a substance enters our body when we breathe.	Machinery	A collection of equipment used for a purpose.
Absorption	When a substance enters our body through our skin.	BHP	Acronym for Broken Hill Proprietary Company Limited- later renamed BHP Billiton, now one of the largest mining companies in the world.
Fumes	A gas or vapour that is dangerous to breathe.	Lead poisoning	A condition where too much lead gets into a person's body through inhalation, ingestion or absorption.
Vitamin C	An important vitamin your body needs every day. It is needed to keep your bones, teeth and blood vessels strong and healthy. It can also reduce the amount of lead absorbed into the body by helping the body absorb more iron. Vitamin C can be found in foods such as vegetables, tomatoes, berries and citrus fruits.	Strike	A period of time where workers refuse to work in order to bring awareness to their needs by another party.
Iron	An essential mineral that your body needs to keep blood moving around your body efficiently. It can also reduce the amount of lead absorbed into the body and help remove it from the body. It is found in foods such as red meat, fish, chicken, turkey, green leafy vegetables, beans and lentils and whole grain foods.	Botanist	A plant scientist. Albert Morris was the botanist who developed the Regeneration Reserve in Broken Hill in a bid to combat prevailing windy, dry and dusty conditions. Native trees and shrubs were planted to act as a barrier to wind and trap dust to prevent it travelling over the residential areas in Broken Hill.

Term	Definition	Term	Definition
Calcium	A mineral in your body which is essential for strong, healthy teeth and bones and is also important for keeping your heart healthy. It can also reduce the amount of lead absorbed into the body and help remove it from the body. The main source of Calcium is dairy foods such as milk, cheese and yoghurt.	CBH	Acronym for Consolidated Broken Hill Rasp Mine. One of the biggest and newest mines in Broken Hill.
Spleen	Located in the upper far left of the abdomen, it acts as a filter for blood as part of the immune system.	LeadSmart	Ensuring you follow all the strategies necessary to help protect yourself (and others) from lead harm.
Kidneys	Two bean-shaped organs located at the back of the abdominal cavity on each side of the spinal column. They separate waste from the fluid in the body and make our urine.		
Diagnosis	The identification of an illness or state of being, by properly examining symptoms.		