See page 6 – Minerals Downunder Teacher Guide (2002) - Activity 4a

Types of Mining - Expert Table

How to Jigsaw Information

1. Divide the class into 'Home Groups' of five for the five different types of mining described in the Minerals Downunder Student Information Book
2. Allocate each 'Home Group' member a different type of mining. (refer pages 2-6 below).
3. Members of each 'Home Group' then go to their 'Expert Group.'
4. Each 'Expert Group' investigates the type of mining it has been allocated.
5. Each member of the 'Expert Groups' completes the following table to take back to their 'Home Group".
6. Students return to 'Home Groups' to share their 'Expert' information using the jigsaw matrix.

Type of mining	
Explanation of process	
Where used	
Minerals mined in this way	
Environmental Issues	

See page 6 – Minerals Downunder Teacher Guide (2002) - Activity 4a – text - P2

Information for 'Expert Groups' - Mining Australia's Minerals -

Open-cut Mining – 'Expert Group' 1

Open-cut mining is usually carried out when the ore body is less than 200 metres below the surface. The open-cut mine is mined downward in benches or steps which slope in towards the centre of the pit. Ore and the surrounding waste rock are mined at the same time and separated later.

Explosives are used to break up the ore which is then scooped up by front-end loaders or large electric shovels, loaded into giant trucks and taken to a crusher. Waste material is place in large piles and later covered with soil and revegetated.

Mining continues until the pit becomes too deep and therefore too expensive or too difficult to mine by this method.

Iron ore is usually mined in this way.

See page 6 – Minerals Downunder Teacher Guide (2002) - Activity 4a –text - P3

Information for 'Expert Groups' - Mining Australia's Minerals

Strip Mining – 'Expert Group' 2

Strip mining is conducted where ore bodies are located close to the Earth's surface. First the vegetation on the selected area is cleared and the valuable topsoil is removed and stored. Overburden, which is overlying soil and rock, is then removed in wide long, narrow trench called a 'box cut' is dug to remove the ore.

While the ore from the first area is being mined, the draglines remove the overburden from a second parallel cut. These draglines have a boom length of up to 80 metres and a large bucket able to lift 100 tonnes of rock material at a time.

Once all the ore has been mined from the first cut the overburden and topsoil are replaced and the area is replanted with vegetation. The mine then advances in a series of parallel strips until it is no longer cost effective to continue operation.

Coal and bauxite are often mined this way.

See page 6 – Minerals Downunder Teacher Guide (2002) - Activity 4a – text – P4

Information for 'Expert Groups' - Mining Australia's Minerals

Dredge Mining – 'Expert Group' 3

Some materials are mined using a dredge which floats on the top of a large body of water. This type of mining is carried out along some of the beach and sand dune systems of Australia's coastline where heavy mineral sands are found.

The dredge moves slowly through the water and draws up material, mostly sand, from the bottom. Once on the dredge, the heavier minerals are easily separated from the lighter sand grains (quartz). The minerals, about 1%, are pumped ashore where they are separated from each other, while the sand, about 99%, is pumped straight back onto the beach or dune system.

The sand is then shaped to match the way it was before mining commenced. It is then covered with topsoil and revegetated.

Ilmenite, rutile, zircon and monazite are the heavy minerals mined this way.

See page 6 – Minerals Downunder Teacher Guide (2002) - Activity 4a – text – P5

Information for 'Expert Groups' - Mining Australia's Minerals

Underground Mining – 'Expert Group' 4

Underground mining is used when an ore body is too deep beneath the Earth's surface or where the use of the land on the surface is such that surface mining is not appropriate. Access to these underground deposits is by vertical shafts or by a sloping tunnel called a 'decline'.

Large machinery is often taken underground in pieces and assembled in the work area.

All underground mines have ventilation systems which continually circulate fresh air for the people working there.

One efficient way of mining coal underground is by 'longwall' mining. This is when mechanised shearers advance along the face of a block or seam of coal which can be up to 250 metres wide. The shearers cut off the coal in slices. The coal is then transported to the surface by conveyor belts. The roof over the area where the coal is being removed is held up by hydraulic powered supports which automatically move along as the coal is removed. The roof of the mined area is then allowed to collapse as the equipment moves forward.

Another method of underground mining involves blasting hard rock and ore from large openings known as 'stopes'. The mined material is brought to the surface in trucks or hoisted up a shaft in large containers called 'skips'. To protect workers from cave-ins, the roofs and walls of these underground workings are supported by various methods including rock bolts, cable dowels, steel straps and steel mesh.

Minerals which contain metals are mined this way.

See page 6 – Minerals Downunder Teacher Guide (2002) -Activity 4a text – P6

Information for 'Expert Groups' - Mining Australia's Minerals

In Situ Leaching – 'Expert Group' 5

The in situ leaching mining process is used when ore exists in aquifers and can be mined by drilling bores into the orebody. The water from the aquifer is then treated with chemicals which produces a mining solution called 'leachate'. This leachate is then circulated through the aquifer. As it passes through the orebody it dissolves the valuable mineral. At the surface the mineral is removed from the leachate. Once the mineral has been extracted, the leachate is circulated through the orebody again, repeating the process, until no more of the mineral can be removed.

In situ leaching requires a field containing a well and a small processing plant and is essentially a safe, controllable water pumping activity.

In situ leaching has been used successfully overseas for the past 25 years to mine a whole range of different ores. This method of mining is now being introudced in Australian and will be used even more in the future. In situ leaching has less impact on the environment than open-cut or underground mining.

Uranium, iron and copper are sometimes mined this way.