

EXPLORING MINING IN QUEENSLAND: PAST, PRESENT AND FUTURE



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Mining has been vital to the development of Queensland with the establishment of inland towns and cities as well as jobs and providing billions of dollars in export earnings. The department has played a central role in the industry by providing a number of services. These include promoting the State's potential, assisting in land access negotiations, developing geological data, managing safety and health standards and encouraging environmental best practice. NR&M also manages leasing, permits and royalties, assists with investment opportunities and improves safety through scientific research.

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OVERVIEW

Exploring Mining in Queensland: Past, Present and Future provides middle and upper primary school students with opportunities to explore past, present and future mining activities in Queensland. The material is organised around key concepts and outcomes from the Years 1-10 Queensland *Studies of Society and Environment (SOSE) Syllabus*.

RELATIONSHIP WITH STUDIES OF SOCIETY AND ENVIRONMENT (SOSE) SYLLABUS

Teaching and learning activities in this resource have been designed to enhance student understanding of six of the SOSE key concepts. They provide opportunities for students to demonstrate the outcomes associated with these concepts at levels two, three and four. The three strands and six key concepts examined are:

Time, Continuity and Change

- People and Contributions
- Cause and Effect

Place and Space

- Human and Environment Relationships
- Processes and Environments

Systems, Resources and Power

- Interactions between Ecological and Other Systems
- Economy and Business.

STRUCTURE

This resource is divided into six chapters, each focusing on one of the above key concepts from the syllabus. Each of the sections has:

- An explanation of teaching and learning activities
- Resource sheets.

The teacher explanation section includes focus questions, outcome statements from the SOSE syllabus, a list of resource sheets, a brief description of the teaching and learning activities and teaching procedures.

The resource kit contains 30 activities in total. Each section describes between four and six teaching and

learning activities. Three of these relate directly to the outcome for that key concept at each of the three levels. The remainder of the activities in each chapter provides opportunities to further explore the concept without tying them to a specific level or outcome. In some instances there are strong links between activities in different sections. As a result, some activities are best completed following others. Where this is desirable, it is noted in the teaching procedure section.

The resource sheets may be copied for classroom use. Each section has between nine and 13 resource sheets, some of which include multiple pages. These have been written at different levels to cater for a range of abilities.

LEVELS

The material has been written for students operating at levels two, three and four. These levels commonly span the range of conceptual development of students in middle and upper primary school. Because each of the six key concepts is examined at three levels, teachers can cover similar content with all students in their class irrespective of their level of conceptual development. In most cases, general activities can be completed with all students. After this, teachers can provide students working at different levels with an appropriate activity (at level two, three or four) to demonstrate their understanding of the concept.

OUTCOMES

Exploring Mining in Queensland - Past, Present and Future provides teaching and learning activities that address 18 SOSE outcomes. These outcomes are drawn from three of the four SOSE strands. For each of the six key concepts examined in this resource, there is an activity at levels two, three and four. (The first numeral of each outcome indicates the level of that outcome. The second numeral indicates the number of the key concept.) For example, the activity entitled Exploring Changes provides an opportunity for students to demonstrate an understanding of people and contributions at level two. (People and Contributions is the third of five key concepts in the Time, Continuity and Change strand). The following table lists the activities that specifically address each of the 18 outcomes covered in this resource.

SOSE Strands	SOSE Key Concepts	SOSE Outcomes	Activities for Students to Demonstrate Outcomes
Time, Continuity and Change (TCC)	People and Contributions		Chapter 1
		2.3	Exploring Changes (Activity C)
		3.3	Imagining and Designing the Future (Activity D)
	Cause and Effect	4.3	Understanding Experiences (Activity E)
			Chapter 2
		2.4	Matching Cause and Effect (Activity C)
Place and Space (PS)	Human and Environment Relationships	3.4	Exploring Consequences (Activity D)
		4.4	Considering Perspectives (Activity E)
			Chapter 3
		2.1	Travelling around the State (Activity C)
	Processes and Environments	3.1	Exploring Mining Communities Across Time and Space (Activity D)
		4.1	Researching the Mining Process (Activity F)
			Chapter 4
		2.2	Predicting Consequences (Activity B)
Systems, Resources & Power (SRP)	Interactions between Ecological and Other Systems	3.2	Examining Decision-making (Activity C)
		4.2	Comparing Evidence and Predicting Consequences (Activity D)
			Chapter 5
		2.1	Looking at Computers and the Environment (Activity C)
	Economy and Business	3.1	Identifying Human Impacts on the Water Cycle (Activity D)
		4.1	Mapping Global Connections (Activity E)
			Chapter 6
		2.2	Creating a Product Picture (Activity B)
		3.2	Interviewing for Mining Jobs (Activity D)
		4.2	Planning a Project (Activity E)

ASSESSMENT

It must be stressed that the activities in this resource do not, on their own, provide enough information for decisions about students' demonstrations of outcomes to be made. Activities stating a particular outcome at the top of an activity/resource sheet may be used in conjunction with other assessment pieces to gather information about students and make decisions regarding their demonstrations of outcomes.

CHAPTER 1

THE MINERALS INDUSTRY OVER TIME

STRAND TIME CONTINUITY & CHANGE
KEY CONCEPT PEOPLE AND CONTRIBUTIONS

INDEX

THE MINERALS INDUSTRY OVER TIME

FOCUS QUESTIONS

- Who are some of the people that have been part of Queensland's mining history?
- What contributions have they made to Queensland's communities and how have they contributed to change?
- What can we learn from the experiences of others?
- What might the mining industry be like in the future?

SOSE OUTCOMES

- TCC 2.3 Students cooperatively evaluate how people have contributed to changes in the local environment.
- TCC 3.3 Students use knowledge of peoples' contributions in Australia's past to cooperatively develop visions of preferred futures.
- TCC 4.3 Students share empathetic responses to contributions that diverse individuals and groups have made to Australian or global history.

RESOURCE SHEETS

- 1 Message from the Past
- 2 Old Newspaper Clippings
- 3 Stories of Pioneers
- 4 How People Change Things (OHT)
- 5 Mineral Exploration Over Time
- 6 Probable and Preferred Futures Timeline (OHT)
- 7 Amazing and Possible
- 8 Designing the Future
- 9 Sample Journal Entry (OHT)

TEACHING & LEARNING ACTIVITIES

THE MINERALS INDUSTRY OVER TIME

ACTIVITY A UNEARTHING THE PAST

Students 'discover' an old tin containing part of an old letter and some curious artifacts and begin to imagine the life of an old-time miner.

Purpose

- To engage students' curiosity in activities of the past and invite them to imagine the life of a miner in colonial Queensland.

Teaching Procedure

- Arrange for students to 'discover' an old tin or leather satchel containing Resource 1, *Message from the Past*, and Resource 2, *Old Newspaper Clippings*. Photocopy Resource 1 and 2 onto parchment-like paper and crumple and/or singe it to create an aged look. Add a couple of interesting rocks, an old bottle, an old tobacco tin, etc. Alternatively, have the contents sent to the school in a package from someone who 'found them in their back shed'.
- Working in small groups, give students time to examine the contents. Ask them to respond to a number of questions, such as:
 - What was the owner of the objects involved in? Give reasons for your conclusions.
 - Where and when do you think the owner lived/worked? Why do you think that?
- Invite groups to share their conclusions with the class.

ACTIVITY B DISCOVERING PIONEERS

Using the expert jigsaw process, students read the stories of some pioneers of the mining industry in Queensland.

Purpose

- To introduce students to some of the many different groups of people who participated in the mining industry in Queensland over the years.

Teaching Procedure

- Make three copies of each story in Resource 3, *Stories of Pioneers*.
- Invite students to divide themselves into eight groups of three. Number these groups from one to eight.
- Give each group (of three) copies of one of the eight stories in Resource 3, eg group one gets the geologist story, group two gets the Aboriginal story etc.
- Students in each group read their story making sure they understand it. They can do this by asking the teacher any necessary questions of clarification. Students underline what they consider to be the most important information.

- Move students into three groups of eight with each new group having a person from each original group of three.
- Each student briefly describes to their group (of eight) what their story is about, using their underlined information as a focus. The groups of eight build up a picture of colonial mining pioneers and present it in a visual form such as a concept map. The groups then present their representation to the other two groups.

TEACHING NOTE: This activity is designed for a group of 24, however it can easily be adapted for more or fewer students. A range of sources have been utilised to suit the different reading needs of students. Some sheets can be deleted. You may prefer to start with six or seven groups of four, or five groups of five or six depending on numbers and reading abilities.

Also, many places around Queensland are mentioned in the stories. You may like to have students locate these on a blank state map. Alternatively, students might like to highlight the seven locations mentioned which are also labeled on Resource 2, *Queensland cities and towns* a map found in Chapter 3.

ACTIVITY C EXPLORING CHANGES

Using summaries of the stories from Activity B, students consider how pioneers in the mining industry contributed to change in Queensland.



This task can be used to demonstrate outcome TCC 2.3.

Purpose

- To explore the ways that some of the participants in the mining industry contributed to changes in Queensland.

Teaching Procedure

- Revisit Resource 3, *Stories of Pioneers*, from Activity B and invite students to consider the changes to which these pioneers contributed.
- Create an overhead transparency (OHT) of Resource 4, *How People Change Things*, and together go through the directions and discuss the examples on the first page. Turning to the second page, complete the first row of the table. Each sentence refers to a story in Resource 3, so re-read if students don't recall them.
- Provide students with their own copies of Resource 4 and ask them to complete the bottom table.
- Invite students to share their responses with a partner.

ACTIVITY D IMAGINING AND DESIGNING THE FUTURE

Students read about mineral exploration, mining and manufacturing processes and develop probable and preferred futures.



This task can be used to demonstrate outcome TCC 3.3.

Purpose

- To provide students with an opportunity to imagine the future of mining.

Teaching Procedure

- Provide students with a copy of Resource 5, *Mineral Exploration Over Time*, to read.
- Make an OHT of Resource 6, *Preferred Futures Timeline*, and explain the concept of probable and preferred futures. Invite students to draw their own timeline listing events in the past and present sections

after a discussion of these. Students then go on to complete the probable and preferred sections drawing on their reading and research from prior activities.

- Completed timelines can be displayed in the classroom or library, then added to student folios.
- Provide students with a copy of Resource 7, *Amazing and Possible*, to read.
- Invite students to use the ideas in readings in Resources 5 and 7 to imagine a product or process (material, machine, device) that would enable us to extract and use the minerals we need with as little disturbance to the environment as possible.
- Provide students with a copy of Resource 8, *Designing the Future*, and invite students to consider:
 - In which part(s) of the mining process will it operate eg exploration, mining, processing, rehabilitation;
 - The environment in which the imagined product/process will operate eg underwater, underground, in desert/forested areas, in outer space, in a factory;
 - How it might copy nature, eg so that it doesn't require a lot of energy.
- Invite students to draw and label their work on the sheet provided, describing briefly how each part of their design functions.
- Students share their completed designs with the class and, if desired, a wider audience.

ACTIVITY E UNDERSTANDING EXPERIENCES

Students choose a character from one of the groups of pioneers from Activity B and write a letter home or a journal entry describing an experience they had mining, including difficulties and/or successes. Alternatively, students plan and complete a collage representing the difficulties and successes of one of these pioneer groups.



This task can be used to demonstrate outcome TCC 4.3.

Purpose

- To provide students with an opportunity to empathise with the experiences of people who have been engaged in the mining industry in Queensland.

Teaching Procedure

- Students re-read the pioneer stories from Activity B, choose one of the groups and create and name a character from that group. Students may wish to research this group further.
- Make an OHT of Resource 9, *Sample Journal Entry*, to show students an example of a journal entry.
- Invite students to write a letter home or a journal entry describing an experience their character has had mining in Queensland. The entry or letter could include a recount of their difficulties and/or successes in the mines. Students publish their recounts/letters/diary entries in a class book using fonts and graphic effects to 'age' their work.
- Alternatively, students may respond by creating a collage that illustrates the struggles and triumphs of a particular individual or group. Collages can combine text, photos, drawings, materials of different textures, paint, crayon and other media. Ask students to list the feelings and ideas they want to reflect or evoke, eg for a digger on a 19th century goldfield: physical hardship, loss, love, loneliness, poverty, hope, mateship, joy, wealth, relief, prosperity, luck. Invite students to consider images, textures and colours that reflect these ideas and feelings. Students label and display their work.

MESSAGE FROM THE PAST

RESOURCE 1

12th day of March, 1898

Dear Brother,

I have made an amazing discovery but am afraid to tell anyone about it. I do not have much time. There are many men who would try to rob me of my inheritance. Please come as quickly as you can as I need your help. When you get into town, go straight to the Grand Hotel. Turn to face due west and walk for five and one half miles. You will see a very large gum tree with pale, smooth bark. Dig on the southern side of the tree. Here you will find further instructions which will lead you to my camp. These instructions include a riddle from our childhood that only you will understand. If I am not at my camp, I may have met with foul play. If this happens - do not delay. Take the tin from under the black stone at my camp and return to Brisbane as you may also be in danger. Make haste my dear brother and bring with you whatever provisions you have time to collect. We will make our fortune together.

Yours faithfully,
Jeremiah Hathaway

OLD NEWSPAPER CLIPPINGS

RESOURCE 2



[ABOVE] Prospectors' Old Workings

The Copper Mines and Mineral Fields of Queensland.

NOBEL'S
GLASGOW
EXPLOSIVES COMPANY LTD.

Dynamite Gelignite
Blasting Gelatine
Gelatine Dynamite
"Thistle" Brand
Detonators
"Sporting Ballistite"
(New Smokeless Powder)
"Thistle" Brand
Safety Fuse
Electric Detonator
Fuses, Batteries,
Cables, &c.

AGENTS FOR QUEENSLAND

Brabant & Co.,
BRISBANE.

ARMSTRONG, LEDLIE, & STILLMAN,

General Merchants, Commission,
Mining, and Forwarding Agents.

BRANCHES:

Herberton, Irvinebank, Mount Garnet,
Coolgarra, Nymbool, Newelton, and
Gurrumba.

AGENCIES:

United Fire and Marine Insurance Co.; Cedar Creek Timber Co.;
Ruberoid; Irvinebank Mining Company.

SPECIALITY: MINING SUPPLIES. CORRESPONDENCE INVITED.

STORIES OF PIONEERS

RESOURCE 3

GEOLOGISTS

In 1868, the Queensland Government appointed its first government geologists. Their task was to identify and map areas where valuable minerals could be found in order to expand the economy of the State. Christopher D'Olyly Hale Alpin became the geologist for the Southern District of Queensland and Richard Daintree for the Northern District. Both men had studied in England and were members of the Geological Survey of Victoria before moving to Queensland. They were given an annual salary of 800 pounds sterling.

Richard Daintree arrived in Victoria from England in 1852 and took a job as assistant surveyor with the Victorian Government. In 1863, bored with filling out forms, he took a three month leave of absence to visit the new colony of Queensland. He explored and prospected from Moreton Bay to the Upper Burdekin in the north of the colony. He reported that gold could be found in the Fanning River and found fossil corals in the limestone about 110km from the Lower Burdekin River Crossing. He also found prehistoric Diprotodon bones. Over the years, he collected many fossil and mineral specimens and took many photographs. When he left his job as geologist in 1871, he donated his large collection to the Government to exhibit at the London Exhibition of Art

and Industry. Unfortunately his collection was lost when in 1872 the ship carrying it to England, the Queen of the Thames, sank off the South African coast.

Other noted geologists worked for the Geological Survey of Queensland after Alpin and Daintree. Among these were Augustus C. Gregory, Robert Logan Jack and William Henry Rands. The Geological Survey of Queensland is still operating today. It is now part of the Department of Natural Resources and Mines.

Adapted from Queensland Government Mining Journal, May 1993, published by The Queensland Department of Minerals and Energy, Brisbane



STORIES OF PIONEERS

RESOURCE 3

ABORIGINAL PEOPLE

Aboriginal people are widely recognised as Australia's first miners having mined for ochres of red, white and black pigment for thousands of years. Manganese dioxide was a source of black pigment for painting while kaolin was a source of white pigment.

Aboriginal people made a number of mineral discoveries in the early days of the colony. Often Aboriginal men and women travelled with European explorers and prospectors to help them to find mineral deposits. Sometimes Aboriginal people were employed to work in the mines.

- Ernest Henry, explorer, prospector, miner and pastoralist was led to copper outcrops by Aboriginal guides on a number of occasions. In 1880, a Kalkadoon man showed Ernest Henry where, 'big fella copper sat down'. The Kalkadoon name for the place was Yamamillah, which Henry changed to Argylla. Henry bought the land (from the Government) and employed some men from the Kalkadoon clan to break the ore and build roads.
- In the early days of the Hodgkinson goldrush, an Aboriginal woman picked up a piece of quartz on the bank of Explorer Creek at Thornborough. It had 1866 grams of gold in it!
- Jupiter Mosman, the 10 year old Aboriginal companion of Hugh Mosman, found gold at Charters Towers in 1871. This led to one of Queensland's major gold rushes. Gold is still mined in Charters Towers today.
- An Aboriginal man known as King found gold at Mount Emu on the Flinders River in 1909. He was given the name King as he was the son of an elder of the clan. He was taken to Mount Emu by the Thompson family and grew up there.
- Pluto, an Aboriginal man from the Rockhampton area, and his wife Kitty both prospected and made significant gold finds in 1910 and 1922 in the Wenlock area.

As the colony of Queensland grew and expanded, conflict between Aboriginal people and settlers developed. Some Aborigines were driven off their land or killed by settlers and soldiers as mines, farms and towns spread across the State.

- In 1872 European and Chinese miners came in their thousands to the Palmer River in north Queensland to try and find gold. As a result, the local Aboriginal people were unable to access their water supply and violent conflict between the groups developed. Many Aborigines and miners were killed.

In other instances close relationships between Aboriginal and non-Aboriginal people developed.

- Christie Palmerston was a legendary prospector and explorer in the far north whose great friend and guide from 1877 to 1882 was Pompo, a local Aboriginal man. When Pompo died, Palmerston buried him in the old Herberton cemetery.
- Mount Romeo, a rich tin deposit, was found by and named after Romeo, the Aboriginal companion and guide of prospector Bill Baird. Later in 1892, up on Retreat Creek, a tributary of the Wenlock River, Baird found gold. While Baird was working a gully he was speared to death by local Aborigines. Romeo came galloping up two minutes too late to save him. Mad with grief Romeo rode into the bush with rifle and ammunition to take revenge. He was never seen again.

Sources

Blainey, G., 1960, *Mines in the Spinefex: The Story of Mt Isa Mines*, Angus and Robertson, Sydney

Hooper, C., 1993, *Angor to Zillmanton: Stories of North Queensland's Deserted Towns*, Townsville



STORIES OF PIONEERS

RESOURCE 3

THE CHINESE

The Queensland gold rushes brought the first mass immigration of non-Europeans to Queensland. At first, the Chinese came from the southern goldfields in Victoria and later directly from southern China. By the late 1870s nearly 20,000 Chinese people were living and working in mining communities in north Queensland. Many were poor farmers from Kwangtung Province sent to the goldfields by wealthy Chinese merchants. Most of the gold they found was sent back to China to pay for their journey, help poor relatives and pay their wealthy employers.

The European miners did not understand the culture of Chinese immigrants and they were often treated poorly. There were a number of riots where the Chinese were smoked out of their mines, beaten and killed. Growing jealousy at their mining successes, fear of their cultural differences and growing numbers led to laws which were aimed at limiting the numbers of Chinese in Australia. The 1877 *Chinese Immigrants Regulation Act* imposed a tax on all Chinese entering Australia. This did not deter the Chinese immigrants however. They just landed their ships at places away from authorities to avoid paying the toll.

The Palmer goldfield, in particular, has many artifacts of early Chinese mining and lifestyle. As well as mining, the Chinese carted goods and ore, set up stores, planted market gardens and cooked food in mining towns and camps. Early records list a

market garden and hut at Dog Leg Creek in 1883, owned by Ah Yow. This site can still be seen today. Other remaining sites include Chinese ovens, water races, mine shafts, temples, shrines and grave sites. Most of these are in ruins but there are some still standing. One of these is the Hou Wang Miao Temple built in Atherton in 1903. It was built using iron and steel and had Chinese murals painted along the tops of the walls. In 1980 a local businessman, John Fong On, donated the temple and the land beside it to the National Trust of Queensland.

Most of the Chinese who remained after the gold rushes had to find different types of work. They worked on farms, cleared scrub, became cooks and waiters, ran laundries, made furniture, and became merchants and shop keepers. Perhaps more than anything else they became market gardeners. Many country towns would have had few or no fresh vegetables if it hadn't been for the work of the Chinese market gardeners.

Sources

Hooper, C., 1993, Angor to Zillmanton: Stories of North Queensland's Deserted Towns, Townsville

http://www.att.virtualclassroom.org/vc98/vc_09/attchineseimm.html

Thomas, J., 1999, Gold Rushes, Franklin Watts Australia, Sydney



STORIES OF PIONEERS

RESOURCE 3

WOMEN



On the Goldfields

When the gold rushes began, thousands of men left their families to find gold. Many people thought that respectable women could not handle the rough conditions. Most women stayed at home with their children but it wasn't long before some women began arriving on the goldfields. Many of these worked side by side with their husbands and families. There were a few women who worked independently as gold diggers, and unlike the men, they did not need to buy a licence. Women on the goldfields also worked as domestic servants, storekeepers, dress makers and shoe binders. They lived in cramped conditions in tents and fresh clean water was often difficult to get. For most women on the goldfields daily life revolved around washing, ironing and cooking as well as making candles, butter, jams, bread, soap, mending and making clothes for their family. Women usually had to face childbirth without any trained help. Many women and babies died during or shortly after childbirth. Diseases such as whooping cough, measles, diphtheria and scarlet fever were common on the goldfields. Despite the hardships faced by women, their arrival often contributed to the end of disorganised, dirty tent towns and the establishment of flourishing towns.

In a Tin Mining Town

Koorboora was a mining town in the Chillagoe district (west of Cairns) with a population of between 300-500 people when its tin mine was in full operation. The battery manager's wife was Mrs William Waddell. Her life in the mining town in 1904 was described by her daughter.

'Infant in arms and with small tired children Mother faced the roughest of conditions. The lean-to kitchen had two iron bars over an open fire for cooking, a gypsy cauldron swung on a hook for heating water and bread was baked in a camp oven and water was short. The difficulties to be overcome by a pioneer wife were legion. Ants swarmed in her kitchen and over the set table. All food had to be kept in safes with legs standing in tins of kerosene. Flying ants and beetles surrounded the kerosene lamps. Dingoes took the young goats, goannas the hens' eggs, native cats slaughtered poultry, hawks the young chickens, snakes invaded the house when the rains came and a rainwater tank tainted by a dead frog could mean disaster.'

Sources

Hooper, C., 1993, Angor to Zillmanton: Stories of North Queensland's Deserted Towns, Townsville

Nicholson, J., 1994, Gold!, Allen and Unwin, Sydney

<http://www.sovereignhill.austasis.net/education/women.htm>

STORIES OF PIONEERS

RESOURCE 3

ACCIDENT AND RESCUE TEAMS

In the early days, diggers usually helped each other when they were injured during a mining accident. If a married digger was killed, a collection was often taken up for his widow and children.

- In 1887 at the Just-in-Time mine near Northcote, Frank Blackmore was setting charges of dynamite when some of it exploded and he was badly injured. Miners made up a stretcher so they could carry him to the hospital in Herberton. It was the wet season so they had to travel the 80km on foot. About 40 miners took turns carrying him shoulder height across the boggy country. They had to cross the flooded Walsh River three times and climb up mountains and down into gorges to get there. Finally, within sight of Herberton, Frank died from his injuries.

Later, when most miners worked for companies, some were trained in search and rescue techniques. After an accident the teams would search for survivors and bring dead bodies to the surface.

Today, working in the Queensland mining industry is much safer. All large mines have rescue teams. Teams are highly skilled and training is taken very seriously. These teams participate in mines rescue competitions to help workers see the value of safe mining practices. In competitions, exercises include events such as underground rescue, fire fighting, search and rescue, rope rescue, road rescue, breathing apparatus, first aid and endurance events.

Sources

Hooper, C., 1993, Angor to Zillmanton: Stories of North Queensland's Deserted Towns, Townsville

Queensland Government Mining and Energy Journal, October 2000, Vol. 101, No 1187, Department of Mines and Energy, Queensland Government, Brisbane



STORIES OF PIONEERS

RESOURCE 3

INVESTORS AND COMPANIES



With so many people looking for minerals (especially gold) it didn't take long before the minerals that were on the surface and easy to find (such as alluvial gold) had been removed. As the work became harder, groups of miners worked together to dig shallow mine shafts. After a while even those miners came up empty handed. The minerals they wanted were further underground and mines had to be dug much deeper. The miners could not afford the equipment they needed and were forced to sell their claims to companies. Investors provided the money to buy pumps, drills and other equipment needed to continue mining. Some miners decided to work for a salary with these companies.

- In 1882, Tom and Edward Morgan discovered an ironstone mountain near Rockhampton rich in gold. They bought 260 hectares of private land on the mountain and pegged claims on all the public land around the mountain. Mount Morgan was the first Australian goldfield to be entirely controlled by one company. They mined lots of gold and became very rich. After a while they sold the mine to the Hall brothers and William Knox D'arcy. D'arcy became the richest man in Australia at the time because beneath the gold was an even bigger fortune in copper. D'arcy used the fortune he made at Mount Morgan to discover the Arabian oil fields and he became a founder of British Petroleum (BP).
- In 1923, John Campbell Miles pegged mining leases on the western bank of the Leichhardt

River and named his find Mount Isa. To begin with, the rich silver-lead ores were handpicked and sent to a treatment works more than 1,500 km away. It cost so much to transport the minerals that it became clear that only large-scale mining would make any money. Douglas MacGillivray, a Cloncurry storekeeper, bought up leases and asked William Corbould, who had managed mining projects around the world, to help him set up a public company. Corbould hurried to Sydney and registered Mount Isa Mines Limited. Then he bought out any remaining leases and convinced the Queensland Government to extend the railway from Duchess to Mount Isa to provide a direct rail link with the port of Townsville. (It took four years to build the track, which was very controversial, because the Government ministers who approved the scheme had shares in Mount Isa companies). Corbould then began searching for investors to pay for the development of the mines and a treatment plant. A lot of money had to be spent before the mine could make any money.

Sources

Chaput, D., and Kennedy, K.H., 1992, *The Man from ASARCO: The Life and Times of Julius Kruttschnitt*, The Australasian Institute of Mining and Metallurgy, Melbourne

Coupe, R., 2000, *Australia's Gold Rushes*, New Holland Publishers, Sydney

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STORIES OF PIONEERS

RESOURCE 3

THE 'DIGGERS'

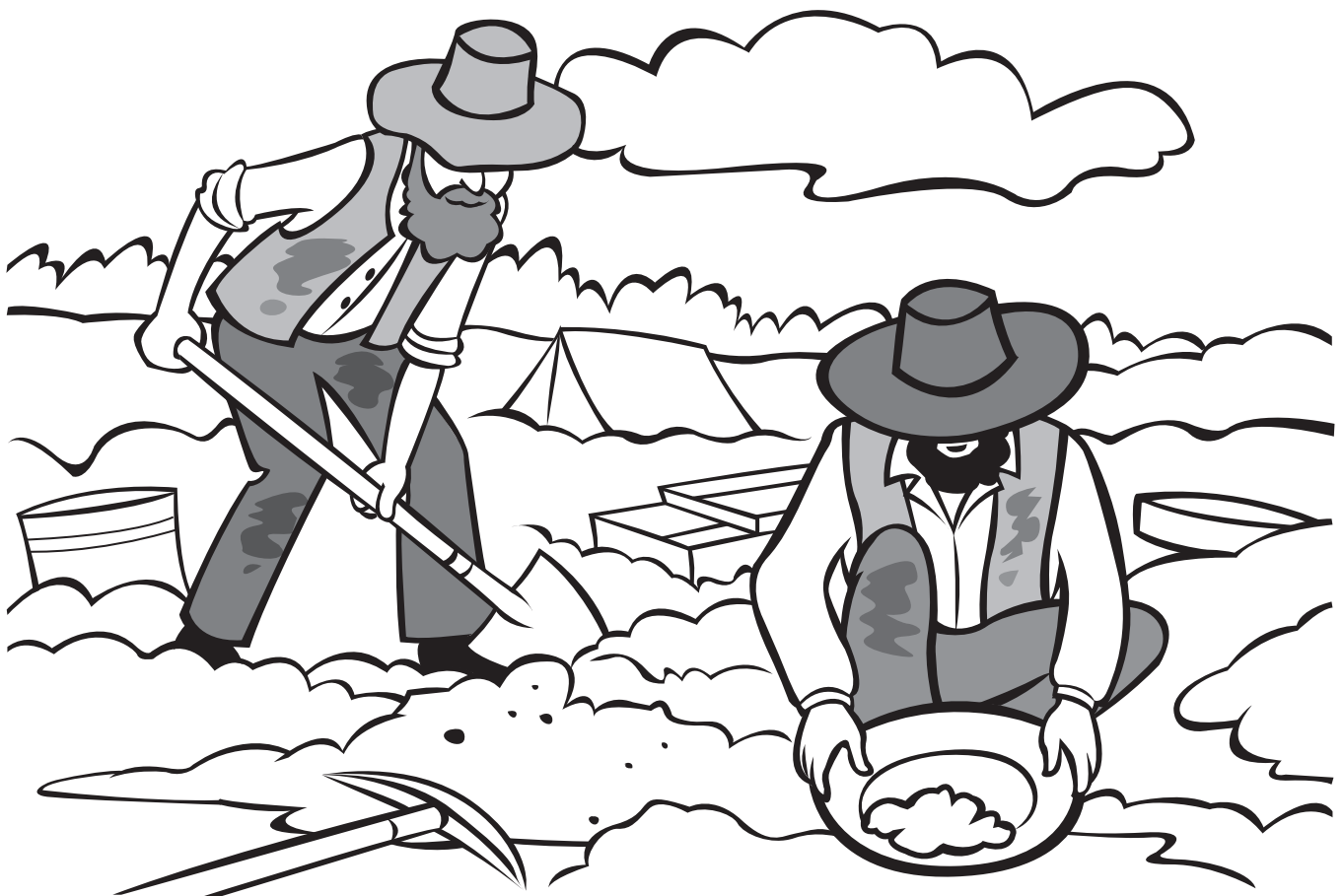
In the rush for gold in Queensland, many men left their jobs and headed for the diggings. At first these men came from Queensland towns including Brisbane. Many men also came from Victoria and New South Wales. When news spread to England, many skilled tin and coal miners from Cornwall, Scotland and Wales sailed for Australia. A few diggers, as they were called, became rich quickly but most remained poor.

The diggers suffered great hardships such as sun, dust, rain, cold and heat that made them tired and sick. They lived in tents or shanty huts made from canvas, wood and bark. Food and other goods had to be brought in by cart and were very expensive.

Although life on the goldfields was difficult, the diggers still found time for entertainment. Horse racing and fighting were popular. In the evenings the diggers would often sit around campfires and play songs and tell stories.

When World War 1 started in 1914, many diggers joined the army to fight for Australia. Australian soldiers became known as diggers because so many of them had been miners before the war.

Source <http://www.sovereignhill.austasia.net/education/gf-life.htm>



STORIES OF PIONEERS

RESOURCE 3

BUSHRANGERS

The gold rushes also brought bushrangers to Queensland. Most were small-time criminals who thought they could get rich by stealing gold rather than working hard to dig it out of the ground. They held up people on lonely roads near the goldfields, taking their possessions, money and gold. Others were professional criminals, working in organised gangs, who robbed banks in gold towns and the gold escorts that transported gold from the diggings to large towns and cities. There are many bushranging stories from Queensland's gold rush days.

- At Norwood, west of Charters Towers, on 18 August, 1868, James Elliot, James Howard and George Hughes were put on trial for bushranging and stealing from Ah Hing Gin Woo. They stole 170 pounds sterling in 5 pound notes, 10 ounces of gold, two watches, a nugget of gold and a revolver. All three had painted their faces black.
- James "Alpen" McPherson, the 'Wild Scotsman', had a reputation as a bit of a Robin Hood, giving to the needy and being polite to women. After escaping many attempts by the police to capture him he was finally caught near Mackay and was sent to the gaol at St Helena. One story says that he made cabbage tree hats there - so well they were sold by a Brisbane store under the "Wild Scotsman" label costing between two and 20 pounds each.
- Frank Gardiner, one of Australia's most notorious bushrangers, was a cattle thief and sold stolen meat to diggers. After masterminding a spectacular gold robbery near Forbes in New South Wales in 1862, he fled to Queensland to escape the law. He settled at Appis Creek, about 100km north-west of Rockhampton. After living there for 18 months, he was captured in 1864 by three policemen who were disguised as gold miners.

Sources

Coupe, R., 2000, *Australia's Gold Rushes*, New Holland Publishers, Sydney

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<http://www.whiskershill.dynamite.com.au/m.htm>





HOW PEOPLE CHANGE THINGS

RESOURCE 4

People can contribute to changes in the environment. The environment includes:

- Natural places (nature)
- Built places (towns, farms)
- Social places (between people).

People can contribute to changes in positive or negative ways. Examples of positive contributions include:

- Doing something to help
- Doing something to prevent a problem
- Doing something to solve a problem.

Examples of negative contributions include:

- Doing nothing about a problem
- Creating or adding to a problem
- Acting in a way that interferes with peoples' rights.

Look at the examples below of peoples' activities and how they contribute to changes in their environment.

- Alex does volunteer work in a hospital. Alex is making a positive contribution to the social environment (the patients in the hospital).
- Jo drops litter on the ground in a city park. Jo is making a negative contribution probably to each environment. The rubbish might spoil other people's enjoyment (social) of the park (a built place). The litter may then be washed down a storm water drain and into a creek or sea (natural place). You can put more than one tick in the environment columns or just tick the one that you think is most affected.
- Kit drives a 4-wheel drive car onto the beach without using the proper access to take the family fishing. Kit is making a positive contribution to the family day out and to getting dinner (social). However, Kit is making a negative contribution by damaging sand dunes (natural). If you think the person is making both positive and negative contributions, use two rows in the table.

These examples could be marked on the table like this:

Person	Contribution	Positive or Negative?		Which Environment Did They Change?		
		Positive	Negative	Natural	Built	Social
Who?	What did they do?					
Alex	Helps people at the hospital	✓				✓
Jo	Leaving rubbish in a park		✓	✓	✓	✓
Kit	Driving onto the beach to go fishing	✓				✓
" "	" "		✓	✓		

Read the list below. With a partner, decide whether the contribution was positive or negative. Also decide which environment they changed. Fill in the table together.

- a) Richard Daintree was a geologist who found gold on the Fanning River in north Queensland in the 1860s. This led to a gold rush in the area.
- b) William Knox D'arcy and the Hall brothers formed a company that operated a copper and gold mine in Mount Morgan. Later D'arcy (with others) formed the British Petroleum company (BP).
- c) Jupiter Mosman was an Aboriginal boy who helped Hugh Mosman find gold at Charters Towers in the 1870s.
- d) Frank Gardner was a bushranger who stole cattle and gold from people in the 1860s.
- e) Ernest Henry employed local Aboriginal people in north-west Queensland to break copper ore.
- f) Mrs Waddell was William Waddell's wife. She worked hard to care for her children and husband in difficult conditions.
- g) Ah Yow was a Chinese market gardener who grew vegetables for miners at Dog Leg Creek on the Palmer goldfields in the 1880s.
- h) The diggers working with Frank Blackmore near Herberton in the 1880s carried him to hospital on foot after he was injured in a mine blast.

Person <i>Who?</i>	Contribution <i>What did they do?</i>	Positive or Negative?		Which Environment Did They Change?		
		<i>Positive</i>	<i>Negative</i>	<i>Natural</i>	<i>Built</i>	<i>Social</i>

MINERAL EXPLORATION OVER TIME

RESOURCE 5



With continuous improvements in technology, the ways in which people have explored for minerals has changed dramatically over time. This change, however, has more often involved new techniques being added to the old, rather than replacing them.

In the early days explorers and prospectors journeyed for months at a time with teams of horses and camels, looking for signs of mineral deposits at the surface. They examined the rocky outcrops using geologists picks (rock hammers) and hand lenses and panned the sands and gravels of riverbeds. Along the way they made maps of where they had

been and where they had found mineral deposits large enough to mine. These deposits are called ore bodies.

Companies were formed to mine the ore bodies found by the early prospectors and geologists were employed to help them look for further deposits. With the invention of the motor vehicle, geologists could explore large areas in a much shorter time. They didn't limit themselves to the few tracks that existed and sometimes travelled large distances across country.

In order to explore very large areas, mining companies started using aeroplanes, firstly with geologists on board to look at the rock formations from above, and later with special cameras to take aerial photographs for geologists to examine in detail. The rock patterns seen from the air can sometimes tell us where mineral deposits might be found.

Today, aerial photography is still one of the main techniques used by mineral exploration companies. Even larger areas, however, can now be examined using images from satellites orbiting the Earth. The light patterns reflected from the surface of the Earth can show areas where mineral deposits have formed.

Looking for mineral deposits at the surface is generally limited to those areas where rocks crop (stick) out. Now that most of these areas have been explored, geologists are using techniques to look at rocks covered by layers of soil and sediments. One way is to take samples and analyse the soil for unusually high concentrations of elements which may indicate buried ore bodies.

A faster method of looking beneath the surface is to use special instruments carried by aeroplanes which

can give a picture of the rocks as well as indicate where ore bodies may be found. This technique has led to the recent discoveries of the Ernest Henry copper-gold mine and the Cannington silver-lead-zinc mine near Cloncurry in north-west Queensland, where the ore bodies are buried beneath approximately 40m of sedimentary rocks.

While modern technology has enabled most recent mineral discoveries, we still rely partly on earlier discoveries to guide us to new ore bodies. Patterns of small surface deposits found by prospectors more than 100 years ago led to the recent discovery of the Century zinc-lead-silver mine north-west of Mount Isa. New deeper ore bodies have also now been discovered from drilling beneath the gold deposits,

first found by prospectors around the turn of the century, for example at Gympie, north of Brisbane, and at Cracow, west of Bundaberg.

As mineral resources on Earth are becoming increasingly difficult to find, and in some cases more costly to extract, people are looking at the possibilities of exploring and mining in space. Many of the Earth's nearest neighbours in the solar system are rich in mineral resources. On the moon's surface, for example, there are significant deposits of silicon, aluminium, iron and magnesium, and one United States company has started prospecting a near-by asteroid using a NASA probe.

Source Brad John, Department of Natural Resources and Mines

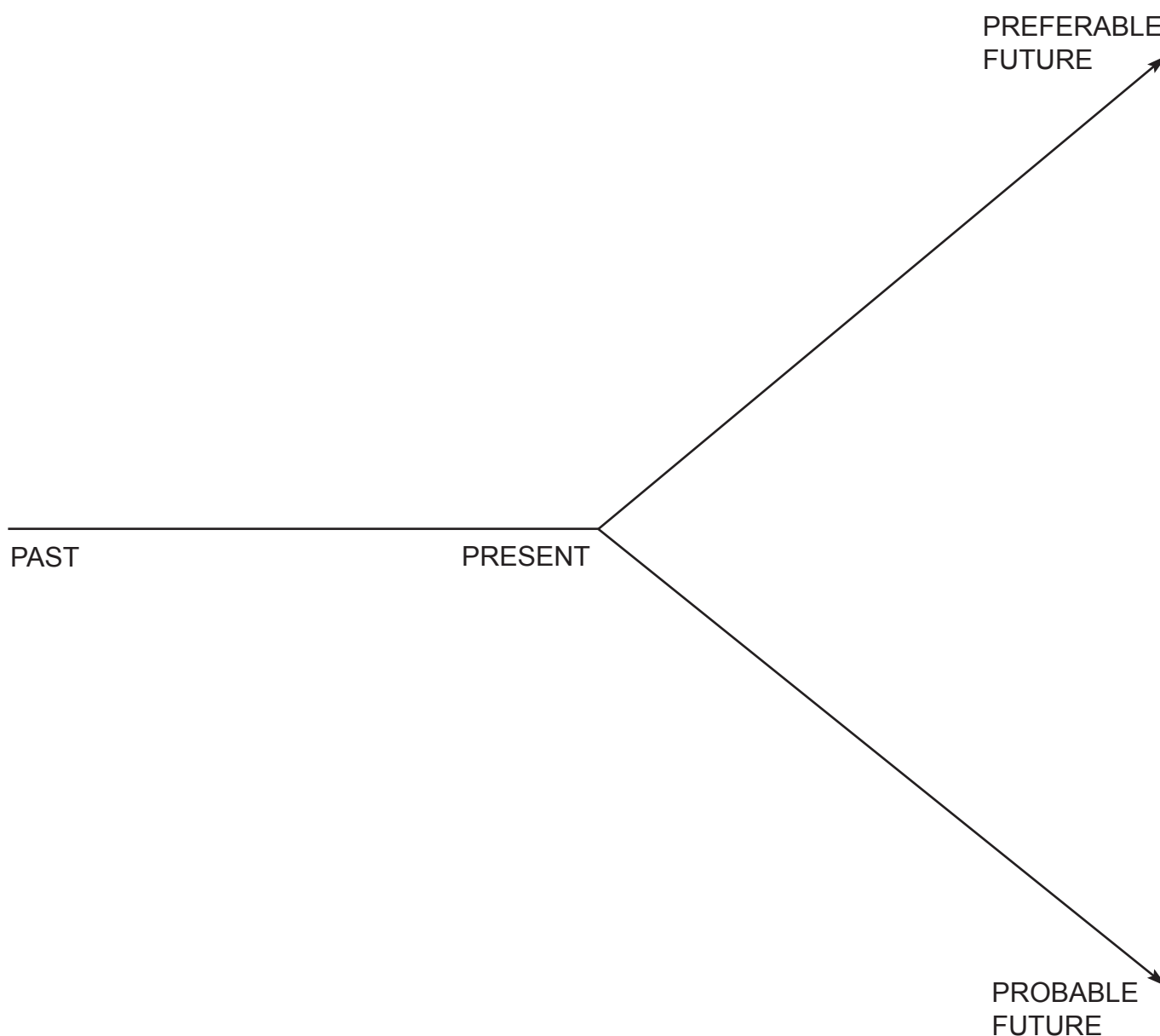




PROBABLE AND PREFERRED FUTURES TIMELINE

RESOURCE 6

- 1 Choose a partner to work with and read Mineral Exploration Over Time together.
- 2 In the past section of the timeline list events/actions in Queensland's mining history.
- 3 Continue along the timeline and add some things that are happening today in mining (present).
- 4 In the lower branch of the timeline write what you think will probably happen in mining (probable future).
- 5 Finally, in the upper branch of the timeline, write some things you would prefer to happen in mining (preferable future).



AMAZING AND POSSIBLE

RESOURCE 7

Very clever scientists have invented many amazing materials that benefit people in a variety of ways. Many of these are made from fossil fuels (coal, oil and gas) and minerals. Where would we be without plastic? The things we make often create waste and may use a lot of energy in their production.

Most people aren't ready to give up all the useful things that are made from fossil fuels and minerals - like cars, televisions and clothing, but perhaps we can look at different ways of making those things.

Some researchers have already discovered ways to use less energy and create less waste. Scientists working in the steel making industry have discovered ways to reduce energy use by about three-quarters, saving millions of dollars in the process.

Two Queensland brothers have invented an environmentally friendly lightweight brick from the waste created when power stations burn coal to produce electricity. This waste, called fly-ash, can now be used to build houses instead of being dumped. The bricks are stronger and lighter and have better insulating properties than ordinary concrete blocks.



Some people have used nature to inspire them. For example, when a hairdresser from the USA was watching a TV report on an oil spill he noticed that otter fur soaked up the oil very well. While that was harmful to the otters he wondered if human hair

would do the same thing. He swept up hair from his salon floor, stuffed it into a pair of tights to make a dummy otter and threw it into a baby pool filled with water and 4 litres of motor oil. In two minutes the water was crystal clear. A salon client who worked

for NASA put him in touch with an expert there who ran a larger scale test with excellent results.

Perhaps we can get other ideas from nature. For example, the only thing that people can make that is close to the strength of spider silk, for its weight, is Kevlar. Kevlar is a fibre so tough that it can stop bullets. But the process to make Kevlar uses a lot of energy. First, oil must be extracted from the ground and the parts of the oil that make petrol are taken out. Then, these parts are placed into a special tub of sulfuric acid and boiled at very high temperatures, which change into liquid crystals. Next it is put under very high pressure to make the fibres go together in a certain way. At the end of this process we have Kevlar. A spider can make a fibre that is just as strong and much tougher than Kevlar for its weight. A spider does this at body temperature without heat, high pressures or chemicals. If we could learn to do what the spider does, we could make a superstrong fibre that would need only a small amount of energy to make and create little waste.

Imagining what might be possible, no matter how far-fetched it seemed at the time, has produced some amazing inventions. Imagining inventive ways of doing things, which cause as little harm to our environment as possible, is a challenge that some people have proven is possible already.



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Olsson, K., 'Smart bricks take a load off the environment', in *The Courier Mail*, Wednesday September 6, 2000, Brisbane

DESIGNING THE FUTURE

RESOURCE 8



**DEMONSTRATING
OUTCOME** TCC 3.3

- 1 Read Resource 5, Mineral Exploration Over Time, and Resource 6, Amazing and Possible.
- 2 Design a product or process (material, machine, device) that would enable us to extract (take out) minerals from the Earth that we need without harming the environment. When designing your product or process, consider:
 - In which part(s) of the mining process will your product or process operate, eg exploration, mining, processing, monitoring, rehabilitation;
 - The environment in which your product/process will operate, eg underwater, underground, in desert/forested areas, in outer space, in a factory;
 - How it might mimic or copy nature? eg so that it doesn't need a lot of energy and that waste produced can be reused.
- 3 Draw and label your work describing briefly how each part of your design functions.

SAMPLE JOURNAL ENTRY

RESOURCE 9


**DEMONSTRATING
OUTCOME** TCC 4.3

	Sunday 9 July 1854
	The Gravel Pits, Ballarat
	For all the diggers, Sunday is a Day of Rest.
	So for the first time the beat of the cradles
	and windlasses has stopped. And even here at
	our campsite the frenzy of the last couple of
	days seems to be halted, and no one is shouting
	"Rosa! Hold this rope!" or "Fetch us the hammer,
	Rosie Posie!" or "Come and hang out this
	washing, meine liebchen!"
	Now Mama is struggling to cook a leg of
	mutton in the camp oven, and the men are
	sitting on logs around the fire, mending their
	boots or darning their socks or writing letters
	home (Sancho Panza has three little girls
	back in Spain), and Vati is writing up notes
	for his guide book, and I can hear a bell being
	rung at the little Chapel that is on the edge of
	this field and the Eureka field, and for once
	the million mad dogs of the diggings seem
	to be quiet.

From My Story: A Banner Bold, by Nadia Wheatley

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CHAPTER 2

CHANGES IN MINING

STRAND TIME CONTINUITY & CHANGE
KEY CONCEPT CAUSE AND EFFECT

INDEX

CHANGES IN MINING

FOCUS QUESTIONS

- What are some important events in Queensland's mining history?
- What happened as a result of those events?
- What were the positive and negative consequences for different groups of people?

SOSE OUTCOMES

- TCC 2.4 Students describe cause and effect relationships about events in familiar settings.
- TCC 3.4 Students organise information about the causes and effects of specific historical events.
- TCC 4.4 Students critique information sources to show the positive and negative effects of a change or continuity on different groups.

RESOURCES SHEETS

- 1 Key Events
- 2 Diamond Ranking (OHT)
- 3 Good Luck Bad Luck Stories (OHT)
- 4 A Mining Story
- 5 Matching Sentences 1
- 6 Matching Sentences 2
- 7 Event Account
- 8 Sample Consequence Wheel (OHT)
- 9 Consequence Wheel
- 10 Perspectives on an Event
- 11 Positives and Negatives Table

TEACHING & LEARNING ACTIVITIES

CHANGES IN MINING

ACTIVITY A RANKING KEY EVENTS

Students read and cooperatively diamond rank their set of historical mining events according to its perceived importance. Groups report back to the class giving reasons for their decision.

Purpose

- To introduce students to some of the key events in Queensland's mining history.

Teaching Procedure

- Make a copy of Resource 1, Key Events, for each pair of students and an OHT of Resource 2, *Diamond Ranking*.
- Invite students to read the events in Resource 1 and cut out each card. Clarify any vocabulary.
- Present the OHT of Resource 2 and explain the diamond ranking process. Invite students to rank the statements in order of their significance.
- Students share their ranking with the class providing a brief statement to explain their reason for making their number one choice.

ACTIVITY B READING AND CREATING GOOD LUCK BAD LUCK STORIES

Students read a good luck bad luck story about going camping and finding gold. Students create their own good luck bad luck stories.

Purpose

- To provide students with an opportunity to explore the idea of cause and effect, positive and negative, in a humorous way.

Teaching Procedure

- If your school/town library has a copy of *Fortunately* by Remy Charlip, read it to your students. (It is a short, funny story suitable for any age group).
- Prepare an OHT of Resource 3, *Good Luck Bad Luck Stories*, then read 'Good as Gold' to the students.
- Invite students to create a short story using this format. This can be done orally around a circle with students alternating between positive and negative events. It can also be done in written form with students working individually or in pairs.

ACTIVITY C MATCHING CAUSE AND EFFECT

Students read and act out a short story about life on a 19th century goldfield. Students then read and match sentences that demonstrate cause and effect relationships in the story.



This task can be used to demonstrate outcome TCC 2.4.

Purpose

- To provide students with an opportunity to explore the causes and effects of some events in Queensland's mining history.

Teaching Procedure

- Make copies of Resource 4, *A Mining Story*, and Resources 5 and 6, *Matching Sentences*, for each student.
- Read the short mining story in Resource 4 with students. Discuss any words that students need clarified. Ask students to re-read the story in pairs.
- Reinforce the story by asking students to act out sections of the story as you read it again to the class.
- Provide students with copies of Resources 5 and 6 and invite them to match the first part of the sentences with the last part.
- Ask students to read their matched sentences with their partner before inviting a number of students to read a matched sentence out to the class.

ACTIVITY D EXPLORING CONSEQUENCES

Students read an account of an important event in Queensland's mining history and then construct a consequence wheel based on that account.



This task can be used to demonstrate outcome TCC 3.4.

Purpose

- To provide students with an opportunity to explore the consequences of the discovery of gold in Queensland.

Teaching Procedure

- Make a copy of Resource 7, *Event Account*, for each student.
- Read through the account with students, clarifying vocabulary as required.
- Make an OHT of Resource 8, *Sample Consequence Wheel*, and explain the consequence wheel process. Invite students to add to the sample.
- Working in pairs, provide students with a copy of Resource 9, *Consequence Wheel*, or provide students with paper and pens to draw their own.

ACTIVITY E CONSIDERING PERSPECTIVES

Students read information from a number of perspectives about early gold mining experiences in Queensland. Students complete a table recording the positive and negative effects of early gold mining operations on each of the groups involved. Students consider the positive and negative impacts of more recent events.



This task can be used to demonstrate outcome TCC 4.4.

Purpose

- To examine a number of perspectives on experiences of mining in Queensland's early goldfields.

Teaching Procedure

- Make a copy of Resource 10, *Perspectives on an Event*, for each student. Invite students to read through the three accounts. Clarify any vocabulary.
- Provide students with a copy of Resource 11, *Positives and Negatives Table*, and using Resource 10 as a reference, complete the table by recording the positive and negative effects of mining on each group.

TEACHING NOTE: The same strategy can be used to look at the positive and negative effects of a more recent or current event on different groups in a community, eg a mine opening or closure. Use articles from newspapers to find examples of these. Additionally, the strategy can be used to explore 'what if' scenarios to consider the positive and negative impacts on different groups of people, eg What if we stop mining coal in Queensland? What if we continue mining coal in Queensland?

KEY EVENTS

RESOURCE 1

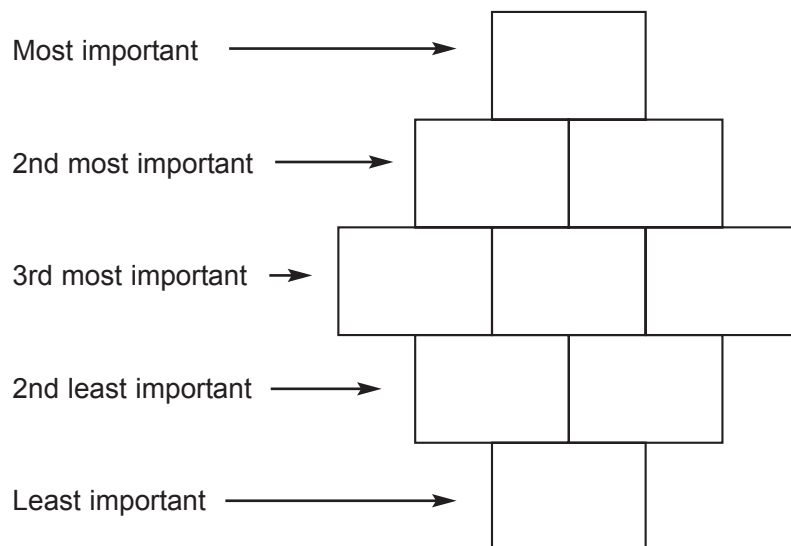
- 1 The discovery of gold at Gympie in 1867 saved Queensland from bankruptcy.
- 2 The introduction of the mechanical drill in 1895 meant ore could be mined a lot faster.
- 3 The discovery of gold at Mount Morgan in 1882 led to the setting up of the company British Petroleum (BP) and financed the first discovery of oil in the Middle East.
- 4 The discovery of coal in the Bowen Basin in 1845 led to the development of mines in the area which now supply more than 30 percent of Queensland's total overseas exports.
- 5 The discovery of gold on the Etheridge River in 1867 caused many people to travel to and settle in north Queensland.
- 6 The discovery of natural gas at Roma in 1900 was the first time a good supply was found in Australia. This led to further exploration and the establishment of a petroleum industry in Australia.
- 7 The discovery of copper-rich rocks in Cloncurry in 1867 led to more exploration and the discovery of huge mineral deposits in north-west Queensland.
- 8 The introduction of aerial photography at Mount Isa in 1924 allowed large areas of land to be explored.
- 9 The discovery of tin at Herberton in 1880 caused a huge increase in the population of north Queensland and opened up farming and more mining in the area.

DIAMOND RANKING

RESOURCE 2

Part A

- 1 Put the number of the event that you think may have been the most important or significant in the top box of the diamond.
- 2 Then put the number of the least important event in the bottom box of the diamond.
- 3 Next put the numbers of the next two most important events on the second level.
- 4 Continue until all events have been ranked.
- 5 Share your rankings with a partner, justifying your decisions.



Part B

Finish these sentences.

1 I think number ____ was most important because

2 I think number ____ was least important because

GOOD LUCK BAD LUCK STORIES

RESOURCE 3

GOOD AS GOLD

Fortunately, I went on a camping holiday with my family last summer.
Unfortunately, it was very, very hot.
Fortunately, we were camped beside a lovely cool creek.
Unfortunately, our dog, Gemma, chased a lizard and went missing.
Fortunately, I found alluvial gold while walking along the creek looking for Gemma.
Unfortunately, I had nothing to put it in.
Fortunately, I had pockets in my shorts.
Unfortunately, they had holes in them.
Fortunately, I found Gemma.
Unfortunately, I lost the gold.
But fortunately, we all got safely back to camp.

CREATING YOUR OWN GOOD LUCK BAD LUCK STORY

Alternating positive and negative events can be fun. Follow the pattern to create your own story.

Fortunately _____

Unfortunately _____

Fortunately _____

Unfortunately _____

Fortunately _____

Unfortunately _____

Fortunately _____

Unfortunately _____

But fortunately _____

A MINING STORY

RESOURCE 4



When the gold rush started many men left their homes and jobs to look for gold. They wanted to be rich. Many left their families and travelled a long way to get to the goldfields. People came from many countries to find gold. Most miners came from America, Britain and China.

Life on the goldfields was very hard. There was not much food. Most miners, or diggers as they were called, worked very hard. Sometimes miners were killed when their underground mines caved in.



As more and more miners came to the goldfields tension between the miners and Aborigines grew. Some miners were killed by Aborigines. The Aborigines were angry because the miners had taken their land and water. Some miners had also killed Aboriginal people. Today, there is more cooperation between miners and Aboriginal people.

Many diggers did not like the Chinese miners working on the goldfields. They did not understand them and became angry when the Chinese miners found gold where they could not.



Sometimes men on the goldfields would steal gold from other miners because they were lazy or greedy. Sometimes they took it because they were upset that they couldn't find any. They didn't care about what happened to the man they stole it from. Many men went home sad and tired because they could not find any gold. Many other men found gold. Some found enough to be very rich.



MATCHING SENTENCES 1

RESOURCE 5



**DEMONSTRATING
OUTCOME** TCC 2.4

- 1 Read the words in each box.
- 2 Match the beginning of the sentence with its end.
- 3 Read the whole sentence. If it makes sense, glue it in.

Men left their
homes and
jobs

because

Some men
became rich

because

Some men
stole gold from
other people

because

The
Aborigines
were angry

because

Many diggers
did not like the
Chinese miners

because

Some men
went home
sad

because

MATCHING SENTENCES 2

RESOURCE 6

they wanted to
find gold.

they were greedy
or lazy & did not
care about other
people.

they found lots
of gold.

they did not
understand them.

they did not find
any gold.

the miners took
their land and
water.

EVENT ACCOUNT

RESOURCE 7

THE GOLD THAT SAVED QUEENSLAND

In 1867 Queensland was a very new colony. It had been separated from New South Wales for only a few years. Life was difficult for many people in the small, dusty town of Brisbane. The town had been a



convict settlement called Moreton Bay for many years. Many people didn't have jobs or money. The government treasury had hardly any money left. Things were becoming really tough so the government offered a reward of 3,000 pounds to anyone who could find gold.

In September 1867 James Nash discovered gold in Gympie. He was a young man who had come from England. In October he told the government he had found gold.

The rush was on. Men from the small town of Maryborough rushed to the site first. Then men from Brisbane, Ipswich and other settlements followed. Soon there were hardly any men left in the towns as thousands rushed to find gold. About 20,000 men rushed to the site to try to strike it rich.

There were no roads to the goldfield. To get there most people went to Maryborough by ship. Then they walked or rode through the bush for several days. People used bullocks and horses to pull wagons, carts and drays. Some people came to Tewantin by boat and went on foot the rest of the way. A few people came overland from Brisbane. This was a long and difficult journey.

Miners had to buy a 'Miner's Right' from the government every year to be allowed to mine on the goldfield. At first, most of the gold found was only a few metres under the ground. In February of 1868, George Curtis found the largest gold nugget ever found in Queensland. It weighed 30 kilograms. Gympie gold put a lot of money in Queensland's bank.

After two years there wasn't much shallow gold left.

Some miners had more luck digging deep underground to find gold. Some of these mines were 700 metres deep.

Because of the effort in digging such deep shafts, many early miners formed syndicates. This means they joined their claims and worked together. They shared the gold when they found it. They also shared the disappointment when they did not find any.

Soon men with money, called investors, built mills to process the gold. Companies were formed and more and more men started to work for a company rather than for themselves. This meant that they wouldn't get rich but it also meant they would be paid every week and wouldn't go hungry.

In 60 years, about 130 tonnes of gold was mined at the Gympie goldfields. By 1923 almost all mining on the Gympie goldfields stopped because there were not enough men to work in the mines because many had died in the First World War.

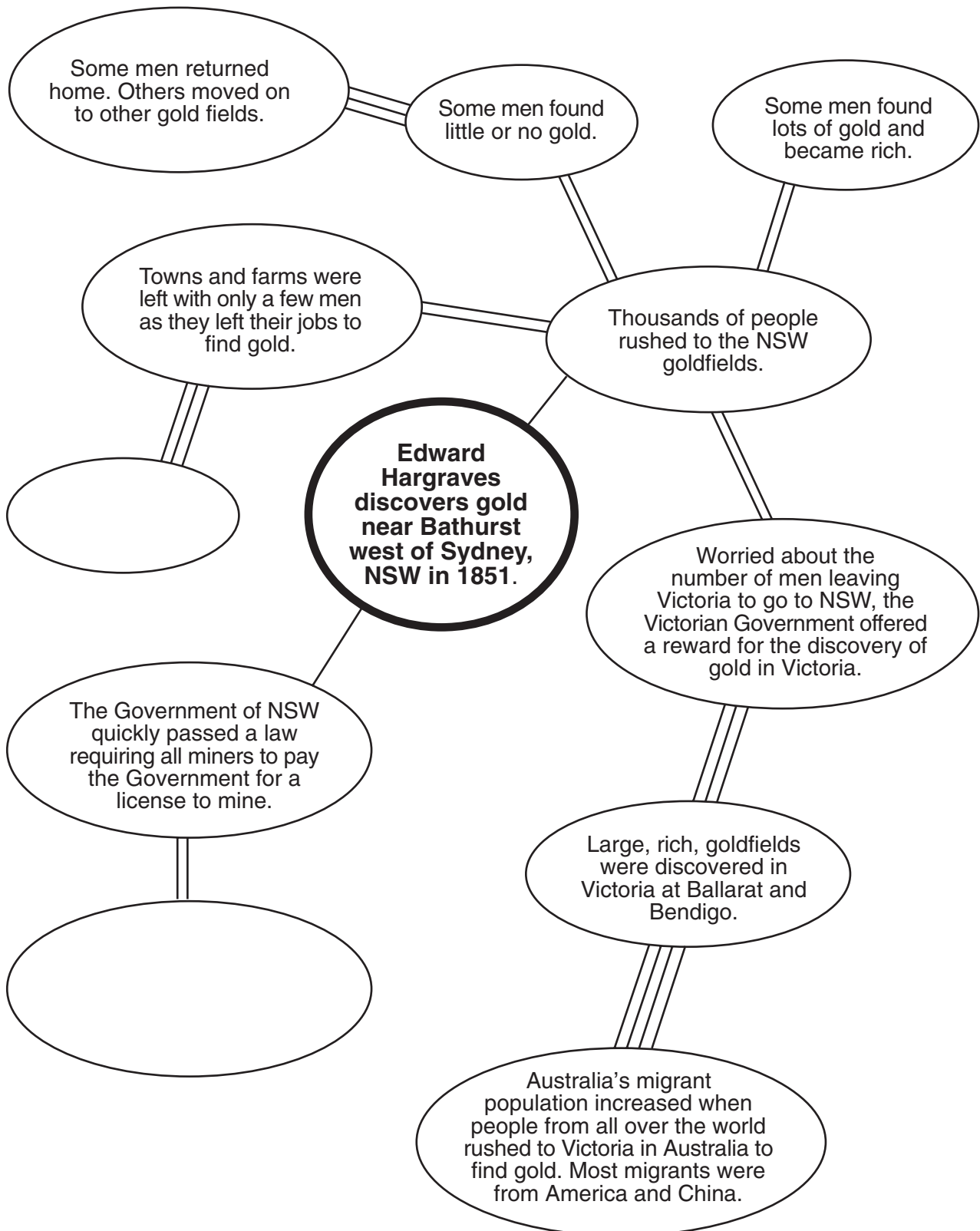
In 1991, the Queensland Government started to find and cover up the old abandoned mine shafts. They capped hundreds of mines that were dangerous.

Today, the Gympie goldfield has become famous again with new discoveries of rich gold. This gold production at Gympie provides income to many workers, profits to investors and contributes to Queensland's export revenue earnings.



SAMPLE CONSEQUENCE WHEEL

RESOURCE 8

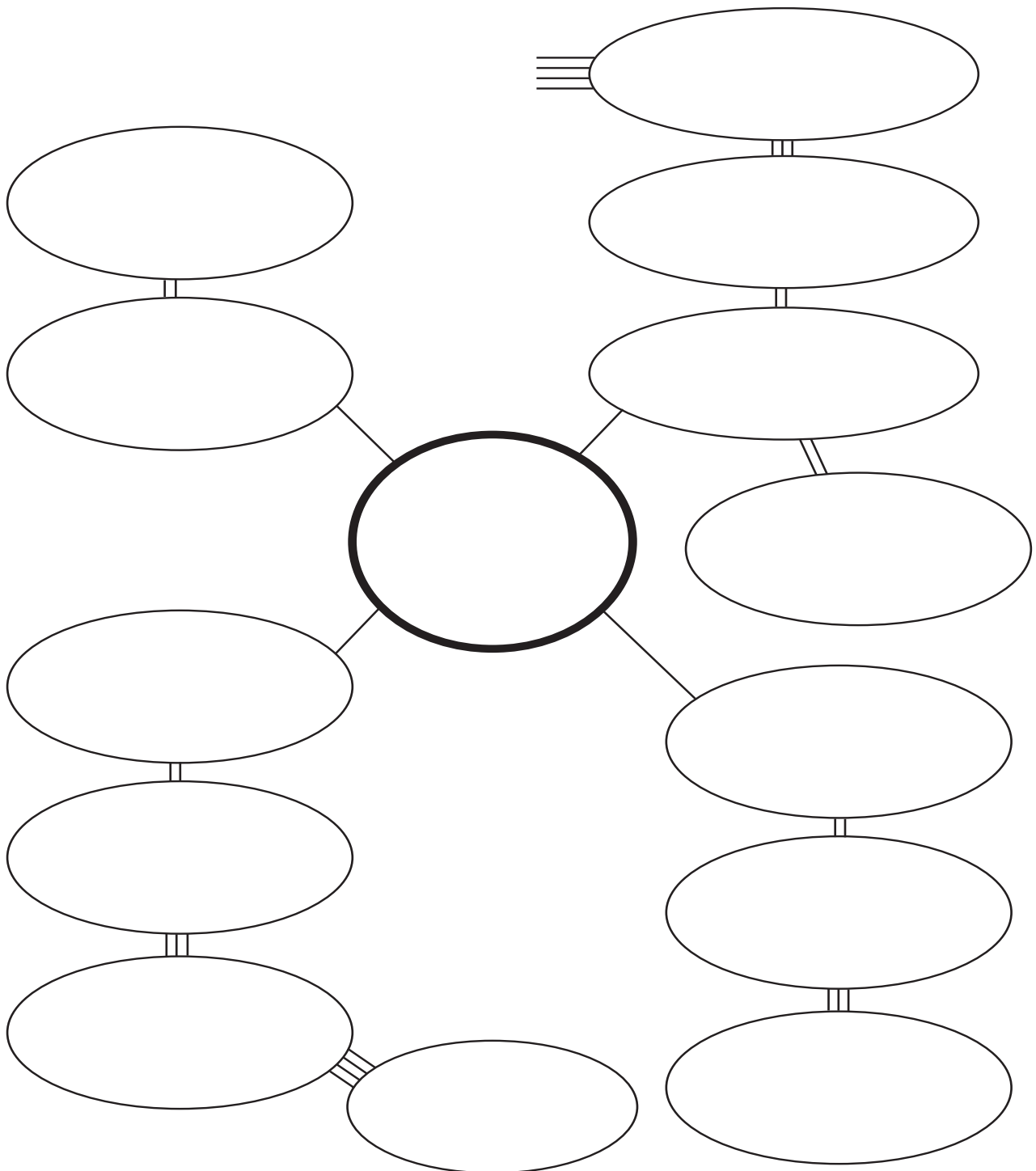




CONSEQUENCE WHEEL

RESOURCE 9

- 1 In the centre circle, write an event in Queensland's mining history, eg the discovery of gold at Gympie.
- 2 Write a direct consequence of this event in an oval and connect it to the centre with a single line. This is a first order consequence.
- 3 Write down a second order consequence that resulted from the first order consequence. Join it to first order consequence by a double line.
- 4 Keep going until you cannot think of any more consequences.



PERSPECTIVES ON AN EVENT

RESOURCE 10

A CHINESE PERSPECTIVE

This is a difficult place to be in. They all hate us and I am very home sick. The famine back home was very bad though, so I suppose this is better. We always have enough to eat here because we grow our own vegetables. My group even grows enough to sell to the others. We work very hard and have found much gold in sites that have been abandoned by the Europeans. I think this makes them mad but I don't know why. Back home we called Australia, 'Hsin Chin Shan' (New Gold Mountain). It's true - there is much gold here and we find enough to make our repayments to the trader for our tickets. We have also been sending money back to Kwangtung to help our families. This has been good for our families. Last week was very bad though. Li narrowly escaped being speared by some natives. At the main camp some bad men chased him and when they caught him, they cut off his pigtail. It was terrible. Despite this he wants to stay in Australia. He says there are many opportunities here. I think I will go back after I have paid off my ticket and have saved some money to take back home to my parents' farm.

A DIGGER'S PERSPECTIVE

Smithy and I found about 10 ounces today and are celebrating our luck with some grog that I bought from Danno. It's foul stuff that he makes himself but it goes down warm and it's getting colder here at night now that winter is coming on. It's a lot harder out here than I thought it would be. Sometimes I wish I were back home. When my brother Matthew died, I was going to leave but Smithy talked me out of it. He is convinced we'll strike it rich soon. Supplies are short and very expensive. We spend most of our findings on supplies but we're doing better than some folks who are in debt and working off what they owe. The natives kill anyone who wanders out of the camp so none of us go very far, especially at night. They are very hostile and seem to kill for no reason. Even the Chinamen won't work in groups of less than 20 for fear of being attacked. Now they're a strange lot and I don't think they should be allowed to mine here and take our gold. Still they are the only ones growing any food around here. Some of the blokes want to drive off all the Chinamen and the natives and don't care how many they kill in the process. I just want to find enough gold so I can go back to town and get a nice place for Kate and the kids and me. Maybe I could set up a business too. I sure do miss them but it's too dangerous for them to be here.

AN ABORIGINAL PERSPECTIVE

Many, many people have come to the rocky creek beside the old trees where the flying foxes rest. They are mostly men without their families, though there are some male children and women among them. Most of them have white skin although some have brown skin. The white skins are mean to the brown skins and won't let them near their camp. There are so many men they cover the ground like flies on a dead kangaroo. They dig big holes in the ground all day and into the night. Sometimes they fight among themselves and even kill one another over pieces of rock. They look tired and skinny and are always dirty. They are even eating the flying foxes which is very bad food. They must have a terrible sickness or be very mad. They won't let us come down to the water and they shoot at us with a weapon stick that kills at a distance. My uncle was killed this way. We need this water and have fought back, killing both white and brown skins, but there are more and more of them coming here every day.



POSITIVES AND NEGATIVES TABLE

RESOURCE 11

Complete the table below by recording the positive and negative effects of mining on the following groups:
Chinese, Diggers and Aborigines.

Event/Change		
Group	Positive Consequences	Negative Consequences

CHAPTER 3

FROM ROCK TO PRODUCT

STRAND PLACE AND SPACE

KEY CONCEPT HUMAN AND ENVIRONMENT RELATIONSHIPS

INDEX

FROM ROCK TO PRODUCT

FOCUS QUESTIONS

- Where are Queensland's mining communities located?
- How have people managed mineral resources in various mining communities in Queensland?
- How are the benefits of obtaining and using mineral resources linked to the environmental costs of mining?

SOSE OUTCOMES

- PS 2.1 Students identify how environments affect lifestyles around Australia.
- PS 3.1 Students compare how diverse groups have used and managed natural resources in different environments.
- PS 4.1 Students make justifiable links between ecological and economic factors and the production and consumption of a familiar resource.

SCIENCE OUTCOMES

- Life and Living 2.3 Students make links between different features of the environment and the specific needs of living things.

RESOURCE SHEETS

- 1 Children's Experiences
- 2 Maps of Queensland Mines and Towns (OHT)
- 3 Significant Queensland Mines
- 4 Board Game
- 5 Matching Communities with Mineral Resources
- 6 Queensland Mining Communities
- 7 Managing Resources Table
- 8 Researching Mining Communities
- 9 Graphic Organiser Template
- 10 Rock Cake Recipe
- 11 Rocky Cake Mining Table
- 12 From Rock to Product
- 13 Group Research Project

TEACHING & LEARNING ACTIVITIES

FROM ROCK TO PRODUCT

ACTIVITY A LIVING IN A MINING TOWN - A CHILD'S PERSPECTIVE

Students read two short stories about children living in mining communities. Students share stories of their experiences of living in or visiting mining communities and write a recount.

Purpose

- To introduce students to different experiences of mining.

Teaching Procedure

- Make a copy of Resource 1, *Children's Experiences*, and read the two short stories about children living in mining communities.
- Invite students to share any stories of their experiences of living in or visiting mining communities. If you live in a mining town, ask students to write their own recount. If you don't live in a mining town, ask students to write an imaginary recount. Alternatively, assist students to locate schools in Queensland mining communities and email them asking other students about their experiences.

ACTIVITY B DISCOVERING A MINE NEAR YOU

Students locate past and present mines closest to their location using OHT overlays of towns and mines. If students have access to the Internet, listed websites could also be used.

Purpose

- To demonstrate to students how many mining communities there were and are in Queensland, and provide them with an opportunity to locate mines near where they live.

Teaching Procedure

- Using the first OHT of Resource 2, *Maps of Queensland Mines and Towns*, ask students to locate their local area. (If your town is not on the map, locate the nearest one and use an atlas to mark the approximate location of your town). Mark your location with an X.
- One at a time, use the overlays to note the location of the mines (coal, gold and all other commodities) near your town. Are they abandoned or operating mines? Use Resource 3, *Significant Queensland Mines*, to find the names of operating mines in your area.

TEACHING NOTE: The Department of Natural Resources and Mines site at www.nrm.qld.gov.au is also useful. This site allows users to zoom in on mining locations around Queensland.

ACTIVITY C TRAVELLING AROUND THE STATE

Students play a board game that takes players on a journey around some of Queensland's mines and mining communities. Students understand that mining communities are established near mines and mineral deposits.



This task can be used to demonstrate SOSE outcome PS 2.1 and Science outcome Life and Living 2.3.

Purpose

- To provide students with an opportunity to demonstrate that the location of mineral deposits has influenced the establishment of communities in Queensland.

Teaching Procedure

- Enlarge Resource 4, *Board Game*, and make a number of copies onto A3 card. Divide the class into small groups and provide students with dice and markers to play the game a number of times over a week.
- At the end of the week make a copy of Resource 5, *Matching Communities with Mineral Resources*, for each student and invite them to match the towns with mineral deposits.

ACTIVITY D EXPLORING MINING COMMUNITIES ACROSS TIME AND SPACE

Students read an example of change in a mining community in Queensland. Working in small groups, students research a late 1800s goldfield and a present day mining community comparing the ways that mining activities have been managed. Students present their research graphically.



This task can be used to demonstrate outcome PS 3.1.

Purpose

- For students to appreciate the diverse contexts in which mining has taken place and is taking place in Queensland.

Teaching Procedure

- Students read Resource 6, *Queensland Mining Communities: Anakie Sapphire Fields*, about a mining community in Queensland.
- Provide students with a copy of Resource 7, *Managing Resources Table*, and ask them to use Resource 6 to complete the middle column of the table.
- Together, find out what you can about an early Queensland goldfield. Collect and share information and record it on a class list. Use this information to complete the first column of Resource 7.
- Invite students to form small groups and research a present day mining community in Queensland. Use Resource 8, *Researching Mining Communities*, to assist students to access information.
- Have students present their research graphically using Resource 9, *Graphic Organiser Template*, as a guide.
- Students individually complete the final column of Resource 7.

TEACHING NOTE: If students live in a mining community, encourage them to make a multimedia presentation for the school website or a PowerPoint® presentation that can be viewed as a slide show on a computer and even emailed as an attachment to the mine and perhaps posted on their website.

ACTIVITY E CREATING A ROCKY CAKE MINE

Students make rock cakes and extract the sultanas and nuts using any method they choose. Students examine the impact of their method in relation to costs, benefits and impacts on the environment.

Purpose

- To provide students with an opportunity to make links between the economic and ecological factors involved in the extraction of ore at a mine.

Teaching Procedure

- Purchase rock cake ingredients and collect other items needed for this activity.
- Using Resource 10, *Rock Cake Recipe*, students, working in small groups, make rock cakes and leave in a sealed container overnight.
- The following day, provide pairs of students with mining tools (such as scissors, paddle pop sticks, drawing compasses, toothpicks) and one rock cake. Give the following instructions one at a time:
 - Mine the ore out of your rock cake mine using the tools provided. (Time the activity with a stopwatch);
 - Sort the ore into separate piles;
 - Weigh the ore and record the results on a class list;
 - Put the mine back together.
- Students will be aghast at this last instruction. Ask students why it would be a problem to rehabilitate their rocky cake mine. Ask students what they could have thought about before starting. (Before mining companies begin to mine they choose appropriate mining methods and plan how to manage their impact on the environment).
- Invite students to record their observations of this first attempt on Resource 11, *Rocky Cake Mining Table*.
- Provide each pair with another 'ore-body' and ask them to mine again being more environmentally aware. Weigh and record the results on the class list.
- Invite students to record their observations on Resource 11 and discuss a comparison of the two methods of mining including costs, benefits and impact on the environment. For example:
 - Which method of mining produced the most ore?
 - Which method would be most profitable?
 - What environmental management issues might there be with different methods of mining?
 - How might mining companies attempt to address these issues?

TEACHING NOTE: A piece of fruitcake can substitute for a rock cake.

ACTIVITY F RESEARCHING THE MINING PROCESS

Students examine the steps in the mining process, then research one of these steps in more detail focusing on relevant economic and environmental factors.



This task can be used to demonstrate outcome PS 4.1.

Purpose

- To provide students with an opportunity to identify some economic and ecological factors relevant at each stage in the mining process.

Teaching Procedure

- Provide students with a copy of Resource 12, *From Rock to Product*.
- Read through the sheet together and match the heading with its explanation.
- Choose six students and give each one a sheet of paper with the mining process written on it. Ask these six students to stand at the front of the class, side by side in no particular order, with their sheet of paper clearly visible.
- Challenge the rest of the class to reposition them so together they represent the correct sequence of the mining process from start to finish. (Correct order: exploration, approvals, mining, monitoring, processing ore, rehabilitation).
- Using the headings, the students write a brief description of each step in their own words.
- Invite students to form groups of six and give each student a copy of Resource 13, *Group Research Project*. Assist groups with step three of the project and discuss their presentation options at step five. Discuss assessment guidelines before continuing.

CHILDREN'S EXPERIENCES

RESOURCE 1

After reading the following stories, write a recount, real or imagined, of what it might be like living in a mining community today.

Working on a North Queensland Goldfield in the 1870s: William's Story

We lived in a tent on our claim, which was 7.5 metres square. It was always hot and often wet. The floor of the tent was usually muddy. Every morning I would walk upstream to where the water wasn't very muddy, fill up two old tins with water and carry them back to our tent Chinese style - one on either end of a stick, which I laid across my shoulders.

I went to school for half a day at two other fields we were on, so I knew how to read - sort of anyway. When we got letters from mother, I would read them to father. When I turned 11, father said I was old enough to do a man's work. We worked side by side from dawn to dusk, six days a week. On Sunday we rested and did chores though not as well as mother. I really missed her and I think father did too. Sometimes in the evenings he would play sad songs on his harmonica till one of the other men would ask him to play a jig.

When we got lucky, and we did every now and then, we sent some gold home to mother and the babies. We bought rations and equipment with the rest. Dad always said we needed a bit more so we could buy a farm and livestock. I think he was always hoping to find a nugget so big that he would never have to work again.



Life on a Central Queensland Gemfield in the 1960s: Lauren's Story

Being a mining town our play ideas naturally ran underground at times. Small birds tunnelled into the soft earth of the creek banks to nest, and we would mimic them with our own diggings, but our underground cubbyholes were generally pronounced 'unsafe for play'. To copy our father's

shaft sinking activities out in the sapphire scrub, we once dug our own mineshaft, shoulder wide and two pick handles long. We grew tired of it about 4 feet down when it became tiresome to get into and out of. Besides, we never found a speck of colour for our efforts...

Specking for sapphires was always on the cards for us gemfields kids, especially after good soaking rain. This would wash away the dust and surface layers, exposing the stones underneath. Then the hunt would be on, combing the tussocky ground with head down and eyes peeled, searching along little rivulets freshly eroded into the soft earth, looking for the telltale glint of sapphires.... We'd stay out specking all day, roving the countryside with empty matchboxes in our pockets, grubbing in the dirt and losing all track of time. Till we heard Mum's call drifting faintly across the valley on the cool evening air, "Ron-el, Laur-en, Jeff-rey - DIN-NER!" and raced home to show off our findings.

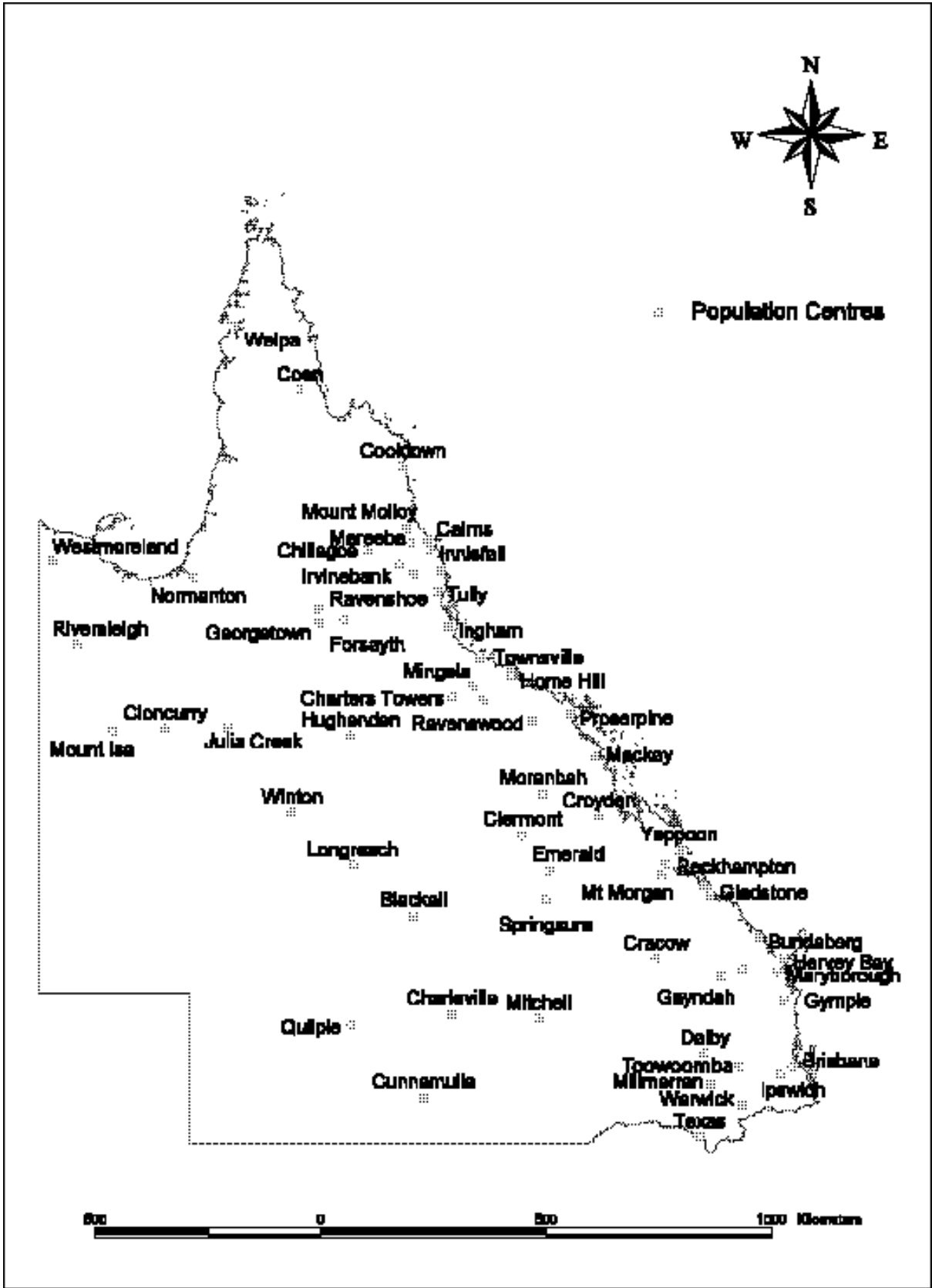


Source of 'Lauren's Story': Gartrell, B., 1998, Rubyvale, Slow Down or You'll Pass It, Beryl Gartrell, Babinda, Queensland

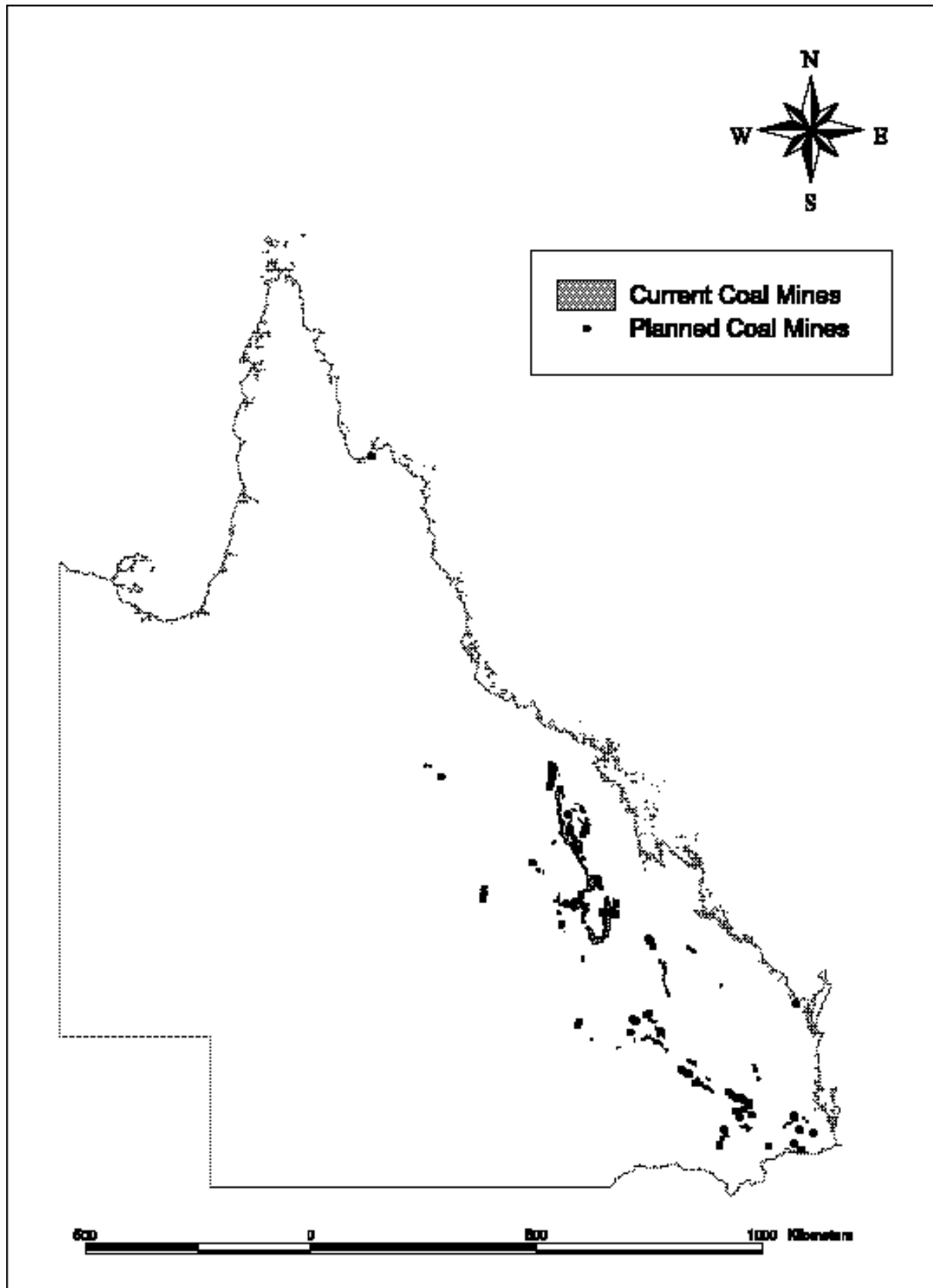
MAPS OF QUEENSLAND MINES AND TOWNS

RESOURCE 2

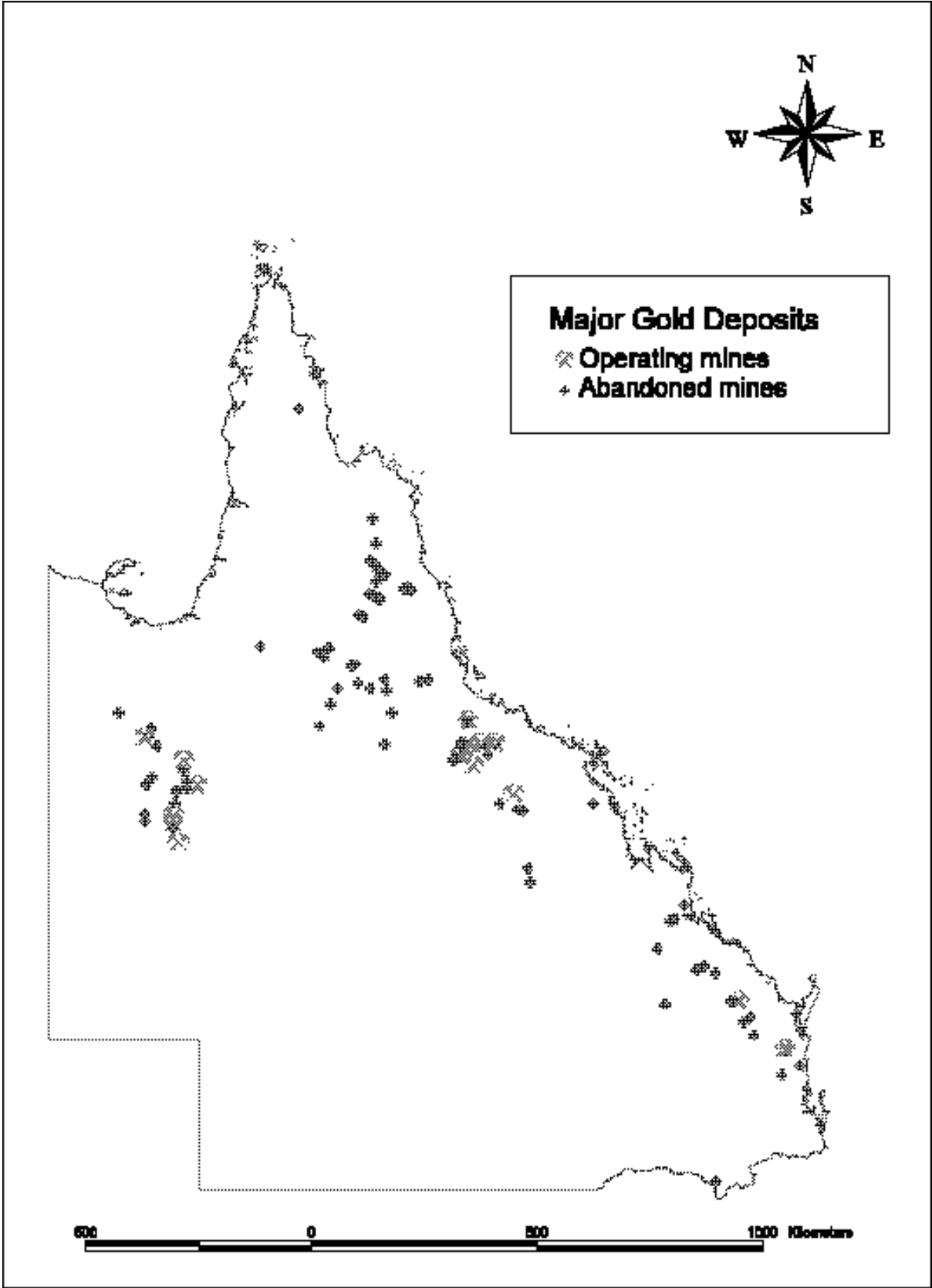
QUEENSLAND CITIES AND TOWNS



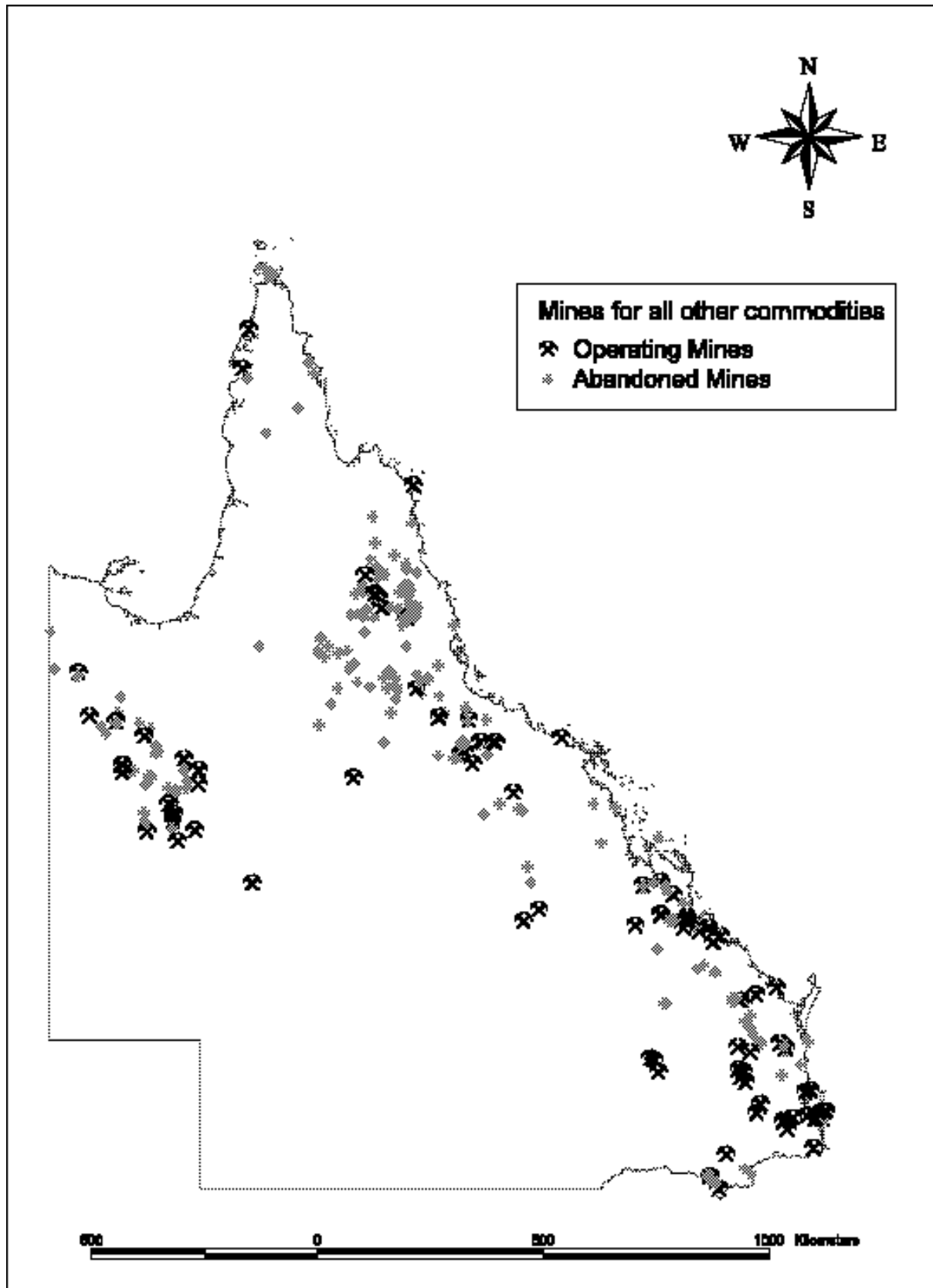
COAL DEPOSITS AND MINES



MAJOR GOLD MINES



MINES FOR ALL OTHER COMMODITIES



SIGNIFICANT QUEENSLAND MINES

RESOURCE 3

MINERAL MINES

Mine Name	Mineral Mined	Location	Mining Method
Aquamarina	Marble	8km south-south-east of Chillagoe	Open cut
Bajool (Ulam)	Limestone	17.5km south of Bajool	Open cut
Boral Brisbane	Brick clay	Darra, Brisbane	Open cut
Bowder	Brick clay	17km south-west of Bundaberg	Open cut
Buckland	Limestone, dolomite	12.2km west-north-west of Mount Surprise	Open cut
Cannington	Silver, lead, zinc	140km south-south-east of Cloncurry	Underground
Cape Flattery	Silica sand	30.2km east-south-east of Munburra, north of Cooktown	Surface
Cathedral Quarry	Sandstone	4km north-west of Helidon	Open cut
Cedars	Bentonite, kaolin	10km south-west of Yarraman	Open cut
Cement Mills	Limestone	54km south-west of Warwick	Open cut
Century	Zinc, lead, silver	150km south-west of Burketown	Open cut
Charters Towers	Gold, silver	0.9km east-south-east of Charters Towers	Underground
Claypave	Clay/brick tile	Ipswich	Open cut
Christmas Creek	Limestone	150km west-northwest of Townsville	Open cut
Comerford's Quarry	Sandstone	4km north-west of Helidon	Open cut
Cork (Zinaback)	Gypsum	110km south-west of Winton	Open cut
Cooroy	Brick clay	Cooroy	Open cut
Coralime	Limestone	4.5km north-east of Mount Garnet	Open cut
Curra Limestone	Limestone	13km north-west of Gympie	Open cut
East End	Limestone	6km east of Bracewell	Open cut
Eden Valley	Gypsum	175km south-west of Winton	Open cut
Eidsvold	Siltstone	15km south-east of Eidsvold	Open cut
Elbow Valley	Limestone	20km south-east of Warwick	Open cut
Eloise	Copper, gold	60km south-east Cloncurry	Underground
Ernest Henry	Copper, gold	38km north-east of Cloncurry	Open cut
Far Fanning	Gold	100km south-west of Townsville	Open cut
Flinders	Earthy lime, dolomite	45km west of Brisbane	Open cut
George Fisher/Hilton	Zinc, lead, silver	19.2km north of Mount Isa	Underground
Great Australia	Copper	106km east of Mount Isa	Open cut
Gro-Fast	Peat	8.7km west-south-west of Malanda, Atherton	Open cut
Gumigil	Chrysoprase	15km south of Marlborough	Open cut
Gurulmundi	Bentonite	30km north of Miles	Open cut
Hadleigh Castle	Gold, silver	28.9km west of Ravenswood	Open cut
Highway-Reward	Copper	33km south-south-west of Charters Towers	Open cut
Hillgrove Dolomite	Dolomite	74km north-west of Charters Towers	Open cut
Hivesville Dolomite	Dolomite	20km north-west of Wondai	Open cut
Hugenden	Gypsum	8km west of Hugenden	Open cut
Ibis	Rutile, ilmenite, zircon	North Stradbroke Island	Dredge
IMT Bentonite	Bentonite	32km north of Miles	Open cut
Products Gurulmundi			
Ingham Lime	Limestone	24km south-east of Ewan	Open cut
Inkerman Lime	Limestone	24km south of Home Hill	Open cut
Iveragh	Silica sand	2km south-east of Tannum Sands	Open cut
Jeebropilly	Bentonite	South-east of Rosewood	Open cut
Kirknie	Limestone	27km south of Home Hill	Open cut
Kleinton	Brick clay	Toowoomba	Open cut
Kunwarara	Magnesite	60km north-west of Rockhampton	Open cut
Laroon	Dolomite	95km north-west of Charters Towers	Open cut
Limevale Quarry	Limestone	10km north of Texas	Open cut
Maidenwell	Diatomite	5km west of Maidenwell	Open cut
Marcotta	Clay tile	Maryborough	Open cut
Marmor	Limestone	North of Marmor	Open cut
Marule Lime	Limestone	21km north-north-west of Childers	Open cut
Mayne River	Gypsum	165km south-west of Winton	Open cut
Miles	Bentonite	5km south-west of Miles	Open cut
Moffatdale	Limestone	6km south-east of Murgon	Open cut
Montgomery's Quarry	Sandstone	6km north-west of Helidon	Open cut
Moreton Dolomite	Dolomite	20km south of Ipswich	Open-cut
Mount Etna	Limestone	25km north of Rockhampton	Open cut
Mount Cuthbert	Copper	13km north-west of Kajibbi	Open cut
Mount Garnet	Zinc, lead, copper, silver, gold	Mount Garnet	Open cut
Mount Gordon	Copper, cobalt	115km north of Mount Isa	Open cut
Mount Isa	Copper/silver, lead, zinc	1.3km west of Mount Isa	Underground
Mount Norma	Copper	30km south-west of Cloncurry	Open cut
Mount Rawdon	Gold, silver	80km west-southwest of Bundaberg	Open cut
Mount Sylvia	Diatomite	38km south of Gatton	Open cut
Myora	Silica sand	2km north of Dunwich, North Stradbroke Island	Surface
New Hope Collieries	Brick clay	6km south-east of Ipswich	Open cut
Numinbah Perlite	Perlite	McPherson Range, south-east of Beechmont	Open cut
Nychum	Perlite	50km north-west of Chillagoe	Open cut

Nyora Kaolin	15km south of Kingaroy	Open cut	
Osborne	Copper, gold	109km south-east of Duchess	Underground
Oxley	Brick clay	Oxley, Brisbane	Open cut
Pajingo Vera Nancy	Gold, silver	72km south of Charters Towers	Underground
Partridge	Limestone	50km south-west of Sarina	Open cut
Phoenix Lime	Limestone	11km south-southwest of Almaden, west of Cairns	Open cut
Phosphate Hill	Phosphate rock	150km south-east of Mount Isa	Open cut
Port Alma	Salt	Port Alma	Evaporative
Ravensbourne	Kaolin	5km north-east of Ravensbourne	Open cut
River of Gold Slate Mine	Slate, sandstone	62km north of Mount Carbine	Open cut
Riverton Quarry	Limestone	19.3km east of Bonshaw	Open cut
Rochedale	Brick clay	Rochedale/Redland Bay	Open cut
Sarsfield	Gold, silver	1.4km south-east of Ravenswood	Open-cut
Schultz	Dolomite	87km north-west of Charters Towers	Open cut
Scotsman's Folly	Sandstone	2km south-east of Stanwell	Open cut
Skardon River	Kaolin	13.5km north-east of Mapoon, Weipa	Open cut
Southern Pacific Sands	Silica Sand, Foundry Sand	12km east of Caboolture	Open cut
Stevenson Gypsum	Gypsum	125km west of Dirranbandi	Open cut
Strathpine	Brick clay	Brendale, Brisbane	Open cut
Stuart	Oil shale	11.2km north-west of Gladstone Power Station	Open cut
Sugar Lime	Limestone	95km south-west of Cairns	Open cut
Sunstate Sands	Silica sand	20km south of Bundaberg	Open cut
Taragoola	Limestone	10.5km south-south-east of Calliope	Open cut
Undilla	Limestone	140km north of Mount Isa	Open cut
Wagner's Quarry	Sandstone	5km north-east of Helidon	Open cut
Warbrick	Brick clay, shale	12km south-west of Warwick	Open cut
Weipa	Bauxite	5.7km west-north-west of Weipa airstrip	Open cut
Whitehill	Earthy lime, dolomite	19km north-west of Wondai	Open cut
Wide Bay Pits	Brick clay	Bundaberg region	Open cut
Willows	Zeolite	2km south of Willows, west of Emerald	Open cut
Yarraman	Rutile, ilmenite, zircon	North Stradbroke Island	Dredge
Young Australian	Copper	117km south-east of Mount Isa	Open cut

COAL MINES

Mine Name	Coal type	Location	Mining Method
Blackwater	Coking, & thermal	Blackwater	Open cut
Blair Athol	Thermal	Clermont	Open cut
Burton	Coking & thermal	Glenden	Open cut
Callide	Thermal	Biloela	Open cut
Collinsville	Coking & thermal	Collinsville	Open cut
Commodore	Thermal	Millmerran	Open cut
Cook	Coking & thermal	Blackwater	Underground
Coppabella	PCI & thermal	Coppabella	Open cut
Crinum	Thermal	Emerald	Underground
Curragh	Coking & thermal	Blackwater	Open cut
Ensham	Coking & thermal	Emerald	Open cut
Foxleigh	PCI & thermal	Middlemount	Open cut
German Creek Mines			
Central & Southern	Coking	Middlemount	Underground
German Creek East	Coking	Middlemount	Open cut
Goonyella	Coking	Moranbah	Open cut
Gregory	Coking	Emerald	Open cut & underground
Hail Creek	Coking	Mackay	Open cut
Jeebropilly	Thermal	Amberley	Open cut
Jellinbah East	PCI, thermal & coking	Bluff	Open cut
Kestrel	Coking & thermal	Emerald	Underground
Meandu (Tarong Coal)	Thermal	Nanango	Open cut
Moorvale	PCI & thermal	Nebo	Open cut
Moranbah North	Coking	Moranbah	Underground
Moura	Coking & thermal	Moura	Open cut
New Acland	Thermal	Acland	Open cut
New Oakleigh	Thermal	Rosewood	Open cut
Newlands	Thermal	Glenden	Open cut & underground
North Goonyella	Coking	Glenden	Underground
Norwich Park	Coking & thermal	Dysart	Open cut
Oaky Creek	Coking	Tieri	Underground & open cut
Alliance Colliery	Coking	Tieri	Underground
Oak Creek No.1	Coking	Tieri	Underground
Oak North	Coking	Tieri	Underground
Peak Downs	Coking	Moranbah	Open cut
Riverside	Coking	Moranbah	Open cut
Saraji	Coking	Dysart	Open cut
South Walker Creek	PCI & thermal	Moranbah	Open cut
Wilkie Creek	Thermal	Dalby	Open cut
Yarrabee	Thermal	Blackwater	Open cut

BOARD GAME

RESOURCE 3 [continued]



START

- 1 **Weipa:** Ship a load of bauxite to be refined at the Alumina Plant in Gladstone. Go straight to Gladstone.
- 2 **Get bogged in the mud after heavy rain.** Miss a turn.
- 3 **Cape Flattery:** Tour the silica sand mine. Miss a turn.
- 4 **Chillagoe:** Take some marble tiles to Cairns. Go straight to Cairns.
- 5 **Cairns**
- 6 **Mt Garnet:** Look through an old tin mine. Move on to Century Mine for a look.
- 7 **Century mine:** Find some zinc. Move ahead two spaces.
- 8 **Hilton mine:** Find some silver. Move to Mount Isa to look for some copper.
- 9 **Mount Isa:** Take a tour of the copper, lead and zinc mine. Miss a turn.
- 10 **Phosphate Hill:** Climb the Monument. Miss a turn.
- 11 **Osborne:** Fly to site to begin 10-day work roster. Miss a turn.
- 12 **Cloncurry**
- 13 **Charters Towers:** Stay overnight in this old gold town. Miss a turn.
- 14 **Sarsfield:** Find gold in a rock. Move forward three steps.
- 15 **Collinsville**
- 16 **Goonyella**
- 17 **Peak Downs:** Take the coal train to Blackwater.
- 18 **German Creek:** Visit the coal mine. Go back to Goonyella and look at that mine too.
- 19 **Blair Athol:** Ride the big dragline. Have another turn.
- 20 **Anakie:** Fossick for gems and find a sapphire. Go to Gladstone to celebrate.
- 21 **Blackwater**
- 22 **Mt Morgan:** Visit the old gold mine. Miss a turn.
- 23 **Gladstone:** Unload the Bauxite from Weipa to be refined at the Alumina Plant. Visit the coal port. Miss a turn.
- 24 **Moura:** Stop for a rest in town. Miss a turn.
- 25 **Quilpie:** You find some opal. Stay in town to celebrate. Miss a turn.
- 26 **Jackson oilfield:** Drill for oil and strike it rich. Go ahead two.
- 27 **Run out of water.** Go back to Quilpie.
- 28 **Roma:** Find a new gas producing well. Move ahead one.
- 29 **Gympie:** Find gold missed by the old-timers. Go to the finish.
- 30 **Tarong:** Tour the power station. Miss a turn.
- 31 **Ipswich:** Take a load of coal back to the power station at Tarong. Go back one.
- 32 **North Stradbroke Island:** Look for mineral sands on the beach and stay for a swim. Miss a turn.

FINISH



MATCHING COMMUNITIES WITH MINERAL RESOURCES

RESOURCE 5

Complete these sentences

1 There are gemfields at	
2 There are coal mines at	
3 You can find gold in	
4 Opals are mined in	
5 Bauxite is found at	
6 Copper, lead and zinc are mined in	
7 Mineral sands are found on	
8 Natural gas is piped from	

Weipa
Ipswich and Blackwater
Anakie
Quilpie

Gympie
Mount Isa
Roma
North Stradbroke Island

QUEENSLAND MINING COMMUNITIES

RESOURCE 6

ANAKIE SAPPHIRE FIELDS



Life on the sapphire fields of central Queensland has seen many changes since sapphires of gem quality were discovered by A. J. Richardson at Anakie in 1873. Discoveries were also made during the construction of the western railway in the 1880s. At that time the fever was for gold, mainly in the Clermont area, so it was not until 20 years later when gold was mined out that sapphire mining became an alternative and active industry in Queensland.

Miners worked the sapphire bearing ground by hand with pick and shovel. They settled in their camps around The Willows, Sapphire town and Rubyvale near the gem bearing areas. Sapphires of blue, green, yellow, particolour, pink and black were found in the gem bearing gravels, as well as zircons of mixed colours. The small townships grew quickly in the early 1900s. There were hotels, stores, schools, dance halls, a silent movie house, post offices, butchers, bakers and even a skating rink in Rubyvale. Chinese market gardeners supplied produce and most residents became self-sufficient. In the boom years - the 1920s - more than 1,000 miners and their families lived on the field.

By the 1950s mining had almost come to a standstill. Only a handful of diggers remained on the once bustling fields. The richest sapphire-bearing ground had been worked out, and the effect of the war years as well as better paying jobs elsewhere contributed to the dwindling numbers. In the Rubyvale and Sapphire districts the population shrank to about 100 which prompted Reuben Bradford on his return from the army after the war to nail a sign on an old gum tree in Policeman Creek, 'Rubyvale slow down or you'll pass it'.

A dramatic change took place in the way sapphires were mined in the 1970s and 1980s. It was the age of large-scale mechanisation and large-scale mining. Bulldozers, trucks and treatment plants were everywhere and the gemfields became a hive of activity once again. Tonnes of earth were shifted and processed in the hope of finding all the gemstones left behind from the hand-mining days. This activity continued for several years until the old areas were once again mined out. Many miners found fortunes but for the not so fortunate, high costs and poor returns defeated them.

Today, these areas have been set aside for amateur diggers who enjoy the way of life and the gamble of finding the gem of their dreams in the next shovelful. Residents now number more than 4,000. Tourism has become an important industry in the area with some local people running small businesses to cater for the tourists and visitors who arrive in the winter months. These tourists can be seen fossicking the old dumps or scratching in the gravel, sieving in the creeks, or sifting through the wash dirt. Gemstones and jewellery can be bought from many of the locals who eke out livelihoods with mining or gem cutting activities. Progress has brought electricity, television, restaurants, supermarkets, water, sealed roads and other services. Despite the progress, there is still a fascination about the gemfields, a need to experience its mystery and a desire to search for and find one of Earth's exciting treasures for oneself.

Source Gartrell, B., 1998, Rubyvale, Slow Down or You'll Pass It, Beryl Gartrell, Babinda, Queensland



MANAGING RESOURCES TABLE

RESOURCE 7

- 1 Read Resource 6, *Queensland Mining Communities: Anakie Sapphire Fields* and complete the middle column of the table.
- 2 Research and record information about a 19th century goldfield and a current Queensland mine. The Cannington mine case study at http://www.minerals.org.au/envirosmart/case_studies is helpful.

	Queensland Goldfield (late 1800s)	Queensland Gemfield (1900s) <i>Anakie, Central Qld</i>	Queensland Mine (2000s)
Describe how mining took/takes place (eg tools/machines, mining methods).			
Describe any changes over time in the way mining activities were carried out.			
Who did/does the mining? (eg individuals, groups, companies).			
How did/do mining activities change the environment?			
How were/are these environmental changes managed? (eg replanting trees).			

RESEARCHING MINING COMMUNITIES

RESOURCE 8

- 1 Choose an operational Queensland mine.
- 2 Use the sources below to help you find the information about your chosen mine.
- 3 Record your information on the Graphic Organiser Template.

USING THE INTERNET

Websites

- Local councils sometimes include information about mining activities and history on their websites. The Local Government Association of Queensland (LGAQ) has a list of all Queensland councils and some of these have websites. Access these sites at:
www.lgaq.asn.au/LGOWebApps/dirOrgWebsiteList.do
- The Australian Geological Survey Organisation and Queensland Department of Natural Resources and Mines (DNRM) websites have maps showing Queensland mineral deposits that you can zoom in on for closer investigation. The sites are at: www.agso.gov.au and www.nrm.qld.gov.au/mines/ click on 'interactive maps' (use this site if you need help with the DNRM maps www.nrm.qld.gov.au/mines/pdf/maps_help.pdf).
- The Queensland Department of Natural Resources and Mines has student project information on their site at: www.nrm.qld.gov.au/education/students/index.html
- The Queensland Resources Council has mineral fact sheets for students at: www.qrc.org.au
- The Minerals Council of Australia in its national education program section also has educational materials on their site at: www.minerals.org.au
- Links to Queensland mining companies can be accessed through the Queensland Resources Council website at www.qrc.org.au

Emailing Schools in Mining Communities

- You might like to ask students at a school in a mining community about their experiences in and knowledge of their community. To find Queensland schools on line visit:
www.studentnet.edu.au.

Phone, Fax and Mail

- If there is a mining town in your region, look up the council for that town in the local government section of your phone book. The council may have information about the mining community.
- Call, fax or write to the mine itself and ask for information.

Using Libraries

- Your school and local library may have information about mining communities in your shire or region. Ask a librarian if they have any such material.

If You Live in a Mining Community

- If you live in a mining community, you may consider writing about your experiences of living in and knowledge of your own community - including mining activities. These stories can be compiled in a book for your school and town/city library, posted on your school website or made into a PowerPoint® presentation to share with others.

GRAPHIC ORGANISER TEMPLATE

RESOURCE 9

The Minerals

What is mined?

How is it mined? (eg open cut, underground)

The Miners

How many people work at the mine?

What are some of the different tasks/jobs that people do at the mine?

Mining Company

What is the name of the mining company?

Name of the mine

The Town

What is the name of the town nearest the mine?

What services are provided or supported by the mine?

The Environment

How has the environment been changed by mining activities?

What does the mine do to rehabilitate the disturbed environment?

How will the land be rehabilitated?

ROCK CAKE RECIPE

RESOURCE 10

Ingredients

- 1 1/2 cups self-raising flour
- 1/4 cup margarine
- 1/4 cup sugar
- 1 cup 'ore'
- 1 egg
- 1/4 cup milk
- 1 level teaspoon ground cinnamon

(Ore = a selection of sultanas, currants, dried apricots, cherries and chopped nuts)

Method

- 1 Using fingers, rub margarine into flour
- 2 Add cinnamon and sugar
- 3 Add 'ore'
- 4 Beat egg, add to milk
- 5 Stir into dry mix, make a stiff dough
- 6 Grease baking tray
- 7 Spoon roughly shaped heaps onto baking tray
- 8 Bake at 180°C for 10-15 minutes
- 9 Allow to cool

Source: Minerals Council of Australia, 1996, Mineral Magic, Minerals Council of Australia, Canberra

ROCKY CAKE MINING TABLE

RESOURCE 11

	Description of Mining Method First Attempt	Description of Mining Method Second Attempt
Amount of 'Ore' Produced		
Time it Took		
Environmental Consequences		

FROM ROCK TO PRODUCT

RESOURCE 12

- 1 Read the steps in the mining process below.
- 2 Match the headings with their correct box.
(Processing Ore, Rehabilitation, Approvals, Mining, Monitoring, Exploration)
- 3 Place the headings into the correct mining process order.
- 4 Using the headings, write your own description of each step.

Geoscientists explore for minerals buried under the surface of the Earth by gathering as many clues as possible. They use various methods including satellite images, aerial surveys, soil and water sampling and drilling holes. Exploration can take place from the desert to under the ocean floor!

However, exploration first requires a license to proceed and the company must show how its exploration activities will impact on the environment and how it will minimise this impact.

Environmental scientists are involved in researching this.

Open-cut mining is used when the orebody is on or near the surface. It involves uncovering the ore by first removing the topsoil and rock. Explosives are then used to break up the rock so a series of steps can be cut into the sides of the pit. In open cut mining, the broken ore is scooped up by large front-end loaders and then dumped onto trucks, which take the ore to the processing plant. Underground mining, accessed via a shaft or tunnel (decline), is used when the ore body lies deeper in the ground. The ore is taken to the surface by a conveyor belt or in skips.

Mining engineers and mine geologists oversee these operations.

The mining company must seek approval from the State Government to mine, and the local community is given the chance to participate in the approval process. An Environmental Impact Statement (EIS) must be written by the company's environmental scientists to outline the possible impact the mine could have on the environment, what action would be taken to minimise this impact and what would be done to rehabilitate mined land after use.

Water run-off, containing waste products from the mine's operation, is contained on site in a tailings dam. This ensures nearby land and waterways are not effected. Gas emissions from coal mines are monitored and minimised. Levels of noise and dust are monitored to minimise any impact on nearby residents or local fauna.

After mining is complete, the area must be left in a satisfactory condition, to be used in a way agreed to under the EIS approval. This might be a return to bushland (through replacing topsoil and replanting local plant species), conversion to a landfill site, creation of a wetlands or recreational lake, return to crop or grazing land, or another use.

Environmental scientists oversee this step.

The mined ore must be processed. For example, nickel is produced by crushing and grinding the ore to release or liberate the valuable ore mineral (pentlandite) from the unwanted rock (gangue); concentrating the pentlandite using froth flotation; heating (smelting) the concentrate to 1550°C in a flash furnace to produce the metal nickel; purifying (refining) the nickel by heating and adding chemicals.

Metallurgists oversee the processing plant.

Source Envirosmart, 2000, Minerals Council of Australia, Canberra



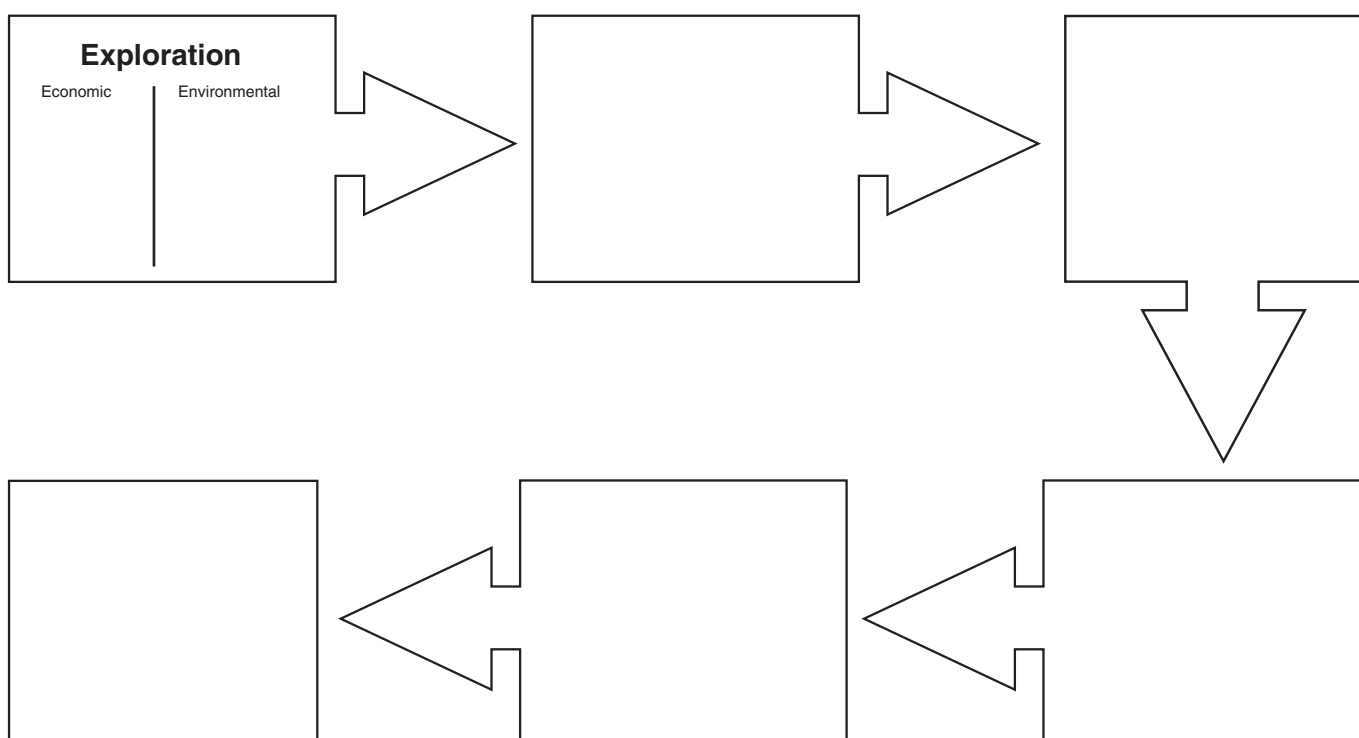
GROUP RESEARCH PROJECT

RESOURCE 13

- 1 Form a group of six.
- 2 Each group member must choose one of the stages in the mining process (exploration, approvals, mining, monitoring, processing ore, rehabilitation).
- 3 Gather and sort information from a range of sources about the economic and environmental factors associated with your chosen step in the mining process. (The case studies at http://www.minerals.org.au/envirosmart/case_studies are very useful). Decide together how you will record your individual findings, that is design and use the same set of questions or graphic organiser so that every person in your group has consistent data.
- 4 Do your individual research.
- 5 As a group, decide how you want to present your findings, eg make a model, prepare a set of labelled diagrams, create a computer presentation.

Steps in Mining Process	Economic Factors to Consider	Environmental Factors to Consider
Exploration		
Approvals		
Mining		
Monitoring		
Processing Ore		
Rehabilitation		

OR
Flowchart



CHAPTER 4

MINING AND LAND USE

STRAND PLACE AND SPACE
KEY CONCEPT PROCESSES AND ENVIRONMENTS

INDEX

MINING AND LAND USE

FOCUS QUESTIONS

- What impact do mining activities have on the environment?
- How are decisions about mining options discussed and negotiated in the community?

SOSE OUTCOMES

- PS 2.2 Students predict possible consequences for an ecological system when an element is affected.
- PS 3.2 Students create and undertake plans that aim to influence decisions about an element of a place.
- PS 4.2 Students predict the impact of changes on environments by comparing evidence.

RESOURCE SHEETS

- 1 Impacts Diagram
- 2 Impacts Table
- 3 An Unfinished Story
- 4 Consequence Tables
- 5 Food Chains (OHT)
- 6 Fighting Fair and Foul (OHT)
- 7 Issue and Group Profiles (OHT)
- 8 Helpful and Unhelpful Role-plays
- 9 Decision-making Maze
- 10 A Mineral Sands Development
- 11 Comparing Evidence (OHT)
- 12 Sample Development-consequence Chart (OHT)
- 13 Development-consequence Chart Pro-forma

TEACHING & LEARNING ACTIVITIES

MINING AND LAND USE

ACTIVITY A LOOKING AT IMPACTS

Students view a diagram of a mine site and list the possible impacts of various mining activities on the environment.

Purpose

- To introduce students to some of the impacts of mining on the environment.

Teaching Procedure

- Provide students with a copy of Resource 1, *Impacts Diagram*.
- Invite students to examine the features of the mine site, eg ore stockpile, seedling nursery, and the activities on the site, eg excavation, trucks hauling ore. Ask students to group those features and activities according to which aspect of the environment (air, water, land, energy, and waste management) they could have an impact on, eg trucks hauling ore make dust which can affect air quality. Note that some of these features and activities are ways of addressing possible impacts, eg water trucks reduce dust in the air. Students record their observations on Resource 2, *Impacts Table*.

ACTIVITY B PREDICTING CONSEQUENCES

Students read a short unfinished story about the effect of human activities on the environment. Students predict what may happen to plants and animals after mining starts at a bush site and complete a consequence table. Students write their own story ending and share their paragraphs.



This task can be used to demonstrate outcome PS 2.2.

Purpose

- To provide students with an opportunity to predict the consequences of mining on elements in the environment.

Teaching Procedure

- Read Resource 3, *An Unfinished Story*, to students.
- Ask students to respond by predicting what might happen to the plants and animals in the story. Record responses on a class chart using table one in Resource 4, *Consequence Tables*, as a guide.
- On an OHT, show students the first food chain on Resource 5, *Food Chains*, and discuss what happens when an element of the food chain is affected.
- Re-read the story and invite students to write a paragraph explaining what might happen next.
- Students share their story endings and make class books using the existing story and adding their endings. Students can illustrate their work.
- Examine the other food chains on Resource 5 and invite students to consider what would happen to an animal at the top of the food chain if a plant or animal further down the chain died. Complete tables two and three on Resource 4 using the second and third food chains.

ACTIVITY C EXAMINING DECISION-MAKING

Students consider how decision-making and negotiating about the management of a potential mine site occurs in the community. They examine examples of helpful and unhelpful processes and propose win-win solutions that meet the needs of all participants.



This task can be used to demonstrate outcome PS 3.2.

Purpose

- For students to explore helpful and unhelpful discussion/decision-making processes and suggest ways to meet the needs of all groups involved.

Teaching Procedure

- Make an OHT of Resource 6, *Fighting Fair and Foul*, and discuss with students. For more information and resources about this approach, visit the Conflict Resolution Network at <http://www.crnhq.org>.
- Make an OHT of Resource 7, *Issue and Group Profiles*, and invite selected students to read a section each to the class.
- Provide every student with a copy of the unhelpful role-play from Resource 8, *Helpful and Unhelpful Role-plays*. Have students form groups of five, choose a character each and read through the unhelpful role-play together. Invite one group to read/perform the role-play in front of the class.
- Ask students to go through the text of the unhelpful role play and underline any words or actions that show people playing foul. Display the OHT of Resource 6 again to assist students in this task. Invite students to share their findings with the class.
- Repeat the last two steps with the helpful role-play.
- Provide students, working in pairs, with a copy of Resource 9, *Decision-making Maze*, to complete.
- As an extension, students could use the decision-making maze to map a local or regional conflict and communicate their deliberations to the participants.

ACTIVITY D COMPARING EVIDENCE AND PREDICTING CONSEQUENCES

Students read and share information about mining activities from differing sources. Following a comparison of the sources, students complete a development-consequence chart recording the possible impacts and the possible effects of these impacts.



This task can be used to demonstrate outcome PS 4.2.

Purpose

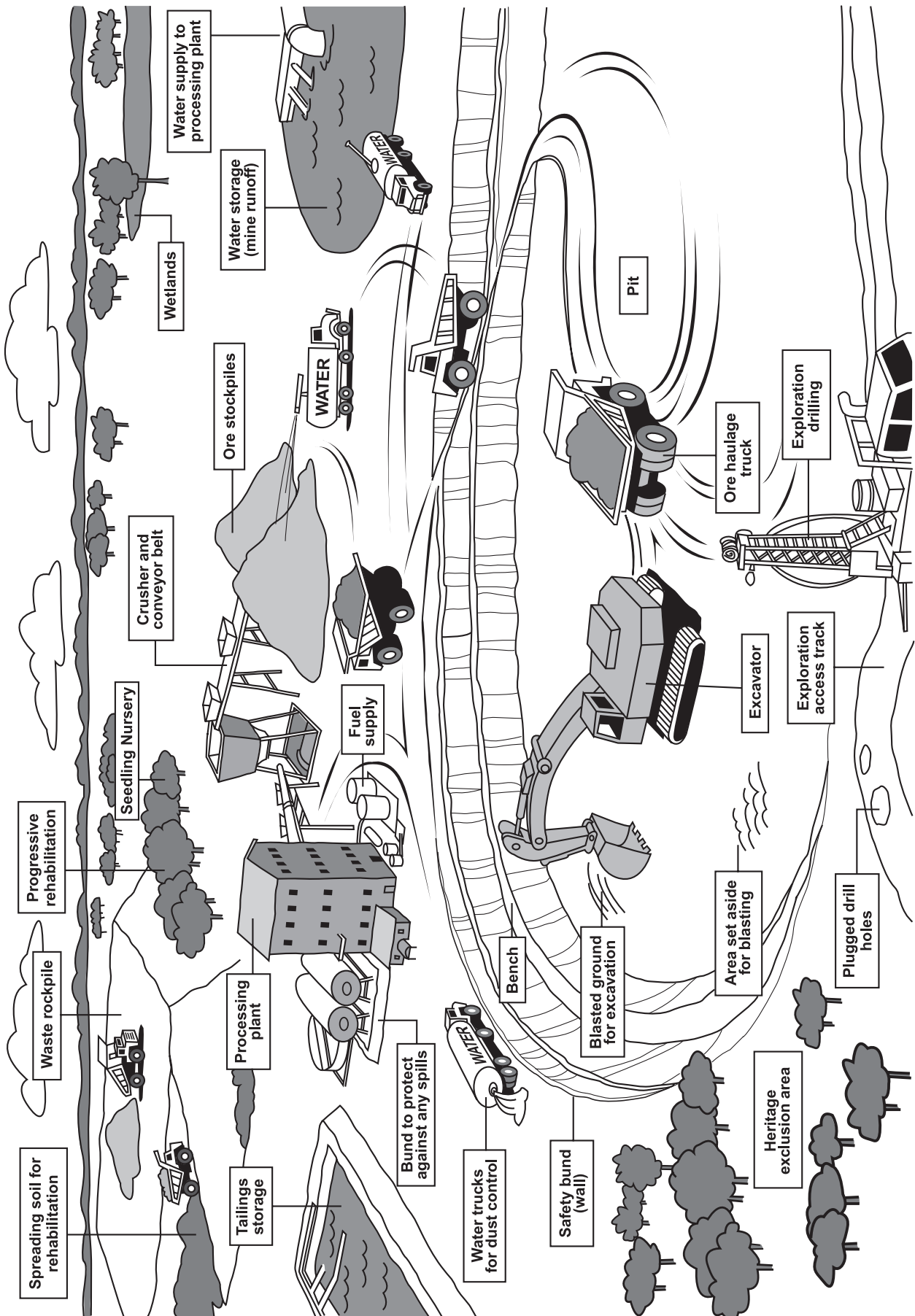
- To assist students to compare conflicting evidence and consider the impact of a mining activity on the environment.

Teaching Procedure

- Provide students with a copy of Resource 10, *A Mineral Sands Development*. Invite students to read both statements and ask any questions of clarification.
- Ask students to compare the two statements and record the differences and similarities on an OHT of Resource 11, *Comparing Evidence*.
- Prepare an OHT of Resource 12, *Sample Development-consequence Chart*, and explain the chart to students.
- Provide students, working in pairs, with a copy of Resource 13, *Development-consequence Chart Pro-forma*, and ask them to record the possible impacts of the mine on the environment. Share these ideas before asking students to consider and record the likelihood of the impacts occurring and the possible effects of those impacts.
- Invite students to share their responses.
- As an extension, students could research a local, regional or state development and individually complete a development-consequence chart to demonstrate their understanding of the impact of changes on a place.

IMPACTS DIAGRAM

RESOURCE 1



IMPACTS TABLE

RESOURCE 2

- 1 Look closely at the Impacts Diagram of a mine site and consider the features and activities that could have an effect on the environment (air, water, land, energy and waste management). List these in the table below.
- 2 Consider which features and activities at the mine site could reduce these impacts. List these in the last column of the table.

Aspects of Environment	Mining Activities that May Impact on the Environment	Action Taken at the Mine to Reduce the Impact
Air		
Water		
Land		
Energy		
Waste Management		

AN UNFINISHED STORY

RESOURCE 3

A FRAGLET TALE



One day, in a small creek, a number of fraglets were meeting at the big rock seat.

"It's no good," said Flay, the oldest fraglet. "Soon there will be no more moff left to eat."

She was right. Moff used to grow all over the rocks in the small creek. It was soft and spongy, shiny, green and wet. It tasted great and was the best food the fraglet could get.

But over the last few weeks the moff had changed. Now it was turning hard and brown. It was dry and scratchy, dirty and dusty and tasted all musty.

"But what is making the moff die?" asked Fid, the youngest fraglet, with a sigh.

"I think I know," said a quiet voice that sounded

meek. The voice belonged to Frem a friendly fraglet from further down the creek.

Frem had blue, bulging eyes and strong stripy thighs. Frem was slippery, smooth and sleek.

"Not far from here, people have started a mine you see. They dig in the ground to get rocks that they need. The digging and the trucks make lots of dust. The wind is bringing that dust to our home. Now there is too much dust for the moff to grow, because the moff needs clean air as you all know."

They were so busy talking, they didn't hear anyone walking along the creek to their meeting place. Two young homans suddenly appeared through the trees and the fraglets fled just as quick as you please. All except Frem who said in a very brave croak, "This is fraglet country. Who are you folk?"

"I'm Heap and this is Hilth," said the tallest homan. "Who are you little thing with lovely blue eyes?"

Frem blushed bright aqua and replied with vigour, "I'm Frem and I'll thank you not to mention my size. I used to be healthy with bright shining eyes. But now it won't be long before everything dies."

"But why is everything dying?" asked Hilth.

"The dust from the mine is killing the moff that we eat," croaked Fid, who had crawled out of the water and onto the seat.

"Our parents work at the mine and I'm sure they don't know that the dust from the mine is hurting you so. If you come with us to our family home, they'll be able to help so the moff starts to grow" said Heap.

Frem and Fid exchanged worried looks. They had read bad things about homans in books.



CONSEQUENCE TABLES

RESOURCE 4

TABLE ONE

Living Things in the Creek	What Might Happen if the Dust from the Mine Keeps Blowing Towards the Creek?
Moff	
Fraglet	

TABLE TWO

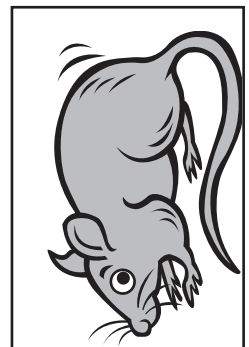
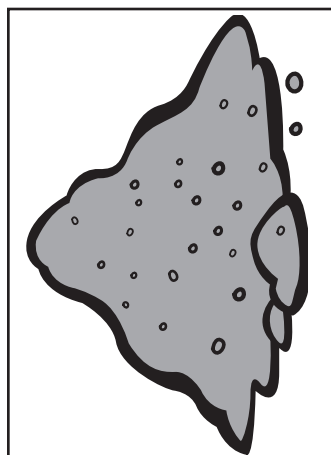
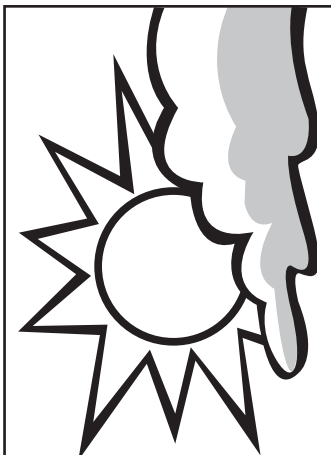
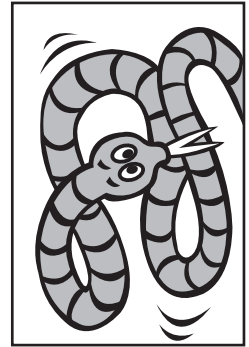
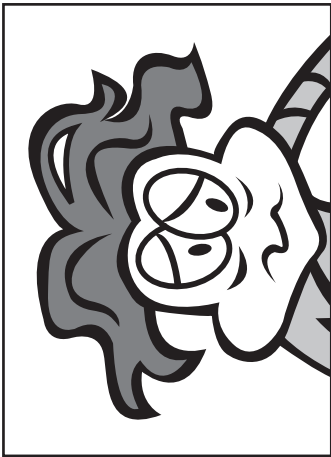
Living Things	What Might Happen if the Soil was Changed?
Worm	
Bird	

TABLE THREE

Living Things	What Might Happen if ----- -----

FOOD CHAINS

RESOURCE 5



FIGHTING FAIR AND FOUL

RESOURCE 6

FIGHTING FAIR

- Be willing to fix the problem
- Say what the problem is for you
- Listen to what the problem is for them
- Attack the problem not the person
- Look for answers so everyone gets what they need

FIGHTING FOUL

- Name calling
- Put downs
- Sneering - Blaming
- Threats - Hitting
- Bringing up the past
- Making excuses
- Not listening
- Getting even

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ISSUE AND GROUP PROFILES

RESOURCE 7

MINING ON 'EDENVALE'



Mincalco Mining Company has established a mine on a cattle property operated by Reg Wyndam called 'Edenvale'. The company has already spent much time and money surveying the site, conducting tests

and setting up the first stage of the mine which is due to start production in the next couple of months. The CEO, Geoffrey Singh, is worried about losing money on this project.



**WESTERN ABORIGINAL
LAND COUNCIL**

The Western Aboriginal Land Council has asked to be included in decision-making about the specific sites to be mined. Chairperson of the Council, Margaret Williams, says that there are a number of special cultural sites on the property. She wants to make sure that these sites are not disturbed.



After years of drought and no income from his cattle, Mr Wyndam wants the mine to go ahead because Mincalco will pay him for the use of his land. The property is in debt and he doesn't want to lose the land that his family has worked on for five generations.

The local MP, Joanne Lee, wants the mine to go ahead as it will bring jobs and money to the area where many of her supporters live. There is high unemployment in the area and she is worried that without the support of the mine the towns will die.



The Nature Conservation Society doesn't want the mine to go ahead. They say it will further damage land already damaged by grazing cattle and threaten an endangered regional ecosystem. Some members of the group including the coordinator, Maxine Kennis, have been at the site protesting.

Notes

- CEO is an abbreviation for Chief Executive Officer. The CEO of a mining company has to be good at making decisions and planning activities that make money for the company and shareholders.
- MP is an abbreviation for Member of Parliament. The people who live in the local area vote the local member into office. A good member will work hard to help the people in their area get the things that they need, such as health care, jobs, roads and schools.
- An ecosystem is a distinct community of living things that is defined by types of vegetation, landforms and soils.

HELPFUL AND UNHELPFUL ROLE-PLAYS RESOURCE 8

UNHELPFUL ROLE-PLAY

In groups of five, choose a character and read through the script together. Underline the words that show people are fighting foul.

Characters (in order of appearance)

- Joanne Lee - local Member of Parliament
- Maxine Kennis - Coordinator of the Nature Conservation Society
- Geoffrey Singh - Chief Executive Officer of Mincalco Mining Company
- Reg Wyndam - owner of 'Edenvale' (the cattle property where the mine is)
- Margaret Williams - Chairperson of the Western Aboriginal Land Council

LEE: Good. We're all here. Let's get started.

KENNIS: We object strongly to Mincalco mining in this environmentally sensitive area. It must stop before any more damage is done.

SINGH: Now let's be honest. It's really just scrub with little value. You're over-reacting again.

KENNIS: You don't even want to understand. You only care about the money!

WYNDAM: Stop arguing. It's my land. I should be able to do whatever I want with it.

WILLIAMS: Your land! Aren't you forgetting something. My people lived on this land for thousands of years before you came here.

WYNDAM: Not this again.

WILLIAMS: Well no-one's listening.

LEE: Please calm down. (Pause) Look, we all agree that this area needs jobs and money.

KENNIS: I don't agree - not if that means wrecking the environment.

SINGH: Can't you be reasonable for once? You have never been prepared to see the bigger picture.

KENNIS: Oh - and you have I suppose?

WYNDAM: What's wrong with you? We need to sort this out. We need the mine. We need the money. The land will survive. It will survive this drought but I won't.

WILLIAMS: You're so narrow-minded, there's more to the land than running cattle and digging holes.

LEE: Please, this is not getting us anywhere. Let's stay calm. I'm sure we can find a way to compromise and make the best decision for the local area.

WILLIAMS: Is that the best you can do? You are only concerned about getting voted back in at the next election.

SINGH: This is a waste of time. (To Kennis) I want that scruffy rent-a-crowd off the site by tomorrow or else!

KENNIS: Or what?

LEE: I give up.

HELPFUL AND UNHELPFUL ROLE-PLAYS

HELPFUL ROLE-PLAY

In your original group of five and keeping the same character, read through the script together. Circle the words that show people are trying to fight fair.

Characters (in order of appearance)

- Joanne Lee - local Member of Parliament
- Maxine Kennis - Coordinator of the Nature Conservation Society
- Geoffrey Singh - Chief Executive Officer of Mincalco Mining Company
- Reg Wyndam - owner of 'Edenvale' (the cattle property where the mine is)
- Margaret Williams - Chairperson of the Western Aboriginal Land Council

LEE: Good. We're all here. Let's get started.

KENNIS: We are concerned about Mincalco mining in this environmentally sensitive area. We need to consider alternatives.

SINGH: Look, to be honest, I don't understand your concerns. It doesn't look like valuable land to me. It's just scrub, isn't it?

KENNIS: You could call it scrub, but the site contains an endangered regional ecosystem. It's one of the few remaining patches of semi-evergreen vine thicket on alluvial plains.

WYNDAM: Yeah, the Landcare guy said something about that. I didn't know there was anything rare on my land until then.

WILLIAMS: Our land. I feel like no one recognises that my people managed this land for thousands of years.

WYNDAM: No offence, but my family has worked hard on this property for five generations.

WILLIAMS: I know. My grandpa, Billy Watkins, worked for your dad.

WYNDAM: Old Mr Watkins! He taught me how to ride when I was a boy. My father said he was the best stockman he'd even seen in the saddle.

(Pause)

LEE: Well. Perhaps we can all get what we need.

KENNIS: How do you think that's possible?

SINGH: We will protect the environment through the detailed environmental plan we have to submit to the Government.

KENNIS: Good, and what about using some of your resources to help develop a native seed bank and help with revegetating Rocky Creek near the site. It's quite degraded.

SINGH: I think we could do that. Our environmental scientist could meet with your team and discuss possibilities.

WYNDAM: I'm sure the Landcare people would help.

SINGH: (To Kennis) Now, will your protestors remove the signs and the camp and allow my workers to work without interruptions?

KENNIS: We will but we're going to hold you to your promise.

(Pause)

LEE: This sounds really positive.

WILLIAMS: Wait. What about the protection of our cultural sites? (Looking at Singh) Would you agree to meet with the council of elders?

SINGH: That's also in our plans as part of our native title negotiations.

WILLIAMS: That's good, when shall we meet.

SINGH: How about next week?

LEE: This is looking good. What can I do to help?



DECISION-MAKING MAZE

RESOURCE 9

Problem	Participants	Their Needs	Their Fears
		→	
		→	
		→	
		→	
		→	

Solution	They Could
	←

A MINERAL SANDS DEVELOPMENT

RESOURCE 10

MEDIA RELEASE



SAND MINING CO STATEMENT

Sand Mining Co has located a significant deposit of heavy mineral sands at Sandy Point on the Queensland coast. Exploration evidence suggests the mine will have a life-span of 20 years. The mine would produce the mineral sands rutile, zircon and ilmenite. These three minerals are important as they are used in products such as paints, plastics, paper, ink, rubber, textiles, cosmetics, ceramics, aircraft and motor vehicles.

The development of the mine would bring significant economic benefits to the local area and to Queensland. The gross revenue from the main dune region is estimated to be \$250 million each year. Mining of lowlands would add to this figure. Mining royalties and taxes paid by the company to the Government would help to pay for increased services in health care and education. The development of the mine would benefit the community by improving roads, power and water into the area, increasing employment opportunities and encouraging growth in small businesses servicing the mine.

The mining process will involve a dredge floating on the top of a large body of water drawing up the sand and extracting the heavy mineral sands. The remaining 99 per cent of sand will be pumped straight back onto the dune system and shaped to match the way it was before mining commenced. The dunes will then be covered with the original topsoil and revegetated with local plant species. No chemicals will be used in the process.

The Environmental Impact Statement conducted by Sand Mining Co has identified the mine would not adversely impact on the biodiversity of flora and fauna in the area. The company will also be bound by environmental conditions that prevent permanent damage of the surrounding lagoons.

‘Environmental best practice and rehabilitation needs will be integrated into every step of the mining process from beginning to end,’ said Tom Green, Managing Director of Sand Mining Co.

Heritage surveys will be conducted to determine if any sensitive Aboriginal sites exist on the mining lease. If they do, the company will work with local Indigenous representatives to protect the sites. The development of the mine will mean employment and training opportunities for the local Aboriginal people. All mine employees will be required to undertake a cultural awareness program.

Sand Mining Co looks forward to the challenges of developing the mine in this area as it is one of the few places in the world where mineral sands are located in viable economic quantities.

(This case study is fictional and does not pertain to any sand-mining operations, past or present).

MEDIA RELEASE



ENVIROACT STATEMENT

EnviroAct, a local environmental conservation group, has expressed concerns about the development of a mineral sands mine at Sandy Point on the Queensland coast.

The group acknowledges that the mine would boost capital investment in the area and improve community services such as water, power and roads. The mine would also provide long-term jobs and training for the local population, including the Indigenous population, and would reduce the high youth unemployment rates in the area. Revenue for the project is expected to be approximately \$250 million each year. The mine would benefit Queenslanders through the payment of royalties and taxes to the Government.

EnviroAct believes that the development of the mine at Sandy Point would have a major impact on the environment. Dredging, hauling, clearing and extracting in this pristine environment will impact on this sensitive area. Sand dunes, some up to 100 metres in height, will be destroyed and a series of lakes between the dunes, notably the Banksia and Fraser lagoons, will come under threat. Gillian Smith, spokesperson for EnviroAct said:

‘What the company says and does are two different things. Sand Mining Co has had accidents in the past with seepage from dredge ponds and drainage of lakes’.

Mining would also mean the end to some small wetlands on the mine lease and destruction of parts of the native forests. Even though the mining company plans to rehabilitate, it will take many years for the trees to reach maturity. The forests on the high sand dunes are home to the brahminy kite and white-bellied sea eagle. With the clearing of this forest these species may no longer inhabit the area.

Even though mining will not occur on the mangroves and tidal swamp areas, the proximity of the mine lease could have an impact on them. The area is home to the long necked tortoise (*Chelodina longicollis*) that frequents the permanent swamps and lakes. The mangrove heron and mangrove kingfisher also use the area as a breeding ground.

EnviroAct is also concerned that mining will damage or destroy Aboriginal sacred sites and that middens (ancient shell dumps) will be disturbed. The local Indigenous council has called on the company to consult and negotiate with the local aboriginal community.

EnviroAct has called for a blockade of the proposed mine and is preparing a long-term campaign to halt any development.

(This case study is fictional and does not pertain to any sand-mining operations, past or present).

**DEMONSTRATING
OUTCOME** PS 4.2

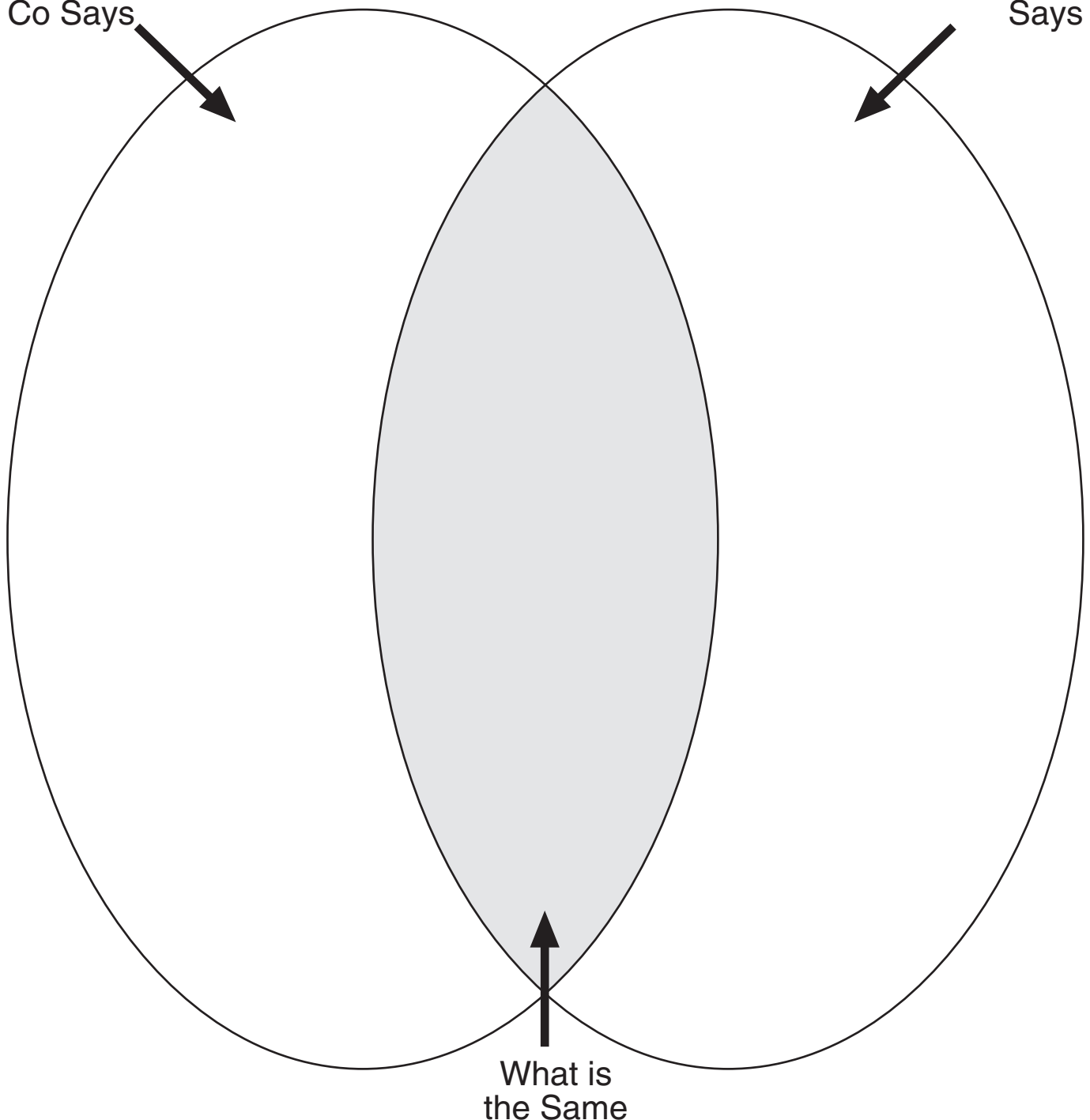
COMPARING EVIDENCE

RESOURCE 11

- 1 Read the two accounts of a proposed mine development in Queensland.
- 2 Record briefly what Sand Mining Co says about the project in the left-hand circle.
- 3 Record briefly what EnviroAct says about the project in the right hand circle.
- 4 Is there anything that both accounts agree on? If so, record these in the middle or overlapping sections of the two circles.

What Sand Mining
Co Says

What EnviroAct
Says



SAMPLE DEVELOPMENT-CONSEQUENCE CHART

RESOURCE 12

- 1 The development being considered is written on the line below.
- 2 In the first column (A - F) list six things that could happen as a consequence of the development going ahead.
- 3 Each consequence is rated (with ticks in appropriate columns) according to its perceived likelihood and effect.

Development: Establishment of a Mine Site

	What is the likelihood of this consequence happening?				If it happened what effect would it have?				
	Certain	Probable	Possible	Almost Impossible	Very Favourable	Favourable	Little or no Impact	Harmful	Very Harmful
Consequences it might result in:									
A Job creation	✓				✓				
B Displacement of native animals		✓						✓	
C Native animal breeding program	✓				✓				
D Better local resources (roads, medical facilities etc)			✓		✓				
E Removal of top soil for use in rehabilitation of the mine site		✓							✓
F Loss of some local native plants.		✓							✓



DEVELOPMENT-CONSEQUENCE CHART PRO-FORMA

RESOURCE 13

- 1 Write the development being considered on the line below.
- 2 In the first column (A - F) list six things that could happen as a consequence (both positive and negative) of the development.
- 3 Taking one consequence at a time, tick the appropriate columns showing how likely it might be and its possible effect.

Development:

	What is the likelihood of this consequence happening?				If it happened what effect would it have?				
	Certain	Probable	Possible	Almost Impossible	Very Favourable	Favourable	Little or no Impact	Harmful	Very Harmful
Consequences it might result in:									
A									
B									
C									
D									
E									
F									

CHAPTER 5

MINING AND YOU

STRAND SYSTEMS, RESOURCES AND POWER

KEY CONCEPT INTERACTIONS BETWEEN ECOLOGICAL
AND OTHER SYSTEMS

INDEX

MINING AND YOU

FOCUS QUESTIONS

- How do mining and the manufacture of goods made from minerals impact upon the natural environment?
- What conservation strategies are being used, and could be used, to minimise the impacts of mining on the environment?
- How are activities in Queensland's mining industry connected to people, economies and environments outside Australia?

SOSE OUTCOMES

- SRP 2.1 Students investigate the origins and processing of a familiar product to describe relevant conservation strategies.
- SRP 3.1 Students make inferences about interactions between people and natural cycles, including the water cycle.
- SRP 4.1 Students outline how Australian industries link to global economic and ecological systems.

RESOURCE SHEETS

- 1 People and Minerals Matching Game
- 2 Minerals Matching Game Information
- 3 Sample Crossword (OHT)
- 4 Crossword Pro-forma
- 5 Impacts Table: Making a Computer
- 6 The Water Cycle
- 7 Impacts on the Water Cycle
- 8 The Global Light Bulb
- 9 Mining - Linking Queensland with the World
- 10 World Map

TEACHING & LEARNING ACTIVITIES

MINING AND YOU

ACTIVITY A TUNING IN TO PEOPLE USING MINERALS

Students play a matching game finding classmates who have used everyday items made from minerals.

Purpose

- To introduce students to some of the many everyday uses of minerals and metals.

Teaching Procedure

- Provide each student with a copy of Resource 1, *People and Minerals Matching Game*, and read through the directions and the boxes with the students.
- Give students about 15 minutes to walk around the classroom and fill in their Matching Game card.
- Following this, choose one box at a time and ask students to indicate if they are, for example, wearing jewellery. Then read out or explain the supporting text for each box found in Resource 2, *Minerals Matching Game Information*.

ACTIVITY B EXPLORING MINING AND ENVIRONMENT IDEAS VOCABULARY

Students develop a class vocabulary list of mining and environment words. Working in pairs, students create a crossword using words from their list.

Purpose

- To introduce students to some of the ideas and vocabulary associated with mining and the environment.

Teaching Procedure

- Students brainstorm a list of words about mining and its impact on the environment. This could follow the viewing of a video, reading of books, participating in a session with a Queensland Mining Council Education Officer (see booking forms on QMC website www.qmc.com.au), or completion of other activities in this resource.
- Discuss with students the meaning of words on the list and invite students to provide a description/definition for a couple of words.
- Invite students, working in pairs, to create a crossword choosing their words from the class vocabulary list. Use an OHT of Resource 3, *Sample Crossword*, to demonstrate the steps in making a crossword. Provide students with a copy of Resource 4, *Crossword Pro-forma*, to use as a template.

TEACHING NOTE: Students could also use a crossword-making computer program to complete this task.

ACTIVITY C LOOKING AT COMPUTERS AND THE ENVIRONMENT

Students review the steps in the production and consumption of a computer (refer to Economy and Business section). Students identify the possible impacts on the environment at each step and then identify ways to minimise that impact.

TEACHING NOTE: Students need to do this activity after activities A, B and C in the Queensland's Mineral Resources section, pp 110-116.



This task can be used to demonstrate outcome SRP 2.1.

Purpose

- To provide students with an opportunity to investigate the fossil fuel and mineral origins and manufacture of a computer, and to describe conservation strategies used at different stages of production.

Teaching Procedure

- Review the steps in the production and consumption of a computer covered in the Economy and Business section, ie Activities A, B and C, pages 110-116.
- Students discuss the possible impacts on the environment at key steps in production and suggest ways that impact could be minimised. Using Resource 5, *Impacts Table*, students choose text boxes and place them in the appropriate places in the table.

ACTIVITY D IDENTIFYING HUMAN IMPACTS ON THE WATER CYCLE

Students review the elements of the water cycle and look at some of the ways water is used in the mining industry. They consider how these activities may affect the water cycle.



This task can be used to demonstrate outcome SRP 3.1.

Purpose

- To examine some of the impacts that mining has on the water cycle.

Teaching Procedure

- Provide students with a copy of Resource 6, *The Water Cycle*. Read through together and ask students to label the four parts of the water cycle.
- Read Resource 7, *Impacts on the Water Cycle*, and invite students to consider the impact the listed activities may have on the water cycle and suggest ways to minimise these impacts. Students record their ideas on the table.

ACTIVITY E MAPPING GLOBAL CONNECTIONS

Students examine data that demonstrate global interdependence in the manufacture of a light bulb and the movement of minerals, people and money to and from Queensland. Students record the links on a map of the world.



These tasks can be used to demonstrate outcome SRP 4.1.

Purpose

- To demonstrate how the Queensland mining industry is linked to the world through natural resources, people and money.

Teaching Procedure

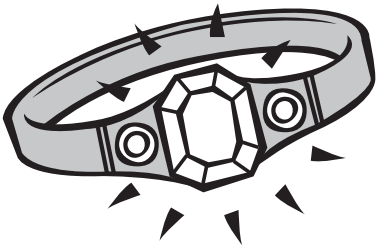
- Provide students with a copy of Resource 8, *The Global Light Bulb*, to read and discuss.
- Using an atlas and Resource 10, *World Map*, and Resource 8, *The Global Light Bulb*, ask students to locate and record all the countries whose mineral resources are shared to create a light bulb.
- Provide students with a copy of Resource 9, *Mining - Linking Queensland with the World*, to read and discuss.
- Using the coal export figures in Resource 9, ask students to create a pie graph on a computer to show Queensland coal export destinations.
- Using their map, ask students to map how the minerals industry links Queensland to the world through the movement of minerals, people and money into and from Queensland. Ask the students to consider ways to show this, eg using dotted lines, different size arrows and different colours. Ensure students indicate the direction of movement.

PEOPLE AND MINERALS MATCHING GAME RESOURCE 1

Move around the room to find someone who fits the descriptions in the boxes below. Write their name in the box. You can write down a person's name only once.

Find someone who

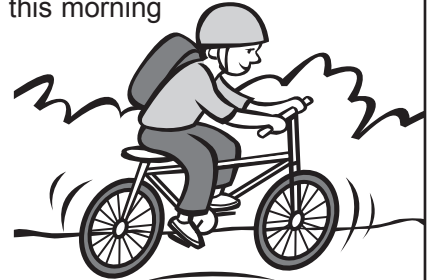
1 is wearing jewellery



2 has had a drink from a soft-drink can in the past week



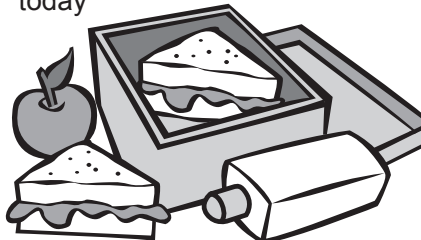
3 rode to school on a bike this morning



4 brushed their teeth this morning



5 has brought their lunch to school in a plastic container today



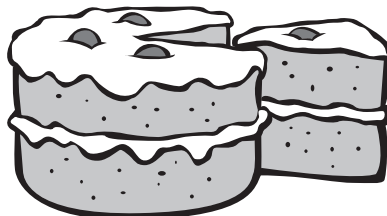
6 used sun-screen in the past week



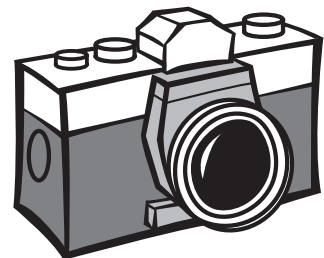
7 came to school by car this morning



8 has eaten some cake in the last two days



9 owns a camera



10 has used toilet paper in the past 24 hours



11 has optical glasses or sunglasses



12 has walked on carpet today



MINERALS MATCHING GAME INFORMATION

RESOURCE 2

During our lifetime we will use many tonnes of minerals, usually without even realising it. Here are some everyday uses of minerals, many of which are mined in Queensland.

- 1 Jewellery can be made from gold, silver, and oil (plastic costume jewellery). Jewellery may also use precious and semi-precious gemstones such as opals, garnets, sapphires and rubies. All of these are mined in Queensland.
- 2 Soft drink cans are made from aluminium, which can be recycled.
- 3 Bicycle frames, wheels, chain and gearing are made from steel, aluminium, chromium and titanium minerals. The seat and helmet are made from oil (plastics from petrochemicals).
- 4 Toothpaste contains titanium (from mineral sands).
- 5 Plastic lunchboxes are typically made from oil, limestone, clay and talc.
- 6 Sunscreens contain zinc and titanium minerals (from mineral sands).
- 7 Cars are made by combining about 40 different minerals and metals including aluminium, copper, iron (steel), lead, magnesium, manganese, nickel, oil, silica sand and zinc. All of these, with the exception of iron, are mined in Queensland.
- 8 Cake contains soda ash and gypsum.
- 9 Silver and oil are used to make the film for a camera.
- 10 Limestone, clay, talc and titanium minerals are used in the manufacture of toilet paper.
- 11 The lenses of optical glasses and sunglasses are made from silica sand (into glass) or oil (into plastic). Frames can be made from oil, gold, copper and zinc (brass) and chromium.
- 12 Wool used in making carpets is cleaned with clays, soda ash, zeolite or petrochemicals from oil. Synthetic carpets are made from petrochemicals (oil and gas).

SAMPLE CROSSWORD

RESOURCE 3

		¹ M	I	N	E		
		I					
² M	I	N	E	³ R	A	⁴ L	S
E		E		E		A	
T		R		P		W	
A		S		A		S	
L			⁵ D	I	G		
				R			

Making Your Own Crossword

A Start with a long word and put it near the middle of your grid. This will be an across word, eg 2 across

Find words that you can fit vertically through your first long word. These will be down words, eg 4 down

Find some other words that you can fit horizontally at the top and bottom of your crossword. These will be across words, eg 5 across

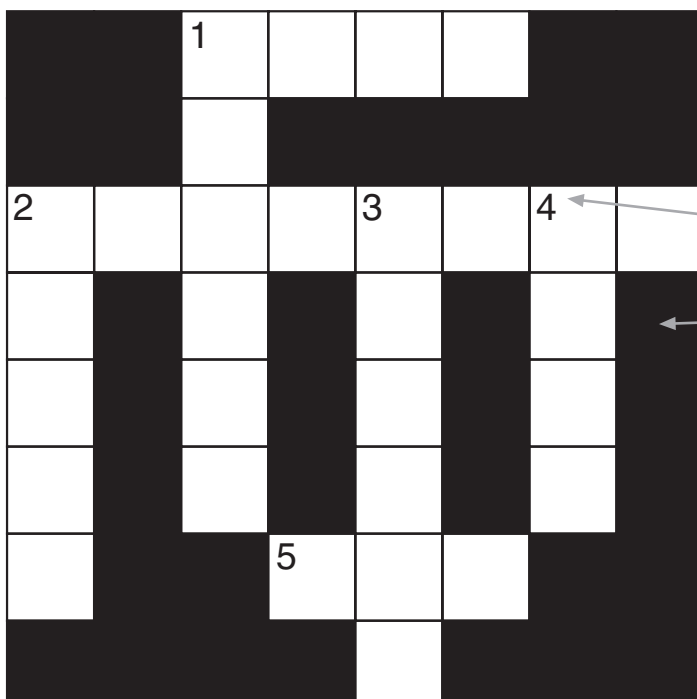
B Make up clues for each word

Across

- 1 Place where minerals are mined
- 2 Rocks are made of these
- 5 You do this to make a hole

Down

- 1 People who work in a mine
- 2 This is made from minerals and turned into many useful things
- 3 Fix
- 4 Rules



C Make sure your spaces and clues are correctly numbered

Colour in the squares that you don't need

Make a photocopy of your crossword and give it to someone else to solve

CROSSWORD PRO-FORMA

RESOURCE 4

- 1 Pick one of the words from the class mining and environment vocabulary list. (Hint: Choose a long word).
- 2 Put this long word near the middle of your grid. Place it horizontally (across).
- 3 Find more key words and fit them vertically (up and down) along the length of the first word. Add in more across words using the vertical words.
- 4 Make up clues for each word.
- 5 Number the spaces and clues.
- 6 Colour in the squares you don't need.

CLUES

Across

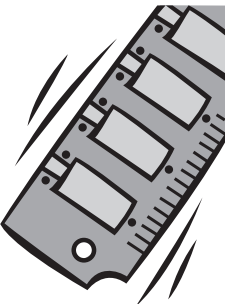
Down



IMPACTS TABLE: MAKING A COMPUTER

RESOURCE 5

- 1 Read what happens at each step to make a computer.
- 2 Think about how each step could affect the environment and how impacts could be reduced.
- 3 Place the text boxes into their correct position on the table. Glue them into place.

Steps in Making a Computer	What Happens at Each Step	Possible Impacts on the Environment	Ways to Reduce Impacts (Conservation Strategies)
Mining	 Minerals are extracted from the ground. Oil is pumped from under the ground or sea.		
Processing	 Minerals are washed, crushed and melted and made into metal and glass. Oil is made into different products.		
Making Parts	 The metal, glass materials and oil products are made into parts at a factory. Parts are put together to make computers.		
Buying and Selling Computers	 Computers are sold in shops and used by people at home and work.		

IMPACTS TABLE: MAKING A COMPUTER [CONTINUED]

Possible Impacts on the Environment

Cut around the rectangles and glue into the correct place in the third column of the table.

Uses lots of power.	Creates waste when it is thrown away.
Soil and plants are moved.	Air and water can be polluted.

Conservation Strategies

Cut around the rectangles and glue into the correct place in the last column of the table.

Recycle old computers.	Save energy.
Put the soil back and plant trees.	Check and reduce amount of pollution.

THE WATER CYCLE

RESOURCE 6

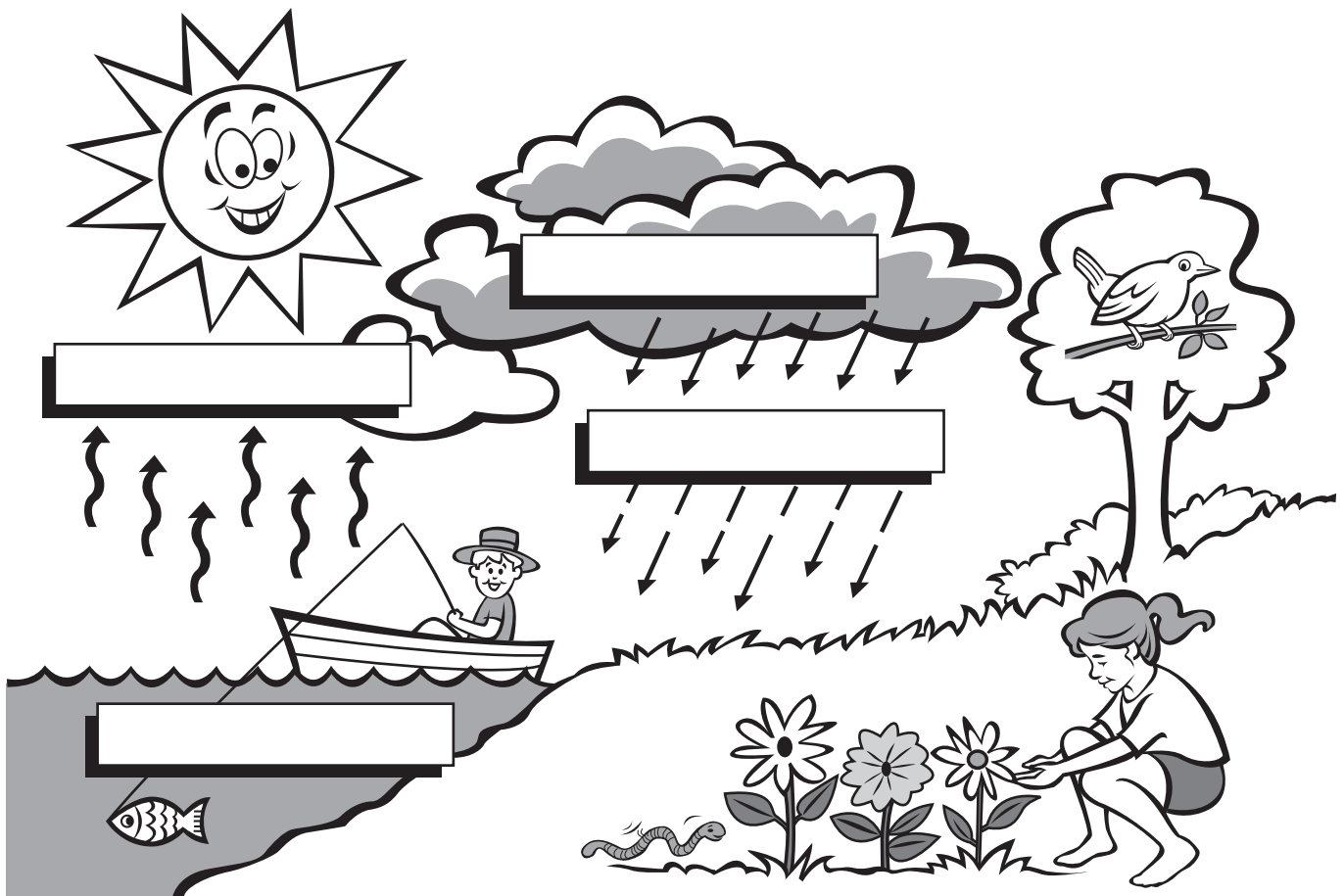
About 70 percent of the Earth is covered with water. That water has been around for millions of years. The same water is recycled over and over again. This is called the water cycle. There are four parts to the water cycle.

Evaporation happens when lakes, oceans, rivers and streams are heated by the sun. The liquid water evaporates into a gas called water vapor.

Condensation is when the water vapor comes together to make clouds.

Precipitation is when water from the clouds falls to Earth as rain, hail or snow.

Collection happens when the rain, hail and snow goes back into oceans, lakes, rivers and streams.



Write the bold words in their correct places in the water cycle.



IMPACTS ON THE WATER CYCLE

RESOURCE 7

- 1 Read through the list below of mining activities that use water.
- 2 Think about how the stated activities could affect the water cycle. Consider where the water used comes from (eg river, dam, bores), how much is used, how it is changed and what happens to it after it is used.
- 3 What do/could mining operations do to minimise these impacts?

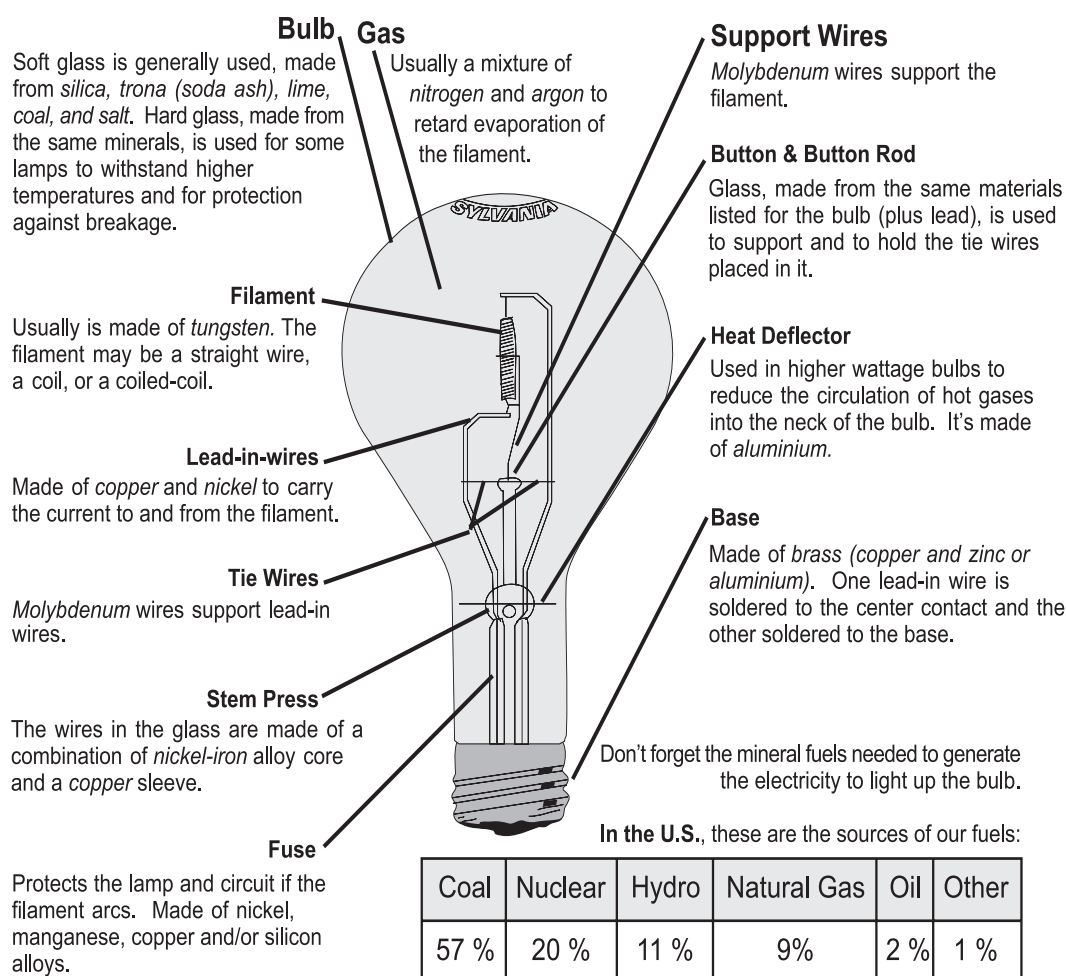
Mining Activities	How they Could Affect Water Quality/Quantity	Ways to Minimise Impacts
Most mine sites have large dirt roads called haul roads. Big trucks using the roads stir up dust. In these places, water trucks spray water onto dirt roads to reduce the amount of dust in the air.		
Some minerals (eg coal) are washed to remove dirt before being loaded onto trains.		
Water and chemicals are added to crushed rocks which contain copper. The copper floats in bubbles on top of the water and the waste rock sinks. The bubbles containing copper are collected.		
When rocks are drilled, water is sometimes used to bring the crushed rock material to the surface.		
When crushed ore is transported in a pipeline, water is added to make a slurry to enable it to flow.		

THE GLOBAL LIGHT BULB

RESOURCE 8



Dig A Little Deeper How Many Minerals and Metals Does It Take to Make A Light Bulb?



In Queensland, the sources of our fuels are:

Black Coal	Petroleum Products	Natural Gas	Renewables
44%	36%	8%	12%

Source: Queensland Government, Department of Energy, 2005

The world has to share its resources to make a single light bulb.
What if no one shared their electricity to light up a bulb?

Raw Material	Countries Supplying the USA to Make Light Bulbs
Silica (sand)	USA
Limestone	USA
Trona (soda ash)	USA
Nitrogen (liquid air)	USA
Argon (liquid air)	USA
Manganese	Brazil, China, Russia, South Africa
Tungsten	USA, China, Russia
Copper	USA, Chile, Russia, Zambia
Molybdenum	USA, Canada
Aluminium	Australia, Guinea, Jamaica
Zinc	Australia, Canada, Russia
Coal	USA, China, Russia
Salt	USA, China, Russia
Nickel	Australia, Canada, Russia
Lead	USA, Australia, Russia



MINING - LINKING QUEENSLAND WITH THE WORLD

RESOURCE 9

- 1 Once you have read The Global Light Bulb, read the information in the box below.
- 2 On your map, map how the minerals industry links Queensland to the world through the movement of minerals, people and money into and from Queensland. Record using different colours for minerals, people and money or for any movements associated with particular minerals. Use arrows to indicate the direction of the movement.

Mining links Queensland to the rest of the world through the movement of minerals, people and money. Queensland exports and imports a range of minerals and metals. People who work for companies based in Queensland sometimes work on mining projects in other countries. Mining in Queensland also attracts investment (money) from overseas companies.

Mineral Deposits

- Queensland has:
 - 65 per cent of Australia's total silica sand exports
 - 10 per cent of world bauxite production
 - 28 per cent of the world's known lead and zinc resources
 - 8 per cent of the world's known phosphate rock resources
 - 5 per cent of the world's known silver resources
 - 1.5 per cent of the world's known copper resources.

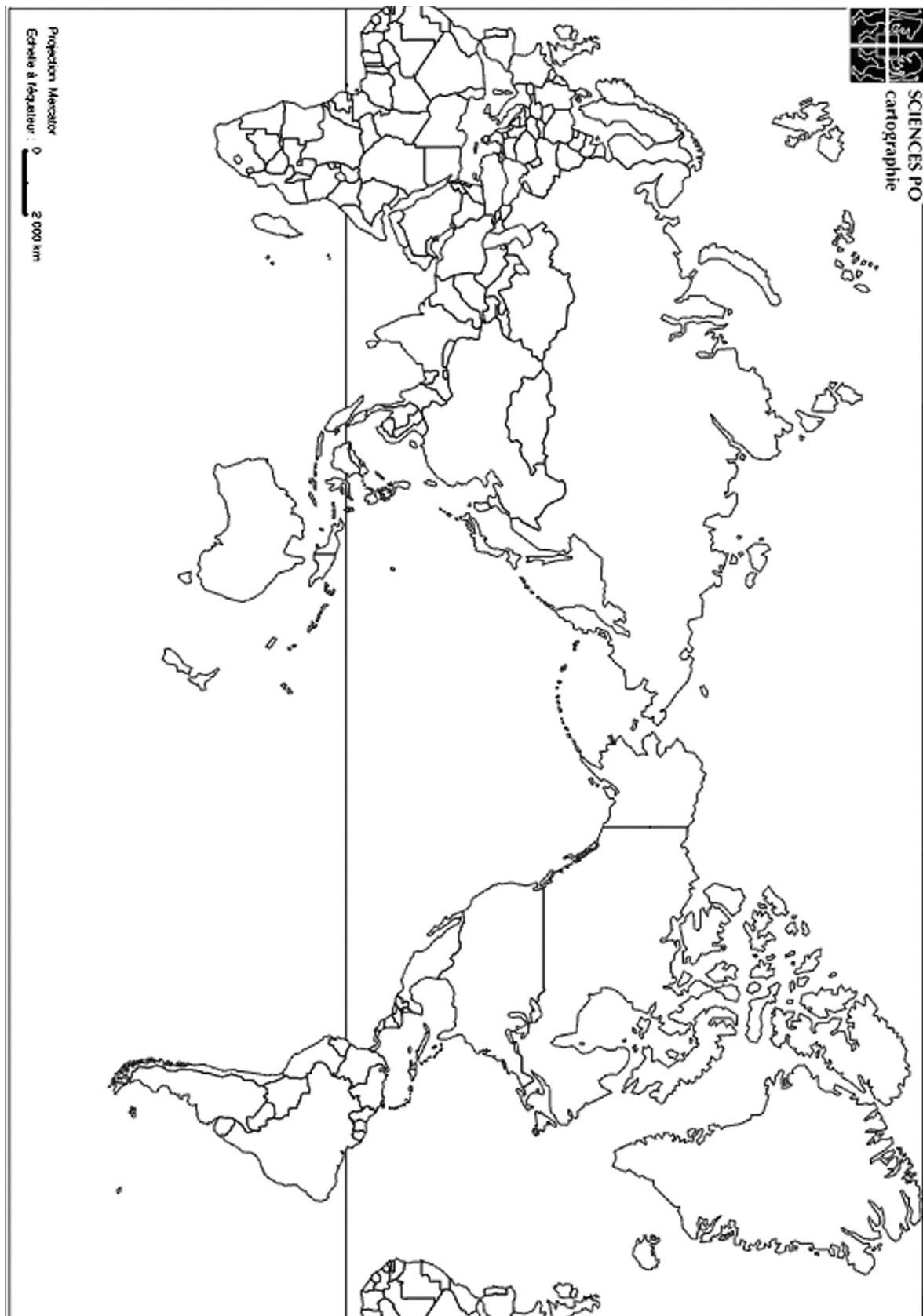
Coal Exports

- In 2003-2004, Queensland exported 135 million tonnes of coal to:
 - Japan (37%)
 - Korea (16%)
 - India (10%)
 - Taiwan (5%)
 - United Kingdom (4%)
 - Brazil (4%)
 - France (3%)
 - China (3%)
 - Spain (3%)
 - Netherlands (2%)
 - Other (13%).
- The value of Queensland's 2003-2004 coal exports was A\$7.24 billion. Coal remains the most important product exported overseas from Queensland.

Further information can be found on the Department of Natural Resources and Mines website at www.nrm.qld.gov.au/mines

WORLD MAP

RESOURCE 10



Courtesy of the General Libraries, The University of Texas at Austin

CHAPTER 6

QUEENSLAND'S MINERAL RESOURCES

STRAND SYSTEMS, RESOURCES AND POWER
KEY CONCEPT ECONOMY AND BUSINESS

INDEX

QUEENSLAND'S MINERAL RESOURCES

FOCUS QUESTIONS

- What are Queensland's mineral resources?
- How are these resources used?
- What jobs do people do in the mining industry?
- How can mining companies and local communities work together on community projects?

SOSE OUTCOMES

- SRP 2.2 Students create a representation of various people and resources involved in the production and consumption of familiar goods and services.
- SRP 3.2 Students create a representation of occupational specialisation and interdependence in an industry from the past, present or future.
- SRP 4.2 Students plan and manage an enterprise that assists a community or international aid project.

SCIENCE OUTCOMES

- Earth and Beyond 3.3 Students collect information which describes ways in which living things use the Earth and sun as resources.

RESOURCE SHEETS

- 1 Queensland's Mineral Resources and their Uses
- 2 Mining Helps Make Many Things
- 3 How Mineral Resources are Combined to Produce a Computer (OHT)
- 4 Sample Flow Chart (OHT)
- 5 Flow Chart Cards
- 6 Jobs in Mining and Job Cards
- 7 Sample Concept Map (OHT)
- 8 Concept Map
- 9 Ravenswood Community Project: A Case Study
- 10 Community Project Planning Guide
- 11 Project Assessment

TEACHING & LEARNING ACTIVITIES

QUEENSLAND'S MINERAL RESOURCES

ACTIVITY A LOOKING AT MINERALS

All students are given either a mineral or a uses card and need to find their matching card. Matched pairs read their information to the class.

Purpose

- To introduce students to Queensland's mineral resources and their uses.

Teaching Procedure

- Make one copy of the mineral cards and the uses cards from Resource 1, *Queensland's Mineral Resources and their Uses*.
- Provide each student with either a mineral card or a uses card. There will be 32 cards in all - so you can either leave cards out or provide more able students with two cards each depending on class size.
- Invite students to find their matching card/partner.
- Matched pairs read their cards to the class.
- Students can then debate whether we need mining in Queensland.

ACTIVITY B CREATING A PRODUCT PICTURE

Students are invited to select a product from the table provided and draw a picture to show how resources are combined to produce that product.



This task can be used to demonstrate SOSE outcome SRP 2.2 and Science outcome Earth and Beyond 3.3.

Purpose

- For students to understand how mineral resources can be combined to produce a product.

Teaching Procedure

- Provide students with a copy of Resource 2, *Mining Helps Make Many Things*, and read through, clarifying any unknown words or meanings.
- Invite students to select a product from the table in Resource 2 and draw a picture to show how resources are combined to produce a product. Display Resource 3, *How Mineral Resources are Combined to Produce a Computer*, as an OHT to demonstrate this task.
- Display students' work and invite them to explain their picture to the class.

ACTIVITY C PRODUCING A FLOW CHART

Students complete a flow chart showing the steps in the production and consumption process for a computer.

Purpose

- To provide students with an opportunity to sequence the steps in the production and consumption of a familiar resource.

Teaching Procedure

- Show students an OHT of Resource 4, *Sample Flow Chart*, demonstrating steps in the production and consumption of a telephone, focusing on the use of minerals in that process.
- Working in pairs, provide students with a copy of Resource 5, *Flow Chart Cards*, and invite them to sequence the flow chart cards to show the steps in the production and consumption process of a computer.

TEACHING NOTE: To assist students in this process leave the OHT of Resource 4 in view to provide some visual clues. As there are many cards, you may wish to direct younger students to sort the cards into the four minerals used first. These four are listed on Resource 3. Then ask students to sequence each of these before attempting to join them all together.

ACTIVITY D INTERVIEWING FOR MINING JOBS

Students read job descriptions and following a class discussion of interviewing techniques, students interview each other about their job.



This task can be used to demonstrate outcome SRP 3.2 students.

Purpose

- To provide students with an opportunity to examine some mining industry occupations.

Teaching Procedure

- Make four copies of Resource 6, *Jobs in Mining and Job Cards*, and provide each student with a copy of one of the jobs featured.
- Ask students to read their job cards and underline any words requiring explanation. Clarify words and meanings with the whole class.
- Make an OHT of Resource 7, *Sample Concept Map*, and discuss concept mapping with students. Using Resource 8, *Concept Map*, ask students to complete their own using their job description.
- Pair students with different job cards and have them interview their partner to find out about their job. Before you begin, decide on three or four questions that everyone will ask their partner. The questions could include:
 - What is your job at the mine?
 - What do you do in that job?
 - Who do you work with?
 - What sort of training and education do you need for your job?
- Encourage students to answer in sentences. Students may use props to help them get into their roles.

TEACHING NOTE: If situated in a mining community, students can interview family and friends working in the mining industry, using the same four questions or any others you decide on as a class. If not in or near a mining community, ask students to look for advertisements for mining industry jobs in newspapers and share them with the class.

ACTIVITY E PLANNING A PROJECT

After reading a case study of a company-school-community project, students discuss how they can work together with others to benefit their community. Students plan and implement a project.



This task can be used to demonstrate outcome SRP 4.2.

Purpose

- To provide students with an opportunity to work with others on a community project.

Teaching Procedure

- Provide students with a copy of Resource 9, *Ravenswood Community Project: A Case Study*, to read. Ask students if they know of any other community projects where schools, businesses and local groups have worked together.
- Students brainstorm possible projects in which they could participate. The Action Research Sequence, described in Resource 10, *Community Project Planning Guide*, could be used to assist students to plan and implement projects. The Know-What-Learnt (KWL) Chart, Options Table, Action Plan and Journal also described in Resource 10 are helpful strategies to organise your project.
- Provide students with a copy of Resource 11, *Project Assessment*, during the initial stages of the project. Read through Resource 11 with students so they understand how their participation in the project will be assessed. This page is designed for self-assessment, however, Part One can also be used as a peer or teacher assessment tool.

QUEENSLAND'S MINERAL RESOURCES AND THEIR USES

RESOURCE 1

MINERAL AND METAL CARDS

ALUMINIUM (BAUXITE)	COAL	COPPER	SAPPHIRES
GOLD	SILICA SANDS	LEAD	MAGNESIUM
LIMESTONE	MINERAL SANDS (RUTILE, ILMENITE, ZIRCON)	NICKEL	OIL AND NATURAL GAS
PHOSPHATE ROCK	SILVER	TIN	ZINC

USES CARDS

Titanium pigment for paints, paper and plastic. Titanium metal for engines. Zircon for glass and steel making, ceramic glazes, computer chips, lasers and aerospace materials.	Heating, fuel (eg petrol, diesel). Petrochemicals for plastics, nylon etc.	Tin plate, pewterware, in bronze, solder, in electrical equipment, in pigments for paints and plastics and in dry batteries.	Stock feed, fertilisers (super phosphate) detergents and soap.
Food and drink cans, buildings, furniture, electrical appliances, ships, motor vehicles, aircraft, cooking utensils, aluminium foil for packaging and kitchen use.	Jewellery, coins, bullion, electronic and space technology.	Jewellery, bearings in precision instruments and abrasives.	Photographic film and developing paper, batteries, coins, jewellery, silverware.
Galvanised fences and roofs, car bodies, zinc die-castings for engine parts, trims for motor vehicles, household appliances, zinc oxides for tyres and paints.	Coke making for production of iron and steel. Electrical power generation, bitumen, plastics and heating.	Storage batteries, petrol additives, solder, radiation-shielding, soundproofing rooms, red lead for construction steel.	Fibre optic glass, computer chips, semi-conductor in electronics.
Cement, glass making, on farms and in gardens to improve soil, and in water and sewage treatment.	In stainless steel, transport equipment, electrical machinery and nickel batteries.	Special industrial cements, rayon making, glassmaking, fertilisers, paints, papermaking, antacid powder, lightweight car parts (mag wheels) and rubber.	All electrical appliances, televisions, radios, telephone cables, motors, electrical systems for vehicles, plumbing pipes, ornaments made of brass and bronze.

MINERAL AND METAL USES - ANSWER CARDS

Titanium pigment for paints, paper and plastic. Titanium metal for engines. Zircon for glass and steel making, ceramic glazes, computer chips, lasers and aerospace materials. [MINERAL SANDS]	Heating, fuel (eg petrol, diesel). Petrochemicals for plastics, nylon etc. [OIL]	Tin plate, pewterware, in bronze, solder, in electrical equipment, in pigments for paints and plastics and in dry batteries. [TIN]	Stock feed, fertilisers (super phosphate) detergents and soap. [PHOSPHATE]
Food and drink cans, buildings, furniture, electrical appliances, ships, motor vehicles, aircraft, cooking utensils, aluminium foil for packaging and kitchen use. [ALUMINIUM]	Jewellery, coins, bullion, electronic and space technology. [GOLD]	Jewellery, bearings in precision instruments and abrasives. [SAPPHIRES]	Photographic film and developing paper, batteries, coins, jewellery, silverware. [SILVER]
Galvanised fences and roofs, car bodies, zinc die-castings for engine parts, trims for motor vehicles, household appliances, zinc oxides for tyres and paints. [ZINC]	Coke making for production of iron and steel. Electrical power generation, bitumen, plastics and heating. [COAL]	Storage batteries, petrol additives, solder, radiation-shielding, soundproofing rooms, red lead for construction steel. [LEAD]	Fibre optic glass, computer chips, semi-conductor in electronics. [SILICA SANDS]
Cement, glass making, on farms and in gardens to improve soil, and in water and sewage treatment. [LIMESTONE]	In stainless steel, transport equipment, electrical machinery and nickel batteries. [NICKEL]	Special industrial cements, rayon making, glassmaking, fertilisers, paints, papermaking, antacid powder, lightweight car parts (mag wheels) and rubber. [MAGNESIUM]	All electrical appliances, televisions, radios, telephone cables, motors, electrical systems for vehicles, plumbing pipes, ornaments made of brass and bronze. [COPPER]

MINING HELPS MAKE MANY THINGS

RESOURCE 2

MINING HELPS MAKE ALMOST EVERYTHING



Magnesium is used to make lightweight carparts. Car batteries contain lead.



Silver is used to make photographic film and also developing paper.



Telephone and electrical cables are made from copper. Most plastics are made from petroleum.



Many musical instruments are made of brass, a metal made from copper and zinc.



Silica sand is used to make glass. Magnesium and manganese are also used in glass making.



The fuels used in fireworks and explosives include aluminium, magnesium and titanium.



Aluminium is made from bauxite. It is used to make drink cans, cars, planes and bikes.



The lead found in most pencils is not actually made from lead. It is made from graphite.



Make-up and skin care products contain minerals such as kaolin clay and petroleum.



Nickel, copper and silver are all used to make coins.



The mineral sands rutile and ilmenite are used to make a white pigment used in paper making and paint.



Gemstones, gold, silver and copper are all used to make jewellery.



Clay is used to make bricks and pavers. Other clay products include tiles and pottery.



Some of the metals used in dentistry and orthodontics include gold, nickel and titanium.



Computer chips contain silica. The wiring is made from copper and gold and the solder from lead.



A number of minerals are used to make medicines and dietary supplements including iron.



Zinc and copper are used together to make brass for such products as taps, ornaments and door handles.



Paint contains mineral fillers and pigments, including cobalt, titanium and magnesia.



Bike frames can be made from aluminium or titanium. Magnesium is used to make rubber for tyres.



Most of Queensland's electricity is made by burning coal.

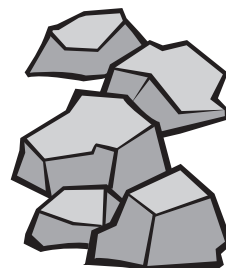


HOW MINERAL RESOURCES ARE COMBINED TO PRODUCE A COMPUTER

RESOURCE 3

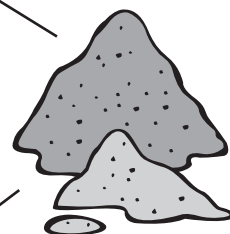


Solder is used to join small pieces of metal together inside the computer. It is made from lead.



The wires inside a computer are made from copper and gold.

The glass screen is made from silica that comes from sand mining.



Computer chips contain silica. They also contain gold.

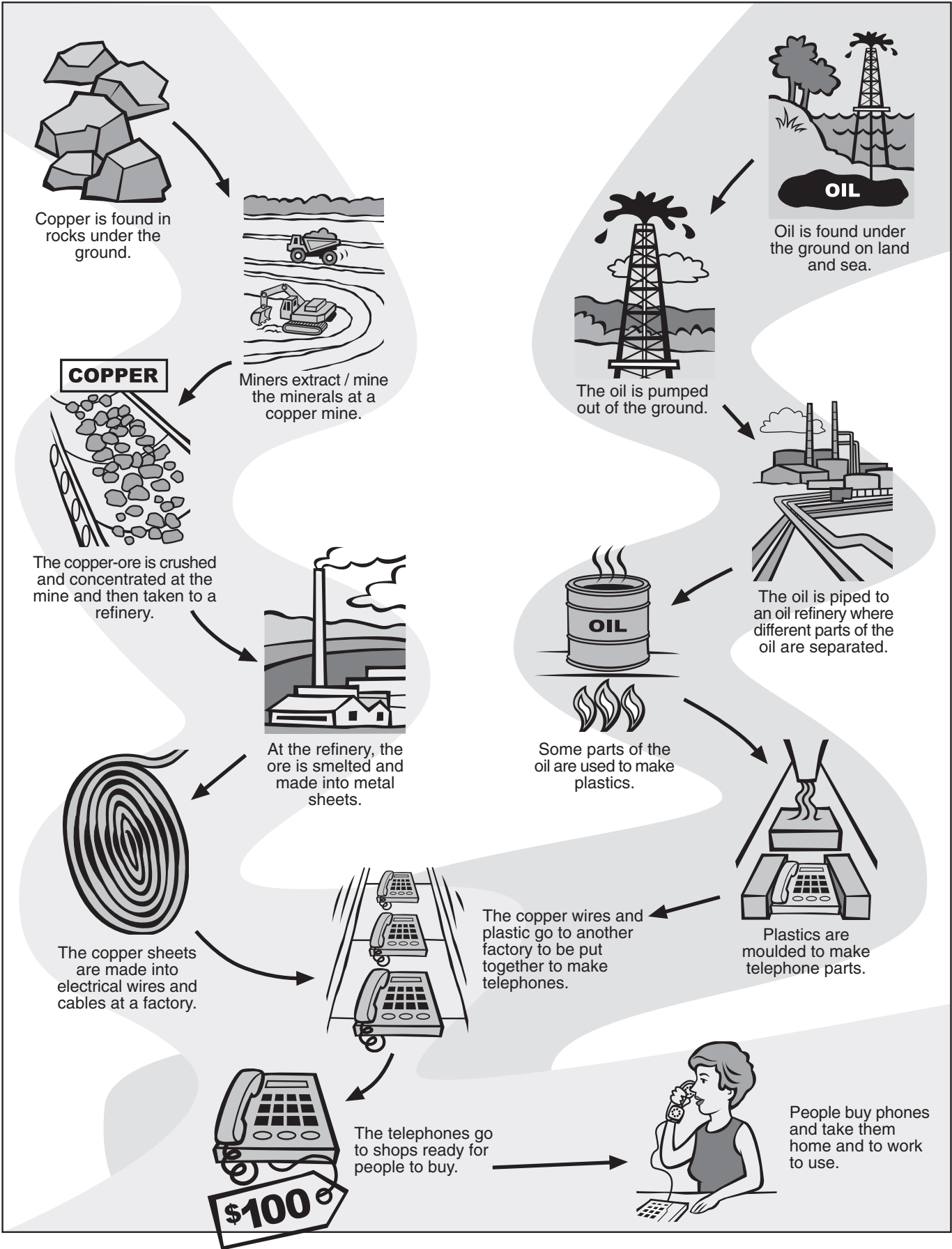


Plastic parts are made from petrochemicals that come from oil and gas.



SAMPLE FLOW CHART

RESOURCE 4

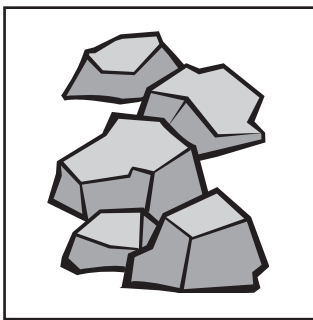


FLOW CHART CARDS

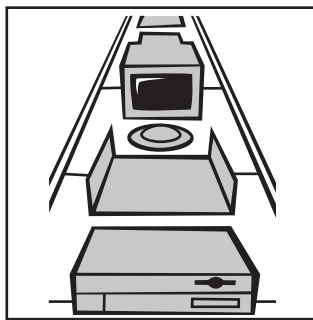
RESOURCE 5

The following cards describe the main steps in the production of a computer using mineral resources. Your task is to put the cards into the right order.

- 1 Cut out the cards and sort the cards into the four main minerals used. (These are lead, copper, silica sand and oil).
- 2 Put the cards for each mineral in order, ie from being extracted from the ground to being made into computer parts. Glue them in place.



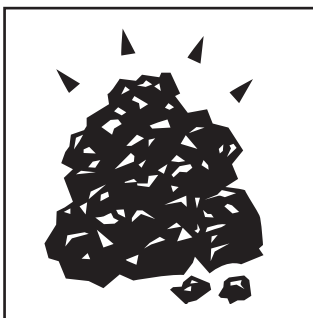
Copper is found in rocks under the ground.



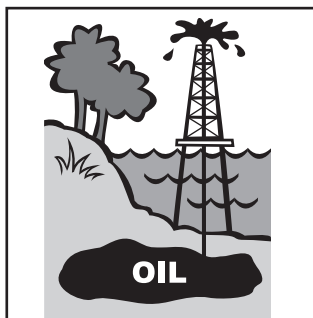
At a factory all the parts of a computer are put together.



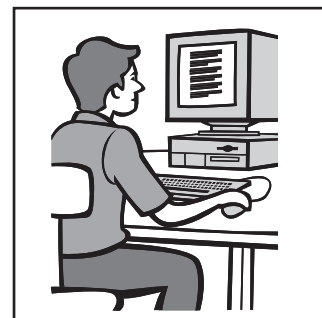
The computers are sent to shops ready for people to buy.



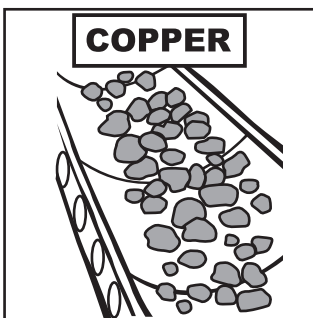
Lead is found in rocks under the ground.



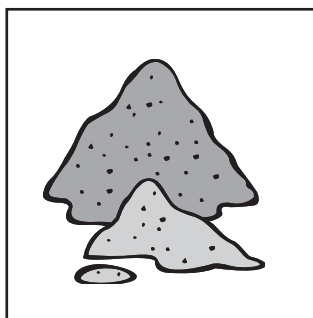
Oil is found under the ground and under the seabed.



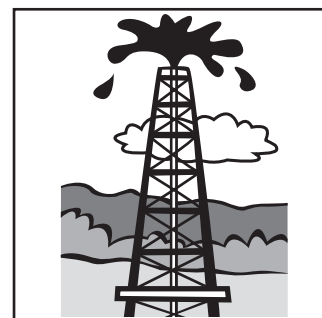
People buy computers to use at home, school and work.



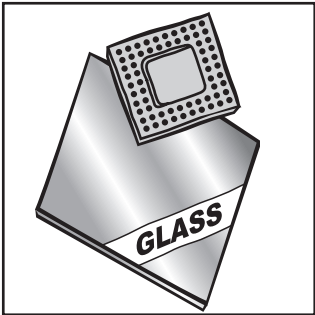
Copper-ore is crushed and concentrated at the mine and then taken to a copper refinery.



Silica is found in sand.



Oil is pumped up out of the ground.



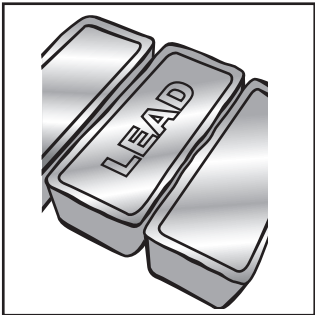
Silica is melted and made into glass and computer chips.



Miners dig up the minerals at a copper mine.



Some parts of the oil are used to make plastic.



At the refinery, the ore is smelted and made into lead ingots.



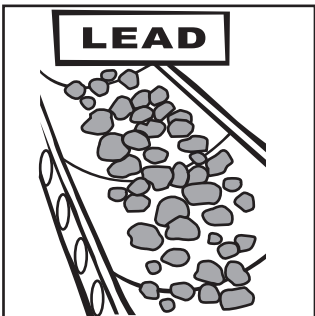
Miners dig up the minerals at a lead mine.



Miners scoop up silica at a sand mine.



At the refinery the ore is smelted and made into copper sheets.



Lead-ore is crushed and concentrated at the mine and taken to a lead refinery.



The oil is piped to an oil refinery where different parts of the oil are separated.

JOBS IN MINING

RESOURCE 6

Many people are employed in the mining industry doing many types of jobs. Some of these are:

- **Geologists** who look for and map the minerals;
- **Engineers** who design mines (and plan how they will operate), structures and equipment and carry out research;
- **Scientists** who collect and study information, run tests and develop new materials and processes;
- **Technicians** and trades people who collect data, operate machinery, repair and maintain equipment. They also support the work of engineers and scientists;
- **Business and communications people** who manage financial, legal, environmental and human resources.

Your Task

- 1 Choose a job card. Read it and underline any unfamiliar words. Use a dictionary to check the meaning of those words that are new to you. This is your job at the mine so make sure you understand what you do.
- 2 Use your job card to draw a concept map summarising what you do.
- 3 Someone will interview you about your job. They will ask you the following questions. Write down your responses and practise them.

1 What is your job at the mine? *I am a*

2 What do you do in your job? *I*

3 Who do you work with? *I work with*

4 What sort of training and education do you need to do your job? *I*

JOB CARDS

Job: Mining Engineer

Job activities:

- Work with geologists to survey mineral deposits and decide whether mining is viable
- Decide the best way to mine at the site and plan the location and construction of the mine
- Decide how and where drilling and blasting will occur
- Work with other engineers to design, select and provide the right machines and other things needed to get the job done
- Make sure the mine has the right people and equipment and that work practices are safe.



Education/training: Bachelor of Mining Engineering at a university.

Job: Geologist

Job activities:

- Search for new mineral deposits using maps, satellite imagery and other data including how and when landforms formed
- Collect and study samples - spending a lot of time looking at rocks
- Work with managers, environmental scientists, engineers and operators as well as talking with people in local communities such as Indigenous people and land owners
- Prepare reports and maps using photographs and survey information.



Education/training: Bachelor of Science at a university.

Job: Environmental Scientist

Job activities:

- Study the area to be mined and suggest ways to minimise the impact of mining on the land, flora and fauna
- Work with the community on environmental management issues
- Check air, dust and waste water at the mine site during mining and write reports for the company and the Government
- Progressively rehabilitate areas on site once mining is complete
- Ensure company complies with environmental legislation and standards.



Education/training: Bachelor of Science or Environmental Engineering at a university.

Job: Machine Operator

Job activities:

- Operate large heavy earthmoving equipment at underground or open-cut mines. (This may involve working a 12-hour shift operating a truck, dozer, shovel or grader. A week on day shift could be followed by a week working night shift followed by a week off).
- Work with engineers, geologists and other operators.



Education/training: On-the-job training but need to have good driving skills, an interest in mechanics and be able to get on with different people. TAFE qualifications are helpful.

Job: Electrical Tradesperson

Job activities:

- Repair and maintain all electrical equipment and control instruments in a mine or processing plant
- Look after mining equipment such as electrical motors, computer control systems, air-conditioning and lighting
- When something breaks down, the fault has to be found and fixed quickly
- Works with engineers and miners.



Education/training: Year 12, TAFE college, apprenticeship. (An interest in maths, physics, electronics, welding, mechanics and working with hand tools will help).

Job: Miner

Job activities:

- Operate equipment to excavate, load and transport coal, ore and rock at an underground or open-cut mine
- Check and maintain fuel or power supplies
- Lay cable and explosives
- Report and/or fix equipment failure
- Work with engineers and other operators.



Education/training: On-the-job training and TAFE qualifications.

Job: Safety Superintendent

Job activities:

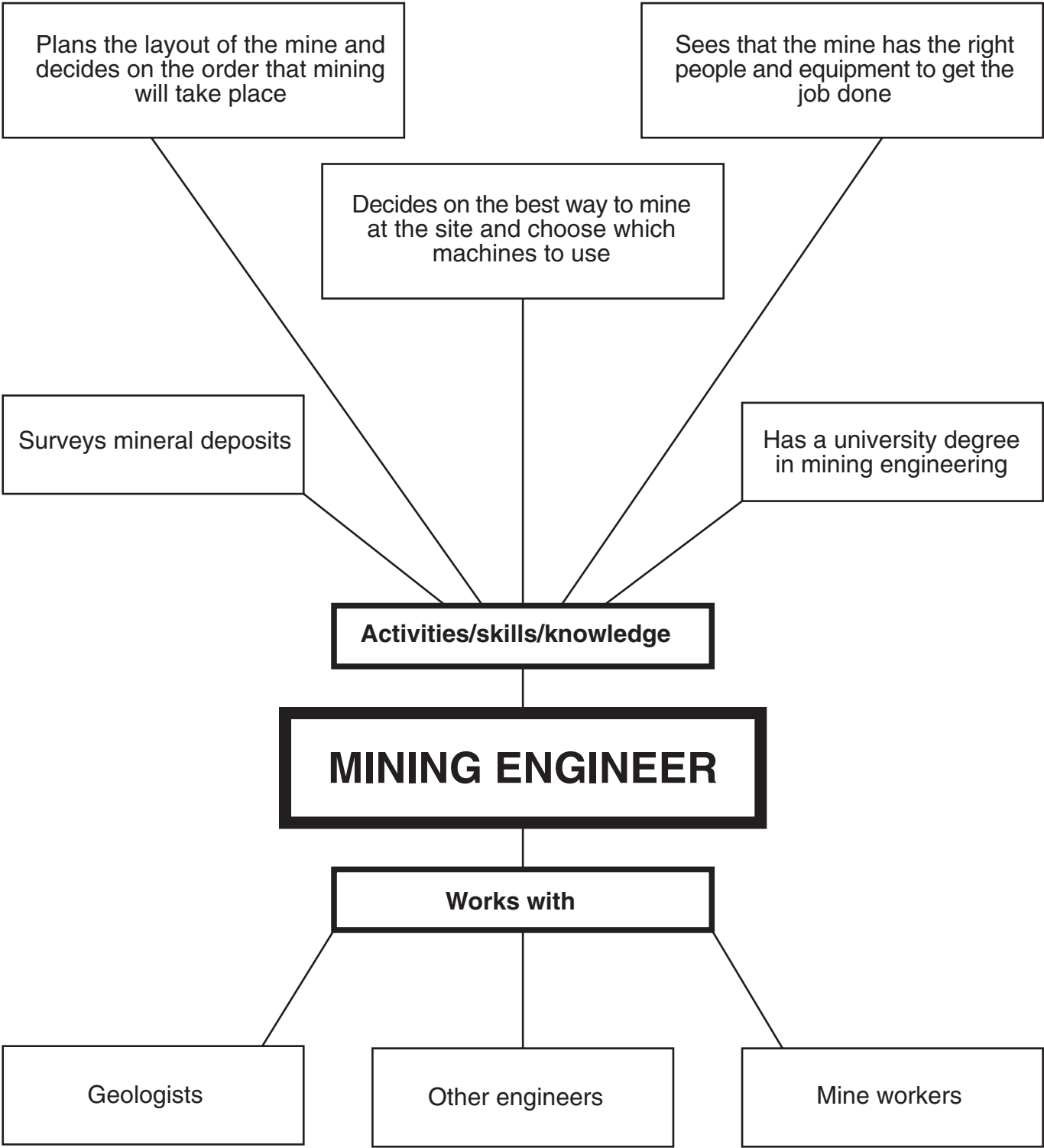
- Develop safety standards (from Government regulations) for activities in the mine and make sure they are carried out
- Operate instruments to monitor and ensure a safe working environment
- Work with and train all groups in a mine including managers, engineers, tradespeople and operators/workers
- Develop plans for responding to different kinds of emergencies, investigate accidents and train rescue teams
- Ensure company meets safety legislation and regulations.



Education/training: Could have training in many areas including university study. Advanced first aid skills and good communication skills are important.

SAMPLE CONCEPT MAP

RESOURCE 7

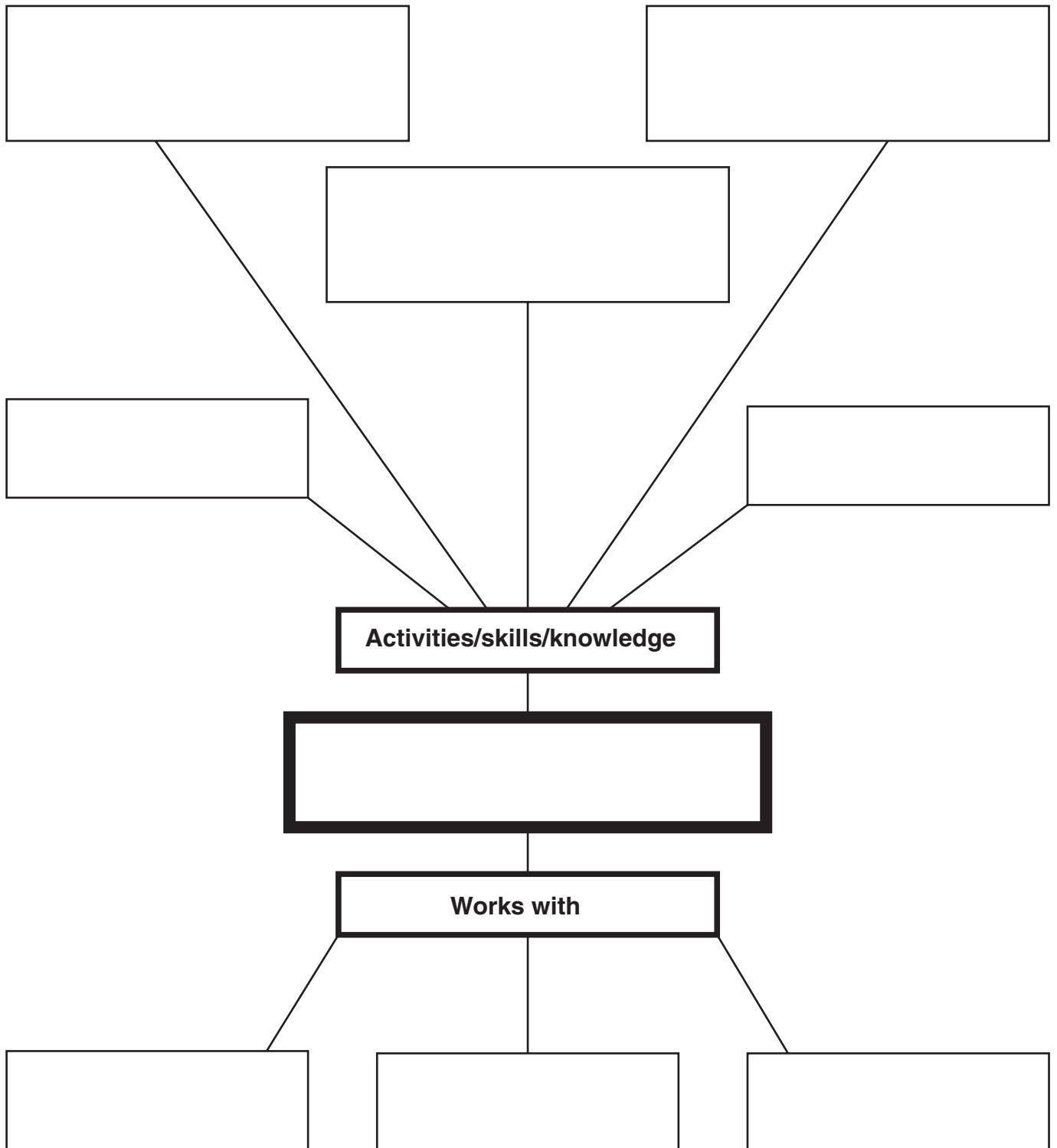


CONCEPT MAP

RESOURCE 8



**DEMONSTRATING
OUTCOME** SRP 3.2



RAVENSWOOD COMMUNITY PROJECT:

A CASE STUDY

RESOURCE 9

ELPHINSTONE CREEK SCHOOL PROJECT, RAVENSWOOD

The Natural Heritage Trust project, Riparian Zone Management - Elphinstone Creek Catchment, is an initiative of the Ravenswood Restoration and Preservation Association. The objective of the project is to reclaim a 3km length of Elphinstone Creek, which runs through the centre of the historical gold mining town of Ravenswood.

Carpentaria Gold - Ravenswood Operations' environmental personnel are playing an active role in the development of the Elphinstone Creek project, through the provision of resources and technical advice to the Ravenswood State School. This is enabling students to conduct a series of monitoring programs and gain a firm understanding of the processes involved in land degradation and rehabilitation.

These monitoring programs focus on water quality, soil erosion and revegetation. With the assistance of the Carpentaria Gold environmental staff, students are collecting and analysing water samples from Elphinstone Creek, setting up creek bank erosion studies and carrying out vegetation surveys.

The activities have expanded to weekend programs involving tree planting and, as part of the Water Watch program, a 'water bugs' study. Results from this study are to be included in an Internet database, which allows students to compare their findings with other areas and creek systems.

These practical activities are being reinforced in the classroom through in-depth presentations and discussions on subjects such as salinity, erosion, nutrient pollutants and weed management.



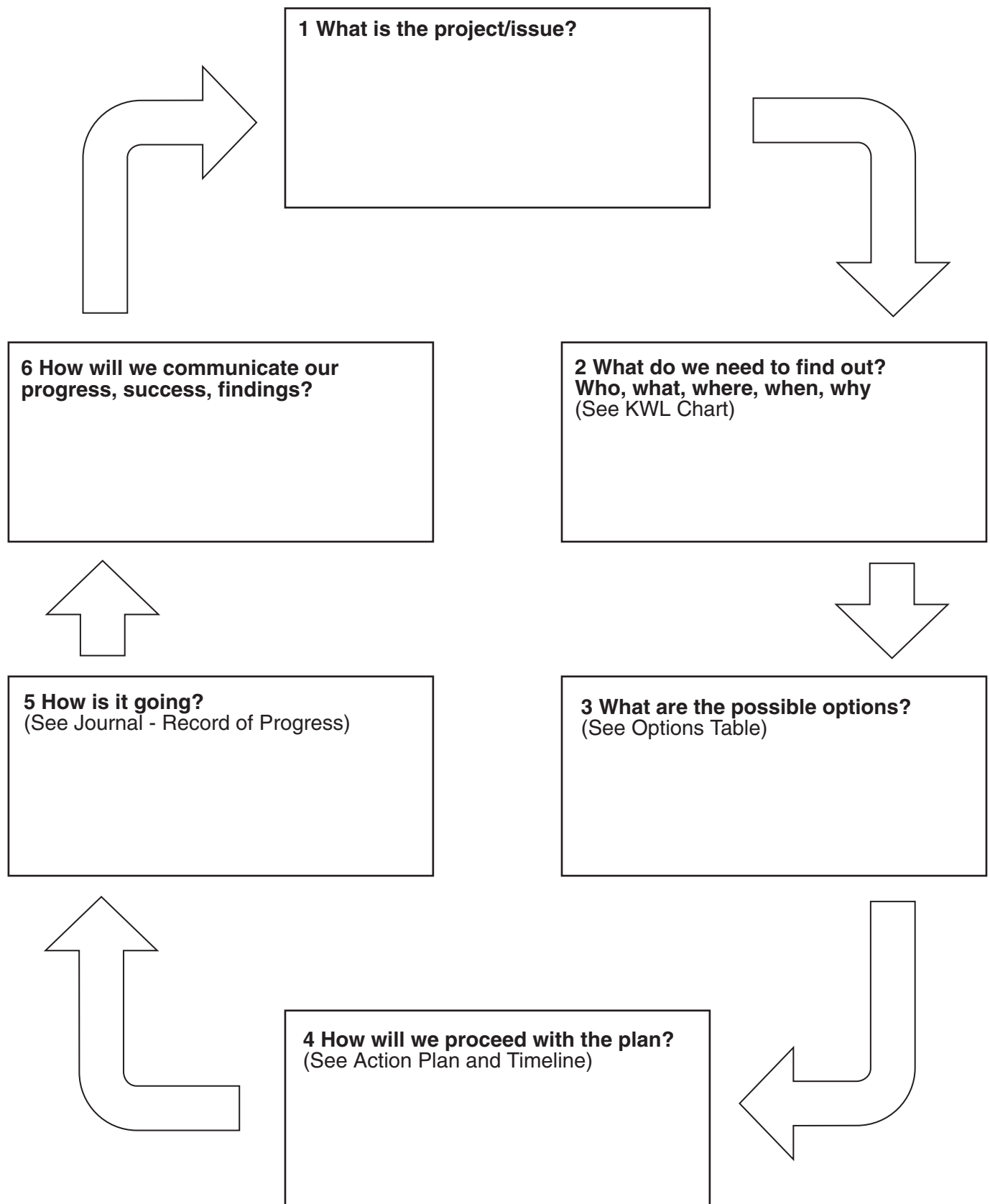
Source MIM Holdings Ltd, 1999, 1999 Annual Environmental Report, page 13, MIM Holdings, Brisbane



COMMUNITY PROJECT PLANNING GUIDE

RESOURCE 10

USING AN ACTION RESEARCH SEQUENCE



KWL Chart

K - What We <u>Know</u> Now.	W - What We <u>Want</u> to Find Out	L - What We've <u>Learnt</u>

Options Table

Option	Positive Aspects	Negative Aspects

Action Plan and Timeline

Time (Day/Week/Month)	What Needs to be Done?	Who's Doing it?

Journal - Record of Progress

Date	Name	What Did you Do or Get Organised? Who Did you See?


**DEMONSTRATING
OUTCOME** SRP 4.2

RESOURCE 11

PROJECT ASSESSMENT

PLANNING AND MANAGING A PROJECT - SELF ASSESSMENT

Part One

Skill	Rating		
	Always	Sometimes	Rarely
I gathered all the information I needed at each step before progressing.			
I listened carefully to what others had to say.			
I was willing to change my mind when I heard new information or convincing reasons.			
I identified options and can discuss their pros and cons.			
I thought about the consequences of making various choices.			
I asked for help when I needed it.			
I worked cooperatively with others.			
I completed my tasks on time.			

Part Two

1 What was the purpose of the project?

2 To what extent was the project's purpose accomplished?

(Rate the success of the project between 1-10. Ten equals complete success.)

3 What contributed to the success of the project?

4 The most difficult part of this project was

because

5 The most interesting thing I learnt was

NOTES
