CORNER BROOK REGIONAL HIGH

Mining Workbook

Canadian Geography

Name: _____ Teacher:_____

February

Outcomes covered in this workbook: Students will describe the spatial distribution of categories of mineral resources. Students will identify the main types of mining operations. Students will reflect upon issues associated with mining activity. (See pages 56 – 58 in c.g.) Complete the following questions on loose-leaf. Use Chapters 10 & 11, plus the notes given in class.

- 1. Write a definition for the term mineral? (4.5.1)
- 2.
- a. List ten ways in which the products of mining contribute to your life. Students' lists will vary because there are so many options. In groups of four, have students brainstorm items and list them on a sheet of chart paper. Give them a five- to ten-minute time limit. Examples:
 - gravel—house footings, cement
 - sand—golf bunker, bags for flood control, hourglass
 - clay—bricks, liner for a landfill site (highly water retentive)
 - copper-telephone cable, plumbing
 - magnesium—alloys are used in airplanes and portable tools where a light mass is important; custom car wheels; prohibits corrosion on ship hulls, pipelines, underground storage tanks; fireworks, flares, and photographic flash bulbs (burns with an intense white flame)
 - gypsum—wallboard, plaster, cement, soil conditioner, filler in paint, mould for ceramics
 - iron ore—engine blocks, water/sewer pipes, manufacture of steel used in car parts
- b. Describe how Canadian society would be different if we did not have the products of the mining industry.
 Mining is one of the primary "building blocks" of our modern lifestyle. Without mining products we would not be able to use the technology that makes our lives so much easier.
- 3. Refer to Figure 10.2 on page 188.
 - a. Describe the employment trend in most areas of mining from 1961 to 1980 and from 1981 to 1992.
 The employment trend increased between 1961 and

1980. After 1981 the number of jobs decreased.

 b. What two factors account for the trend from 1981 to 1992? Global competition has forced mining companies to become more efficient. New technology has made individual workers more productive. This means that fewer workers are needed in the industry.

- c. Which sector of the mining industry did not follow the trend? The employment level in fuels actually continued to increase until 1984, after which it declined slightly. In Chapter 11 students will learn that this rising trend was a result of the high price of oil. High oil prices stimulated the oil industry in Canada, encouraging Canadians to develop unconventional oil reserves. In 1984 oil prices dropped from over \$40 a barrel to below \$20 a barrel.
- 4. What are the differences between metallic minerals and non-metallic minerals? (4.5.2)
- 5.
- a. Copy the chart in Figure 10.6 on page 192 into the space below. Fill in the information for metallic, fuel, and industrial minerals using figure 10.5 and Figures 11.12 and 11.23 on pages 218 and 228.

	Metallic	Industrial Minerals	Mineral Fuels
Physiographic regions	Canadian Shield, Western Cordillera, Appalachian	Interior Plains, Great Lakes- St. Lawrence Lowlands, Appalachians, Western Cordillera	Interior Plains, Innuitians, Appaiachians
Rock type	igneous	sedimentary	sedimentary
Kinds of minerals	iron ore, copper, nickel, goid, uranium	potash, sulphur, asbestos, salt, gypsum	coal, oil, gas
Provinces with major mines	Ontario, British Columbia, New Brunswick, Newfoundland	Alberta, Saskatchewan, Ontario, Quebec, Nova Scotia	Alberta, Saskatchewan, Northwest Territories, New Brunswick, Nova Scotia

b. In what physiographic regions are metallic minerals most commonly found? Explain why?

Métallic minerals are mostly found in igneous rocks and occasionally in metamorphic rock where the igneous rock has been folded under pressure. The igneous rock in the Canadian Shield has an abundant store of minerals. Minerals are also found in the Western Cordillera and Appalachian regions, which are composed of metamorphic rock. There are minerals in the metamorphic rock of the Innuitians, but the climatic conditions in the far north inhibit the exploration of minerals and the development of known mineral reserves. c. In what physiographic regions are industrial minerals most commonly found? Explain why?

Industrial minerals are most commonly found in the Interior Plains, Great Lakes-St. Lawrence Lowlands, Western Cordillera, and Appalachians. The Interior Plains and Great Lakes-St. Lawrence Lowlands contain sedimentary rock in which industrial minerals are found. The Cordillera and Appalachians contain some sedimentary rock and metamorphic rock, which may have originally come from sedimentary rock containing these minerals.

- d. In what physiographic region are fuel minerals most commonly found? Explain why? (4.5.3) & (4.5.4)
 Fuel minerals are most commonly found in the Interior Plains because almost all fuel minerals are found in sedimentary rock.
- 6. Define the following terms: (4.5.4) & (4.6.5)
 - a. Convectional Oilfields
 - b. Unconventional Oilfields
 - c. Potential Reserves
 - d. Actual Reserves
- 7. Draw and describe the 4 types of oil traps in Canada? (4.5.4) & (4.6.5)
- 8.
- a. Describe the differences in the shape and depth of the ore bodies in Figure 10.8. In diagram A the ore body is close to the surface and is irregularly shaped. Open-pit mining is the best method to reach this ore. Sometimes companies attempt surface mining first, but as the cost of removing surface material increases they may choose to go underground.

In diagram B the mineral lies in horizontal layers or strips relatively close to the earth's surface. This makes it ideal for strip mining.

In diagram C the mineral lies well below the surface of the earth, so underground mining is necessary to reach the ore body.

- b. How do the characteristics of each ore body make it suitable for each type of mining? (4.6.4)
- 9.
- a. Strip mining is the least expensive method of mining while underground mining is the most expensive. Explain why this is the case.

Strip mining is the least expensive because it recovers material that lies close to the surface. Underground mining removes material that is deep beneath the earth's surface. The mining company must first build, at a considerable cost, an extensive network of shafts for mining equipment, electricity, water, and ventilation. Underground mining is also the most dangerous type of mining, and large amounts of money are spent to ensure the safety of miners.

b. In order for an underground mine to be profitable, the mineral deposits must be larger and richer than those in open-pit or strip mines. Explain why. (4.6.4) In order for the mining companies to generate a profit, the market value of the mineral deposits must be greater than the cost of building the mine and removing the materials. For this reason mineral deposits in Canada's far north have not yet been excavated.

10. Rank the three mining methods from least destructive to the environment to the most destructive. Give reasons for your ranking.

Underground mining is the least environmentally destructive method of removing materials because it

does not usually damage the surface landscape. Most operations deposit waste rock in empty tunnels, or **stopes**, rather than piling it on the surface. Once underground mines have been abandoned the ground will slowly begin to settle, filling in the stopes. This may create problems if surface soil shifts; for example, roads may be damaged by shifting soils.

Open-pit mining is the most destructive to the landscape. It leaves behind a huge scar in the earth's surface along with piles of waste rock. Filling in the deep pit is often expensive so restoration of the pit does not usually occur. Communities where open pit mines have not been reclaimed search for alternative solutions. For example, Kirkland Lake, a former mining town in northern Ontario, has proposed schemes whereby the empty mine pit would be used for a landfill site. Toronto's garbage would be shipped by rail to Kirkland Lake, where it would be deposited in the abandoned pit. Currently, the cost of transporting the garbage is prohibitive, but as Toronto's population continues to grow and available landfill sites disappear, Kirkland Lake may one day receive Toronto's garbage.

Strip mining is less destructive than open-pit but it still destroys the soil and leaves behind unsightly piles of waste rock. The land can be reclaimed if the waste rock is deposited in empty strip cuts, the topsoil is replaced, and vegetation is replanted.

- 11. Which type of mining method is the most dangerous? Explain your answer. (4.7.1) Underground
- 12. Using the systems model. Describe the possible inputs, process and outputs for an openpit mine. (4.6.2)
- 13. Using the systems model. Describe the possible inputs, mining processes, and outputs for an underground mine. (4.6.3)
- 14. Read the description of life in an underground mine on page 196 and study figure 10.9 on page 195.

a. Imagine you are on a tour of this mine. Write a brief account of your feelings as you experience this underground world.

Students should include descriptions of the following in their accounts of the "tour":

- entering the mine site—high noise level, including explosions
- entering the mine shafts and descending by elevator to the work site—quiet tap of steel on rock, sound of air in ventilation shafts, sound of miners' voices interrupted by loud bursts of drilling
- the different mining functions—blasting, scaling, loading the ore, securing the screening
- the underground garage where mechanical equipment is serviced and repaired
- b. Would you like to work in an underground mine? Explain your answer.

15. Read pages 201 – 206 in your text book. (4.7.4)

a. Describe the cycle of a boom-and-bust economy.

The cycle of a boom-and-bust economy occurs when the economy of a community is dependent on one resource or product. Initially the resource is developed because of market demand and high market value. Employees are brought into the community; homes, schools, etc., are built; and an infrastructure is developed. As long as market prices and demand for the product stay high, the community is successful. This is the "boom" period of the cycle.

When market demand drops, employees are laid off, and service industries and other related jobs (indirect employment) suffer. Some community members move away. This is the "bust" period. b. Why do single-industry towns experience this type of economy?

Single-industry towns are particularly vulnerable to boom-and-bust cycles because their economies are not diversified. In a more diversified economy, other industries continue to attract money into the community and continue to support services there.

c. If single-industry towns have such uncertain economic futures, why would people still settle there?

People are attracted to single-industry towns because they are in search of employment. The mining industry pays well and the northern communities often offer a very appealing lifestyle. There is easy access to outdoor recreation and a small tightly knit community often develops. Many people are optimistic about the future of the mine, expecting that it will continue to employ them for a long period of time.

- d. Refer to figure 10.15.
 - i. Construct a multiple line graph showing changes in the number of mine employees and in the population of Elliot late from 1957 to 1995. Mark the number of people in intervals of 1000 on the vertical axis of the graph and the years at two-year intervals on the horizontal axis. Plot the population of Elliot Lake. Now, using another colour plot the number of works at the mine.



- ii. Describe and explain the pattern of boom-and bust cycles your graph reveals.
- e. Define economic diversification.

Economic diversification means that an economy is based on several industries, not just one. When there is a downturn in one industry, some of the impact can be absorbed by other industries in the community.

- f. Why is economic diversification one solution to the problem of boom-and-bust cycles in single-industry towns?
- g. Why were the types of industries attracted to Sudbury ideal for overcoming boom-and-bust cycles?
- 16. A mining company has just decided to open a mine near your community. Assume each of the following roles and pose a question you would ask company officials at a public meeting (4.7.5):
 - a. an environmentalist
 - b. an unemployed worker
 - c. a road contractor

Westray Mine - Case Study (4.7.3)

From Wikipedia, the free encyclopedia

Background

Following the closure of the last working mine in the 1970s, <u>Pictou County</u>'s hopes for a mining renaissance were revived with the announcement of a proposed mine in the region in the late 1980s. The timing was perfect, politically, since the region had elected a fledgling leader of the federal opposition, <u>Brian Mulroney</u>, in a 1983 <u>by-election</u> in <u>Central Nova</u>. Following the election of a federal <u>Conservative-led</u> government, <u>Elmer MacKay</u> became a <u>Tory</u> political heavyweight in the riding. Provincially, the area was also home to <u>Conservative</u> premier <u>Donald</u> <u>Cameron</u>. Money was made available to Toronto company Curragh Resources for establishing a mine, as well as building an extension to a railway line and custom-built railcars (to be constructed in nearby <u>Trenton</u>). The mine would feed coal to a local <u>Nova Scotia Power</u> <u>Company</u> generating station which was a provincial <u>Crown corporation</u> at the time.

Mine opens

On <u>September 11</u>, <u>1991</u> the mine was opened to great local fanfare but immediately problems began to surface. Accusations were made by mine workers of company cutbacks in safety training and equipment and of negligent and outright criminal behaviour toward safety inspections. Miners complained about working in deep <u>coal dust</u> and on <u>March 9</u>, <u>1992</u> only 2 months before the disaster, a local union official stated in a safety report:

"I strongly feel there will be someone killed in the near future."

The disaster

On Saturday, <u>May 9</u>, <u>1992</u>, a <u>methane gas</u>, and subsequent coal dust explosion at 5:18 a.m. ADT killed 26 miners. It was Canada's worst mining disaster since 1958, when a cave-in at another Nova Scotia coal mine, in <u>Springhill</u>, claimed the lives of 75 miners.

In the wake of the explosion, Canadian and international media coverage descended upon the tiny hamlet of Plymouth and the nearby towns of <u>New Glasgow</u>, <u>Stellarton</u>, <u>Westville</u> and <u>Trenton</u>. Coverage gripped Canadians for several days as teams of <u>draegerman</u> (mine rescuers) searched the debris-strewn depths of the mine for survivors.

Over the next several days, media reported non-stop from a community centre located across the street from the mine while rescue teams encountered extremely hazardous conditions underground. Westray officials did not cooperate well with the media, which affected the release of information.

The bodies of 15 miners were discovered and afterward the search and rescue was changed to a search and recovery operation. After underground conditions worsened, the decision was made to abandon recovery efforts, entombing the bodies of 11 miners at the depths of the mine. Several days later <u>RCMP</u> investigators re-entered the mine with a draeger team to gather evidence for criminal prosecution but they did not enter the "southwest main" shaft where the remaining miners' bodies were located, again due to hazardous conditions.

117 miners who were not working on shift at the time were given 12-weeks severance pay.

Trial

The company was charged with 52 non-criminal counts of operating an unsafe mine under the *Occupational Health and Safety Act*. In 1993 the non-criminal charges were stayed by Crown prosecutors, who expressed concern they might jeopardize future criminal charges.^[11]

Two of the mine's managers, Gerald Phillips and Roger Parry, were charged with manslaughter, but the charges were stayed by the trial judge on the grounds that prosecutors had failed to disclose key evidence to the defence. The stay was appealed to the Nova Scotia Court of Appeal which ordered a new trial. The order for a new trial was upheld by the Supreme Court of Canada, which criticized the trial judge for having called the director of prosecutions during the trial to complain about the manner in which prosecutors were conducting the case.

After the Supreme Court ordered a new trial, prosecutors decided not to pursue the charges because they determined there was not enough evidence to secure convictions.^[2]

Inquiry

The Nova Scotia provincial government conducted a <u>Royal Commission of Inquiry</u> into the Westray Mine and the safety issues resulting from the explosion. The report submitted in 1998 recommended a sweeping overhaul of all provincial labour and mining laws which were mostly acted upon.

Legislation

In late 2003, the federal government enacted Bill C-45 in direct response to the Westray Mine disaster. The bill provided a new regime outlining the framework of <u>corporate liability</u> in Canada. It also provided a new punishment scheme to allow the Courts not simply to fine corporations, but also to put them on probation to ensure that the offences were not repeated. However, Bill C-45 was largely seen as an exercise of political posturing by the federal government, as it is doubtful that the new provisions would have had any effect on the legal implications of the disaster. Because of the division of powers in the Canadian Constitution, the province is the only government that would be able to enact any real change.



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Westray Memorial

Memorial

Today a memorial sits in a park in nearby New Glasgow at the approximate location above ground where the remaining 11 miners are trapped. The memorial will always be there in remembrance of those who died there: The memorial's central monument, engraved with the names and ages of the twenty-six men who lost their lives in the disaster states, "Their light shall always shine."

The names and ages of the 26 miners who were killed in the Westray coal mine disaster at 5:20 am on 9 May 1992^[3]: John Thomas Bates, 56, Larry Arthur Bell, 25, Bennie Joseph Benoit, 42, Wayne Michael Conway, 38, Ferris Todd Dewan, 35, Adonis J. Dollimont, 36, Robert Steven Doyle, 22, Remi Joseph Drolet, 38, Roy Edward Feltmate, 33, Charles Robert Fraser, 29, Myles Daniel Gillis, 32, John Philip Halloran, 33, Randolph Brian House, 27, Trevor Martin Jahn, 36, Laurence Elwyn James, 34, Eugene W. Johnson, 33, Stephen Paul Lilley, 40, Michael Frederick MacKay, 38, Angus Joseph MacNeil, 39, Glenn David Martin, 35, Harry A. McCallum, 41, Eric Earl McIsaac, 38, George S. James Munroe, 38, Danny James Poplar, 39, Romeo Andrew Short, 35, Peter Francis Vickers, 38.

Mine site razed

The former mine site was razed in 1998 with the most visible reminder of the tragedy, the two 15-storey blue concrete coal storage silos, being imploded on <u>November 27</u>, <u>1998</u>. The damaged mine shaft had been permanently sealed following the decision to abort further recovery attempts in May 1992 and after investigations were completed.

- 1. What was the cause of the disaster?
- 2. What was the disasters impact in terms of lives lost, injuries, and damage to property?
- 3. How did the company respond to the incident
- 4. How did the community respond?
- 5. What was the government's involvement before and after the incident?
- 6. Assume the role of the president of a new mining firm that wants to restart the mine. Develop a list of physical, economic, and social conditions you will have to consider before starting to mine the ore? (4.7.2)