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C. Everything Begins With Mining

D. Overview

This lesson “Everything Begins With Mining”, **engages** students with a picture packet requesting students to identify the common characteristics of the sites. Establishing the background of the concept of land reclamation, students then begin to develop a KWL chart by listing what they think or know about the mining industry spotlighting many of the commonly held stereotypes about the industry. Completing a graphic organizer “You House is Mined” students concretely connect mining to their daily lives and address “Mining is a dead issue” in a writing activity.

As a group, students **explore** a variety of primary materials to research geographic, economic, and social characteristics to decide and create either a coal or aggregate mining company. By requiring students to apply for a permit for their company, company officers will **explain** and clarify issues that must be considered creating their company. In the format of a letter to the editor students **extend** their knowledge to address a proposed amendment to the Environment Article, Title 4, Subtitle 4, Annotated Code of Maryland (Water Pollution Control and Abatement). **Evaluation** will be included with an activity specific key for the editorial.

E. Required materials

- Poster: “What do these places have in common?”
- KWL chart: “Mining: Fact or Fiction”
- Graphic Organizer: “Your House Is Mined”
- Fact Resource Sheet: “Common Minerals and Their Uses”
- Coal Sample
- Aggregate Sample
- Worksheet: “Coal or Aggregate”
- Map Packet
- Economic Resource Sheet
- Booklet: “What Everyone Should Know About Coal”
- Booklet: “Our Natural Resources”
- Newspaper Headlines
- Worksheet: Permit Application
- Score Sheet: Permit Application

Description of each section of the 5E model	Short description of the lesson's activities for each section of the 5E model	List of the activity numbers	Indicator from Core Learning Goals for each activities
I. Engagement: The activities in this section capture the students' attention, stimulate their thinking, and help them access prior knowledge	The students will identify reclaimed land using a picture activity. Two graphic organizers; a KWL, and Your House in Mined will address stereotypes and impact on daily life. A formative assessment will be in the form of a journal response.	1-8	Government/Geography/Indicator 2 The student will evaluate the role of government in addressing land use and other environmental issues*
II. Exploration In this section, students are given time to think, plan, investigate, and organize collected information	The students will use a variety of primary source materials to research the geography, economics, and community impacts of coal and aggregate mining.	9-11	Government/Economics/Indicator 2 The student will utilize the principles of economic costs, benefits, and opportunity cost to analyze the effectiveness of government policy in achieving socio-economic goals.
III. Explanation Students are now involved in an analysis of their exploration. Their understanding is clarified and modified because of reflective activities	The students use their information to present a persuasive application to the state for a mining permit.	12-13	Government/Geography/Indicator 2 The student will evaluate the role of government in addressing land use and other environmental issues
IV. Extension This section gives students the opportunity to expand and solidify their understanding of the concept and/or apply it to a real world situation	The students will use persuasive writing to respond individually in a letter to the editor to a piece of proposed legislation that will impact their mine.	14	Government/Political Systems/Indicator 4 The students will explain roles and analyze strategies individuals or groups may use to initiate change in government policy and institution
V. Evaluation This performance-based activity helps students connect all the pieces of information involved in the lesson.	The students will use an activity specific key to evaluate their persuasive editorial.	15	Government/Political Systems/Indicator 4 The students will explain roles and analyze strategies individuals or groups may use to initiate change in government policy and institution

*Necessary for later measure of the indicator

III. Teacher’s Section

DIRECTIONS/SUGGESTIONS

1. Locate the posters, included in the kit, entitled, “What do all these places have in common?” or CD. Separate the pictures with their titles. Also separate the two title phrases from the top and bottom of the poster. Distribute picture packets to pairs or small groups. Do not distribute the phrases.
2. Task: Students will examine the picture packet and write a statement describing what the pictures have in common. For less able students have them answer the question: How are these sites related to mining? Encourage students to look for meaningful commonalities.
3. Establish the meaning of the term “reclamation” using context clues in the following sentence: (reading for meaning)

Mason and Dixon’s Land Reclamation Program is constructing wildlife sanctuaries on land that was mined for gravel and sand.

Reclamation is the process of returning land to cultivation, useful purpose, or original state. (National Mining Association, 1998)

4. Do a KWL chart on mining, entitled: “Mining: Fact or Fiction” with students. Complete first item in the KNOW column. Direct students to make the connection that reclaimed land addresses a commonly held stereotype that environmental destruction is a result of the mining industry. Continue to record responses for the KNOW column. Stimulate students’ thinking to complete the WHAT column by encouraging students to think about how mining has a direct impact on their lives. (Suggested response: What do we use mining for? Is mining still a Maryland industry?) Retain the chart, it will be referred to in a later activity.
5. Say: Let’s take a look at a concrete way that mining impacts our lives. Distribute the graphic organizer entitled, “Your House is Mined,” and the fact resource sheet, “Common Minerals and Their Uses.” In small groups direct students to complete the following task.
6. Task: **Identify** using the resource sheet, “Common Minerals and Their Uses,” the mined items used in your household. **Locate, create** a symbol, and **label** the items on the map of your house. Be sure to complete the key.
7. As a formative assessment direct students to complete the following journal entry.
8. Task: In your journal incorporate personal and environmental evidence to support or refute the following statement.

“Mining is a dead issue.”

Activity Specific Key

3

Includes statements that contain the following evidence: stereotypes impact on daily life, environmental impact, and reclamation. Consistently uses correct grammar and spelling.

2

Includes statements that contain evidence from two of the following categories: stereotypes, impact on daily life, environmental impact, reclamation. Frequently uses correct grammar and spelling.

1

Lacks evidence. Occasionally uses correct grammar and spelling.

0

Other.

9. Begin by defining the terms aggregate and coal using context clues from the following statements. Direct students' attention to the samples of coal and aggregates.

According to TriState Coal Company, Maryland ranks 20th in the mining and production of this fossil fuel.

Maryland Materials produces many of the ingredients, or aggregates such as crushed stone and gravel used on state roadways.

Coal-	Fossil fuel such as gas or oil that comes from below the earth's surface.
Aggregate-	Uncrushed or crushed gravel, stone, rock, sand, or artificially produced inorganic material which form the major part of concrete.

10. Divide students into working groups and distribute the worksheet entitled, "Coal or Aggregate." Review the directions on the worksheet with the students. Monitor each groups' progress, answering questions and making clarification where necessary.
11. When the groups have completed their assignments, allow the students to share information about their company. The class can tally the types and locations of the mines. Company officers can also address questions and concerns from other companies.
12. As an explanatory activity students will complete a permit application for their company. Using the worksheet entitled "Maryland Department of the Environment Mining Permit Application" students will complete the worksheet as a group.
13. When groups complete the application permit, have groups exchange permit applications then utilize the scoring sheet to evaluate the permit. Direct students to share results and justify the approval or denial of the permit.
14. To give students the opportunity to extend their understanding, distribute the following prompt. Review with students the situation, the points to consider, and the plan for writing.

PROMPT: Proposed Legislation:

As an amendment to the Environment Article, Title 4, Subtitle 4, Annotated Code of Maryland (Water Pollution Control and Abatement), the Maryland General Assembly has proposed that all trucks over 20 tons traveling on Maryland roads now pay a gasoline surcharge of \$.01 per gallon that will be used to keep Maryland water clean. You believe that your company does its fair share to address Maryland's environmental issues and that this tax would create an unreasonable burden for your company. Write a letter to the editor of your local newspaper attacking this proposed amendment.

Before you begin to write your letter consider the following:

- The type of mine.
- The location of the mine in regard to your market.
- The economic contributions of your company to the community.
- The social contributions of your company to the community.
- The negative impact of the tax on your company and therefore on the community.

Before you begin to write your letter plan the following:

- Decide what your position or stand is on the topic or subject.
- Think of your reasons for that position or stand.
- Think about the reasons against that stand or position.

- Think about the possible position or stand of your audience.
- Organize the reasons for your position or stand in a logical way.
- Invite your reader to understand and share your position or stand.

15. The prompt will be evaluated using the Activity Specific Key provided.

LEVEL 5

There is evidence in this response that the student explains roles and analyzes strategies used to initiate change in government policy and institutions.

- The student has provided effective economic support for his/her position.
- The student has provided effective social support for his/her position.
- The student has used effective persuasive techniques to address negative impact of the legislation on his/her company and community.

LEVEL 4

There is evidence in this response that the student explains roles and analyzes strategies used to initiate change in government policy and institutions.

- The student has provided moderately effective economic support for his/her position.
- The student has provided moderately effective social support for his/her position.
- The student has used moderately effective persuasive techniques to address negative impact of the legislation on his/her company and community.

LEVEL 3

There is evidence in this response that the student explains roles and analyzes strategies used to initiate change in government policy and institutions.

- The student has provided minimally effective economic support for his/her position.
- The student has provided minimally effective social support for his/her position.
- The student has used minimally effective persuasive techniques to address negative impact of the legislation on his/her company and community.

LEVEL 2

There is evidence in this response that the student explains roles and analyzes strategies used to initiate change in government policy and institutions.

- The student has provided either economic or social support for his/her position.
- The student has used minimally effective persuasive techniques to address negative impact of the legislation on his/her company and community.

LEVEL 1

There is evidence in this response that the student explains roles and analyzes strategies used to initiate change in government policy and institutions.

- The student has provided either economic or social support for his/her position.
- The student has attempted to be persuasive.

LEVEL 0

There is no evidence in this response that the student explains roles and analyzes strategies used to initiate change in government policy and institutions.

- The student's response is completely incorrect or irrelevant or there is no response.

16. As a culminating evaluation revisit the KWL Chart entitled "Mining: Fact or Fiction," introduced in the engagement section of the lesson. Allow students to complete the last column, LEARNED. Allow students to

share their responses. (As an alternative the KWL chart can be used daily as a summary activity for lesson extending over several days.)

REQUIRED RESOURCES

As usual, the teacher should become familiar with all the materials used in the lesson and may benefit from visiting the web sites listed in the bibliography.

BIBLIOGRAPHY

BOOKS

Chironis, Nicholas, Ed. Coal Age Operating Handbook of Coal Surface Mining and Reclamation, McGraw-Hill, Inc. 1978.

Lindberg, Kristina. Coal: A Contemporary Energy Story. Scribe Publishing Corporation, 1978

Skousen, Jeffrey. Ed. Acid Mine Drainage Control and Treatment. West Virginia University and the National Mine Land Reclamation Center, 1995.

BOOKLETS AND OTHERS MATERIALS

“Crushed Stone: Our Natural Resource” National Stone Association, 1415 Elliot Place NW, Washington DC 20007, 202-342-1100

“Everything Comes From Our Natural Resources. If It Can’t Be Grown, It Has To Be Mined” Resource Packet, Mineral Information Institute, 475 17th Street, Suite 510, Denver, Colorado, 80202, (303) 297-3226, WWW.mii.org.

“Facts About Minerals”, National Mining Association, 1130 17th St. N.W., Washington, DC 20036, WWW.nma.org, 1997-98.

“Maryland Coal A ‘Mission Critical’ Resource for One Maryland”, Maryland Coal Association, 12 Village Parkway, Frostburg, MD 21532, 301-689-6609, 1999.

“Nature Aggregate: Building America’s Future- Public Issues and Earth Science” US Geological Survey Circular 1110, USGS Map Distribution, Box 25286, Building 810, Denver Federal Center, Denver, Colorado 80225.

“What Everyone Should Know About Coal”, A Scriptographic Booklet #15438D-8-92, 1997. 1-800-628-7733.

“What Do All these Places Have in Common” Poster, Interstate Mining Compact Commission, 445-A Carlisle Drive, Herndon, VA 20170, (703) 709-8654, WWW.imcc.isa.us.

WEB SITES

Interstate Mining Compact Commission, WWW.imcc.isa.us

National Mining Association, WWW.nma.org

Maryland State Department of Education,

Maryland State Department of the Environment,

Mineral Information Institute, WWW.mii.org

National Mining Association, WWW.nma.org

US Geological Survey,

IV. Student Section

The following student activity sheets are included:

- KWL Chart: “Mining: Fact or Fiction”
- Graphic Organizer: “Your House is Mined”
- Worksheet: “Coal or Aggregate”
- Worksheet: “Permit Application”
- Score Sheet; “Permit Application”

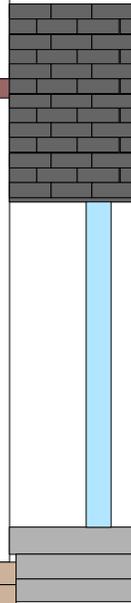
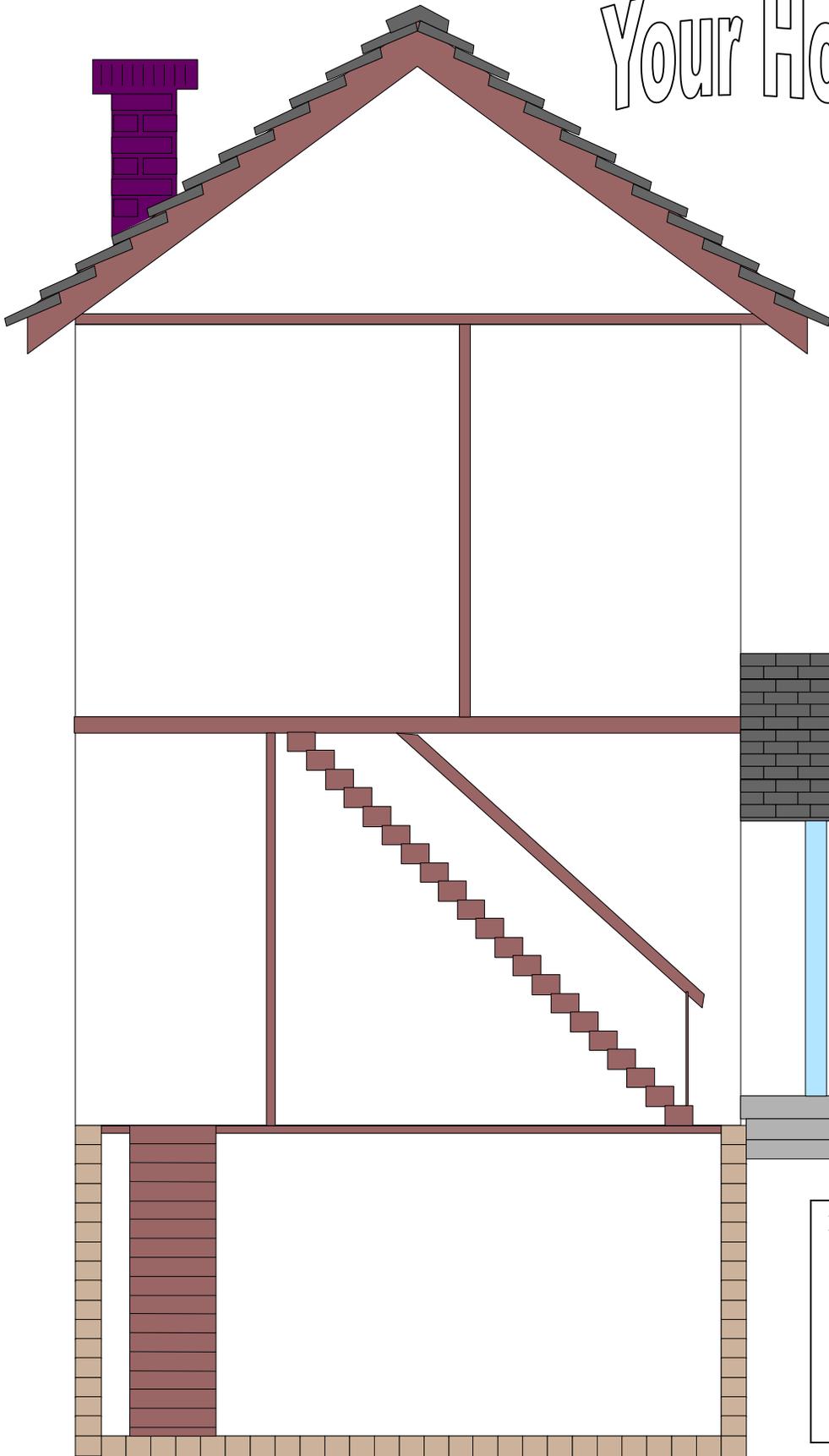
The following student resource sheets are included:

- Fact Resource Sheet: “Common Minerals and Their Uses”
- Coal...
- Aggregates...
- Newspaper Headlines

KWL

KWL

Your House is Mined



KEY

Coal or Aggregate?

Directions:

- Read all directions before beginning the task.
- Choose roles for the members of the group:
 - President of the Company- Group leader
 - Administrative Secretary- Recorder
 - Research Assistant- One or two people responsible for gathering information.
 - Quality Control Officer- Taskmaster to insure the group completes the task.
- The group will use the Geography resource packet to complete the chart entitled “Coal or Aggregates?”
- The group will then use the Economic resource packet to add to their chart.
- After the chart is completed, the group will review the findings.
- As a group choose:
 - An industry
 - A location for your mine
 - A name for the company
- Complete the application process for a permit from the Maryland Department of the Environment.

Coal or Aggregates?

		COAL		AGGREGATES	
G E O G R A P H Y	Define the terms.				
	Identify the counties in Maryland which contain the deposits.				
	What is the production forecast for the industry in the year 2000? 2010?				
	Check the availability of transportation to the deposits.	<input type="checkbox"/> Roads <input type="checkbox"/> Railways <input type="checkbox"/> Port access <input type="checkbox"/> Barge availability (River)		<input type="checkbox"/> Roads <input type="checkbox"/> Railways <input type="checkbox"/> Port access <input type="checkbox"/> Barge availability (River)	
	Evaluate the environmental impact of the following: Water	Water(+)	Water (--)	Water(+)	Water (--)
		1.	1.	1.	1.
		2.	2.	2.	2.
	Wetlands	Wetlands/Wildlife(+)	Wetlands/Wildlife (-)	Wetlands/Wildlife(+)	Wetlands/Wildlife(-)
		1.	1.	1.	1.
		2.	2.	2.	2.
Air	Air (+)	Air (--)	Air (+)	Air (--)	
	1.	1.	1.	1.	
	2.	2.	2.	2.	

E C O N O M I C	What is the unemployment rate in the area where the deposits are located?		
	Market Availability <i>(Hint: Look at the uses for the mined materials in your resource packet.)</i>	Is the location of power plants a consideration for the location of this mine? Is a market available? (i.e. power plant)	How is population a consideration for the location of this mine? What areas of Maryland are expected to experience a population increase?
	Cost of land		
	Taxes and Surcharges		
S O C I A L	List three community concerns.	1. 2. 3.	1. 2. 3.
	List three benefits to the community.	1. 2. 3.	1. 2. 3.

APPLICATION FOR MINING PERMIT

Company Name:

--

Company Officers:

President	
Administrative Secretary	
Research Assistant(s)	
Quality Control Officer	

Circle the type of product mined:

Coal

Aggregates

Identify the location of your mine as specifically as possible:

--

How will your product be transported to market?

--

How will this impact the community?

1.
2.

Explain the environmental impact of your proposed mine on the water, air, wetlands, and wildlife habitat.

Water:
Air:
Wetlands:
Wildlife:

Demonstrate the environmental benefits of your company by explaining your reclamation program giving at least two specific examples

1.
2.

Describes the economic benefits of your company. (i.e. employment, taxes, etc)

1.
2.

How, specifically, will the community benefit from your company?

1.
2.

Permit Application Scoring Tool

Section 1

	Not Included	Included
Company Name	0	1
Company Officers	0	1
Location of Mine	0	1
Type of Mine	0	1
Type of Transportation	0	1
Total		

Section 2

	Not Included	Included without support	Included with support
Impact of Transportation	0	1	2
Environmental impact: Water	0	1	2
Air	0	1	2
Wetlands	0	1	2
Wildlife	0	1	2
Reclamation Program	0	1	2
First economic Benefit	0	1	2
Second Economic Benefit	0	1	2
First Community Benefit	0	1	2
Second Community Benefit	0	1	2
Total			

Section I total	
Section 2 total	
SCORE:	

20-25	PERMIT GRANTED
15-19	PERMIT PENDING ADDITIONAL EVIDENCE
10-14	PERMIT DENIED
0-9	PERMIT DENIED --YOU'RE THE PITS

Common Minerals and Their Uses

Aluminum: Most abundant metal element in Earth's crust. Bauxite ore is the main source of aluminum. Used in packaging (31%), transportation (22%), and building (19%).

Antimony: Used as a hardening alloy for lead, especially storage batteries and cable sheaths; also used in bearing metal, type metal, solder, collapsible tubes and foil, sheet and pipes, and semiconductor technology. Used in fireworks. Antimony salts are used in the rubber and textile industries, in medicine, and glassmaking.

Asbestos: Asbestos fibers are flexible, heat resistant, and chemically inert. Asbestos minerals are used in fireproof fabrics, yarn, cloth, paper, paint filler, gaskets, roofing composition, reinforcing agent in rubber and plastics, brake linings, electrical and heat insulation, cement and chemical filters. Fibers are dangerous when breathed, so uses must protect against fibers becoming airborne.

Barium: Used as a heavy additive in oil well drilling mud; in the paper and rubber industries, as a filler or extender in cloth, ink, and plastics products, in radiography ("barium milkshake") deoxidizer for copper, sparkplugs alloys and in making an expensive white pigment.

Beryllium: Used in the nuclear industry and in light, very strong alloys used in the aircraft industry. Beryllium salts are used in fluorescent lamps, in x-ray tubes, and as a deoxidizer in bronze metallurgy.

Chromite: Found in South Africa and Zimbabwe. Used mainly in chemical and metallurgical industries (chrome fixtures).

Cobalt: Used in superalloys for jet engines, chemicals (paint driers, catalysts, magnetic coatings), permanent magnets, and cemented carbides for cutting tools.

Columbite tantalite group: The principal ore of niobium and tantalum, used mostly as an additive in steel making and in superalloys; used in metallurgy for heat resistant alloys, rust-proofing (stainless steel) and electromagnetic superconductors.

Copper: Used in electric cables and wires, switches, plumbing, heating; roofing and building construction; chemical and pharmaceutical machinery; alloys, alloy castings; electroplated protective coatings and undercoats for nickel, chromium, zinc, etc.

Feldspar: A rock forming mineral; industrially important in glass and ceramic industries; pottery and enamelware; soaps; bond for abrasive wheels; cements and glues; insulating compositions; fertilizers; tarred roofing materials; and as a sizing or filler in textiles and paper.

Fluorite: Used in the production of hydrofluoric acid, which is used in the pottery, ceramics, optical, electroplating and plastics industries; in the metallurgical treatment of bauxite; as a flux in open hearth steel furnaces and in metal smelting; in carbon electrodes; emery wheels; electric arc welders; toothpaste; and paint pigment.

Gold: Used in dentistry and medicine; in jewelry and arts; in medallions and coins; in ingots as a store of value; for scientific and electronic instruments; as an electrolyte in the electroplating industry.

Gypsum: Processed and used as a prefabricated wallboard or an industrial or building plaster; used in cement manufacture; agriculture and other uses.

Halite: (sodium chloride--salt) Used in human and animal diet, food seasoning and food preservations; used to prepare sodium hydroxide, soda ash, caustic soda, hydrochloric acid, chlorine, metallic sodium; used in ceramic glazes; metallurgy, curing of hides; mineral waters; soap manufacture; home water softeners; highway deicing; photography; in scientific equipment for optical parts.

Iron Ore: Used to manufacture steels of various types. Powdered iron; used in metallurgy products; magnets; high frequency cores; auto parts; catalyst. Radioactive iron in medicine; tracer element in biochemical and metallurgical research. Iron blue: in paints, printing inks, plastics, cosmetics, paper dyeing. Black iron oxide: as pigment; in polishing compounds; metallurgy; medicine; magnetic inks.

Lead: Used in lead batteries, fuel tanks, solders, and bearings; electrical and electronic applications; TV tubes and glass, construction, communications and protective coatings; in ballast or weights; ceramics or crystal glass; x-ray and gamma radiation shielding; soundproofing; and ammunition.

Lithium: Compounds are used in ceramics and glass; in primary aluminum production; in the manufacture of lubricants and greases; rocket propellants; vitamins A synthesis; silver solder; batteries; medicine.

Manganese: Essential to iron and steel production.

Mica: Micas commonly occur as flakes, scales, or shreds. Sheet muscovite (white) mica is used in electronic insulators; ground mica in paints, as joint cement, as a dusting agent, in well-drilling muds; and in plastics, roofing, rubber and welding rods.

Molybdenum: Used in alloy steels (47% of all uses) to make automotive parts, construction equipment, gas transmission pipes; stainless steels (21%) and tool steels (9%); cast irons (7%); superalloys (7%); and chemicals and

lubricants (8%). As a pure metal, molybdenum is used because of its high melting temperatures (703° degrees F) as filament supports in light bulbs, metal working dies and furnace parts.

Nickel: Vital as an alloy to stainless steel; plays key roles in the chemical and aerospace industries.

Perlite: Expanded perlite is used in roof insulation boards; as fillers, filter aids and in horticulture.

Platinum Group Metals: Includes platinum, palladium, rhodium, iridium, osmium and ruthenium.

Used principally in catalysts for the control of automobile and industrial plant emissions; in jewelry; in catalysts to produce acids, organic chemicals and pharmaceuticals. Used in brushings for making glass fibers used in fiber reinforced plastic and other advanced materials, in electrical contacts, in capacitors, in conductive and resistive films used in electronic circuits; in dental alloys used in making crowns and bridges.

Potash: A carbonate of potassium; used as a fertilizer, in medicine, in the chemical industry and to produce decorative color effects on brass, bronze and nickel.

Pyrite: Used in the manufacture of sulfur, sulfuric acid and sulfur dioxide; pellets of pressed pyrite dust are used to recover iron, gold, copper, cobalt, nickel; used to make inexpensive jewelry.

Quartz: Used for pressure gauges, oscillators, resonators, and wave stabilizers; used in heat-ray lamps, prism, and spectrographic lenses. Also used in the manufacture of glass, paint, abrasives, and precision instruments.

Silica: Used in the manufacture of computer chips, glass and refractory materials; ceramics; abrasives; water filtration; component of hydraulic cements; filler in cosmetics, pharmaceutical, paper, insecticides; anti-caking agent in foods; flattening agent in paints; thermal insulator.

Silver: Used in photography, chemistry, jewelry; in electronics because of its very high conductivity; as currency, usually as an alloy; in lining vats and other equipment for chemical reaction vessels, water distillation; catalyst in manufacture of ethylene; mirrors; silver plating; table cutlery; dental, medical and scientific equipment; bearing metal; magnet windings; brazing alloys, solder.

Sodium Carbonate: (soda ash) Used in glass container manufacture; in fiberglass and specialty glass; also used in production of flat glass; in liquid detergents; in medicines; as a food additive; photography; cleaning and boiler compounds; pH control of water.

Sulfur: Used in the manufacture of sulfuric acid, fertilizers, chemicals, explosives, dyestuff, petroleum refining; vulcanization of rubber; fungicides.

Tungsten: Used in metalworking; construction and electrical machinery and equipment; in transportation equipment; as a filament in light bulbs; as a carbide in drilling equipment; in heat and radiation shielding; textile dyes, enamels, paints and for coloring glass.

Zeolites: Used in aquacultures, water softener; in catalysts, cat litter; odors control; and for removing radioactive ions from nuclear plant effluent.

Zinc: Used as a protective coating on steel, as a die casting, as an alloying metal with copper to make brass, and as chemical compounds in rubber and paints; used as sheet zinc and for galvanizing iron; electroplating; metal spraying; automotive parts; electrical fuses; dry cell batteries; nutrition; chemicals; roof gutter; engravers' plates; cable wrappings; organ pipes and pennies. Zinc oxide used in medicine, paints, in vulcanizing rubber, sunblock.

