

## APPENDIX A

### Abbreviations and Units of Measure

1 carat (metric) (diamond)	= 200 milligrams
1 flask (fl)	= 76 pounds, avoirdupois
1 karat (gold)	= one twenty-fourth part
1 kilogram (kg)	= 2.2046 pounds, avoirdupois
1 long ton (lt)	= 2,240 pounds, avoirdupois
1 long ton unit (ltu)	= 1% of 1 long ton or 22.4 pounds avoirdupois
long calcined ton (lct)	= excludes water of hydration
long dry ton (ldt)	= excludes excess free moisture
Mcf	= 1,000 cubic feet
1 metric ton (t)	= 2,204.6 pounds, avoirdupois or 1,000 kilograms
1 metric ton (t)	= 1.1023 short ton
1 metric ton unit (mtu)	= 1% of 1 metric ton or 10 kilograms
1 pound (lb)	= 453.6 grams
1 short ton (st)	= 2,000 pounds, avoirdupois
1 short ton unit (stu)	= 1% of 1 short ton or 20 pounds, avoirdupois
1 short dry ton (sdt)	= 2,000 pounds, avoirdupois, excluding moisture content
1 troy ounce (tr oz)	= 1.09714 avoirdupois ounces or 31.103 grams
1 troy pound	= 12 troy ounces

## APPENDIX B

### Definitions of Selected Terms Used in This Report

#### Terms Used for Materials in the National Defense Stockpile and Helium Stockpile

**Uncommitted inventory** refers to the quantity of mineral materials held in the National Defense Stockpile. Prior to this report, nonstockpile-grade quantities were not reported in the Stockpile Status table of the Mineral Commodity Summaries. Beginning with this report, however, nonstockpile-grade materials may be included in the table; where significant, the quantities of these stockpiled materials will be specified in the text accompanying the table.

**Committed inventory** refers to materials that have been sold or traded from the stockpile, either in the current fiscal year or in prior years, but not yet removed from stockpile facilities.

**Authorized for disposal** refers to quantities that are in excess of the stockpile goal for a material, and for which Congress has authorized disposal over the long term at rates designed to maximize revenue but avoid undue disruption of the usual markets and loss to the United States.

**Disposal plan FY 2002** indicates the total amount of a material in the National Defense Stockpile that the U.S. Department of Defense is permitted to sell under the Annual Materials Plan approved by Congress for the fiscal year. Fiscal year 2002 is the period October 1, 2001, through September 30, 2002. Note that, unlike the National Defense Stockpile, helium stockpile sales by the Bureau of Land Management under the Helium Privatization Act of 1996 are permitted to exceed disposal plans.

**Disposals FY 2002** refers to material sold or traded from the stockpile in fiscal year 2002; it may or may not have been removed by the buyers.

#### Depletion Allowance

The depletion allowance is a business tax deduction analogous to depreciation, but applies to an ore reserve rather than equipment or production facilities. Federal tax law allows this deduction from taxable corporate income, recognizing that an ore deposit is a depletable asset that must eventually be replaced.

## APPENDIX C

# A Resource/Reserve Classification for Minerals<sup>1</sup>

### INTRODUCTION

Through the years, geologists, mining engineers, and others operating in the minerals field have used various terms to describe and classify mineral resources, which as defined herein include energy materials. Some of these terms have gained wide use and acceptance, although they are not always used with precisely the same meaning.

The U.S. Geological Survey collects information about the quantity and quality of all mineral resources. In 1976, the Survey and the U.S. Bureau of Mines developed a common classification and nomenclature, which was published as U.S. Geological Survey Bulletin 1450-A—*“Principles of the Mineral Resource Classification System of the U.S. Bureau of Mines and U.S. Geological Survey.”* Experience with this resource classification system showed that some changes were necessary in order to make it more workable in practice and more useful in long-term planning. Therefore, representatives of the U.S. Geological Survey and the U.S. Bureau of Mines collaborated to revise Bulletin 1450-A. Their work was published in 1980 as U.S. Geological Survey Circular 831—*“Principles of a Resource/Reserve Classification for Minerals.”*

Long-term public and commercial planning must be based on the probability of discovering new deposits, on developing economic extraction processes for currently unworkable deposits, and on knowing which resources are immediately available. Thus, resources must be continuously reassessed in the light of new geologic knowledge, of progress in science and technology, and of shifts in economic and political conditions. To best serve these planning needs, known resources should be classified from two standpoints: (1) purely geologic or physical/chemical characteristics—such as grade, quality tonnage, thickness, and depth—of the material in place; and (2) profitability analyses based on costs of extracting and marketing the material in a given economy at a given time. The former constitutes important objective scientific information of the resource and a relatively unchanging foundation upon which the latter more valuable economic delineation can be based.

The revised classification systems, designed generally for all mineral materials, is shown graphically in figures 1 and 2; their components and usage are described in the text. The classification of mineral and energy resources is necessarily arbitrary, because definitional criteria do not always coincide with natural boundaries. The system can be used to report the status of mineral and energy-fuel resources for the Nation or for specific areas.

### RESOURCE/RESERVE DEFINITIONS

A dictionary definition of resource, “something in reserve or ready if needed,” has been adapted for

mineral and energy resources to comprise all materials, including those only surmised to exist, that have present to anticipated future value.

**Resource.**—A concentration of naturally occurring solid, liquid, or gaseous material in or on the Earth’s crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible.

**Original Resource.**—The amount of a resource before production.

**Identified Resources.**—Resources whose location, grade, quality, and quantity are known or estimated from specific geologic evidence. Identified resources include economic, marginally economic, and sub-economic components. To reflect varying degrees of geologic certainty, these economic divisions can be subdivided into measured, indicated, and inferred.

**Demonstrated.**—A term for the sum of measured plus indicated.

**Measured.**—Quantity is computed from dimensions revealed in outcrops, trenches, workings, or drill holes; grade and(or) quality are computed from the results of detailed sampling. The sites for inspection, sampling, and measurements are spaced so closely and the geologic character is so well defined that size, shape, depth, and mineral content of the resource are well established.

**Indicated.**—Quantity and grade and(or) quality are computed from information similar to that used for measured resources, but the sites for inspection, sampling, measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for measured resources, is high enough to assume continuity between points of observation.

**Inferred.**—Estimates are based on an assumed continuity beyond measured and(or) indicated resources, for which there is geologic evidence. Inferred resources may or may not be supported by samples or measurements.

**Reserve Base.**—That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. The reserve base is the in-place demonstrated (measured plus indicated) resource from which reserves are estimated. It may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently economic (reserves), marginally economic

<sup>1</sup>Based on U.S. Geological Survey Circular 831, 1980.

(marginal reserves), and some of those that are currently subeconomic (subeconomic resources). The term “geologic reserve” has been applied by others generally to the reserve-base category, but it also may include the inferred-reserve-base category; it is not a part of this classification system.

**Inferred Reserve Base.**—The in-place part of an identified resource from which inferred reserves are estimated. Quantitative estimates are based largely on knowledge of the geologic character of a deposit and for which there may be no samples or measurements. The estimates are based on an assumed continuity beyond the reserve base, for which there is geologic evidence.

**Reserves.**—That part of the reserve base which could be economically extracted or produced at the time of determination. The term reserves need not signify that extraction facilities are in place and operative. Reserves include only recoverable materials; thus, terms such as “extractable reserves” and “recoverable reserves” are redundant and are not a part of this classification system.

**Marginal Reserves.**—That part of the reserve base which, at the time of determination, borders on being economically producible. Its essential characteristic is economic uncertainty. Included are resources that would be producible, given postulated changes in economic or technological factors.

**Economic.**—This term implies that profitable extraction or production under defined investment assumptions has been established, analytically demonstrated, or assumed with reasonable certainty.

**Subeconomic Resources.**—The part of identified resources that does not meet the economic criteria of reserves and marginal reserves.

**Undiscovered Resources.**—Resources, the existence of which are only postulated, comprising deposits that are separate from identified resources. Undiscovered resources may be postulated in deposits of such grade and physical location as to render them economic, marginally economic, or subeconomic. To reflect varying degrees of geologic certainty, undiscovered resources may be divided into two parts.

**Hypothetical Resources.**—Undiscovered resources that are similar to known mineral bodies and that

may be reasonably expected to exist in the same producing district or region under analogous geologic conditions. If exploration confirms their existence and reveals enough information about their quality, grade, and quantity, they will be reclassified as identified resources.

**Speculative Resources.**—Undiscovered resources that may occur either in known types of deposits in favorable geologic settings where mineral discoveries have not been made, or in types of deposits as yet unrecognized for their economic potential. If exploration confirms their existence and reveals enough information about their quantity, grade, and quality, they will be reclassified as identified resources.

**Restricted Resources/Reserves.**—That part of any resource/reserve category that is restricted from extraction by laws or regulations. For example, restricted reserves meet all the requirements of reserves except that they are restricted from extraction by laws or regulations.

**Other Occurrences.**—Materials that are too low grade or for other reasons are not considered potentially economic, in the same sense as the defined resource, may be recognized and their magnitude estimated, but they are not classified as resources. A separate category, labeled other occurrences, is included in figures 1 and 2. In figure 1, the boundary between subeconomic and other occurrences is limited by the concept of current or potential feasibility of economic production, which is required by the definition of a resource. The boundary is obviously uncertain, but limits may be specified in terms of grade, quality, thickness, depth, percent extractable, or other economic-feasibility variables.

**Cumulative Production.**—The amount of past cumulative production is not, by definition, a part of the resource. Nevertheless, a knowledge of what has been produced is important to an understanding of current resources, in terms of both the amount of past production and the amount of residual or remaining in-place resource. A separate space for cumulative production is shown in figure 1. Residual material left in the ground during current or future extraction should be recorded in the resource category appropriate to its economic-recovery potential.

**FIGURE 1.—Major Elements of Mineral-Resource Classification, Excluding Reserve Base and Inferred Reserve Base**

Cumulative Production	IDENTIFIED RESOURCES		UNDISCOVERED RESOURCES		
	Demonstrated		Inferred	Probability Range	
	Measured	Indicated		Hypothetical	(or) Speculative
ECONOMIC	Reserves		Inferred Reserves		
MARGINALLY ECONOMIC	Marginal Reserves		Inferred Marginal Reserves	+	
SUBECONOMIC	Demonstrated Subeconomic Resources		Inferred Subeconomic Resources	+	
Other Occurrences	Includes nonconventional and low-grade materials				

**FIGURE 2.—Reserve Base and Inferred Reserve Base Classification Categories**

Cumulative Production	IDENTIFIED RESOURCES		UNDISCOVERED RESOURCES		
	Demonstrated		Inferred	Probability Range	
	Measured	Indicated		Hypothetical	(or) Speculative
ECONOMIC	Reserve		Inferred	+	
MARGINALLY ECONOMIC	Base		Reserve		
SUBECONOMIC	Base		Base	+	
Other Occurrences	Includes nonconventional and low-grade materials				

## APPENDIX D

### Country Specialists Directory

Minerals information country specialists at the U.S. Geological Survey collect and analyze information on the mineral industries of more than 170 nations throughout the world. The specialists are available to answer minerals-related questions concerning individual countries.

#### Africa and the Middle East

Algeria	Philip M. Mobbs
Angola	George J. Coakley
Bahrain	Philip M. Mobbs
Benin	Thomas R. Yager <sup>1</sup>
Botswana	George J. Coakley
Burkina Faso	Thomas R. Yager <sup>1</sup>
Burundi	Thomas R. Yager
Cameroon	Philip M. Mobbs <sup>1</sup>
Cape Verde	Thomas R. Yager <sup>1</sup>
Central African Republic	Thomas R. Yager <sup>1</sup>
Chad	Philip M. Mobbs
Comoros	Thomas R. Yager
Congo (Brazzaville)	George J. Coakley
Congo (Kinshasa)	George J. Coakley
Côte d'Ivoire	George J. Coakley <sup>1</sup>
Cyprus	Philip M. Mobbs
Djibouti	Thomas R. Yager
Egypt	Philip M. Mobbs
Equatorial Guinea	Philip M. Mobbs
Eritrea	Thomas R. Yager
Ethiopia	Thomas R. Yager
Gabon	George J. Coakley <sup>1</sup>
The Gambia	Thomas R. Yager <sup>1</sup>
Ghana	George J. Coakley
Guinea	Thomas R. Yager <sup>1</sup>
Guinea-Bissau	Thomas R. Yager <sup>1</sup>
Iran	Philip M. Mobbs
Iraq	Philip M. Mobbs
Israel	Thomas R. Yager
Jordan	Thomas R. Yager
Kenya	Thomas R. Yager
Kuwait	Philip M. Mobbs
Lebanon	Thomas R. Yager
Lesotho	George J. Coakley
Liberia	Thomas R. Yager <sup>1</sup>
Libya	Philip M. Mobbs
Madagascar	Thomas R. Yager
Malawi	Thomas R. Yager
Mali	Philip M. Mobbs <sup>1</sup>
Mauritania	Philip M. Mobbs <sup>1</sup>
Mauritius	Thomas R. Yager
Morocco & Western Sahara	Philip M. Mobbs <sup>1</sup>
Mozambique	Thomas R. Yager
Namibia	George J. Coakley
Niger	Philip M. Mobbs <sup>1</sup>
Nigeria	Philip M. Mobbs
Oman	Philip M. Mobbs
Qatar	Philip M. Mobbs
Reunion	Thomas R. Yager
Rwanda	Thomas R. Yager
São Tomé & Príncipe	Philip M. Mobbs <sup>1</sup>
Saudi Arabia	Philip M. Mobbs
Senegal	Thomas R. Yager <sup>1</sup>
Seychelles	Thomas R. Yager
Sierra Leone	Thomas R. Yager <sup>1</sup>

Somalia	Thomas R. Yager
South Africa	George J. Coakley
Sudan	Thomas R. Yager
Swaziland	George J. Coakley
Syria	Thomas R. Yager
Tanzania	Thomas R. Yager
Togo	Thomas R. Yager <sup>1</sup>
Tunisia	Philip M. Mobbs
Turkey	Philip M. Mobbs
Uganda	Thomas R. Yager
United Arab Emirates	Philip M. Mobbs
Yemen	Philip M. Mobbs
Zambia	George J. Coakley
Zimbabwe	George J. Coakley

#### Asia and the Pacific

Afghanistan	Travis Q. Lyday
Australia	Travis Q. Lyday
Bangladesh	Chin S. Kuo
Bhutan	Chin S. Kuo
Brunei	John C. Wu
Burma	John C. Wu
Cambodia	John C. Wu
China	Pui-Kwan Tse
Christmas Island	Travis Q. Lyday
Fiji	Travis Q. Lyday
India	Chin S. Kuo
Indonesia	Pui-Kwan Tse
Japan	John C. Wu
Korea, North	Pui-Kwan Tse
Korea, Republic of	Pui-Kwan Tse
Laos	John C. Wu
Malaysia	John C. Wu
Mongolia	Pui-Kwan Tse
Nepal	Chin S. Kuo
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New Zealand	Travis Q. Lyday
Pakistan	Travis Q. Lyday
Papua New Guinea	Travis Q. Lyday
Philippines	Travis Q. Lyday
Singapore	Pui-Kwan Tse
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Thailand	John C. Wu
Tonga	Travis Q. Lyday
Vanuatu	Travis Q. Lyday
Vietnam	John C. Wu

#### Europe and Central Eurasia

Albania	Walter G. Steblez
Armenia	Richard M. Levine
Austria	Harold R. Newman
Azerbaijan	Richard M. Levine
Belarus	Richard M. Levine

Belgium	Harold R. Newman	<b>North America, Central America, and the Caribbean</b>	Antigua and Barbuda	Ivette E. Torres <sup>1</sup>
Bosnia and Herzegovina	Walter G. Steblez		Aruba	Ivette E. Torres <sup>1</sup>
Bulgaria	Walter G. Steblez		The Bahamas	Ivette E. Torres <sup>1</sup>
Croatia	Walter G. Steblez		Barbados	Ivette E. Torres <sup>1</sup>
Czech Republic	Walter G. Steblez		Belize	Pablo Velasco
Denmark, Faroe Island, and Greenland	Chin S. Kuo		Bermuda	Ivette E. Torres <sup>1</sup>
Estonia	Chin S. Kuo		Canada	Alfredo C. Gurmendi
Finland	Chin S. Kuo		Costa Rica	Pablo Velasco
France	Harold R. Newman		Cuba	Ivette E. Torres
Georgia	Richard M. Levine		Dominica	Ivette E. Torres <sup>1</sup>
Germany	Harold R. Newman		Dominican Republic	Ivette E. Torres
Greece	Harold R. Newman		El Salvador	Pablo Velasco
Hungary	Walter G. Steblez		Grenada	Ivette E. Torres <sup>1</sup>
Iceland	Chin S. Kuo		Guadeloupe	Ivette E. Torres <sup>1</sup>
Ireland	Harold R. Newman		Guatemala	Pablo Velasco
Italy	Harold R. Newman		Haiti	Ivette E. Torres <sup>1</sup>
Kazakhstan	Richard M. Levine		Honduras	Pablo Velasco
Kyrgyzstan	Richard M. Levine		Jamaica	Ivette E. Torres <sup>1</sup>
Latvia	Chin S. Kuo		Martinique	Ivette E. Torres <sup>1</sup>
Lithuania	Chin S. Kuo		Mexico	Ivette E. Torres
Luxembourg	Harold R. Newman	Montserrat	Ivette E. Torres <sup>1</sup>	
Macedonia	Walter G. Steblez	Netherlands Antilles	Ivette E. Torres <sup>1</sup>	
Malta	Harold R. Newman	Nicaragua	Pablo Velasco	
Moldova	Richard M. Levine	Panama	Pablo Velasco	
Netherlands	Harold R. Newman	St. Kitts and Nevis	Ivette E. Torres <sup>1</sup>	
Norway	Chin S. Kuo	St. Lucia	Ivette E. Torres <sup>1</sup>	
Poland	Walter G. Steblez	St. Vincent & the Grenadines	Ivette E. Torres <sup>1</sup>	
Portugal	Harold R. Newman	Trinidad and Tobago	Ivette E. Torres <sup>1</sup>	
Romania	Walter G. Steblez			
Russia	Richard M. Levine	<b>South America</b>		
Slovakia	Walter G. Steblez	Argentina	Ivette E. Torres	
Slovenia	Walter G. Steblez	Bolivia	Pablo Velasco	
Spain	Harold R. Newman	Brazil	Alfredo C. Gurmendi	
Sweden	Chin S. Kuo	Chile	Pablo Velasco	
Switzerland	Harold R. Newman	Colombia	Ivette E. Torres	
Tajikistan	Richard M. Levine	Ecuador	Pablo Velasco	
Turkmenistan	Richard M. Levine	French Guiana	Alfredo C. Gurmendi <sup>1</sup>	
Ukraine	Richard M. Levine	Guyana	Alfredo C. Gurmendi <sup>1</sup>	
United Kingdom	Harold R. Newman	Paraguay	Pablo Velasco	
Uzbekistan	Richard M. Levine	Peru	Alfredo C. Gurmendi	
Yugoslavia	Walter G. Steblez	Suriname	Alfredo C. Gurmendi <sup>1</sup>	
		Uruguay	Pablo Velasco	
		Venezuela	Ivette E. Torres	

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<sup>1</sup>Interim
**Country specialist**

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 Chin S. Kuo  
 Richard M. Levine  
 Travis Q. Lyday  
 Philip M. Mobbs  
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