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UPDATE OF INDUSTRIAL MINERALS AND ROCKS OF NEW MEXICO

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ABSTRACT

Production of industrial minerals remains important to the rural economy of New Mexico. In 2014, some 240 mines were registered in New Mexico, including 25 industrial mineral operations and 189 aggregate operations. New Mexico leads domestic production of potash, perlite, zeolite, and travertine. Other production includes aggregate, humate, pumice, gypsum, salt, common and fire clay, scoria, limestone, fly ash, cement, magnetite, silica, and decorative stone. New Mexico has potential for additional production of industrial minerals. One company is exploring for garnet. Cretaceous black sandstones in the San Juan Basin have drawn interest for titanium, rare earth elements (REE), and zircon. Other REE deposits are being explored. REE-Th-U veins are found in the Gallinas, Capitan, and Cornudas Mountains and Laughlin Peak-Chico Hills. Recent exploration has occurred for beryllium in the San Mateo Mountains, Iron Mountain, and Victorio districts. Companies also are examining High-Ca limestone and High-Mg dolomite for potential development. Aggregate continues to be important in urban areas and along highways.

INTRODUCTION

Industrial minerals and rocks are literally the building blocks of our way of life and they are an exceptionally diverse and vital group of raw materials that underpin almost all aspects of human activity, infrastructure, and standard of living. Industrial minerals and rocks are used in the manufacture of many products, from ceramics to plastics and refractories to paper. Although industrial minerals permeate every aspect of daily life, their presence and their role are typically invisible. A widely used definition of industrial minerals and rocks is "any rock, mineral, or other naturally occurring substance of economic value, exclusive of metal ores, mineral fuels, and gemstones: one of the non-metallics" (Bates, 1975). This definition includes the important construction materials sector as well as specialized industrial minerals, but complex interactions between consumer industries produce a number of apparent anomalies to this definition. Some metals are included as industrial minerals because their use is industrial rather than as a metal. Sulfur is now predominantly extracted as a by-product of cleaning natural gas, one of the world's major energy fuels.

Production of industrial minerals has been and remains important to the rural economy of New Mexico. Industrial minerals constitute nearly 40% of the more than $2.8 billion generated by mineral production in New Mexico in 2013 (Table 1, see APPENDIX). In 2015, some 240 mines were registered in New Mexico. This total includes 25 industrial mineral operations and 189 aggregate operations. New Mexico leads domestic production in potash, perlite, zeolite, and travertine. Other industrial minerals production from New Mexico includes aggregate, humate, pumice, gypsum, salt, common and fire clay, scoria, limestone, fly ash, cement, magnetite, silica, and decorative stone. Additional production statistics are in Harben et al. (2008). Major industrial mineral districts are shown in Figure 1.

The purpose of this paper is to summarize and update the industrial mineral deposits found in New Mexico. Many of the mines and prospects in this report are described in the New Mexico Mines Database (McLemore et al., 2002, 2005a, b). The New Mexico Mines Database is constantly being updated and locations of mines not in McLemore et al. (2002) can be obtained by request using the mine id number.

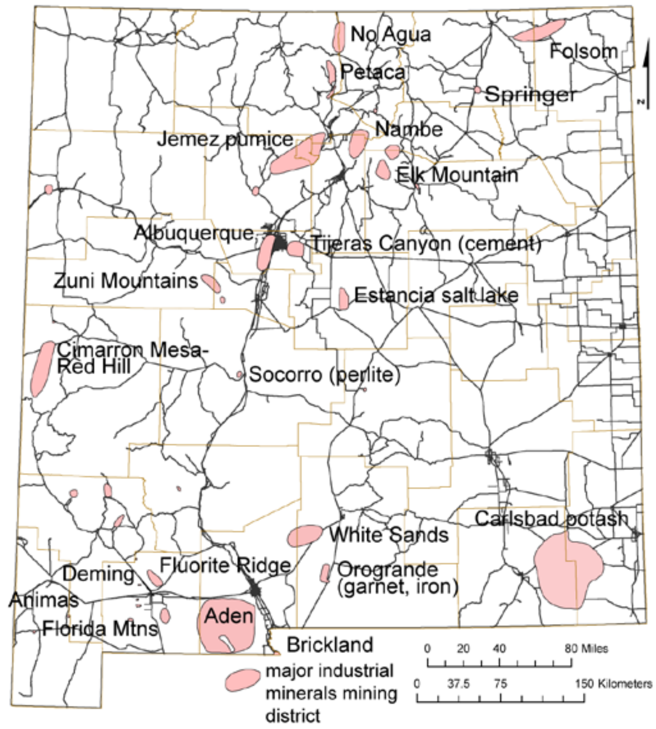

Figure 1. Major industrial minerals districts in New Mexico.

METHODS OF STUDY

Data used in this report have been compiled from a literature review, field examinations, and unpublished data by the author. For a summary of industrial minerals and rocks in New Mexico, see USGS (1965). For less comprehensive information on the industrial minerals and rocks of the state, Austin et al. (1996) and Harben et al. (2008) are useful. For information on mineral occurrences, the reader is urged to consult Northrop (1996) and the many publications of the New Mexico Bureau of Geology and Minerals Resources (NMBGMR). For detailed information on the uses and world-wide deposits, the reader should examine Kogel et al. (2006) and the U.S. Geological Survey (USGS) commodity reports (http://minerals.usgs.gov/minerals/pubs/commodity/, accessed 10/22/15). Information on active mines is from the New Mexico Mining and Minerals Division http://www.emnrd.state.nm.us/MMD/gismapminedata.html, accessed 10/22/15) and their annual reports (New Mexico Mining and Minerals Division, 1999-2013). This paper includes information from all of these sources. Any resource or reserve data presented here are historical data and are provided for information purposes only and do not conform to Canadian National Instrument NI 43-101 requirements (http://web.cim.org/standards/documents/Block484_Doc111.pdf, accessed 10/22/15). Historic and recent production and reserve/resource data are reported in metric or English units according to the original publication to avoid conversion errors.

COMMODITIES AND USES

Potash

The Carlsbad potash district is the largest potash producing area in the U.S. and New Mexico ranks first in production of potash in the U.S. Intrepid Mining LLC and Mosaic Co. operate mines in the district (Fig. 2). Potash is used as fertilizer and as a chemical in specialty and industrial markets. Langbeinite ($K_2SO_4 \cdot 2MgSO_4$) and sylvite (KCl) are the primary potash minerals found in Permian evaporates of the Permian Basin in New Mexico (Barker and Austin, 1996). Mining is by underground methods at depths of 800 to 1500 ft. The estimated potash reserves in the district amount to >553 million short tons. In 2013, 2.2 million short tons of K_2O were produced as mill production, up from the 1.5 million short tons of K_2O produced in 2012 (New Mexico Energy, Minerals and Natural Resources Department, 2013, 2014).

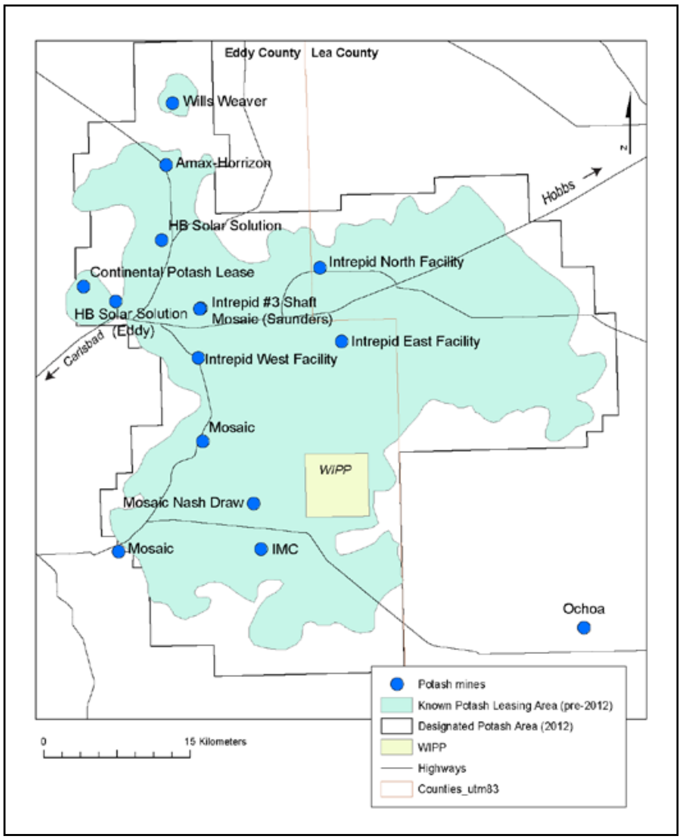

Figure 2. Potash facilities in Eddy and Lea Counties, southeastern New Mexico, showing the general outline of the Designated Potash Area (DPA) (after Barker and Austin, 1999).

When the combination of Cargill Crop Nutrition and IMC Global was completed on October 22, 2004, Mosaic Co. was born and is now the world's largest potash and phosphate producer. In 2013, Mosaic has an annual operational capacity of 10.7 million tonnes of potash product, which accounts for nearly 13% of the world's capacity (Mosaic Company, 2013). The total reserves at Mosaic Carlsbad operations include an estimated total of 1.6 million tonnes of potash ore (Mosaic Company, 2013) in three mining beds at thickness ranging from 4.5 ft to >11 ft. These reserves are expected to last 15-23 years.

Intrepid Mining NM LLC announced on March 1, 2004 it completed the acquisition of all of the assets of Mississippi Potash, Inc. and Eddy Potash, Inc. Since 2004, Intrepid Mining NM LLC has spent approximately $231 million in upgrading the underground mines and processing facilities. Intrepid employs approximately 650 people at 3 facilities in New Mexico (https://www.intrepidpotash.com/AboutUs/LocationsOperations/CarlsbadNM.aspx, accessed 10/15/15). The West Facility, which consists of a potash mine and refinery was originally built in 1929 by U.S. Potash and has an annual production capacity of approximately 538,000 short tons of red potash. The East Facility, which has an annual production capacity of approximately 560,000 short tons of white potash, consists of a potash mine, refinery, and compaction plant. The North facility consists of a granular compaction plant and storage facilities. Two types of ore are processed. Flotation is used to produce red potash and hot leach crystallization is used to produce the higher purity white potash. Plans are under way to produce potash by solution mining at the HB Solar Solution mine (http://www.intrepid-hbproject.com/, accessed 10/15/15).

Intercontinental Potash Corp. (formerly Trigon Uranium Corp.) announced results of their drilling at the Ocha Potash Project in Lea County. The Ocha deposit contains as much as 85% polyhalite with halite and anhydrite in the Rustler Formation (Crowl et al., 2011; http://www.icpotash.com/ochoa/ , accessed 10/15/15). Potash is a leaseable mineral. Mining and exploration activities are administered by the Bureau of Land Management and are excluded from the New Mexico 1993 Mining Act, administered by the New Mexico Mining and Minerals Division.

Salt

United Salt Corp. acquired a solar evaporation salt plant (Lake mine) near Carlsbad in 1962 (http://www.unitedsalt.com/site/html/about.htm, accessed 10/15/15). The salt is harvested on a 2,600 acre salt lake after the sun has evaporated the water from the brine. The salt is then carefully washed three times before it is packaged into a variety of solar salt products. New Mexico Salt and Minerals Corp. also produces salt from a mine in the Carlsbad area. Originally, the salt at Carlsbad was sold as deicing salt for roads. Today, the salt is used in water conditioning, agricultural feed products, chemical feed stocks, for swimming pool chlorine generation and numerous other industrial applications. New Mexico produced 223,000 metric tons of salt in 2013 (Bolen, 2015).

Zeolites

Zeolites are minerals found disseminated in altered volcanic ash and clinoptilolite is the predominant mineral with unique physical, chemical, and cation exchange properties for uses in agriculture, industrial, and environmental applications. Markets include odor control and hygiene products (cat litter), industrial fillers and absorbents, filtration media, environmental products, animal feed supplements, soil conditioners, floor-drying agents, mineral fillers, water and wastewater treatment, air filtration media, and cation exchanged products. Zeolite is produced at two mines in New Mexico, St. Cloud Zeolite mine and Coyote Cliff Nos. 1 and 2 mines (Fig. 3; New Mexico Energy, Minerals and Natural Resources Department, 2014). New Mexico ranks first in production of zeolites in the U.S.

St. Cloud Mining Co. (a subsidiary of Imagin Minerals, Inc.) operates the largest zeolite mine in the U.S. at the Stone House mine in Sierra County. Imagin Minerals, Inc. bought the St. Cloud Mining Company from The Goldfield Corporation in December 2002. St. Cloud Mining Co. has operated the open pit mine since 1993. The mining property consists of approximately 1,500 acres and contains 18.3 million short tons of reserves with a yearly capacity of 100,000 short tons (http://www.stcloudmining.com/, accessed 10/15/15). Clinoptilolite is found in the altered Tertiary tuff of Little Mineral Creek (White et al., 1996). Clinoptilolite is mined, crushed, dried, and sized without beneficiation and shipped packaged to meet customer's specifications. St. Cloud Mining Co. also has made several modifications to its zeolite operation, including the addition of cation exchange capacity for added value products and additional classification capabilities to expand markets for their products. The modern facility has the crushing and sizing capacity of 500 short tons per day.

Pumice

The main use for pumice is as an aggregate in lightweight building blocks and assorted building products. Other major applications for pumice and pumicite included abrasive, absorbent, concrete aggregate and admixture, filter aid, horticultural (including landscaping), and the stonewashing of denim.

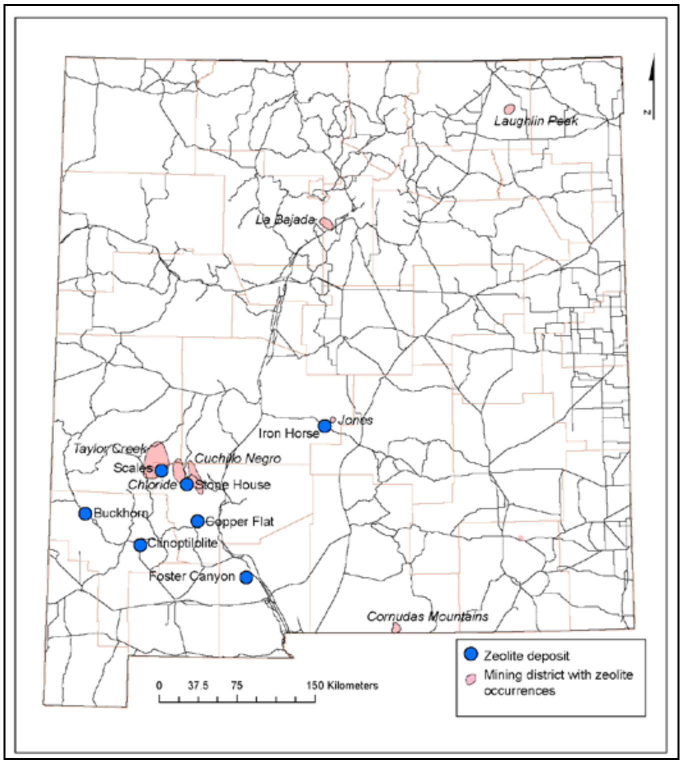

Figure 3. Zeolite deposits in New Mexico.

Pumice is found in the Jemez Mountains and the Mogollon-Datil volcanic field (Hoffer, 1994; McLemore, 1996); however only four operations were active in New Mexico in 2013; Copar Pumice's El Cajete mines and the San Ysidro mines, CR Minerals' Rocky Mountain mine and Santa Fe plant, and Utility Block's U.S. Forest Service mine. CR Minerals Co. closed its Santa Fe mill in spring 2007 and moved its' milling facilities to a new plant on the Ohkay Owingeh Pueblo. The Santa Fe site has been reclaimed and is now the site of a Rail Runner train station.

Copar Pumice Company, Inc. has been in the pumice mining industry for more than 40 years and produces pumice from two quarries, the Guaje Canyon Mine and El Cajete Mine. El Cajete pumice mine expansion in the Jemez Mountains (Copar Pumice Co.) was delayed until preparation of an EIS (draft released early 1997). The mine opened in 1997; reclamation will and has occurred as mining is completed in specific areas. Reserves are estimated at 100,000 short tons of pumice that will be used in making stonewashed jeans and building blocks. Other pumice mines are active in the region. In Sandoval County, Urban Trucking and Excavating began mining pumice in April 2008.

Cement

Cement commonly refers to hydraulic cement, especially Portland cement. Hydraulic cements are those that have the property of hardening under water and are the chief binding agents for concrete and masonry. Portland cement was patented by Joseph Aspdin of Leeds, England, in 1824, and today, it is the predominant variety of hydraulic cement. The name "Portland" was chosen because the set cement resembled a building stone quarried from the Isle of Portland off the southern coast of England. Most of the cement produced in the U.S. is Portland cement; masonry cement is used for stucco and mortar. Portland cement concrete is a principal construction material. New Mexico produces seven different types of cement at a total estimated capacity of 800,000 metric tons/year of cement from the Tijeras cement plant operated by Grupos Cementos de Chihuahua (GCC) near Albuquerque (Fig. 1). The Tijeras cement plant was commissioned in 1959 and GCC took over operations in 1994. The main ingredient in cement is limestone mined at Tijeras with additional varying quantities of iron, sandstone/shale, alumina, and gypsum (locally obtained from throughout New Mexico).

The Mesa del Oro deposit is west of Las Lunas and owned by Daleco Resources Corp. The deposit contains approximately 477.6 million short tons (not NI 43-101 compliant) of high quality calcium carbonate as travertine that is suitable for cement http://dalecoresources.com/s/MesadeOro.asp , accessed 10/15/15).

Gypsum

Gypsum is a soft mineral (hardness of 1.5-2) with the formula $CaSO_4 \cdot 2H_2O$, and is typically formed in sedimentary environments. Gypsum is used primarily in the manufacture of wallboard for homes, offices, and commercial buildings; other uses include the manufacture of Portland cement, plaster-of-Paris, and as a soil conditioner. Eagle Materials (formerly Centex) operates the White Mesa mine near Cuba and two wallboard plants in Albuquerque and Bernalillo. Other smaller gypsum mines are operated in Sandoval and Dona Ana Counties. The Alley Gypsum mine, located in Dona Ana County, began mining gypsum for use as an agricultural amendment in November 2008.

Perlite

Perlite is weathered (hydrated), natural glass that is formed by the rapid cooling of viscous, high-silica rhyolite lava. The distinguishing feature of perlite from other volcanic glasses is that when heated above 1,600ºF, it expands or pops to four to 20 times its original volume to form lightweight, glass foam. This expansion is due to the presence of 2-6% combined water in the mined perlite. This expansion also results in a white color. While the mined perlite may range from waxy to pearly, light gray to black or even brown, blue, or red; the color of expanded perlite ranges from snowy white to grayish white. Perlite is used in building construction products, horticultural aggregate, filter aid, fillers, and other uses. In New Mexico, perlite is found in high-silica rhyolite lava flows and lava domes that are typically 3.3-7.8 Ma (Fig. 4; Chamberlin and Barker, 1996; Barker et al., 1996).

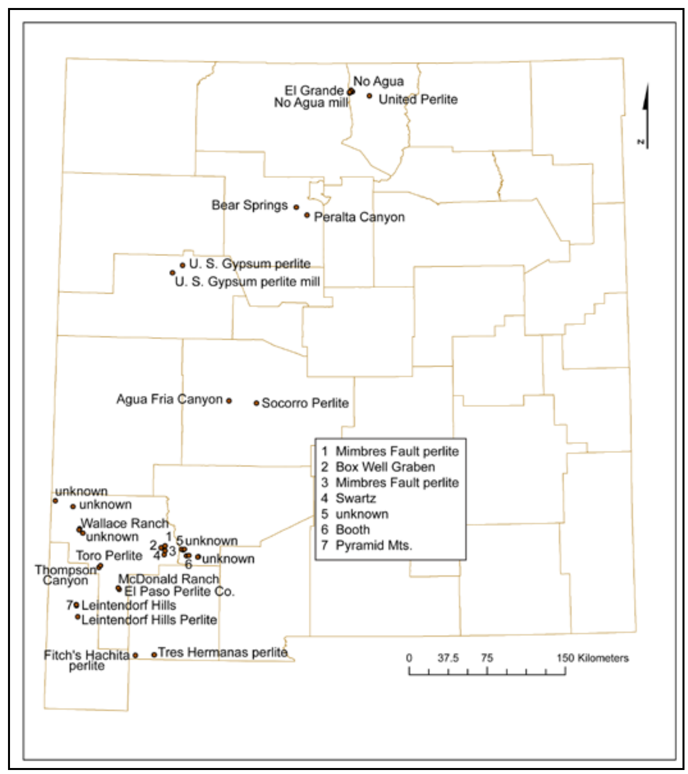

Figure 4. Perlite occurrences and mines in New Mexico.

Perlite is produced from three mines in New Mexico: Socorro, El Grande, and No Agua (Fig. 4; Chamberlin and Barker, 1996). The Atlas Minerals Inc. (formerly Toro Mining and Minerals, Inc.) is examining the Toro perlite deposit northwest of Deming, where more than 15 million short tons of perlite have been estimated (http://www.secinfo.com/d11f65.2G3.htm, accessed 10/15/15). St. Cloud Mining Co. is examining the McCauley Ranch perlite deposit (Thompson Canyon) in Grant County.

Clay

Two types of clay are mined in New Mexico: common and fire clay. Common clay is used for making bricks, roofing granules, and quarry tile. Commercial adobe yards are mostly in northern New Mexico that produce adobe bricks from local alluvial materials. Bricks are manufactured at the Kinney Brick mill in Albuquerque and American Eagle plant in Dona Ana County.

Daleco Resources Corp. drilled 16 holes in 2005 at the Sierra Kaolin deposit (also known as the Kline Mountain deposit) in the Black Range, Sierra County. Evaluation of the deposit continued in 2012-2013 (http://www.dalecoresources.com/s/SierraKaolin.asp, accessed on 10/15/15). The hydrothermal kaolin deposit is found in an advanced argillic alteration zone within the tuff of Kline Mountain and is estimated to contain more than 200 million tons of kaolin (non 43-101 historic resource; Iskender et al., 1994). In 1969, 900 short tons were mined for absorbent.

Rare earth elements (REE)

Deposits of rare earth elements (REE) are located in New Mexico (Fig. 5), but they have not been important exploration targets in past years because demand has been met elsewhere. However, with a projected increase in demand, New Mexico deposits are being re-examined for their REE potential (McLemore, 2015). REE-Th-U veins are found in the Gallinas, Capitan, and Cornudas Mountains and Laughlin Peak-Chico Hills; all are associated with Tertiary alkaline to alkalic-calcic igneous rocks.

A small amount of bastnaesite, a REE mineral, was recovered during processing of fluorite mined in the Gallinas Mountains. Resources in the Gallinas Mountains amount to at least 537,000 short tons of 2.95% total REE (McLemore, 2010b). Four types of deposits are found in the Gallinas Mountains: epithermal REE-F veins, Cu-REE-F veins, REE-F breccia pipes and iron skarn deposits.

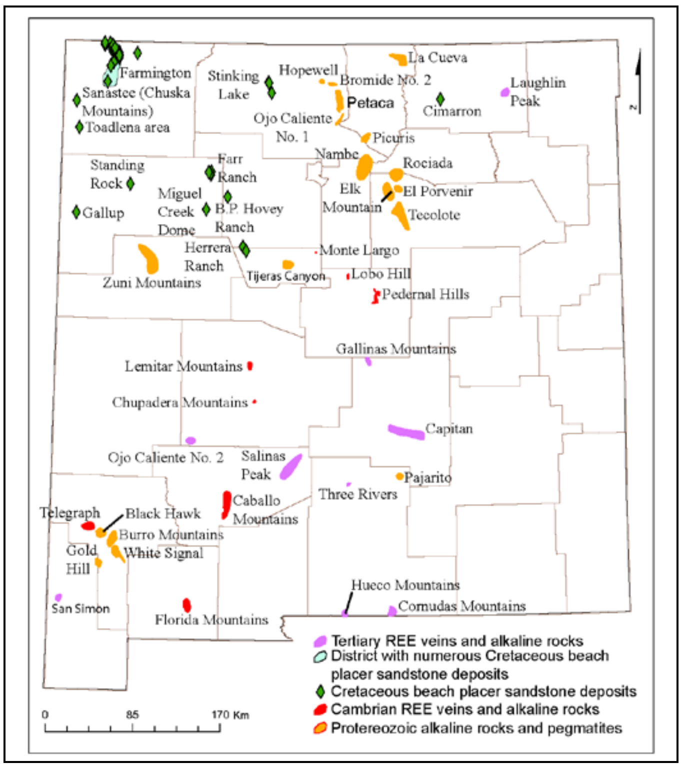

Figure 5. REE deposits in New Mexico (McLemore, 2015).

The abundance of REE and other unusual minerals in the Cornudas Mountains suggests that the area has potential for undiscovered deposits of REE, niobium, and zirconium. U.S. Borax sampled and drilled in the Chess Draw area and found up to 0.06% total REE in samples.

Disseminated Y-Zr deposits in Proterozoic syenite and nepheline syenite are known at Pajarito Mountain on the Mescalero Apache Indian Reservation near Ruidoso, where one sample contained 6869 ppm total REE. In 1990, Molycorp, Inc. reported historic resources of 2.7 million short tons grading 0.18% Y_2O_3 and 1.2% ZrO_2 as disseminated eudialyte. The U.S. Bureau of Indian Affairs drilled five holes in 2014 and results are pending.

Other types of REE deposits in New Mexico include carbonatites in the Lemitar and Chupadera Mountains, Laughlin Peak-Chico Hills, Lobo Hill, and Monte Largo (Sandia Mountains). Two additional deposit types have potential for REE in New Mexico: (1) Cretaceous heavy mineral, beach-placer sandstone deposits and (2) pegmatites. Drilling of one of these deposits, the Apache Mesa (formerly the Stinking Lake) beach-placer sandstone deposit in the Jicarilla Indian Reservation occurred in August 2015. Exploration has occurred in the Lemitar, Gallinas, and Cornudas Mountains for hydrothermal vein deposits.

Many challenges, including permitting, face these industries in supplying REE elements. Most REE deposits are radioactive, although they contain less uranium and thorium then uranium mines, but will require special handling of the mine waste. Future development of these commodities will be challenging and more research is required to fully understand the REE potential in New Mexico.

Beryllium

Beryllium (Be) is a strategic element that is becoming more important in our technological society, because it is six times stronger than steel, has a high melting point, a high heat capacity, is non-sparking, is transparent to X-rays, and when alloyed with other metals it prevents metal fatigue failure. Beryllium is used in the defense, aerospace, automotive, medical, and electronics industries, in the cooling systems for nuclear reactors and as a shield in nuclear reactors. Beryllium deposits in Utah, New Mexico, Texas, and Mexico range from small (Apache Warm Springs, 39,063 metric tons Be, grade <0.26% Be) to world-class (Spor Mountain, 7,011,000 metric tons, grade 0.266% Be).

In New Mexico, past production of beryl has been from pegmatites in Taos, Rio Arriba, Mora, San Miguel, and Grant Counties, with the majority of the beryl production from the Harding pegmatite, Taos County (McLemore, 2010c).

Past drilling in the Apache Warm Springs deposit in the Sierra Cuchillo by BE Resources, Inc. has identified mineralized zones in altered rhyolite (McLemore, 2010a). The deposit is classified as volcanogenic beryllium deposit, also known as Spor Mountain Be-U-F or epithermal volcanic-hosted deposit. The Iron Mountain deposit, also in the Sierra Cuchillo south of the Apache Warm Springs deposit, is a contact metasomatic W-Be-Sn-Fe deposit in limestones adjacent to Tertiary rhyolites and granite (McLemore, 2010c).

W-Mo-Be skarn/vein deposits in Paleozoic dolostones, limestones, and sandstones were discovered in the Victorio Mountains, Luna County in the early 1900s. Gulf Minerals Resources, Inc. drilled 71 holes in 1977-1983 and delineated a porphyry Mo and W-Mo-Be skarn deposits northwest of Mine Hill and south of Middle Hills. At a cut-off grade of 0.02% WO_3, resources were estimated as 57,703,000 tons of 0.129% Mo and 0.142% WO_3. Open pit resources were estimated as 11,900,000 tons of 0.076% WO_3 and 0.023% Be (McLemore, 2010c). Galway Resources Ltd. acquired the Victorio Mountains deposit in the late 1990s.

Beryllium also is found in the nepheline syenite at Wind Mountain, Otero County and in the molybdenum porphyry deposit at Questa, Taos County, although not in economic concentrations.

Future production of beryllium from New Mexico will depend upon an increase in demand, possibly in the nuclear industry or in solar panels. It is unlikely that any of the beryllium deposits in New Mexico will be mined in the near future because the known deposits are small and low grade and the Spor Mountain deposit contains sufficient beryllium reserves to meet the expected demand in the next few years.

Dolomite

There are large deposits of high-purity, high-Mg dolomite in the south-central part of New Mexico, from the Sacramento Mountains west to Deming, and from the north tip of the San Andres Mountains south to Mexico. The dolomite is mainly of early Paleozoic age and occurs in the El Paso (Ordovician) Limestone and Montoya (Ordovician) and Fusselman (Silurian) Dolomites. Dolomites are used to make magnesia, which has important medicinal applications, and in the chemical industry in the manufacture of magnesium salts, used to lower acidic levels of soil. Magnesium also is used in batteries. American Magnesium LLC is examining the high-Mg dolomites in the Florida Mountains for potential economic development of magnesium for use in batteries.

Aggregate

Aggregate, as used in this report, is used for construction purposes and there are three types: (1) construction sand and gravel, (2) crushed stone, and (3) lightweight aggregate. Aggregate also can be used for decorative purposes. The largest demand for aggregates in New Mexico is for highway construction and then for building construction. Since aggregate is a high-bulk, low-unit-value commodity, transportation of these materials can be more expensive than the actual material and most aggregate pits are found close to highways and near the larger towns and cities (Fig. 6). In New Mexico, sand and gravel from the Rio Grande valley supplies much of New Mexico's need for aggregate. Crushed stone is produced principally along the eastern and western borders and to supply specialized needs.

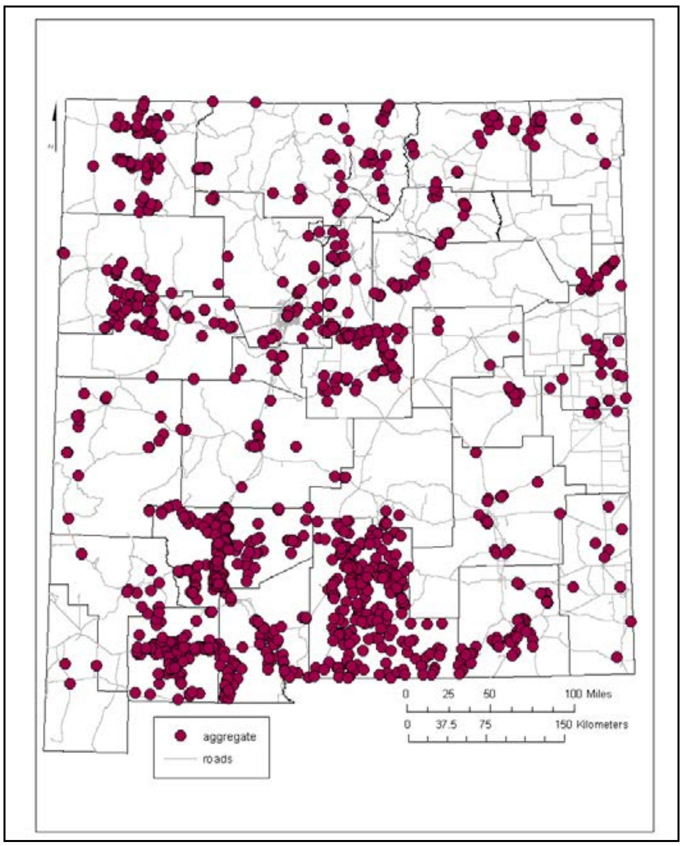

Figure 6. Selected aggregate (sand and gravel) mines in New Mexico (data from the New Mexico Mines Database).

Other industrial minerals

Humates are weathered coal or highly organic mudstone that is found in the coal-bearing sequences. New Mexico has significant deposits of humates, predominantly in the Fruitland and Menefee formations in the eastern San Juan Basin. Humate is produced from 10 mines and mills in New Mexico, Rammsco's Eagle Mesa mine, Morningstar's San Juan mill, Horizon Ag-Products' San Luis mine, Mesa Verde Resources' Star Lake mine, Pueblo Alto mine and San Ysidro mill, Menefee Mining's Star Lake mine and Menefee mill, and U-Mate International's U-Mate mine. The Horizon Ag Products mine and mill are south of Cuba. Menefee Mining operates one pit and a mill near Cuba. The mining operations, processing site, and transportation facility of U-Mate International, Inc. are located in the Gallup area. The Eagle Mesa mine is near Cuba and the Morningstar mine is in San Juan County. The Jaramillo humate mine in McKinley County is under development by Anasazi Stone LLC. Humate is used as a soil conditioner and as an additive to drilling muds (Hoffman et al., 1996). Approximately 12.1 billion short tons of humate resources are within the San Juan Basin (Hoffman et al. 1996).

Magnetite was shipped from the stockpiles at the Cobre (Continental) mine owned by Freeport-McMoRan Copper and Gold Inc. and used in cement and other minor industrial uses. The Iron Duke mine in the Orogrande district also produced iron ore from the mine rock piles (dumps) remaining after previous iron mining.

Small flagstone operations are throughout New Mexico producing sandstone, travertine and other ornamental rock. The largest is the New Mexico Travertine plant near Belen. New Mexico Travertine Inc. is currently producing travertine for dimension stone from the Lucero quarry in Valencia County. Daleco Resources Inc. is evaluating the Mesa Del Oro property, Cibola County for additional travertine production where an estimated 477.6 million short tons of travertine are found (non 43-101 historic resource; http://www.dalecoresources.com/s/MesadeOro.asp, accessed 10/15/15).

Although garnet has not been produced in New Mexico since 1998, at least one company is examining areas in the state for potential resources for uses as an abrasive. Garnet typically is found in skarn deposits in southern and central New Mexico and in some areas, garnet is a major constituent of waste rock piles remaining after recovery of metals (Lueth, 1996). For example, approximately 135,000 metric tons of 20-36% garnet is estimated to occur in four tailings piles at Hanover (Cetin et al., 1996). Average values for crude garnet concentrates ranged from approximately $55 to $120 per ton in 1999 (Olson, 2000). B.O.W. Corporation is examining the Orogrande district for garnet resources.

Tellurium (Te) is one of the least abundant elements in the crust and tends to form minerals associated with copper, lead, zinc and iron sulfide deposits. Today, most tellurium production comes from the anode slimes and other wastes generated in metal refining. Most of the current tellurium produced in the world is used as an alloying agent in iron and steel, as catalysts, and in the chemical industry. However, future demand and production could increase because tellurium is increasingly used in solar panels and some electronic devices. Tellurium is found associated with porphyry copper deposits in southwestern New Mexico and with Au-Ag veins in the Eureka, Sylvanite, Organ, Lordsburg, Steeple Rock, Wilcox, Mogollon, Chloride, Cuchillo, Hillsboro, Zuni Mountains, White Oaks, and Nogal-Bonito districts (McLemore, 2013). The only tellurium production from New Mexico has been from the Lone Pine deposit (Wilcox district), where approximately 5 tons of tellurium ore was produced. Gold-tellurides are found with gold, silver, pyrite, and fluorite in fracture-filling veins in rhyolite at Lone Pine, with reported assays as much as 5,000 ppm Te. Other districts in New Mexico have potential for tellurium, but require field evaluation.

SUMMARY

Production of industrial minerals has been and remains important to the rural economy of New Mexico. New Mexico leads domestic production of potash, perlite, zeolite, and travertine. It is 2nd in humate, 4th in pumice, 13th in gypsum, and 11th in salt. Other production includes clay, scoria, limestone, fly ash, cement, magnetite, silica, and decorative stone. At least one company is exploring for garnet. Cretaceous black sandstones in the San Juan Basin have drawn interest for titanium, iron, REE, and zircon. Other REE deposits are being explored. Recent exploration has occurred for beryllium in the San Mateo Mountains, Iron Mountain, and Victorio districts. Aggregate continues to be produced throughout New Mexico as construction activities, including highway construction and upgrading, increase.

ACKNOWLEDGMENTS

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APPENDIX

Table 1. Production of industrial minerals, aggregates and potash from New Mexico from 2000-2013 (from New Mexico Mining and Minerals Division, 2000-2014). Other industrial minerals include gypsum, perlite, salt, limestone, dimension stone, silica flux, clay, humate, scoria, pumice, mica, and zeolites.

YEAR	OTHER INDUSTRIAL MINERALS		AGGREGATES		POTASH		TOTAL MINERAL PRODUCTION (INCLUDING COAL)
	SHORT TONS	DOLLARS	SHORT TONS	DOLLARS	SHORT TONS	DOLLARS	DOLLARS
2000	2,925,926	$162,402,617	13,752,251	$66,810,485	1,377,801	$215,737,596	$1,377,411,947
2001	2,561,004	$166,705,643	12,353,090	$61,115,960	985,574	$191,732,005	$1,236,641,553
2002	2,393,754	$174,603,868	15,441,510	$73,499,682	1,014,529	$188,611,426	$1,255,111,627
2003	2,274,999	$153,198,856	14,838,772	$77,848,579	1,064,485	$202,166,863	$1,235,443,804
2004	2,379,183	$168,557,974	34,547,746	$103,810,297	1,069,285	$237,619,345	$1,556,919,881
2005	2,466,281	$200,871,063	20,014,987	$128,730,636	988,782	$282,710,833	$1,859,392,448
2006	2,285,585	$261,668,905	19,317,521	$140,022,212	825,540	$237,603,468	$2,169,731,560
2007	2,110,308	$192,398,110	15,864,974	$140,214,362	922,628	$273,946,696	$2,200,256,141
2008	2,108,801	$157,840,649	16,740,148	$102,273,471	1,076,759	$612,745,114	$2,359,634,440
2009	156,111	$124,402,302	13,537,659	$110,879,335	602,231	$491,276,710	$1,756,799,711
2010	2,343,734	$110,718,970	10,752,950	$81,697,488	812,756	$512,426,376	$1,780,236,662
2011	1,472,746	$107,097,166	9,813,528	$68,432,817	781,282	$636,047,697	$2,214,706,950
2012	1,491,760	$108,975,769	8,543,379	$76,945,909	1,548,047	$953,477,008	$2,801,634,159
2013	1,248,312	$91,113,849	9,393,307	$81,505,531	2,188,874	$914,659,051	$2,827,405,091
Total 2000-2013	28,218,504	$2,180,555,741.00	214,911,822	$1,313,786,764.00	15,258,573	$5,950,760,188.00	$26,631,325,974.00