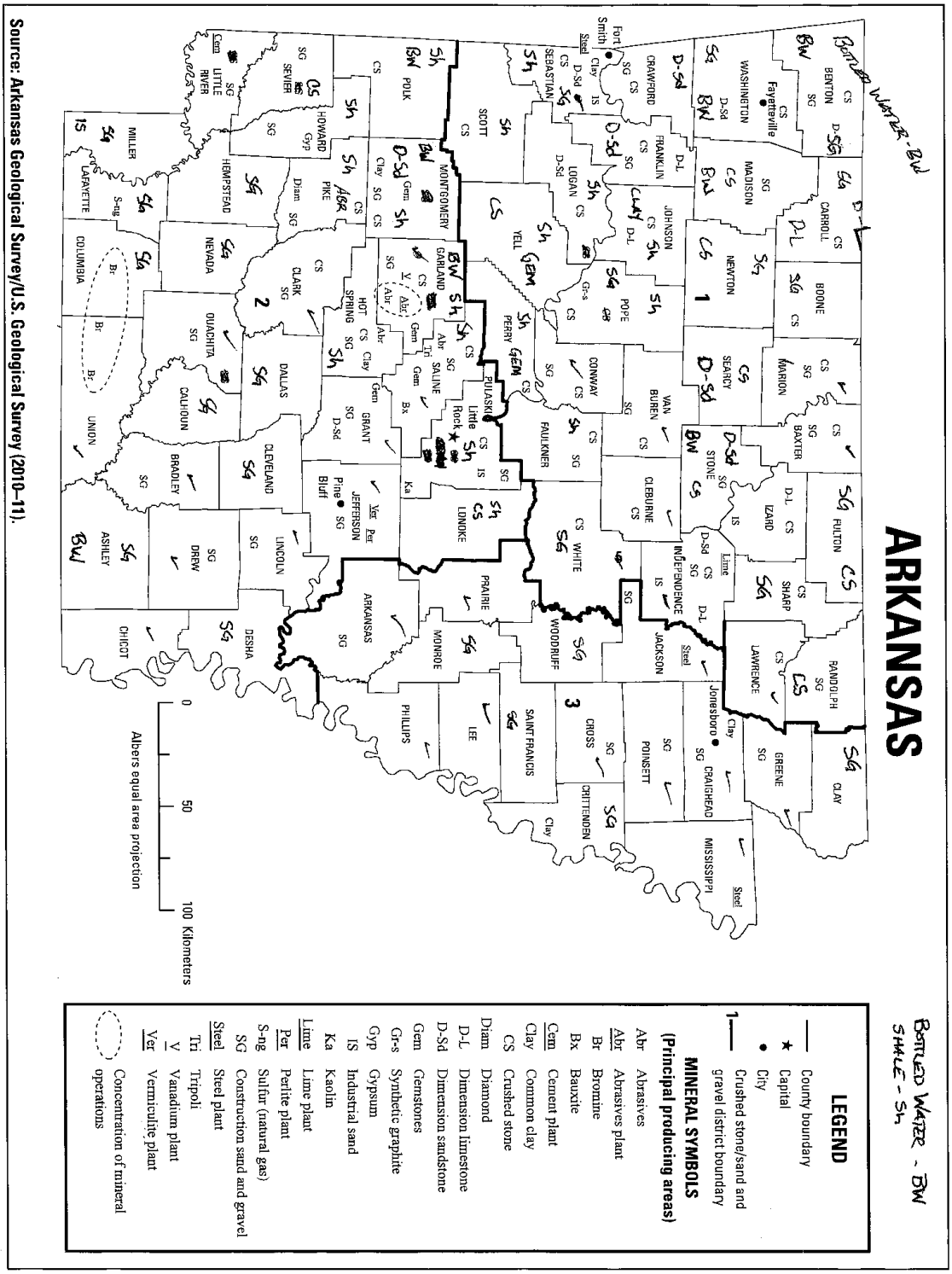
Below is the updated industrial minerals map for 2013. The narrative follows



Source: Arkansas Geological Survey/U.S. Geological Survey (2010–11).

Commodity Review - 2013

Industrial Minerals

Mining Permits and Authorizations

During 2013, 335 non-coal mine sites and quarries were permitted or authorized in Arkansas. The total area of non-coal sites and quarries under permit or authorization was 30,383 acres. Of that total, 59% or 18,063 acres were bonded for reclamation. Additional information on Arkansas mining operations can be obtained from the Arkansas Department of Environmental Quality's Facility and Permit Summary database, available at http://www.adeq.state.ar.us/home/pdssql/pds.aspx.

Abrasives, Natural

Five companies continued to mine and (or) process novaculite to make whetstones in the Hot Springs area of Garland County, including B & C Abrasives, Inc., Dan's Whetstone Company, Hall's Sharp Stones, Inc., Natural Whetstones Company, and Saint Gobain Abrasives, Inc. (Norton Stones Company). In addition to construction aggregates, Martin Marietta also continued to produce novaculite from a quarry near Glen Rose in Hot Spring County. Malvern Minerals Company continued to mine Tripoli from the Bigfork Chert (Ordovician) at it's mine in Saline County for processing at their plant in Hot Springs, Garland County.

Bromine

Bromine compounds are naturally occurring, and available in many of earth's environments including lakes, ocean water, and oil brines. Oil brines are mineral-rich waters trapped in petroleum reservoirs. Though widely available, commercial bromine production has historically been focused on the most enriched bromine sources. One of the world's richest known sources of bromine compounds is the oil brines of south Arkansas. The bromine enriched brines are extracted with oil from the Smackover Formation, and processed locally by two manufacturers.

In 2013, Albemarle Corporation continued operations at its bromine extraction and production plants near Magnolia, Columbia County, Arkansas. They reported in 2012, having 50 or more years of reserves at this location. In 2013 they updated that estimate to 70 or more years of reserves. They use bromine compounds to produce brominated flame retardants.

In 2013, Chemtura Corporation continued operations at its chemical plant in El Dorado, Union County, Arkansas. They produce flame retardant materials as well as bromine and bromine chemical products for industry.

Cement

Ash Grove Cement Company in Little River County was the only cement manufacturer in Arkansas during 2013. They use the modern dry process to manufacture a variety of Portland cement products. Raw materials utilized in the process include a combination of chalk from the Cretaceous Annona Formation, and silica from the Cretaceous Ozan Formation.

Clays

In 2013 369,000 tons of common clay were produced in the state with a value of $1,400,000. Acme Brick Co., owned by Berkshire-Hathaway, near Malvern, Hot Spring County, continued operation of its Wilcox Group (Eocene) clay mines for brick manufacture at Perla, Arkansas. McGeorge Construction Company continued custom mining of bauxite on the ALCOA property in Saline County for Saint Gobain. CertainTeed Corporation mined and processed slaty shale from the Stanley Formation (Mississippian) north of Glenwood, Pike County to produce black roofing granules.

Gemstones

Minerals produced in Arkansas as gemstones in 2013 were primarily quartz, wavellite, and diamonds. There were 18 quartz contracts with the Forest Service, and 4 quartz leases and two active wavellite leases with the Bureau of Land Management. During the year, $413,000 worth of gemstones was recovered making Arkansas the 8th largest producer out of 50 states that produced gemstones in the US that year.

Crater of Diamonds State Park in Pike County, Arkansas is the only place in the world that allows visitors to keep the diamonds that they find. In 2013 the total number of diamonds recovered was 585 and 17 of those were over one carat. Of these, 346 were white diamonds, 135 were brown, and 104 were yellow. The combined weight of the diamonds recovered was 121.02 carats.

Gypsum

CertainTeed Corporation's (Valley Forge, PA)[subsidiary of Saint-Gobain Company (Courbevoie France)] gypsum mine and wallboard plant near Nashville, Howard County, continued to be a leading wallboard manufacturing plant, with a capacity of 130 million square meters per year of wallboard. The principal markets for the wallboard, sold under the trade name CertainTeed, were in the eastern United States.

Lime

Arkansas Lime Company, part of United States Lime and Minerals, Inc., of Batesville, Independence County, produced hydrated lime and quicklime, agricultural lime, and pulverized limestone for glass manufacturing. Arkansas Lime's quarry is in a section of Ordovician

limestone that is very pure and low in silica. Midwest Lime Company, also of Batesville, Independence County, produced agricultural lime.

Nepheline Syenite

The Big Rock Arch Street Quarry, operated by Minnesota Mining and Manufacturing Co. [a 3M company (Maplewood, MN)], continued to produce nepheline syenite to supply material for the company's roofing granule plant in Sweet Home, Pulaski County.

Sand and Gravel, Construction

A total of 6,460,000 metric tons of sand and gravel were produced in Arkansas with a value of $71,100,000 during 2013. More than 17,000 metric tons of aggregate (19,000 short tons), generating almost $11,000 in revenue, were produced from gravel and stone operations under lease in the Ouachita National Forest under the jurisdiction of the U.S. Forest Service.

Sand and Gravel, Industrial

In order to be suitable for hydraulic fracturing applications, sand must meet minimum requirements of grain size, sphericity, roundness, compositional homogeneity (quartz sand), and crush strength. Sand meeting the minimum requirements for hydraulic fracturing is relatively rare and is produced from a limited number of geographic areas in Arkansas. The majority is sourced from the Ordovician-aged St. Peter Formation: nearly pure quartz sandstone in north central Arkansas. Other areas with potential to produce frac-sand include the channels of major rivers such as the Arkansas, Red River, or White River.

In 2013, there were a total of 13 active industrial sand permits on file with the Arkansas Department of Environmental Quality. Ten of those were in Independence County in north central Arkansas producing frac-sand from the St. Peter Formation. There was one each in neighboring Izard and Jackson counties. The Izard County operation produced from the St. Peter Formation and the operation in Jackson County is produced from Alluvium. There was one permit in Miller County in southwest Arkansas producing frac-sand from the Red River. Total production of industrial sand and gravel for 2013 was 2,130,000 metric tons with a value of $133,000,000. Arkansas was ranked 5th out of 33 states in the US for quantity of industrial sand produced in 2013.

Stone, Crushed

Crushed stone is produced extensively throughout the highlands area of Arkansas where bedrock is at or near the earth's surface. Sandstone is the most abundant rock in the state utilized for crushed stone applications. Limestone and dolostone are produced principally from the Salem and Springfield Plateaus in the northernmost Ozarks where those rock types are

common. Other kinds of rock quarried for crushed stone locally include chert, novaculite, and nepheline syenite.

In the southern and eastern portions of the state, there is no competent bedrock near the surface and rock must be brought in from other locations as needed. The most extensive quarrying is concentrated around high population areas that are experiencing growth, and along major transportation routes such as the Arkansas River. Two growing, high-population areas as of 2013 were the central (Little Rock-Conway), and northwest (Fayetteville-Bentonville) Arkansas metropolitan complexes. Additionally, some large-scale operations are located near the Arkansas River where their products can be easily loaded onto barges and there are some near the town of Hot Springs, Arkansas. There are also distribution centers along the Mississippi River.

In the past decade there has been a high demand for crushed stone for road and pad construction in north central Arkansas due to the infrastructural development stemming from natural gas drilling in the Fayetteville Shale. That demand has been declining in 2013 due to the gas industry slowdown.

Notable crushed stone producers in Arkansas for 2013 included the Rogers Group, which produces sandstone from six quarries in the Middle Atoka Formation in central Arkansas and limestone from one in Northwest Arkansas; Martin Marietta, which operates the Jones Mill Quarry near Hot Springs producing from the alteration zone of the Stanley group adjacent a Cretaceous igneous intrusion, and produces the Hatton Tuff of the Stanley Group in Polk County at the Hatton Quarry; Granite Mountain Quarries which extracts nepheline syenite from three quarries in central Arkansas near Little Rock, and Arkola, which produces crushed stone near Fort Smith Arkansas.

In 2013, Arkansas produced 25,200,000 metric tons of crushed stone with a value of $197,000,000.

For more information about specific crushed stone producers throughout Arkansas visit our website at: *www.geology.arkansas.gov* to use our interactive Mining Web Map.

Stone, Dimension

The dimension stone production in the state is still thriving although, it has slowed down due to fewer new homes being built. In 2013, 10,000 metric tons of dimension stone with a value of $1,320,000 were produced in the state. Rock types in the state being utilized for production of interior and exterior, structural and architectural stone include sandstone, limestone, dolostone, and marble. In north Arkansas, dimension stone is produced from Ordovician- to Mississippian-aged formations. In the Arkansas Valley region production is from Pennsylvanian-

aged formations. In the Ouachita Mountain region dimension stone is produced from Ordovician- to Mississippian-aged formations south of Lake Ouachita. There are too many producers of this type of product to try and list them by name. One producer may maintain many quarry sites with each site producing a different product, whether it's a different colored stone or a different rock type. Rounded and smooth cobbles from the Arkansas River Valley are also being marketed for exterior purposes.

Environmental Issues and Mine Reclamation

During 2013, 12 non-coal mines or quarries had 367 acres released from reclamation liability. Most of the mines were small operations that decided to shut down and complete the required reclamation.

Legislation and Government Programs and Activities

There was no regulatory or legislative activity during 2013 concerning non-coal mineral operations in the State of Arkansas.

The Arkansas Geological Survey (AGS) maintained both paper and digital records on the geology of Arkansas. Information posted on the agency's website includes state resource data (energy, water, and industrial minerals); state stratigraphic, geologic, and geohazard publications and maps; educational materials, agency services, news items, and links. Recent additions include downloadable water well reports, well logs, and mineral commodities, all searchable by map location.

By the close of 2013, the AGS completed updating its mineral commodities database. Sites of mineral extraction in all 75 counties in the state, excluding petroleum and natural gas, have now been field checked and entered in the database.

The AGS has been an active participant in the STATEMAP program since 1995. STATEMAP is a component of the National Cooperative Geologic Mapping Program (NCGMP), a matching-funds grant program administered by the USGS which supports geologic mapping efforts at the State level. During 2012-13, the AGS completed geologic mapping of the Sylamore and Fox 7.5-minute topographic quadrangles for STATEMAP. Work began late in 2013 on the Shirley and Fairfield Bay quadrangles (Arkansas Geological Survey, 2013).

Staff cartographers continued to make it easier for the public to access the publications on stratigraphy and geology of the state at various scales, by region, county, and quadrangle on the AGS website.

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