U.S. SILICA HOLDINGS, INC.
Form 10-K
February 20, 2019

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

ý ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the Fiscal Year Ended December 31, 2018
OR
¨ TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
Commission file number 001-35416

U.S. Silica Holdings, Inc.
(Exact name of registrant as specified in its charter)

Delaware	26-3718801
(State or other jurisdiction of Incorporation or Organization)	(I.R.S. Employer Identification No.)
24275 Katy Freeway, Suite 600 Katy, Texas 77494	
(Address of Principal Executive Offices) (Zip Code)	
(281) 258-2170 (Registrant's telephone number, including area code)	

Securities registered pursuant to Section 12(b) of the Securities Act:

Title of each class:	Name of each exchange on which registered:
Common Stock, par value $0.01 per share	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Securities Act: None

Indicate by a check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes þ No ¨

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15 (d) of the Act. Yes ¨ No þ

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes þ No ¨

Indicate by check mark whether the registrant has submitted electronically and posted on its website, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes þ No ¨

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of the registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ¨

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	ý	Accelerated filer	¨
Non-accelerated filer	¨	Smaller reporting company	¨
		Emerging growth company	¨

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ¨

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ¨ No þ

The aggregate market value of the outstanding common stock held by non-affiliates of the registrant as of June 29, 2018, the last business day of the registrant's most recently completed second fiscal quarter, was $1,933,539,379 based on the closing price of $25.69 per share, as reported on the New York Stock Exchange, on such date.

As of February 14, 2019, 73,152,701 shares of common stock, par value $0.01 per share, of the registrant were outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Certain sections of the Proxy Statement for the 2019 Annual Meeting of Shareholders for U.S. Silica Holdings, Inc. (the "2019 Proxy Statement") are incorporated by reference in Part III of this Annual Report on Form 10-K.

U.S. Silica Holdings, Inc.
FORM 10-K
For the Fiscal Year Ended December 31, 2018
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Forward Looking Statements

This Annual Report on Form 10-K contains forward-looking statements within the meaning of Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act") and Section 27A of the Securities Act of 1933, as amended (the "Securities Act"). All statements other than statements of historical fact included in this Annual Report on Form 10-K are forward-looking statements. Forward-looking statements give our current expectations and projections relating to our financial condition, results of operations, plans, objectives, future performance and business. You can identify forward-looking statements by the fact that they do not relate strictly to historical or current facts. These statements may include words such as "anticipate," "estimate," "expect," "project," "plan," "intend," "believe," "may," "will," "can have," "likely" and other words and terms of similar meaning in connection with any discussion of the timing or nature of future operating or financial performance or other events. For example, all statements we make relating to our estimated and projected costs; reserve and finished products estimates; anticipated expenditures, cash flows, growth rates and financial results; our plans and objectives for future operations, growth or initiatives; strategies and their anticipated effect on our performance and liquidity; and the expected outcome or impact of pending or threatened litigation are forward-looking statements. All forward-looking statements are subject to risks and uncertainties that may cause actual results to differ materially from those that we expect, including:

- fluctuations in demand for commercial silica, diatomaceous earth, perlite, clay and cellulose;
- the cyclical nature of our customers' businesses;
- operating risks that are beyond our control, such as changes in the price and availability of transportation, transload network access, natural gas or electricity; unusual or unexpected geological formations or pressures; pit wall failures, underground roof falls or rock falls; or unanticipated ground, grade or water conditions;
- our dependence on five of our plants for a significant portion of our sales;
- the level of activity in the natural gas and oil industries;
- fluctuations in demand or prices for frac sand or the development of either effective alternative proppants or new processes to replace hydraulic fracturing;
- federal, state and local legislative and regulatory initiatives relating to hydraulic fracturing and the potential for related regulatory action or litigation affecting our customers' operations;
- our rights and ability to mine our properties and our renewal or receipt of the required permits and approvals from governmental authorities and other third parties;
- our ability to implement our capacity expansion plans within our current timetable and budget and our ability to secure demand for our increased production capacity, and the actual operating costs once we have completed the capacity expansion;
- our ability to succeed in competitive markets;
- loss of, or reduction in, business from our largest customers;
- operational, regulatory and other risks as a result of our international sales and operations;
- increasing costs or a lack of dependability or availability of transportation services and transload network access or infrastructure;
- extensive regulation of trucking services;
- our ability to recruit and retain truckload drivers;
- increases in the prices of, or interruptions in the supply of, natural gas and electricity, or any other energy sources;
- increases in the price of diesel fuel;
- diminished access to water;
- our ability to successfully complete acquisitions or integrate acquired businesses;
- our ability to make capital expenditures to maintain, develop and increase our asset base and our ability to obtain needed capital or financing on satisfactory terms;
- our substantial indebtedness and pension obligations;

- restrictions imposed by our indebtedness on our current and future operations;
- our ability to comply with contractual obligations that require us to deliver minimum amounts of frac sand, sometimes with certain quality specifications, or purchase minimum amounts of services;
- the accuracy of our estimates of mineral reserves and resource deposits;
- a shortage of skilled labor and rising costs in the mining industry;
- our ability to attract and retain key personnel;
- our ability to maintain satisfactory labor relations;
- our reliance on patents, trade secrets, trademarks, and contractual restrictions to protect our proprietary rights;
- our significant unfunded pension obligations and post-retirement health care liabilities;
- our ability to maintain effective quality control systems at our mining, processing and production facilities;
- seasonal and severe weather conditions;
- fluctuations in our sales and results of operations due to seasonality and other factors;
- interruptions or failures in our information technology systems, due to cybersecurity breaches or for other reasons;
- the impact of a terrorist attack or armed conflict;
- extensive and evolving environmental, mining, health and safety, licensing, reclamation, climate change and other regulation (and changes in their enforcement or interpretation);
- silica-related health issues and corresponding litigation;
- our ability to acquire, maintain or renew financial assurances related to the reclamation and restoration of mining property;
- the impact of the above factors and other future events on the market price and trading volume of our common stock; and
- other factors included and disclosed in Part I, Item 1A. Risk Factors, Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations and elsewhere in this Annual Report on Form 10-K.

We derive many of our forward-looking statements from our operating budgets and forecasts, which are based on many detailed assumptions. While we believe that our assumptions are reasonable, we caution that it is very difficult to predict the impact of the known factors described above, and it is impossible for us to anticipate all factors that could affect our actual results. As a result, forward-looking statements are not guarantees of future performance, and you should not place undue reliance on any forward-looking statements we make. All written and oral forward-looking statements attributable to us, or persons acting on our behalf, are expressly qualified in their entirety by these cautionary statements as well as other cautionary statements that are made from time to time in our other filings with the Securities and Exchange Commission (the "SEC"), and our other public communications. You should evaluate all forward-looking statements made in this Annual Report on Form 10-K in the context of these risks and uncertainties.

We caution you that the important factors referenced above may not contain all of the factors that are important to you. In addition, we cannot assure you that we will realize the results or developments we expect or anticipate or, even if substantially realized, that they will result in the consequences or affect us or our operations in the way we expect. The forward-looking statements included in this Annual Report on Form 10-K are made only as of the date hereof. We undertake no obligation to update or revise any forward-looking statement as a result of new information, future events or otherwise, except as otherwise required by law.

PART I

ITEM 1. BUSINESS

Unless we state otherwise, or the context otherwise requires, the terms “we,” “us,” “our,” “U.S. Silica,” “the Company,” “our business,” “our company” refer to U.S. Silica Holdings, Inc. and its consolidated subsidiaries as a combined entity.

Our Company

Business Overview

We are a performance materials company and one of the largest domestic producers of commercial silica, a specialized mineral that is a critical input into a variety of end markets. Through our acquisition of EP Minerals, LLC and its affiliated companies ("EPM"), we are an industry leader in the production of industrial minerals, including diatomaceous earth, clay (calcium bentonite and calcium montmorillonite) and perlite used as filter aids, absorbents and functional additives for a variety of industries.

During our 119-year history, we have developed core competencies in mining, processing, logistics and materials science that enable us to produce and cost-effectively deliver over 400 diversified product types to customers across our end markets. As of December 31, 2018, we operate 27 production facilities across the United States. We control 627 million tons of reserves of commercial silica, which can be processed to make 297 million tons of finished products that meet American Petroleum Institute ("API") frac sand specifications, and 56 million tons of reserves of diatomaceous earth, perlite, and clays.

Our operations are organized into two reportable segments based on end markets served and the manner in which we analyze our operating and financial performance: (1) Oil & Gas Proppants and (2) Industrial & Specialty Products. We believe our segments are complementary because our ability to sell to a wide range of customers across end markets in these segments allows us to maximize recovery rates in our mining operations, optimize our asset utilization and reduce the cyclicality of our earnings.

Acquisitions

On May 1, 2018, we completed the acquisition of all of the outstanding capital stock of EP Acquisition Parent, Inc., a Delaware corporation (“EPAP”), and the ultimate parent of EPM. Contemporaneous with the merger, EPAP was renamed EP Minerals Holdings, Inc. ("EPMH"). The consideration paid consisted of $743.2 million of cash, net of cash acquired of $19.1 million, including $0.5 million of post-closing adjustments. EPM's industrial minerals are used as filter aids, functional additives, catalysts, adsorbents and absorbents for a variety of industries including food and beverage, biofuels, automotive retail, recreational water, oil refining, edible oil, farm and home, landscape, paint and coatings, agriculture, plastics, pharmaceuticals, and insecticides. The acquisition of EPM increased our industrial materials product offering in our Industrial & Specialty Products segment.

On August 16, 2017, we completed the acquisition of Mississippi Sand, LLC ("MS Sand"). MS Sand is a frac sand mining and logistics company based in St. Louis, Missouri.

On April 1, 2017, we completed the acquisition of White Armor, a product line of cool roof granules used in industrial roofing applications.

On August 22, 2016, we completed the acquisition of Sandbox Enterprises, LLC ("Sandbox") as a “last mile” logistics solution for frac sand in the oil and gas industry.

On August 16, 2016, we completed the acquisition of New Birmingham, Inc. (“NBI”), the ultimate parent company of NBR Sand, LLC (“NBR”), a regional sand producer located near Tyler, Texas. The acquisition of NBI increased our regional frac sand product offering in our Oil & Gas Proppants segment.

See Note E - Business Combinations to our Consolidated Financial Statements in Part II, Item 8. of this Annual Report on Form 10-K for more information.

Corporate History

U.S. Silica Holdings, Inc. was incorporated under the laws of the State of Delaware on November 14, 2008. U.S. Silica Company, which has been a domestic producer of commercial silica for 119 years, became a wholly-owned subsidiary of the Company on November 25, 2008. On January 31, 2012, we completed our initial public offering of our common stock.

Our Strengths

We attribute our success to the following strengths:

- Large-scale producer with a diverse and high-quality reserve base. Our 27 geographically dispersed operating production facilities control an estimated 627 million tons of reserves, including API size frac sand and large quantities of silica with distinct characteristics, and an estimated 56 million tons of reserves of diatomaceous earth, perlite, and clays. These reserves give us the ability to sell over 400 product types to customers in both our Oil & Gas

Proppants segment and Industrial & Specialty Products segment. We believe our large-scale production, logistics capabilities and long reserve life make us a preferred supplier to our customers. Our consistent, reliable supply of reserves gives our customers the security to customize their production processes around our products.

Furthermore, our relatively large scale and wide product portfolio provide us earnings diversification and the ability to reach broader market segments.

- Geographically advantaged footprint with intrinsic transportation advantages. We believe the strategic location of our facilities and our logistics capabilities, including those obtained through strategic acquisitions discussed elsewhere in this Annual Report on Form 10-K, contribute to our customer retention rates and our ability to reach broader market segments. In our Oil & Gas Proppants segment, our network of frac sand production facilities with access to Class I rail either onsite or by truck, combined with the strategic locations of our transloads, enable us to serve every major U.S. shale basin. Additionally, our acquisition of SandBox extends our delivery capability directly to our customers' wellhead locations. We believe we are one of the few frac sand producers capable of cost-effectively delivering API grade frac sand to most of the major U.S. shale basins by on-site rail.

Additionally, due to the high weight-to-value ratio of many silica products in our Industrial & Specialty Products segment, the proximity of our facilities to our customers' facilities often results in us being their sole supplier. This advantage has enabled us to enjoy strong customer retention in this segment, with our top five Industrial & Specialty Products segment customers purchasing from us for an average of over 50 years.

Diatomaceous earth, clay, and perlite facilities are located near major highways and export corridors to optimize the cost of operations and shipment. Products can be shipped via bulk truck, rail or packaged. We utilize experienced in-house international logistics operations using a broad base of steamship partners to enable efficient and cost-effective exports to approximately 100 countries.

- Low-cost operating structure. We focus on building and operating facilities with low delivered cost to enable us to better manage through market downturns. We believe the combination of the following factors contributes to our goal of having a low-cost structure and high margins:
  - our ownership of the vast majority of our reserves, resulting in mineral royalty expense that was less than 0.1% of our sales in 2018;
  - the optimal positioning of our mines and their respective processing plants, enabling cost-efficient and highly automated production processes;
  - our processing expertise, which enables us to create over 400 product types with unique characteristics while minimizing waste;
  - our integrated logistics management expertise and geographically advantaged facility network, which enables us to reliably ship products by the most cost-effective method available, whether by truck, rail or barge, to meet the needs of our customers, whether at in-basin transload locations or directly at wellhead locations via our Sandbox operations, whether domestic or overseas;
  - our large customer base across numerous end markets, which allows us to maximize our mining recovery rate and asset utilization; and
  - our large overall and plant-level operating scale.
- Strong reputation with our customers and the communities in which we operate. We believe we have built a strong reputation during our 119-year operating history. We have a long track record of timely delivery of our products according to customer specifications, which we believe contributes to a reputation for dependability and high-quality, innovative products. We also have an extensive network of technical resources, including materials science and petroleum engineering expertise, which enables us to collaborate with our customers to develop new products and improve the performance of their existing applications. We also believe we are known in the communities in which we operate as a preferred employer and a responsible corporate citizen, which generally serves us well in hiring new employees and securing difficult to obtain permits for expansions and new facilities.
- Commitment to innovation. Our team is dedicated to continuing to develop patentable products through research and development. The acquisition of EPM has accelerated our team's research and development efforts by providing additional expertise and testing equipment, such as experience with filtration and with high temperature manufacturing processes.
- Experienced management team. The members of our senior management team bring significant experience to the dynamic environment in which we operate. Their expertise covers a range of disciplines, including industry-specific operating and technical knowledge as well as experience managing high-growth businesses. We believe we have

assembled a flexible, creative and responsive team that can quickly adapt to the rapidly evolving unconventional oil and natural gas landscape.

Our Business Strategy

The key drivers of our growth strategy include:

- Increase our presence and product offering in specialty products end markets. Our research and business development teams work to enhance our existing products, develop new products and pursue opportunities to acquire new product offerings through business acquisitions, which we expect will increase our presence and market share in certain specialty products end markets and allow us to enter new markets. We manage a robust pipeline of new products in various stages of development. On May 1, 2018, we completed the acquisition of EPM, a global producer of industrial minerals, including diatomaceous earth, clay and perlite, which increased our industrial materials product offerings.
- Optimize product mix and further develop value-added capabilities to maximize margins. We continue to actively manage our product mix at each of our plants as we seek to maximize our profit margins. This requires us to use our proprietary expertise in balancing key variables, such as mine geology, processing capacities, transportation availability, customer requirements and pricing. We expect to continue investing in ways to increase the value we provide to our customers by expanding our product offerings, improving our supply chain management, upgrading our information technology, and enhancing our customer service model.
- Effectively position our Oil & Gas Proppants facilities to optimally serve our customers. We continuously execute initiatives to increase the effectiveness and efficiency of our frac sand production facilities. Our mix of Northern White, regional, and local in-basin mines are positioned to provide a full range of frac sand products to our customers. We are also constantly undergoing continuous improvement efforts to reduce production costs at our facilities.
- Optimize our supply chain network and leverage our logistics capabilities to meet our customers' needs. We continue to strategically position our supply chain in order to deliver sand according to our customers' needs, whether at a plant, a transload or the wellhead. We believe that our supply chain network and logistics capabilities are a competitive advantage that enables us to provide superior service for our customers.

    Our acquisition of Sandbox extends our delivery capability directly to our customers' wellhead locations, which increases efficiency and provides a lower cost logistics solution for our customers. Sandbox has operations in the major United States oil and gas producing regions, including Texas, New Mexico, Oklahoma, the Rocky Mountains and the Northeast, where their largest customers are located.

We manage our transload network through partnerships rather than owned transloads because we believe this approach enables us to receive high quality service from our specialized transloading partners without the significant capital investment related to owning the assets. As of December 31, 2018, we have storage capacity at 51 transloads located near all of the major shale basins in the United States.

- Evaluate both Greenfield and Brownfield expansion opportunities and other acquisitions. We expect to continue leveraging our reputation, processing capabilities and infrastructure to increase production, as well as explore other opportunities to expand our reserve base and sell new products.

We have completed several Greenfield projects that became operational in 2018. In May 2017, we purchased a Greenfield site in Crane County, Texas, which became operational during the first quarter of 2018 and which we expect will eventually produce approximately 4 million tons of annual frac sand capacity. Additionally, in July 2017, we purchased a Greenfield site near Lamesa, Texas, which became operational during the third quarter of 2018 and which we expect will eventually produce approximately 6 million tons of annual frac sand capacity.

We are continuing to actively pursue acquisitions to grow. Our primary objective is to acquire value adding products in our Industrial & Specialty Products segment, and assets that are complementary to our current offering for our Oil & Gas Proppants segment. We prioritize acquisitions that provide opportunities to realize synergies, including entering new geographic markets, acquiring attractive customer contracts and improving operations. For example, on December 31, 2018, we completed our acquisition of a manufacturing facility located in Millen, Georgia. This facility has a kiln, which will allow for the production of specialty industrial products that require high temperature heat treatments. See the descriptions of other recent and notable acquisitions under "Business Overview-Acquisitions" above. See the risk factors disclosed in Item 1A of Part I of this Annual Report on Form 10-K for a description of certain risks related to our acquisition activities.

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Maintain financial strength and flexibility. We intend to maintain financial strength and flexibility to enable us to better manage through industry downturns and pursue acquisitions and new growth opportunities as they arise. In connection with the EPM acquisition, on May 1, 2018, we entered into a Third Amended and Restated Credit Agreement (the "Credit Agreement") with BNP Paribas, as administrative agent, and the lenders named therein. The Credit Agreement increased our then existing senior debt by establishing a new $1.380 billion senior secured credit facility, consisting of a $1.280 billion term loan (the “Term Loan”) and a $100 million revolving credit facility (the “Revolver”) (collectively the "Credit Facility) that may also be used for swingline loans or letters of credit, and we may elect to increase the term loan in accordance with the terms of the Credit Agreement. For more information on the Credit Agreement see Note K - Debt to our Consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K. As of December 31, 2018, we had $202.5 million of cash on hand and $95.2 million of availability under the Revolver.

Our Products and Services

In order to serve a broad range of end markets, we produce and sell a variety of commercial silica, diatomaceous earth, clay and perlite products. We also offer services including transportation, equipment rental and contract labor.

Whole Grain Silica Products—We sell whole grain commercial silica products in a range of shapes, sizes and purity levels. We sell whole grain silica that has a round shape and high crush strength to be used as frac sand in connection with oil and natural gas recovery. We also sell whole grain silica products in a range of size distributions, grain shapes and chemical purity levels to our customers involved in the manufacturing of glass products, including a low-iron whole grain product sold to manufacturers of architectural and solar glass applications. In addition, we sell several grades of whole grain round silica to the foundry industry and provide whole grain commercial silica to the building products industry. Sales of whole grain commercial silica products accounted for approximately 64%, 72%, and 81% of our total sales for 2018, 2017, and 2016, respectively.

Ground Silica Products—Our ground commercial silica products are inherently inert, white and bright, with high purity. We market our ground silica in sizes ranging from 40 to 250 microns for use in plastics, rubber, polishes, cleansers, paints, glazes, textile fiberglass and precision castings. We also produce and market fine ground silica in sizes ranging from 5 to 40 microns for use in premium paints, specialty coatings, sealants, silicone rubber and epoxies. Our milling technology allows us to offer some of the smallest particle size ground silica products in the United States. Sales of ground silica products accounted for approximately 6%, 6%, and 12% of our total sales for 2018, 2017, and 2016, respectively.

Performance Material Products—We sell engineered performance materials made from diatomaceous earth (DE), clay and perlite. DE is used in filtration for foods and beverages, pharmaceuticals and swimming pools. DE is also used as a functional additive for paint and coatings, plastics and rubber, and agriculture. Perlite (hydrated volcanic glass) is used mainly for filtration. Calcium bentonite clay from Mississippi is used for bleaching, catalysis and adsorption in edible oil processing, aromatics purification, and industrial and chemical applications. Sales of our performance material products accounted for approximately 8% of our total sales for 2018. We had no sales of performance material products in 2017 and 2016.

Industrial Mineral Products—We also produce and sell certain other industrial mineral products, such as aplite, magnesium silicate and aggregates made with DE and clay. Aplite is a mineral used to produce container glass and insulation fiberglass and is a source of alumina that has a low melting point and a low tendency to form defects in glass. Magnesium silicate is a highly selective adsorbent made from a mixture of silica and magnesium, used extensively in preparative and analytical chromatography. DE and clay aggregates are mainly used as an absorbent for automotive, industrial and sports turf applications. Sales of our other industrial mineral products accounted for approximately 3%, 3%, and 1% of our total sales for 2018, 2017, and 2016, respectively.

Services—We offer services through the provision of transportation, equipment rental and contract labor services, primarily through SandBox, to companies in the oil and gas industry. Sales of our Services accounted for approximately19%, 19%, and 6% of our total sales for 2018, 2017, and 2016, respectively.

Our Industry

The commercial silica industry consists of businesses that are involved in the mining, processing and distribution of commercial silica. Commercial silica, also referred to as “silica,” “industrial sand and gravel,” “sand,” “silica sand” and “quartz

sand," is a term applied to sands and gravels containing a high percentage of silica (silicon dioxide, SiO_2) in the form of quartz. Commercial silica deposits occur throughout the United States, but mines and processing facilities are typically located near end markets and in areas with access to transportation infrastructure. Other factors affecting the feasibility of commercial silica production include deposit composition, product quality specifications, land-use and environmental regulation, including permitting requirements, access to electricity, natural gas and water and a producer's expertise and know-how. New entrants face hurdles to establish their operations, including the capital investment required to develop a mine and build a plant, a lack

of industry-specific mining knowledge and experience, the difficulty of obtaining operating permits, and the difficulty of assembling a diverse portfolio of customers to optimize operations.

EPM's diatomaceous earth, perlite, montmorillonite clay and bentonite clay products are sold globally, where they are used in hundreds of applications for filtration, functional additives, absorbents and adsorbents. The largest industries for these products include food and beverage, wine, beer, paint and coatings, biofuel, pharmaceuticals, chemical, oil and gas, plastics and rubber, automotive and agriculture.

Extraction Processes

Commercial silica deposits are formed from a variety of sedimentary processes and have distinct characteristics that range from hard sandstone rock to loose, unconsolidated dune sands. While the specific extraction method utilized depends primarily on the deposit composition, most silica is mined using conventional open-pit bench extraction methods and begins after clearing the deposit of any overlaying soil and organic matter. The silica deposit composition and chemical purity also dictate the processing methods and equipment utilized. For example, broken rock from a sandstone deposit may require one, two or three stages of crushing to liberate the silica grains required for most markets. Unconsolidated deposits may require little or no crushing, as silica grains are not tightly cemented together.

We conduct only surface mining operations and do not operate any underground mines, although we do lease underground reserves at our Festus, Missouri, operation, which are being mined underground by a contractor. Mining methods at our facilities include conventional hard rock mining, hydraulic mining, surface or open-pit mining of loosely consolidated silica deposits and dredge mining. Hard rock mining involves drilling and blasting in order to break up sandstone into sizes suitable for transport to the processing facility by truck, slurry or conveyor. Hydraulic mining involves spraying high-pressure water to break up loosely consolidated sandstone at the mine face. Surface or open-pit mining involves using earthmoving equipment, such as bucket loaders, to gather silica deposits for processing. Lastly, dredging involves gathering silica deposits from mining ponds and transporting them by slurry pipelines for processing. We may also use slurry pipelines in our hydraulic and open-pit mining efforts to expedite processing. Silica mining and processing typically has less of an environmental impact than the mining and processing of other minerals, in part because it uses fewer chemicals. Our processing plants are equipped to receive the mined sand, wash away impurities, eliminate oversized or undersized particles and remove moisture through a multi-stage drying process. Our 27 production facilities are located primarily in the eastern half of the United States, with operations in Alabama, Illinois, Louisiana, Michigan, Mississippi, Missouri, Nebraska, Nevada, New Jersey, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia and Wisconsin. Our acquired subsidiary, EPM, operates plants and/or mines in Nevada, Oregon, Nebraska, Tennessee, Mississippi and Arizona. Each of our facilities operates year-round, typically in shift schedules designed to optimize facility utilization in accordance with market demand. Our facilities receive regular preventative maintenance, and we make additional capital investments in our facilities as required to support customer volumes and internal performance goals. For more information related to our production facilities, see Item 2. Properties.

Freshwater diatomaceous earth (DE) deposits were formed from the compression of diatoms (single-celled algae skeletons) that are a unique species with superior characteristics for filtration and for use as functional additives. The DE is usually layered with volcanic ash and tephra and overlaid with basalt. We use conventional open-pit bench extraction methods that begin after clearing the overlaying soil and organic matter. DE may require a crushing stage before processing to remove moisture through a multi-stage drying process.

Clay deposits may contain volcanic ash, calcareous concretions, sand, or silt that are removed during mining and processing. We use conventional open-pit bench extraction methods that begin after clearing the overlaying soil and organic matter.

We believe we have broad and high-quality mineral reserves due to our strategically located mines and facilities. At December 31, 2018, we estimate that we had approximately 683 million tons of proven and probable mineral reserves. The quantity and nature of the mineral reserves at each of our properties are estimated by our mining engineers. Our mining engineers update our reserve estimates annually, making necessary adjustments for reserve usage at each location during the year and additions or reductions due to property acquisitions and dispositions, quality adjustments and mine plan updates. Before acquiring new reserves, we perform surveying, drill core analysis and other tests to

confirm the quantity and quality of the to-be acquired reserves. In some instances, we acquire the mineral rights to reserves without actually taking ownership of the properties.

Production Processes

After extracting silica ore, the silica is washed with water to remove fine impurities such as clay and organic particles. In some deposits, these fine contaminants or impurities are tightly bonded to the surface of the silica grain and require attrition scrubbing to be removed. Other deposits require the use of flotation to collect and separate contaminants from the silica. When

these contaminants are weakly magnetic, special high intensity magnets may be utilized in the process to improve the purity of the final commercial silica product. After the silica has been washed, most output is dried prior to sale.
The next step in the production process involves the classification of commercial silica products according to their chemical purity, particle shape and particle size distribution. Generally, commercial silica is produced and sold in either whole grain form or ground form. Whole grain silica generally ranges from 12 to 140 mesh. Mesh refers to the number of openings per linear inch on a sizing screen. Whole grain silica products are sold in a range of shapes, sizes and purity levels to be used in a variety of industrial applications, such as oil and natural gas hydraulic fracturing proppants, glass, foundry, building products, filtration and recreation. Some whole grain silica is further processed to ground silica of much smaller particle sizes, ranging from 5 to 250 microns. A micron is one-millionth of a meter.
After extracting diatomaceous earth (DE) ore, the DE is crushed and fed into a continuous production process consisting of wet end drying and classification, calcination through a rotary kiln, and finished end sizing. Clay undergoes a multi-step process that could include crushing, calcining, drying, screening/sizing, acid activation, flash drying, classification, milling, and roller/compaction.

Quality Control

We maintain quality standards in all of our mining and processing facilities, some of which include International Organization for Standardization ("ISO") 9001-registered quality systems. We use automated process control systems that efficiently manage the majority of the mining and processing functions, and we monitor the quality and consistency of our products by conducting hourly tests throughout the production process to detect variances. All of our major facilities operate a testing laboratory to evaluate and ensure the quality of our products and services. We also provide customers with documentation verifying that all products shipped meet customer specifications. These quality assurance functions are designed to ensure that we deliver quality products to our customers and maintain customer trust and loyalty.
In addition, we have certain company-wide quality control mechanisms. We maintain a company-wide quality assurance database that facilitates easy access and analysis of product and process data from all plants. We also have fully staffed and equipped corporate laboratories that provide critical technical expertise, analytical testing resources and application development to promote product value and cost savings. The labs consist of different departments: a foundry lab, a paint and coatings lab, an analytical lab, a minerals-processing lab and an oil and gas lab. The foundry lab is fully equipped for analyzing foundry silica based on grain size distribution, acidity, acid demand value and turbidity, which is a measure of silica cleanliness. The paint and coatings lab provides formulation, application, and testing of paints, coatings and grouts for end use in fillers and extenders as well as building products. The analytical lab performs various analyses on products for quality control assessment. The minerals processing lab models plant production processes to test variations in deposits and improve our ability to meet customer requirements. The oil and gas lab performs testing and provides in-depth analysis of all types of hydraulic fracturing proppants to verify products meet specifications, such as API size and crush strength specifications.
EPM also implemented control standards and processes that are suited for its industrial minerals production activities. For example, it has a separate team dedicated to quality that works with the research & development team and directly with plants to constantly test incoming ores and finished products.
EPM's diatomaceous earth and perlite products are classified as “Generally Recognized as Safe (GRAS)" by the United States Food and Drug Administration ("FDA") when they are used in food processing as filtration media. To best position ourselves with certain end-users, EPM filter aids and functional additives comply with the respective specifications of the U.S. Food Chemical Codex (FCC). This regulatory body focuses on food safety by maintaining strict standards on diatomaceous earth and perlite products that come in contact with food and beverage goods, and according to customer specifications.

Distribution

We ship our commercial silica products direct to our customers by truck, rail or barge and through our network of in-basin transloads. Recent trends in the oil and gas market and the expansion of our logistics footprint have resulted in more of our product volumes being transported by high-efficiency unit trains over the past two years. During 2018, we shipped 421-unit trains to both our transload sites and our customers. Our 2016 acquisition of Sandbox extended our delivery capability directly to our customers' wellhead locations, which increases efficiency and provides a lower

cost logistics solution for certain of our customers. Sandbox has operations in the major United States oil and gas producing regions, including Texas, New Mexico, Oklahoma, the Rocky Mountains and the Northeast, where their largest customers are located.

For bulk commercial silica, transportation cost represents a significant portion of the overall product cost. Generally, we utilize trucks for shipments of 200 miles or less from our plant sites and to distribute our bagged products. Given the weight-to-value ratio of most of our products, the majority of our shipments outside this 200-mile radius are by rail or barge. As a result, facility location is one of the most important considerations for producers and customers. Generally, our plant sites are

strategically located to provide access to rail and/or barge, which enables us to cost effectively send product to each of the strategic basins in North America.

We continually look to optimize our network to position product close to the point of end use. This approach is designed to allows us to provide strong customer service and positions us to take advantage of opportunistic spot market sales. As of December 31, 2018, we have 51 transload facilities strategically located in or near all major shale basins in the United States. For more information related to our transload facilities, see Item 2. Properties.

Both we and our customers lease a significant number of railcars for shipping purposes, as well as to facilitate the short-term storage of our products, particularly our frac sand products. As of December 31, 2018, we leased a fleet of 7,823 railcars, of which 1,461 cars were in storage.

In addition to bulk shipments, commercial silica products can be packaged and shipped in 50- to 100-pound bags or bulk super sacks. Bag shipments are usually made to smaller customers with batch operations, warehouse distributor locations or for ocean container shipments made overseas. The products that are shipped in bags are often higher value products, such as ground and fine.

Diatomaceous earth, clay, and perlite facilities are located near major highways and export corridors to optimize the cost of operations and shipment. Products can be shipped via bulk truck and rail. Products can also be packaged and shipped in jugs, 25- to 50-pound bags or bulk super sacks. Packaged shipment can be made via common carriers for the North/South American markets and intermodal carriers to ports for shipment overseas. We utilize experienced in-house international logistics operations using a broad base of steamship partners to enable efficient and cost-effective exports to approximately 100 countries.

Primary End Markets

The special properties of commercial silica-chemistry, purity, grain size, color, inertness, hardness and resistance to high temperatures-make it critical to a variety of industries. Commercial silica is a key input in the well completion process, specifically, in the hydraulic fracturing techniques used in unconventional oil and natural gas wells. In the industrial and specialty products end markets, stringent quality requirements must be met when commercial silica is used as an ingredient to produce thousands of everyday products, including glass, building and foundry products and metal castings, as well as certain specialty applications such high-performance glass, specialty coatings, polymer additives and geothermal energy systems. Due to the unique properties of commercial silica, we believe it is an economically irreplaceable raw material in a wide range of industrial applications.

High quality diatomaceous earth (DE) possesses superior characteristics for filtration and for functional additives. The perlite (hydrated volcanic glass) is used for filtration, lightweight construction, horticulture and insulation. The calcium

bentonite clay from Mississippi and calcium montmorillonite clay from Tennessee are thermally processed to produce powder and granular products for bleaching clays, absorbents, catalysis, and adsorbents.

Our major end markets include:

Oil and Gas Proppants

Commercial silica is used as a proppant for oil and natural gas recovery in conventional and unconventional resource plays. Unconventional oil and natural gas production requires hydraulic fracturing and other well stimulation techniques to recover oil or natural gas that is trapped in the source rock and typically involves horizontal drilling. Frac sand is pumped down oil and natural gas wells at high pressures to prop open rock fissures in order to increase the flow rate of hydrocarbons from the wells. Proppants are also used in the "refracturing" process where older wells are restimulated using newer technologies and additional frac sand as a viable and lower-cost alternative to drilling new wells. Oil and gas horizontal rig count in North America increased during 2017 and 2018, leading to more well completion activity.

Glass

Commercial silica is a critical input into and accounts for 55% to 75% of the raw materials in glass production. The glassmaking markets served by commercial silica producers include containers, flat glass, specialty glass and fiberglass. Demand typically varies within each of these end markets.

The container glass, flat glass and fiberglass end markets are generally mature end markets. Demand for container glass has historically grown in line with population growth, and we expect similar growth in the future. Flat glass and

fiberglass tend to be correlated with construction and automotive production activity. To the extent construction and domestic automotive production activity grow in the coming years, we expect that demand in these end markets will continue to increase. Some of the anticipated growth in the glass markets may be offset through the use of recycled glass.

Building Products

Commercial silica is used in the manufacturing of building products for commercial and residential construction. Whole grain commercial silica products are used in flooring compounds, mortars and grouts, specialty cements, stucco and roofing shingles. Ground commercial silica products are used by building products manufacturers in the manufacturing of certain fiberglass products and as functional extenders and to add durability and weathering properties to cementious compounds. In addition, geothermal wells,an alternative energy source, require specialized ground silica products in their well casings for effectiveness. The market for commercial silica used to manufacture building products is driven primarily by the demand in the construction markets. The historical trend for this market has been one of growth, especially in demand for cementious compounds for new construction, renovation and repair. We have seen an increase in permits and housing starts since 2012, and those gains continued in 2018. To the extent the housing market growth continues in the coming years, we expect that demand in this end market will increase.

Foundry

Commercial silica products are used in the production of molds for metal castings and in metal casting products. In addition, commercial whole grain silica is sold to coaters of foundry silica, or coated internally, who then sell their product to foundries for cores and shell casting processes. The demand for foundry silica primarily depends on the rate of automobile and light truck production, construction and production of heavy equipment such as rail cars. Over the past decade, there has been some movement of foundry supply chains to Mexico and other offshore production areas. We have experienced increases in foundry demand since 2011. During 2018, several of the foundry markets continued to see growth. To the extent production levels continue to strengthen in the coming years, we expect that demand in this end market will increase.

Chemicals

Both whole grain and ground silica products are used in the manufacturing of silicon-based chemicals, such as sodium silicate, that are used in a variety of applications, including food processing, detergent products, paper textile, specialty foundry applications and as inputs for some precipitated silicas. This end market is driven by the development of new products by the chemical manufacturers, including specialty coatings and polymer additives as well as the growth of “green” tires. We expect this end market to grow if and to the extent these manufacturers continue their product and applications development.

Fillers and Extenders

Commercial silica products are sold to producers of paints and coating products for use as fillers and extenders in architectural, industrial and traffic paints and are sold to producers of rubber and plastic for use in the production of epoxy molding compounds and silicone rubber. The commercial silica products used in this end market are most often ground silica, including finer ground classifications. The market for fillers and extenders is driven by demand in the construction and automotive production industries as well as by demand for materials in the housing remodeling industry. We have experienced increases in demand in these sectors since 2011. To the extent these industries continue to grow in the coming years, we expect demand to increase.

Filtration

Diatomaceous earth and perlite filter aid products are used to filter and purify unwanted solids from a variety of liquids including wine, beer, juice, pharmaceuticals, biofuels, swimming pools and edible oil.

Absorbents

Diatomaceous earth and montmorillonite clay are used for absorbent products used for small floor spills,large scale industrial accidents, hazardous waste spills, pet litter and in the automotive industry.

Functional Additives

A broad portfolio of diatomaceous earth, perlite, cellulose and blends of specialty minerals and fibers are used around the world as functional additives in hundreds of applications including animal feed, catalysts, cosmetics, paper mills, plastic molders, and paint and coatings.

Agriculture / Insecticide

We offer a wide variety of natural agricultural products used by farmers and ranchers. Our natural diatomaceous earth and montmorillonite clay products are mined and specifically produced for agricultural use, including fertilizer carrier, soil amendment, animal feed additive, and a range of seed-coating products to provide strength and carry nutrients.

We also offer insecticide diatomaceous earth products effective for use on crops, orchards, gardens, plants, and around the house, apartment buildings, hotels, farms, ranches, animal stalls, animal bedding, stored grains and insulation. These insecticides are effective treatments for the control of fleas and ticks, mites and other pests on pets, poultry and livestock.

Sportsfield

We offer high-performance super calcined clay solutions for sportsfields, such as a patent-pending premier infield conditioner, a drying agent and mound clay..

Bleaching Clays

Our bleaching clay products are well known for oil bleaching, color removal and purification of any edible oil including canola, soybean, coconut, palm, fish and sunflower oils, and tallow. These clays can also be effectively used for metal removal from biodiesel obtained via renewable, eco-friendly technologies.

Adsorbents

Our adsorbent products are for the purification of hydrocarbon streams to industrial gases. The comprehensive product portfolio includes adsorbent technologies for applications in industries such as chemical, gas processing, petrochemical, dimerization, and refining.

Catalytic Solutions

We produce bentonite clays that are used effectively as catalysts. A catalyst is a material that increases a chemical reaction rate without sustaining any permanent change. Solid acid catalysts are environmentally-friendly products that eliminate the need for liquid acid. These products are used in the oil and gas and chemical industries.

Our Customers

We sell our products to a variety of end markets. Our customers in the oil and gas proppants end market include major oilfield services companies and exploration and production companies that are engaged in hydraulic fracturing. Sales to the oil and gas proppants end market comprised approximately 75%, 82%, and 65% of our total sales in 2018, 2017 and 2016, respectively.

During most of our 119-year history, our primary markets have been core industrial end markets with customers engaged in the production of glass, building products, foundry products, chemicals and fillers and extenders. Our diverse customer base drives high recovery rates across our production. We also benefit from strong and long-standing relationships with our customers in each of the industrial and specialty products end markets we serve. Through our acquisition of EPM, we also serve a variety of industrial mineral markets including pool filtration, paints and plastics, absorbents and food and beverage. Sales to our industrial and specialty products end markets comprised approximately 25%, 18%, and 35% of our total sales in 2018, 2017 and 2016, respectively.

Sales to one customer in the Oil & Gas Proppant end market accounted for 15% of our total sales in 2018. Sales to two of our largest customers in the Oil & Gas Proppant end market accounted for 15% and 12% of our total sales in 2017. Sales to one of our largest customers in the Oil & Gas Proppant end market accounted for 13% of our total sales in 2016. No other customers accounted for 10% or more of our total sales in 2018, 2017 and 2016.

Competition

Both of our reportable segments operate in highly competitive markets that are characterized by a small number of large, national producers and a larger number of small, regional or local producers. According to a January 2018 publication by the United States Geological Survey, in 2017, there were 200 producers of commercial silica with a combined 340 active operations in 35 states within the United States. Competition for both of our reportable segments is based on price, consistency and quality of product, site location, distribution capability, customer service, reliability of supply, breadth of product offering and technical support. Because transportation costs are a significant portion of the total cost to customers of commercial silica (in many instances transportation costs can represent more than 50% of delivered cost), the commercial silica market is typically local, and competition from beyond the local area is limited. Notable exceptions to this are the frac sand and fillers and extenders markets, where certain product characteristics are not available in all deposits and not all plants have the requisite processing capabilities, necessitating that some products be shipped for extended distances. We compete with national producers such as Covia Holdings Corporation, Hi-Crush Partners LP and Emerge Energy Services LP. Because the markets for our products are typically local, we also compete with smaller, regional or local producers in each of the regions in which we operate. For more information regarding competition, see Item 1A. Risk Factors.

Seasonality

Our business is affected to some extent by seasonal fluctuations in weather that impact our production levels and our customers' business needs. For example, during the second and third quarters we sell more commercial silica

to our customers in the building products and recreation end markets due to increased construction activity resulting from more favorable

weather. In the first and fourth quarters, we can experience lower sales, and sometimes production levels, largely from adverse weather hampering logistical capabilities and general decreased customer activity levels.

Intellectual Property

Other than operating licenses for our mining and processing facilities, there are no third-party patents, licenses or franchises material to our business. Our intellectual property primarily consists of trade secrets, know-how and trademarks, including our name US SILICA® and products with trademarked names such as OTTAWA WHITE®, MIN-U-SIL®, MYSTIC WHITE II®, Q-ROK®, SIL-CO-SIL®, PREMIUM HICKORY®, US SILICA WHITE®, InnoProp, EP Minerals® and SANDBOX® among others. We own patents and have patent applications pending related to Sandbox, our "last mile" logistics solution. Most of the issued patents have an expiration date after August 20, 2027 with a majority of issued patents expiring after December 21, 2031. With respect to our other products, we principally rely on trade secrets, rather than patents, to protect our proprietary processes, methods, documentation and other technologies, as well as certain other business information. Although we do seek patents from time to time, patent protection requires a costly and uncertain federal registration process that would place our confidential information in the public domain. As a result, we typically utilize trade secrets to protect the formulations and processes we use to manufacture our products and to safeguard our proprietary formulations and methods. We attempt to protect our trade secrets indefinitely through the use of confidentiality agreements and other security measures, but these efforts could prove to be ineffective. See Item 1A. Risk Factors for more information.

Condition of Physical Assets and Insurance

Our business is capital intensive and requires ongoing capital investment for the replacement, modernization and/or expansion of equipment and facilities. For more information, see Part II, Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations - Liquidity and Capital Resources of this Annual Report on Form 10-K.

We maintain insurance policies against property loss and business interruption and insure against other risks that are typical in the operation of our business, in amounts that we believe to be reasonable. Such insurance, however, contains exclusions and limitations on coverage, particularly with respect to environmental liability and political risk. There can be no assurance that claims would be paid under such insurance policies in connection with a particular event. See Item 1A. Risk Factors for more information.

Commercial Team

Our commercial team consists of approximately 293 individuals responsible for all aspects of our sales process, including pricing, marketing, transportation and logistics, product development and general customer service. This necessitates a highly organized staff and extensive coordination between departments. For example, product development requires the collaboration of our market development team, sales team, our production facilities and our corporate laboratories. Our sales team interacts directly with our customers in determining their needs, our production facilities fulfill the orders and our corporate laboratories are responsible for ensuring that our products meet those needs.

Our commercial team can be divided into five units:

- Sales—Our sales team is organized by both region and end market. We have an experienced group of dedicated sales team members for the oil and gas proppants and the industrial and specialty products end markets. Our oil and gas proppants team is led out of our Katy and Houston offices and is regionally positioned in the major oil and gas markets across the United States. This staff consists of experienced experts in the use of frac proppants in the oil and gas industry. Our industrial and specialty products sales team is strategically located across the county and overseas near our major customers. As we make decisions to enter or expand our presence in certain end markets or regions, we expect we will continue to add dedicated team members to support that growth.
- Marketing—Our marketing team coordinates all of our new and existing customer outreach efforts and identifies emerging market trends and new product opportunities. This includes producing exhibits for trade shows and exhibitions, manufacturing product overview materials, participating in regional industry meetings and other trade associations and managing our advertising efforts in trade journals.
- Transportation and Logistics—Our transportation and logistics team manages domestic and international shipments and wellhead deliveries of frac sand by directing inbound and outbound rail, barge, ocean vessel and truck traffic,

supervising equipment maintenance, coordinating with freight carriers to ensure equipment availability, ensuring compliance with shipping regulations and strategically planning for future growth.

Technical—Our technical team is anchored by our industrial & specialty products laboratory in Berkeley Springs, West Virginia and our research and development laboratory in Reno, Nevada. At these facilities, we perform a variety of analyses including:

- analytical chemistry by X-Ray Fluorescence ("XRF") and Inductively Coupled Plasma ("ICP") spectroscopy;
- particle characterization by sieve, SediGraph, Brunauer, Emmett and Teller ("BET") surface area and microscopy;
- ore evaluation by mineral processing, flotation and magnetic separation;
- API frac sand evaluation, including crush resistance; and
- American Foundry Society ("AFS") green sand evaluation by various foundry sand tests.

Many other product analyses are performed locally at our 27 production facilities to support new product development, plant operations and customer quality requirements.

We also have a variety of other technical competencies including process engineering, equipment design, facility construction, maintenance excellence, environmental engineering, geology and mine planning and development. We believe effective integration of these capabilities has been a critical component of our business success and has allowed us to establish and maintain our reserve base, maximize the value of our reserves by producing and selling a wide range of products, optimize processing costs to provide strong value to customers and prioritize operating in a safe and environmentally sustainable manner.

In addition, our Reno, Nevada research and development laboratory is fully equipped with state-of-the-art research instruments. R&D and technical experts provide the following capabilities for customers:

Expert geologists and engineers for desirable ore-body and processing evaluations;

Material analysis and formulation assistance by Ph.D. chemists; and

An array of testing capabilities

Customer Service—Our customer service team is dedicated to creating an exceptional customer experience and making it easy to do business with our company. Our customer service team aims to accomplish this by consistently exceeding our customers' expectations, continually improving our performance, offering efficient and timely responses to customer needs, being available to our customers 24/7 and providing customers with personal points of contact on whom they can rely.

Employees

As of December 31, 2018, we employed a workforce of approximately 2,812 employees, the majority of whom are hourly wage plant workers living in the areas surrounding our mining facilities. The majority of our hourly employees are represented by labor unions that include the Teamsters Union; United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union; Laborers International Union of North America; Glass, Molders, Pottery, Plastics and Allied Workers International Union; Cement, Lime, Gypsum and Allied Workers' Division of International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers; and International Union of Operating Engineers A.F.L. - C.I.O. We believe that we maintain good relations with our workers and their respective unions and have not experienced any material strikes or work stoppages since 1987.

Our employees average approximately seven years of tenure with us, and we have an annual employee turnover rate of 29%, excluding the impact of reductions in workforce as part of our restructuring actions during market downturns. We believe this represents a relatively stable workforce in our industry, and that this stable workforce has directly contributed to improved process efficiencies and safety, which in turn help drive cost reductions. We believe our labor rates compare favorably to other mining and manufacturing facilities in the same geographic areas. We maintain workers' compensation coverage in amounts required by law and have no material claims pending. We also offer all full-time employees a competitive package of employee benefits, which includes medical, dental, life and disability coverage.

Regulation and Legislation

Mining and Workplace Safety

Federal Regulation

The U.S. Mine Safety and Health Administration (“MSHA”) is the primary regulatory organization governing the commercial silica industry. Accordingly, MSHA regulates quarries, surface mines, underground mines and the industrial mineral processing facilities associated with quarries and mines. The mission of MSHA is to administer the provisions of the Federal Mine Safety and Health Act of 1977 (the "Mine Act") and to enforce compliance with mandatory safety and health standards. MSHA works closely with the Industrial Minerals Association, a trade association in which we have a significant leadership role, in pursuing this mission. As part of MSHA’s oversight, representatives perform at least two unannounced inspections annually for each above-ground facility. For additional information regarding mining and workplace safety, including MSHA safety and health violations and assessments in 2018, see Item 4. Mine Safety Disclosures.

We also are subject to the requirements of the U.S. Occupational Safety and Health Act (“OSHA”) and comparable state statutes that regulate the protection of the health and safety of workers. In addition, the OSHA Hazard Communication Standard requires that information be maintained about hazardous materials used or produced in operations and that this information be provided to employees, state and local government authorities and the public. OSHA regulates the customers and users of commercial silica and provides detailed regulations requiring employers to protect employees from overexposure to silica bearing dust through the enforcement of permissible exposure limits and the OSHA Hazard Communication Standard.

Internal Controls

We adhere to a strict occupational health program aimed at controlling exposure to silica bearing dust, which includes dust sampling, a respiratory protection program, medical surveillance, training and other components. Our safety program is designed to ensure compliance with the standards of our Occupational Health and Safety Manual and MSHA regulations. For both health and safety issues, extensive training is provided to employees. We have safety committees at our plants made up of salaried and hourly employees. We perform annual internal health and safety audits and conduct annual crisis management drills to test our plants’ abilities to respond to various situations. Health and safety programs are administered by our corporate health and safety department with the assistance of plant Environmental, Health and Safety Coordinators.

Motor Carrier Regulation

Our trucking services are regulated by the U.S. Department of Transportation ("DOT"), the Federal Motor Carrier Safety Administration ("FMCSA") and by various state agencies. These regulatory authorities have broad powers, generally governing matters such as authority to engage in motor carrier operations, as well as motor carrier registration, driver hours of service, safety and fitness of transportation equipment and drivers, transportation of hazardous materials and periodic financial reporting. In addition, each driver is required to have a commercial driver’s license and may be subject to mandatory drug and alcohol testing. We may be audited periodically by these regulatory authorities to ensure that we are in compliance with various safety, hours-of-service, and other rules and regulations.

The transportation industry is subject to possible other regulatory and legislative changes (such as the possibility of more stringent environmental, climate change, security and/or occupational safety and health regulations, limits on vehicle weight and size and a mandate to implement electronic logging devices) that may affect the economics of our trucking services by requiring changes in operating practices or by changing the demand for motor carrier services or the cost of providing truckload or other transportation or logistics services.

Environmental Matters

We and the commercial silica industry in general are subject to extensive governmental regulation on, among other things, matters such as permitting and licensing requirements, plant and wildlife protection, hazardous materials, air and water emissions and environmental contamination and reclamation. A variety of state, local and federal agencies enforce this regulation.

Federal Regulation

At the federal level, we may be required to obtain permits under Section 404 of the Clean Water Act from the U.S. Army Corps of Engineers for the discharge of dredged or fill material into waters of the United States, including wetlands and streams, in connection with our operations. We also may be required to obtain permits under Section 402 of the Clean Water Act from the U.S. Environmental Protection Agency ("EPA") (or the relevant state environmental agency in states where the permit program has been delegated to the state) for discharges of pollutants into waters of the United States, including

discharges of wastewater or storm water runoff associated with construction activities. Failure to obtain these required permits or to comply with their terms could subject us to administrative, civil and criminal penalties as well as injunctive relief.

The federal Safe Drinking Water Act (the "SDWA") regulates the underground injection of substances through the Underground Injection Control Program (the "UIC Program"). Hydraulic fracturing generally has been exempt from federal regulation under the UIC Program, and the hydraulic fracturing process has been typically regulated by state or local governmental authorities. The EPA, however, has taken the position that certain aspects of hydraulic fracturing with fluids containing diesel fuel may be subject to regulation under the UIC Program, specifically as "Class II" UIC wells. In February 2014, the EPA released an interpretive memorandum to clarify UIC Program requirements under the SDWA for underground injection of diesel fuels in hydraulic fracturing for oil and gas extraction and issued technical guidance containing recommendations for EPA permit writers to consider in implementing these UIC "Class II" requirements. Among other things, the memorandum and technical guidance clarified that any owner or operator who injects diesel fuels in hydraulic fracturing for oil or gas extraction must obtain a UIC "Class II" permit before injection.

In 2012 the EPA issued final rules that included the first federal air standards for natural gas and oil wells that are hydraulically fractured, along with other requirements for several other sources of pollution in the oil and gas industry that had not been regulated at the federal level. Building on the 2012 rules, the EPA announced in May 2016 additional regulations to reduce methane and smog-forming emissions from new, modified or reconstructed sources in the oil and natural gas industry. In June 2017, the EPA issued two proposals to stay certain of these requirements and reconsider the entirety of the 2016 rules; however, the rules currently remain in effect. Also in May 2016, the EPA finalized rules regarding criteria for aggregating multiple small surface sites into a single source for air-quality permitting purposes applicable to the oil and natural gas industry.

Additionally, the EPA published in May 2014 an advance notice of proposed rulemaking regarding Toxic Substances Control Act reporting of the chemical substances and mixtures used in hydraulic fracturing. In June 2016, the EPA finalized effluent limit guidelines that waste water from shale resource extraction operations must meet before discharging to publicly owned wastewater treatment plants. Subsequently, compliance dates for certain sources have been extended by the EPA.

In 2011, a committee of the U.S. House of Representatives (the "House") and a subcommittee of the Secretary of Energy Advisory Board (the "SEAB") of the U.S. Department of Energy ("US DOE") each undertook inquiries related to the practices and effects of hydraulic fracturing, with each concluding that hydraulic fracturing created regulatory concerns and, in addition to regulations already discussed, could potentially spur further regulation of hydraulic fracturing under the SDWA or otherwise. In December 2016, the EPA issued a final assessment of the potential environmental effects of hydraulic fracturing on drinking water and groundwater that found hydraulic fracturing may in some cases result in impacts to drinking water resources. Additionally, from time to time, legislation is introduced before the U.S. Congress to provide for federal regulation of hydraulic fracturing under the SDWA and to require disclosure of the chemicals used in the hydraulic fracturing process. If this or similar legislation becomes law, the legislation could establish an additional level of federal regulation that may lead to additional permitting requirements or other operating restrictions, making it more difficult to complete natural gas and oil wells in shale formations. This could increase our customers' costs of compliance and doing business or otherwise adversely affect the hydraulic fracturing services they perform, which may negatively impact demand for our frac sand products.

In March 2015, the federal Bureau of Land Management ("BLM") published a final rule that established new or more stringent standards for hydraulic fracturing on federal and Indian land. After several rounds of litigation, BLM rescinded this rule in December 2017; however, the rescission is currently being challenged in court. BLM also issued final rules to reduce methane emissions from venting, flaring, and leaks during oil and gas operations on public lands in November 2016; however, in December 2017, BLM postponed compliance requirements for certain provisions of the 2016 methane venting rule. BLM's December 2017 delay decision is also currently being challenged in court.

The U.S. Clean Air Act and comparable state laws regulate emissions of various air pollutants through air emissions permitting programs and the imposition of other requirements. These regulatory programs may require us to install expensive emissions abatement equipment, modify our operational practices and obtain permits for our existing

operations, and before commencing construction on a new or modified source of air emissions, such laws may require us to reduce emissions at existing facilities. As a result, we may be required to incur increased capital and operating costs because of these regulations. We could be subject to administrative, civil and criminal penalties as well as injunctive relief for noncompliance with air permits or other requirements of the U.S. Clean Air Act and comparable state laws and regulations.

As part of our operations, we utilize or store petroleum products and other substances such as diesel fuel, lubricating oils and hydraulic fluid. We are subject to applicable requirements regarding the storage, use, transportation and disposal of these substances, including the relevant Spill Prevention, Control and Countermeasure requirements that the EPA imposes on us. Spills or releases may occur in the course of our operations, and we could incur substantial costs and liabilities as a result of such spills or releases, including those relating to claims for damage or injury to property and persons.

Additionally, some of our operations are located on properties that historically have been used in ways that resulted in the release of contaminants, including hazardous substances, into the environment, and we could be held liable for the remediation of such historical contamination. The Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), also known as the Superfund law, and comparable state laws impose joint and several liability, without regard to fault or legality of conduct, on classes of persons who are considered to be responsible for the release of hazardous substances into the environment. These persons include the owner or operator of the site where the release occurred and anyone who disposed or arranged for the disposal of a hazardous substance released at the site. Under CERCLA, such persons may be subject to liability for the costs of cleaning up the hazardous substances, for damages to natural resources, and for the costs of certain health studies. In addition, it is not uncommon for neighboring landowners and other third parties to file claims for personal injury and property damage allegedly caused by the hazardous substances released into the environment.

In addition, the Resource Conservation and Recovery Act ("RCRA") and comparable state statutes regulate the generation, transportation, treatment, storage, disposal and cleanup of hazardous and non-hazardous wastes. Under the auspices of the EPA, the individual states administer some or all of the provisions of RCRA, sometimes in conjunction with their own, more stringent requirements. In the course of our operations, we generate industrial solid wastes that may be regulated as hazardous wastes.

Our operations may also be subject to broad environmental review under the National Environmental Policy Act ("NEPA"). NEPA requires federal agencies to evaluate the environmental impact of all "major federal actions" significantly affecting the quality of the human environment. The granting of a federal permit for a major development project, such as a mining operation, may be considered a "major federal action" that requires review under NEPA. Therefore, our projects may require review and evaluation under NEPA. As part of this evaluation, the federal agency considers a broad array of environmental impacts, including, among other things, impacts on air quality, water quality, wildlife (including threatened and endangered species), historical and archaeological resources, geology, socioeconomics and aesthetics. NEPA also requires the consideration of alternatives to the project. The NEPA review process, especially the preparation of a full environmental impact statement, can be time consuming and expensive. The purpose of the NEPA review process is to inform federal agencies' decision-making on whether federal approval should be granted for a project and to provide the public with an opportunity to comment on the environmental impacts of a proposed project. While NEPA requires only that an environmental evaluation be conducted and does not mandate a result, a federal agency could decide to deny a permit, or impose certain conditions on its approval, based on its environmental review under NEPA, or a third party may challenge the adequacy of a NEPA review.

Federal agencies granting permits for our operations also must consider impacts to endangered and threatened species and their habitat under the Endangered Species Act. We also must comply with and are subject to liability under the Endangered Species Act, which prohibits and imposes stringent penalties for the harming of endangered or threatened species and their habitat. Federal agencies also must consider a project's impacts on historic or archaeological resources under the National Historic Preservation Act, and we may be required to conduct archaeological surveys of project sites and to avoid or preserve historical areas or artifacts.

State and Local Regulation

Because our operations are located in numerous states, we are also subject to a variety of different state and local environmental review and permitting requirements. Some states in which our projects are located or are being developed have state laws similar to NEPA; thus, our development of new sites or the expansion of existing sites may be subject to comprehensive state environmental reviews even if they are not subject to NEPA. In some cases, the state environmental review may be more stringent than the federal review. Our operations may require state law based permits in addition to federal permits, requiring state agencies to consider a range of issues, many the same as federal agencies, including, among other things, a project's impact on wildlife and their habitats, historic and archaeological sites, aesthetics, agricultural operations and scenic areas. Some states also have specific permitting and review processes for commercial silica mining operations, and states may impose different or additional monitoring or mitigation requirements than federal agencies. The development of new sites and our existing operations also are subject to a variety of local environmental and regulatory requirements, including land use, zoning, building and transportation requirements.

As demand for frac sand in the oil and natural gas industry has driven a significant increase in current and expected future production of commercial silica, some local communities have expressed concern regarding silica sand mining operations. These concerns have generally included exposure to ambient silica sand dust, truck traffic, water usage and blasting. In response, certain state and local communities have developed or are in the process of developing regulations or zoning restrictions intended to minimize dust from getting airborne, control the flow of truck traffic, significantly curtail the amount of practicable area for mining activities, provide compensation to local residents for potential impacts of mining activities and, in some cases, ban issuance of new permits for mining activities. To date, we have not experienced any material impact or disruption to our existing mining operations or planned capacity expansions as a result of these types of concerns.

We have a long history of positive engagement with the communities that surround our existing mining operations. We believe our relatively stable workforce and strong relationship with our employees help foster good relations with the communities in which we operate. Although additional regulatory requirements could negatively impact our business, financial condition and results of operations, we believe our existing operations may be less likely to be negatively impacted by virtue of our good community relations.

Planned expansion of our mining and production capacity in new communities could be more significantly impacted by increased regulatory activity. Difficulty or delays in obtaining or inability to obtain new mining permits or increased costs of compliance with future state and local regulatory requirements could have a material negative impact on our ability to grow our business. In an effort to minimize these risks, we continue to be engaged with local communities in order to grow and maintain strong relationships with residents and regulators.

Costs of Compliance

We may incur significant costs and liabilities as a result of environmental, health and safety requirements applicable to our activities. Failure to comply with environmental laws and regulations may result in the assessment of administrative, civil and criminal penalties, imposition of investigatory, cleanup and site restoration costs and liens, the denial or revocation of permits or other authorizations and the issuance of injunctions to limit or cease operations. Compliance with these laws and regulations may also increase the cost of the development, construction and operation of our projects and may prevent or delay the commencement or continuance of a given project. In addition, claims for damages to persons or property may result from environmental and other impacts of our activities.

The process for performing environmental impact studies and reviews for federal, state and local permits for our operations involves a significant investment of time and monetary resources. We cannot control the permit approval process. We cannot predict whether all permits required for a given project will be granted or whether such permits will be the subject of significant opposition. The denial of a permit essential to a project or the imposition of conditions with which it is not practicable or feasible to comply could impair or prevent our ability to develop a project. Significant opposition and delay in the environmental review and permitting process also could impair or delay our ability to develop a project. Additionally, the passage of more stringent environmental laws could impair our ability to develop new operations and have an adverse effect on our financial condition and results of operations We do not expect any material capital expenditures due to current regulatory compliance obligations.

Availability of Reports; Website Access; Other Information

Our Internet address is http://www.ussilica.com. Through “Investors” — “SEC Filings” on our home page, we make available free of charge our annual reports on Form 10-K, our quarterly reports on Form 10-Q, our proxy statements, our current reports on Form 8-K, SEC Forms 3, 4 and 5 and any amendments to those reports filed or furnished pursuant to Sections 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after we electronically file such material with, or furnish it to, the SEC. Our reports filed with the SEC are also available on its website at http://www.sec.gov.

Stockholders may also request a free copy of these documents from: U.S. Silica Holdings, Inc., attn.: Investor Relations, 24275 Katy Freeway, Suite 600, Katy, Texas 77494 or view them on our website at http://www.ussilica.com/investors.

Executive Officers of the Registrant

Bryan A. Shinn, age 57, has served as our President since March 2011 and as our Chief Executive Officer and a member of the Board since January 2012. Prior to assuming this position, Mr. Shinn was our Senior Vice President of Sales and Marketing from October 2009 to February 2011. Before joining us, Mr. Shinn was employed by the E. I. du Pont de Nemours and Company from 1983 to September 2009, where he held a variety of key leadership roles in operations, sales, marketing and business management, including Global Business Director and Global Sales Director. Mr. Shinn earned a B.S. in Mechanical Engineering from the University of Delaware.

Donald A. Merril, age 54, has served as an Executive Vice President since July 2016 and as our Chief Financial Officer since January 2013. He had previously served as our Vice President of Finance from October 2012 until his appointment as Chief Financial Officer. Previously, Mr. Merril had served as Senior Vice President and Chief

Financial Officer of Myers Industries Inc. from January 2006 through August 2012. Prior to serving at Myers Industries, Mr. Merril held the role of Vice President and Chief Financial Officer, Rubbermaid Home Products Division at Newell Rubbermaid Inc. from 2003 through 2005. Mr. Merril has a B.S. in Accounting from Miami University.

Michael L. Winkler, age 54, has served as an Executive Vice President since July 2016 and as our Chief Operating Officer since December 2013. He served as a Vice President from June 2011 until July 2016 and as our Vice President of Operations from June 2011 until December 2013. Before joining us, Mr. Winkler was Vice President of Operations for Campbell Soup Company from August 2007 to June 2011 and held various positions with Mars Inc. from 1996 to August 2007, including Plant Manager-Columbus Plant and Director of Industrial Engineering. Mr. Winkler earned a B.S. in Industrial Engineering from the University of Wisconsin-Platteville and an M.B.A. from the University of North Texas.

Bradford B. Casper, age 44, has served as an Executive Vice President since July 2016 and as our Chief Commercial Officer since May 2015. He served as our Vice President of Strategic Planning from May 2011 until his promotion to Chief Commercial Officer in May 2015. Before joining us, Mr. Casper was at Bain & Company, Inc., where he held various positions from 2002 to May 2011 in the United States, Australia and Hong Kong, most recently serving as a Principal from July 2010 to May 2011. Mr. Casper earned a B.S. in Accounting from the University of Illinois at Urbana-Champaign and an M.B.A. from the Wharton School at the University of Pennsylvania.

David D. Murry, age 57, has served as a Senior Vice President since July 2016 and as our Chief Human Resources Officer since October 2011. He served as our Vice President of Talent Management from October 2011 until July 2016. Prior to joining us, Mr. Murry was the Director of Human Resources and Talent Management for Arkema, a diversified chemicals company, from October 2005 to October 2011. He has held positions of increasing leadership with Armstrong, Dell, and Alcoa. Mr. Murry earned a B.S. in Mining Engineering from Texas A&M University and a Master of Science in Management from Antioch University.

John P. Blanchard, age 45, has served as our Senior Vice President and President, Industrial & Specialty Products since July 2016, having served as Vice President and General Manager, Industrial & Specialty Products from September 2011 until July 2016. Mr. Blanchard possesses over 20 years' experience in a variety of industries, including nonwovens, composites, building materials and pharmaceuticals. Prior to joining us, Mr. Blanchard held various positions of increasing responsibility with Johns Manville from 2005 to September 2011, including Global Business Director from December 2010 to September 2011 and Global Business Manager from February 2008 to December 2010. Mr. Blanchard earned a B.S. in Chemical Engineering from Michigan Technological University and an M.B.A. from the University of Michigan.

Billy Ray Smith, age 48, has served as a Senior Vice President and President, Oil & Gas since January 2018, having served as Vice President of Oil & Gas since joining us in March 2017. Before joining us, Mr. Smith had held various positions of increasing responsibility with Halliburton Company, a global energy services company, since 1995 including as North America Technology Director from October 2015 to March 2017, Director of North America Operations from September 2014 to October 2015, Global Technical Sales and Marketing Manager from April 2014 to September 2014 and Senior Business Development Manager of Halliburton Australia from May 2012 to April 2014. Mr. Smith earned his B.S. in Petroleum Engineering from Texas Tech University.

W. Andrew Macan, age 46, was appointed U.S. Silica's Senior Vice President, General Counsel and Corporate Secretary in October 2018. Mr. Macan oversees all aspects of U.S. Silica's legal, compliance and ethics functions. Previously, he served in roles of increasing responsibility with Axalta Coating Systems, LLC, from October 2013 until October 2018, most recently as General Counsel and Chief Compliance Officer, Americas, and The Chubb Corporation, from October 2003 until October 2013, including as Vice President, Corporate Counsel and Secretary for over 8 years. Mr. Macan began his career in private practice at Ballard Spahr LLP and Dechert LLP. Mr. Macan earned a B.A. in Government from Franklin & Marshall College and his J.D. from Emory University School of Law with distinction and Order of the Coif.

ITEM 1A. RISK FACTORS

Our operations and financial results are subject to various risks and uncertainties, including those described below and elsewhere in this Annual Report on Form 10-K. You should carefully consider the risk factors set forth below as well as the other information contained in this Annual Report on Form 10-K in connection with evaluating our business and our securities. The categorization of risks set forth below is meant to help you better understand the risks facing our business and is not intended to limit consideration of the possible effects of these risks to the listed categories, nor is it meant to imply that one category of risks is more material than another. Any adverse effects related to the risks discussed below may, and likely will, adversely affect many aspects of our business.

Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial may also materially and adversely affect our stock price, business, results of operations or financial condition. Certain statements in these risk factors are forward-looking statements.

Operational Risks

Our operations are subject to the cyclical nature of our customers' businesses, and we may not be able to mitigate that risk.

The substantial majority of our customers are engaged in industries that have historically been cyclical, such as glassmaking, building products, foundry and oil and natural gas recovery. During periods of economic slowdown, our customers often reduce their production and also reduce capital expenditures by deferring or canceling pending projects. Such developments occur even among customers that are not experiencing financial difficulties.

Demand in many of the end markets for our products is driven by cyclical industries, such as construction and automotive. For example, the flat glass market depends on the automotive and commercial and residential construction and remodeling markets. The market for commercial silica used to manufacture building products is driven primarily by demand in the construction markets. The demand for foundry silica depends on the rate of automobile, light truck and heavy equipment production as well as construction. The demand for frac sand is driven by demand for oil and natural gas. When oil and natural gas prices decrease, as they did throughout 2015 and into 2016, as well as during the second half of 2018, exploration and production companies may reduce their exploration, development, production and well completion activities. The reduced level of such activities could result in a corresponding decline in the demand for frac sand and an oversupply of frac sand. In periods where sources of supply of frac sand exceed market demand, market prices for frac sand may decline and our results of operations and cash flows may decline or be volatile or otherwise adversely affected. In addition, given that silica transportation represents one of our customers' largest costs, if, in response to economic pressures, our customers choose to move their production offshore, the increased logistics costs could reduce demand for our products. Continued weakness in the industries we serve has had, and may in the future have, an adverse effect on sales of our products and our results of operations. The demand for DE, perlite, clay and cellulose is driven by agricultural, food and beverage, chemical industries, filtration, catalyst and absorbent applications. A continued or renewed economic downturn in one or more of the industries or geographic regions that we serve, or in the worldwide economy, could cause actual results of operations to differ materially from historical and expected results.

Our operations are subject to operating risks, some of which are beyond our control, that could adversely affect production levels and costs, and such risks may not be covered by insurance.

Our mining, processing and production facilities are subject to risks normally encountered in the commercial silica and earth minerals industries, many of which are not in our control. These risks include [confirm]:

- changes in the price and availability of transportation and transload network access;
- changes in the price and availability of natural gas or electricity;
- changes in the price and availability of water;
- unanticipated ground, grade or water conditions;
- unusual or unexpected geological formations or pressures;
- pit wall failures, underground roof falls or surface rock falls;
- inclement or hazardous weather conditions, including flooding, and the physical impacts of climate change;
- environmental hazards;
- industrial accidents;
- physical plant security breaches;
- changes in laws and regulations (or the interpretation thereof) related to the mining and hydraulic fracturing industries, silica dust exposure or the environment;
- nonperformance of contractual obligations;
- inability to acquire or maintain necessary permits or mining or water rights;
- restrictions on blasting operations;
- inability to obtain necessary production equipment or replacement parts;
- technical difficulties or key equipment failures;
- labor disputes, including union strikes;
- cybersecurity breaches;
- late delivery of supplies;

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- fires, explosions or other accidents; and
- facility shutdowns in response to environmental regulatory actions.

Any of these risks could result in damage to, or destruction of, our mining properties or production facilities, personal injury, environmental damage, delays in mining or processing, losses or possible legal liability. Any prolonged downtime or shutdowns at our mining properties or production facilities could have a material adverse effect on us. Not all of these risks are reasonably insurable, and our insurance coverage contains limits, deductibles, exclusions and endorsements. Our insurance coverage may not be sufficient to meet our needs in the event of loss and any such loss may have a material adverse effect on us.

Our operations are dependent on our rights and ability to mine our properties and on our having renewed or received the required permits and approvals from governmental authorities and other third parties.

We hold numerous governmental, environmental, mining and other permits, water rights and approvals authorizing operations at each of our facilities. A decision by a governmental agency or other third party to deny or delay issuing a new or renewed permit or approval, or to revoke or substantially modify an existing permit or approval, could have a material adverse effect on our ability to continue operations at the affected facility. Expansion of our existing operations is also predicated on securing the necessary environmental or other permits, water rights or approvals, which we may not receive in a timely manner or at all. In addition, our facilities are located near existing and proposed third-party industrial operations that could affect our ability to fully extract, or the manner in which we extract, the mineral deposits to which we have mining rights.

Increasing costs, a lack of dependability or availability of transportation services, transload network access or infrastructure or an oversupply of transportation services could have a material adverse effect on our business.

Because of the relatively low cost of producing commercial silica, transportation and related costs including freight charges, fuel surcharges, transloading fees, switching fees, railcar lease costs, demurrage costs and storage fees, tend to be a significant component of the total delivered cost of sales. The high relative cost of transportation related expense tends to favor manufacturers located in close proximity to the customer. In addition, when we expand our commercial silica production, we need increased transportation services and transload network access. We contract with truck, rail and barge services to move commercial silica from our production facilities to transload sites and our customers, and increased costs under these contracts could adversely affect our results of operations. In addition, we bear the risk of non-delivery under our contracts. Labor disputes, derailments, adverse weather conditions or other environmental events, an increasingly tight railcar leasing market and changes to rail freight systems could interrupt or limit available transportation services. A significant increase in transportation service rates, a reduction in the dependability or availability of transportation or transload services, or relocation of our customers' businesses to areas farther from our plants or transloads could impair our ability to deliver our products economically to our customers and to expand our markets. Further, reduced demand for commercial silica could result in railcar over-capacity, requiring us to pay railcar storage fees while, at the same time, continuing to incur lease costs for those railcars in storage, which could have a material adverse effect on our business, financial condition, results of operations, cash flows and prospects.

Seasonal and severe weather conditions could have a material adverse impact on our business.

Our business could be materially adversely affected by weather conditions. Severe weather conditions may affect our customers' operations, thus reducing their need for our products. Weather conditions may impact our operations, resulting in weather-related damage to our facilities and equipment or an inability to deliver equipment, personnel and products to job sites in accordance with contract schedules. In addition, climate change may lead to the increased frequency and severity of extreme weather events. Any such interference with our operations could force us to delay or curtail services and potentially breach our contractual obligations or result in a loss of productivity and an increase in our operating costs.

Our production process consumes large amounts of natural gas and electricity. An increase in the price or a significant interruption in the supply of these or any other energy sources could have a material adverse effect on our financial condition or results of operations.

Energy costs, primarily natural gas and electricity, represented approximately 3%, 3% and 5% of our total sales in 2018, 2017 and 2016. Natural gas is the primary fuel source used for drying in the commercial silica production

process and, as such, our profitability is impacted by the price and availability of natural gas we purchase from third parties. The price and supply of natural gas are unpredictable and can fluctuate significantly based on international, political and economic circumstances, as well as other events outside our control, such as changes in supply and demand due to weather conditions, actions by OPEC and other oil and natural gas producers, regional production patterns and environmental concerns. In addition, potential climate change regulations or carbon or emissions taxes could result in higher production costs for energy, which may be passed on to

us in whole or in part. In the past, the price of natural gas has been extremely volatile, and we believe this volatility may continue. In order to manage this risk, we may hedge natural gas prices through the use of derivative financial instruments, such as forwards, swaps and futures. However, these measures carry risk (including nonperformance by counterparties) and do not in any event entirely eliminate the risk of decreased margins as a result of natural gas price increases. A significant increase in the price of energy that is not recovered through an increase in the price of our products or covered through our hedging arrangements or an extended interruption in the supply of natural gas or electricity to our production facilities could have a material adverse effect on our business, financial condition, results of operations, cash flows and prospects.

Increases in the price of diesel fuel may adversely affect our results of operations.

Diesel fuel costs generally fluctuate with increasing and decreasing world crude oil prices, and accordingly are subject to political, economic and market factors that are outside of our control. Our operations are dependent on earthmoving equipment, railcars and tractor trailers, and diesel fuel costs are a significant component of the operating expense of these vehicles. We use earthmoving equipment in our mining operations, and we ship the vast majority of our products by either railcar or tractor trailer. To the extent that we perform these services with equipment that we own, we are responsible for buying and supplying the diesel fuel needed to operate these vehicles. To the extent that these services are provided by independent contractors, we may be subject to fuel surcharges that attempt to recoup increased diesel fuel expenses. To the extent we are unable to pass along increased diesel fuel costs to our customers, our results of operations could be adversely affected.

Diminished access to water may adversely affect our operations.

The mining and processing activities in which we engage at a number of our facilities require significant amounts of water, and some of our facilities are located in areas that are water-constrained. We have obtained water rights that we currently use to service the activities on our various properties, and we plan to obtain all required water rights to service other properties we may develop or acquire in the future. However, the amount of water that we are entitled to use pursuant to our water rights must be determined by the appropriate regulatory authorities in the jurisdictions in which we operate. Such regulatory authorities may amend the regulations regarding such water rights, increase the cost of maintaining such water rights or eliminate our current water rights, and we may be unable to retain all or a portion of such water rights. These new regulations, which could also affect local municipalities and other industrial operations, could have a material adverse effect on our operating costs and effectiveness if implemented. Such changes in laws, regulations or government policy and related interpretations pertaining to water rights may alter the environment in which we do business, which may negatively affect our financial condition and results of operations.

Certain of our contracts contain provisions requiring us to deliver minimum amounts of frac sand, sometimes with certain quality specifications, or purchase minimum amounts of services. Noncompliance with these contractual obligations may result in penalties or termination of the agreement.

In certain instances, we commit to deliver products or purchase services, under penalty of nonperformance. These obligations can require that we deliver or purchase minimum quantities of products or services, and can also require that we deliver products that meet certain specifications that a customer may designate. Our inability to meet these contract requirements may permit the counterparty to terminate the agreements, return products that fail to meet a customer’s quality specifications, or require us to pay a fee equal to the difference between the minimum amount contracted for and the amount delivered or purchased. Further, we may not be able to sell some of our products developed for one customer to a different customer because the products may be customized to meet specific customer quality specifications requirements, and even if we are able to sell these products to another customer, our margin on these products may be reduced. Moreover, any inability to deliver products that meet customer requirements could harm our relationships with these customers and our reputation generally. In such events, our business, financial condition and results of operations may be materially adversely affected.

Inaccuracies in our estimates of mineral reserves and resource deposits could result in lower than expected sales and higher than expected costs.

We base our mineral reserve and resource estimates on engineering, economic and geological data assembled and analyzed by our mining engineers, which are reviewed periodically by outside firms. However, commercial silica reserve estimates are necessarily imprecise and depend to some extent on statistical inferences drawn from available

drilling data, which may prove unreliable. There are numerous uncertainties inherent in estimating quantities and qualities of commercial silica reserves and non-reserve commercial silica deposits and costs to mine recoverable reserves, including many factors beyond our control. Estimates of economically recoverable commercial silica reserves necessarily depend on a number of factors and assumptions, all of which may vary considerably from actual results, such as:

•geological and mining conditions and/or effects from prior mining that may not be fully identified by available data or that may differ from experience;

•assumptions concerning future prices of commercial silica products, operating costs, mining technology improvements, development costs and reclamation costs; and
•assumptions concerning future effects of regulation, including the issuance of required permits and taxes by governmental agencies.

Any inaccuracy in our estimates related to our mineral reserves and non-reserve mineral deposits could result in lower than expected sales and higher than expected costs.

Failure to maintain effective quality control systems at our mining, processing and production facilities could have a material adverse effect on our business and operations.

The performance, quality and safety of our products are critical to the success of our business. These factors depend significantly on the effectiveness of our quality control systems, which, in turn, depends on a number of factors, including the design of our quality control systems, our quality-training program and our ability to ensure that our employees adhere to the quality control policies and guidelines. Any significant failure or deterioration of our quality control systems could have a material adverse effect on our business, financial condition, results of operations and reputation.

Our business and operations could suffer in the event of cybersecurity breaches, information technology system failures, or network disruptions.

We rely on our information technology systems to process transactions, summarize our operating results and manage our business. Our information technology systems are subject to damage or interruption from power outages, computer and telecommunications failures, computer viruses, cyber-attack or other security breaches, catastrophic events, such as fires, floods, earthquakes, tornadoes, hurricanes, acts of war or terrorism, and usage errors by our employees. If our information technology systems are damaged or cease to function properly, we may have to make a significant investment to fix or replace them, and we may suffer loss of critical data and interruptions or delays in our operations.

We may be the target of attempted cyberattacks, computer viruses, malicious code, phishing attacks, denial of service attacks and other information security threats. To date, cyberattacks have not had a material impact on our financial condition, results or business; however, we could suffer material financial or other losses in the future and we are not able to predict the severity of these attacks. Our risk and exposure to these matters remains heightened because of, among other things, the evolving nature of these threats, the current global economic and political environment, the outsourcing of some of our business operations, the ongoing shortage of qualified cybersecurity professionals, and the interconnectivity and interdependence of third parties to our systems.

The occurrence of a cyberattack, breach, unauthorized access, misuse, computer virus or other malicious code or other cybersecurity event could jeopardize or result in the unauthorized disclosure, gathering, monitoring, misuse, corruption, loss or destruction of confidential and other information that belongs to us, our customers, our counterparties, third-party service providers or borrowers that is processed and stored in, and transmitted through, our computer systems and networks. The occurrence of such an event could also result in damage to our software, computers or systems, or otherwise cause interruptions or malfunctions in our, our customers', our counterparties' or third parties' operations. This could result in significant losses, loss of customers and business opportunities, reputational damage, litigation, regulatory fines, penalties or intervention, reimbursement or other compensatory costs, or otherwise adversely affect our business, financial condition or results of operations. We have systems designed to prevent, but also seek to detect security incidents, but in some cases we may be unaware of an incident or its magnitude and effects. The theft, unauthorized use or publication of our intellectual property and/or confidential business information could harm our competitive position, reduce the value of our investment in research and development and other strategic initiatives or otherwise adversely affect our business.

The reliability and capacity of our information technology systems is critical to our operations and the implementation of our growth initiatives. Any material disruption in our information technology systems, or delays or difficulties in implementing or integrating new systems or enhancing current systems, could have an adverse effect on our business, and results of operations.

Mine closures entail substantial costs, and if we close one or more of our mines sooner than anticipated, our results of operations may be adversely affected.

We base our assumptions regarding the life of our mines on detailed studies that we perform from time to time, but our studies and assumptions do not always prove to be accurate. If we close any of our mines sooner than expected, sales will decline unless we are able to increase production at any of our other mines, which may not be possible. The closure of an open pit mine also involves significant fixed closure costs, including accelerated employment legacy costs, severance-related

obligations, reclamation and other environmental costs and the costs of terminating long-term obligations, including energy contracts and equipment leases. We accrue for the costs of reclaiming open pits, stockpiles, tailings ponds, roads and other mining support areas over the estimated mining life of our property. If we were to reduce the estimated life of any of our mines, the fixed mine closure costs would be applied to a shorter period of production, which would increase production costs per ton produced and could materially and adversely affect our results of operations and financial condition.

Applicable statutes and regulations require that mining property be reclaimed following a mine closure in accordance with specified standards and an approved reclamation plan. The plan addresses matters such as removal of facilities and equipment, re-grading, prevention of erosion and other forms of water pollution, re-vegetation and post-mining land use. We may be required to post a surety bond or other form of financial assurance equal to the cost of reclamation as set forth in the approved reclamation plan. The establishment of the final mine closure reclamation liability is based on permit requirements and requires various estimates and assumptions, principally associated with reclamation costs and production levels. If our accruals for expected reclamation and other costs associated with mine closures for which we will be responsible were later determined to be insufficient, our business, results of operations and financial condition would be adversely affected.

Risks Related to Market, Competition, & Sales

The demand for commercial silica, diatomaceous earth (DE), perlite, clay and cellulose fluctuates, and changes in demand mix among our products could impact our profitability, all of which could adversely affect our results of operations.

Demand for our products, as well as the demand in the end markets served by our customers is influenced by many factors, including the following:

- demand for oil, natural gas and petroleum products;
- fluctuations in energy, fuel, oil and natural gas prices and the availability of such fuels;
- our ability to successfully implement price increases and surcharges;
- fluctuations in currency;
- the use of alternative proppants, such as ceramic proppants, in the hydraulic fracturing process;
- global and regional economic, political and military events and conditions;
- changes in residential and commercial construction demands, driven in part by fluctuating interest rates and demographic shifts;
- demand for automobiles and other vehicles;
- substitution for diatomaceous earth, perlite and clay;
- inclement or hazardous weather conditions, including flooding, and the physical impacts of climate change;
- the substitution of plastic or other materials for glass;
- changes in trade agreements and/or tariffs for qualifying imports and exports;
- the use of recycled glass in glass production;
- competition from offshore producers of glass products;
- changes in demand for our products due to technological innovations, including the development and use of new processes for oil and gas production that do not require proppants;
- changes in laws and regulations (or the interpretation thereof) related to the mining and hydraulic fracturing industries, silica dust exposure or the environment;
- overall tax rate of the business, which may be affected by a number of factors, including the use of tax attributes and the financial results of our international subsidiaries;
- prices, availability and other factors relating to our products; and
- increases in costs of labor and labor strikes.

We cannot predict or control the factors that affect demand for our products. Negative developments in the above factors, among others, could cause the demand for commercial silica, DE, perlite, clay, cellulose or other minerals to decline, which could have a material adverse effect our business, financial condition, results of operations, cash flows and prospects.

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A significant portion of our sales is generated at five of our plants. Any adverse developments at any of those plants or in the end markets those plants serve could have a material adverse effect on our financial condition and results of operations.

A significant portion of our sales are generated at our plants located in Ottawa, Illinois; Sparta, Wisconsin; Mill Creek, Oklahoma; Utica, Illinois; and Festus, Missouri. These plants represented a combined 38%, 51%, and 51% of our total sales in 2018, 2017 and 2016, respectively. Any adverse development at these plants or in the end markets these plants serve, including adverse developments due to catastrophic events or weather, decreased demand for commercial silica products, a decrease in the availability of transportation services or adverse developments affecting our customers, could have a material adverse effect on our financial condition and results of operations.

Our business and financial performance depend on the level of activity in the oil and natural gas industries.

Our operations that produce frac sand are materially dependent on the levels of activity in natural gas and oil exploration, development and production. More specifically, the demand for the frac sand we produce is closely related to the number of natural gas and oil wells completed in geological formations where sand-based proppants are used in fracture treatments. These activity levels are affected by both short- and long-term trends in natural gas and oil prices. In recent years, natural gas and oil prices and, therefore, the level of exploration, development and production activity, have experienced significant fluctuations. Worldwide economic, political and military events, including war, terrorist activity, events in the Middle East and initiatives by the Organization of the Petroleum Exporting Countries ("OPEC"), have contributed, and are likely to continue to contribute, to price volatility. Additionally, warmer than normal winters in North America and other weather patterns may adversely impact the short-term demand for natural gas and, therefore, demand for our products. Reduction in demand for natural gas to generate electricity could also adversely impact the demand for frac sand. A prolonged reduction in natural gas and oil prices would generally depress the level of natural gas and oil exploration, development, production and well completion activity and result in a corresponding decline in the demand for the frac sand we produce. Such a decline could result in us selling fewer tons of frac sand at lower prices or selling lower priced products, which would have a material adverse effect on our results of operations and financial condition. When demand for frac sand increases, there may not be a corresponding increase in the prices for our products or our customers may not switch back to higher priced products, which could have a material adverse effect on our results of operations and financial condition. In addition, any future decreases in the rate at which oil and natural gas reserves are discovered or developed, whether due to increased governmental regulation, limitations on exploration and drilling activity or other factors, could have a material adverse effect on our business, even in a stronger natural gas and oil price environment.

We may be adversely affected by decreased demand for frac sand or the development of either effective alternative proppants or new processes to replace hydraulic fracturing.

Frac sand is a proppant used in the completion and re-completion of natural gas and oil wells through hydraulic fracturing. Frac sand is the most commonly used proppant and is less expensive than ceramic proppant, which is also used in hydraulic fracturing to stimulate and maintain oil and natural gas production. A significant shift in demand from frac sand to other proppants, such as ceramic proppants, could have a material adverse effect on our financial condition and results of operations. The development and use of other effective alternative proppants, or the development of new processes to replace hydraulic fracturing altogether, could also cause a decline in demand for the frac sand we produce and could have a material adverse effect on our financial condition and results of operations.

Our future performance will depend on our ability to succeed in competitive markets, and on our ability to appropriately react to potential fluctuations in demand for and supply of our products.

We operate in a highly competitive market that is characterized by a small number of large, national producers and a larger number of small, regional or local producers. Competition in the industry is based on price, consistency and quality of product, site location, distribution capability, customer service, reliability of supply, breadth of product offering and technical support. Because transportation costs are a significant portion of the total cost to customers of commercial silica (in many instances transportation costs can represent more than 50% of delivered cost), the commercial silica market is typically local, and competition from beyond the local area is limited. Notable exceptions to this are the frac sand and fillers and extenders markets, where certain product characteristics are not available in all deposits and not all plants have the requisite processing capabilities, necessitating that some products be shipped for

extended distances.

We compete with national producers such as Covia Holdings Corporation, Hi-Crush Partners LP and Emerge Energy Services LP. Our competitors may have greater financial and other resources than we do, may develop technology superior to ours or may have production facilities that are located closer to key customers than ours.

Because the markets for our products are typically local, we also compete with smaller, regional or local producers. There typically is an increasing number of small producers servicing the frac sand market when there is increased demand for

hydraulic fracturing services. If demand for hydraulic fracturing services decreases and the supply of frac sand available in the market increases, prices in the frac sand market could continue to materially decrease as less-efficient producers exit the market, selling frac sand at below market prices. Furthermore, our competitors may choose to consolidate, which could provide them with greater financial and other resources than us and negatively impact demand for our frac sand products. In addition, oil and natural gas exploration and production companies and other providers of hydraulic fracturing services could acquire their own frac sand reserves, expand their existing frac sand production capacity or otherwise fulfill their own proppant requirements, and existing or new frac sand producers could add to or expand their frac sand production capacity, which would negatively impact demand for our frac sand products. We may not be able to compete successfully against either our larger or smaller competitors in the future, and competition could have a material adverse effect on our business, financial condition, results of operations, cash flows and prospects.

If our customers delay or fail to pay a significant amount of our outstanding receivables, it could have a material adverse effect on our liquidity, consolidated results of operations, and financial condition.

We bill our customers for our products in arrears and are, therefore, subject to our customers delaying or failing to pay our invoices. In weak economic environments, we may experience increased delays or failures due to, among other reasons, a reduction in our customers' cash flow from operations and their access to the credit markets. If our customers delay or fail to pay us a significant amount of our outstanding receivables, it could have a material adverse effect on our liquidity, consolidated results of operations, and financial condition.

Some of our customers may experience financial difficulties, including insolvency. If a customer cannot provide us with reasonable assurance of payment, we will fully reserve the outstanding accounts receivable balance for the customer and only recognize revenue when we collect payment for our products shipped, assuming all other criteria for revenue recognition have been met. Although we will continue to try to obtain payments from these customers, it is likely that one or more of these customers will not pay us for our products. With respect to customers that are in bankruptcy proceedings, we similarly may not be able to collect sums owed to us by these customers and we also may be required to refund pre-petition amounts paid to us during the preference period (typically 90 days) prior to the bankruptcy filing.

A large portion of our sales is generated by our top ten customers, and the loss of, or a significant reduction in purchases by our largest customers could adversely affect our operations.

Our ten largest customers accounted for approximately 48%, 58% and 52% of total sales during the year ended December 31, 2018, 2017 and 2016, respectively. As of December 31, 2018, we had twenty-one long-term, competitively-bid minimum purchase supply agreements in the Oil & Gas Proppants segment with initial terms expiring between 2019 and 2034, including 10 that expire between 2018 and 2020. While some of our largest customers have entered into supply agreements with us, these customers may not continue to purchase the same levels of our commercial silica products in the future due to a variety of reasons, contract requirements notwithstanding. For example, some of our top customers could go out of business or, alternatively, be acquired by other companies that purchase the same products and services provided by us from other third-party providers. Our customers could also seek to capture and develop their own sources of commercial silica. If any of our major customers substantially reduces or altogether ceases purchasing our commercial silica products, depending on market conditions, we could suffer a material adverse effect on our business, financial condition, results of operations, cash flows and prospects.

In addition, the long-term minimum purchase supply agreements may negatively impact our results of operations.

Some of our long-term agreements are for sales at fixed prices that are adjusted only for certain cost increases. As a result, in periods with increasing prices, our sales could grow at a slower rate than industry spot prices.

Our sales and profitability fluctuate on a seasonal basis and are affected by a variety of other factors.

Our sales and profitability from period to period are affected by a variety of factors, including actions of competitors, changes in general economic conditions, weather conditions and seasonal periods. As a result, our results of operations may fluctuate on a quarterly basis and relative to corresponding periods in prior years. For example, we sell more of our products in the second and third quarters in the building products and recreation end markets due to the seasonal rise in construction driven by more favorable weather conditions. Conversely, we sell fewer of our products in the first and fourth quarters due to reduced construction and recreational activity largely as a result of adverse

weather conditions. Any unanticipated decrease in demand for our products during the second and third quarters could have a material adverse effect on our overall sales and profitability. Moreover, our performance may also fluctuate from period to period in unpredictable ways as a result of the non-seasonal factors described above or other factors, such as changes in market or industry conditions. Many of these factors cannot be foreseen or are outside of our control. These fluctuations in our operating results may render period-to-period comparisons less meaningful, and investors in our securities should not rely on the results of any one period as an indicator of performance in any other period. Additionally, these fluctuations could cause our performance in any period to fall below the financial

guidance we have provided to the public or the estimates and projections of the investment community, which could negatively affect the price of our common stock.

We face risks as a result of our international sales and business operations.

We derived approximately 4% of our consolidated sales from sales outside of the United States in 2018. Our ability to sell our products and conduct our operations outside of the United States is subject to a number of risks, including, among others:

•local economic, political and labor conditions in each country could adversely affect demand for our products or disrupt our operations in these markets, particularly when local political and economic conditions are unstable;
•international sales and operations are subject to currency exchange fluctuations, fund transfer and trade restrictions and import/export duties, which are subject to increased uncertainty as a result of the trade policies of the current Administration regarding existing and proposed trade agreements, the ability to import and export goods, and newly imposed tariffs on a number of goods that could impact our operations;
•international operations are subject to foreign regulatory requirements and issues, including with respect to environmental, employee and other matters;
•operating in several geographic territories subjects us to challenges complying with the laws and regulations of multiple jurisdictions, which can vary substantially;
•certain jurisdictions offer limited intellectual property protections relative to the United States; and
•we may have difficulty enforcing agreements and collecting accounts receivable through a foreign country’s legal system.

Any of these matters could result in sudden, and potentially prolonged, changes in demand for our products, limit our international operations, increase our costs or expose us to fines or other legal sanctions or damages, any of which would negatively impact our business and financial condition.

Legal & Compliance Risks

Federal, state and local legislative and regulatory initiatives relating to hydraulic fracturing and the potential for related regulatory action or litigation could result in increased costs and additional operating restrictions or delays for our customers, which could negatively impact our business, financial condition and results of operations.

A significant portion of our business supplies frac sand to hydraulic fracturing operators in the oil and natural gas industry. Although we do not directly engage in hydraulic fracturing activities, our customers purchase our frac sand for use in their hydraulic fracturing operations. Increased regulation of hydraulic fracturing may adversely impact our business, financial condition and results of operations. There is significant federal oversite by the EPA, BLM, and the US DOE.

Additionally, various state, local and foreign governments have implemented, or are considering, increased regulatory oversight of hydraulic fracturing through additional permitting requirements, operational restrictions, disclosure requirements and temporary or permanent bans on hydraulic fracturing. A number of local municipalities across the United States have instituted measures resulting in temporary or permanent bans on or otherwise limiting or delaying hydraulic fracturing in their jurisdictions. Such moratoriums and bans could make it more difficult to conduct hydraulic fracturing operations and increase our customers’ cost of doing business, which could negatively impact demand for our frac sand products. A number of states have also enacted legislation or issued regulations which impose various disclosure requirements on hydraulic fracturing operators. The availability of information regarding the constituents of hydraulic fracturing fluids could make it easier for third parties opposing the hydraulic fracturing process to initiate individual or class action legal proceedings based on allegations that specific chemicals used in the hydraulic fracturing process could adversely affect groundwater and drinking water supplies or otherwise cause harm to human health or the environment. Moreover, disclosure to third parties or to the public, even if inadvertent, of our customers’ proprietary chemical formulas could diminish the value of those formulas and result in competitive harm to our customers, which could indirectly impact our business, financial condition and results of operations.

The adoption of new laws or regulations at the federal, state, local or foreign levels imposing reporting obligations on, or otherwise limiting or delaying, the hydraulic fracturing process could make it more difficult to complete natural gas and oil wells in shale formations, increase our customers’ costs of compliance and doing business and otherwise adversely affect the hydraulic fracturing services they perform, which could negatively impact demand for our frac

sand products. In addition, heightened political, regulatory and public scrutiny of hydraulic fracturing practices could potentially expose us or our customers to increased legal and regulatory proceedings, and any such proceedings could be time-consuming, costly or result in substantial legal liability or significant reputational harm. Any such developments could have a material adverse effect on our business, financial condition and results of operations, whether directly or indirectly. For example, we could be directly

affected by adverse litigation involving us, or indirectly affected if the cost of compliance limits the ability of our customers to operate in the geographic areas we serve.

Title to, and the area of, mineral properties and water rights may also be disputed. Mineral properties sometimes contain claims or transfer histories that examiners cannot verify. A successful claim that we do not have title to one or more of our properties or lack appropriate water rights could cause us to lose any rights to explore, develop and extract any minerals on that property, without compensation for our prior expenditures relating to such property. Our business may suffer a material adverse effect in the event one or more of our properties are determined to have title deficiencies.

In some instances, we have received access rights or easements from third parties, which allow for a more efficient operation than would exist without the access or easement. A third party could take action to suspend the access or easement, and any such action could be materially adverse to our results of operations or financial condition.

See Part I, Item 1. Our Business - Regulation and Legislation, in this Annual Report on Form 10-K.

We and our customers are subject to extensive environmental and health and safety regulations which impose, and will continue to impose, significant costs and liabilities. In addition, future regulations, or more stringent enforcement of existing regulations, could increase those costs and liabilities, which could adversely affect our results of operations.

We are subject to a variety of federal, state and local regulatory environmental requirements affecting the mining and mineral processing industry, including among others, those relating to employee health and safety, environmental permitting and licensing, air and water emissions, greenhouse gas emissions, water pollution, waste management, remediation of soil and groundwater contamination, land use, reclamation and restoration of properties, hazardous materials and natural resources. These laws, regulations and permits have had, and will continue to have, a significant effect on our business. Some environmental laws impose substantial penalties for noncompliance, and others, such as CERCLA, impose strict, retroactive and joint and several liability for the remediation of releases of hazardous substances. Liability under CERCLA, or similar state and local laws, may be imposed as a result of conduct that was lawful at the time it occurred or for the conduct of, or conditions caused by, prior operators or other third parties. Failure to properly handle, transport, store or dispose of hazardous materials or otherwise conduct our operations in compliance with environmental laws could expose us to liability for governmental penalties, cleanup costs and civil or criminal liability associated with releases of such materials into the environment, damages to property or natural resources and other damages, as well as potentially impair our ability to conduct our operations. In addition, future environmental laws and regulations could restrict our ability to expand our facilities or extract our mineral deposits or could require us to acquire costly equipment or to incur other significant expenses in connection with our business. Future events, including changes in any environmental requirements (or their interpretation or enforcement) and the costs associated with complying with such requirements, could have a material adverse effect on us.

Any failure by us to comply with applicable environmental laws and regulations may cause governmental authorities to take actions that could adversely impact our operations and financial condition, including:

•issuance of administrative, civil and criminal penalties;
•denial, modification or revocation of permits or other authorizations;
•imposition of injunctive obligations or other limitations on our operations, including cessation of operations; and
•requirements to perform site investigatory, remedial or other corrective actions.

Moreover, environmental requirements, and the interpretation and enforcement thereof, change frequently and have tended to become more stringent over time. For example, greenhouse gas emission regulation is becoming more rigorous. We expect to be required to report annual greenhouse gas emissions from our operations to the EPA, and additional greenhouse gas emission related requirements at the supranational, federal, state, regional and local levels are in various stages of development. The U.S. Congress has considered, and may adopt in the future, various legislative proposals to address climate change, including a nationwide limit on greenhouse gas emissions. In addition, the EPA has issued regulations, including the “Tailoring Rule,” that subject greenhouse gas emissions from certain stationary sources to the Prevention of Significant Deterioration and Title V provisions of the federal Clean Air Act. Any such regulations could require us to modify existing permits or obtain new permits, implement additional pollution control technology, curtail operations or increase significantly our operating costs. Any regulation of

greenhouse gas emissions, including, for example, through a cap-and-trade system, technology mandate, emissions tax, reporting requirement or other program, could adversely affect our business, financial condition, reputation, operating performance and product demand.

In addition to environmental regulation, we are subject to laws and regulations relating to human exposure to crystalline silica. Several federal and state regulatory authorities, including MSHA and OSHA, may continue to propose changes in their regulations regarding workplace exposure to crystalline silica, such as permissible exposure limits and required controls and personal protective equipment. For instance, in June 2016, OSHA issued final regulations that will reduce permissible exposure

limits to 50 micrograms of respirable crystalline silica per cubic meter of air, averaged over an 8-hour day.

We may not be able to comply with any new laws and regulations that are adopted, and any new laws and regulations could have a material adverse effect on our operating results by requiring us to modify our operations or equipment or shut down some or all of our plants. Additionally, our customers may not be able to comply with any new laws and regulations, and any new laws and regulations could have a material adverse effect on our customers by requiring them to shut down old plants or to relocate plants to locations with less stringent regulations farther away from our facilities. We cannot at this time reasonably estimate our costs of compliance or the timing of any costs associated with any new laws and regulations, or any material adverse effect that any new standards will have on our customers and, consequently, on our operations.

We are subject to various lawsuits relating to the actual or alleged exposure of persons to silica. See the risk factor discussing silica-related health issues and litigation below for more information about these risks.

We are subject to the Mine Act, which imposes stringent health and safety standards on numerous aspects of our operations.

Our operations are subject to the Mine Act, as amended by the Mine Improvement and New Emergency Response Act of 2006, which imposes stringent health and safety standards on numerous aspects of mineral extraction and processing operations, including the training of personnel, operating procedures, operating equipment and other matters. Our failure to comply with such standards, or changes in such standards or the interpretation or enforcement thereof, could have a material adverse effect on our business and financial condition or otherwise impose significant restrictions on our ability to conduct mineral extraction and processing operations.

We and our customers are subject to other extensive regulations, including licensing, plant and wildlife protection and reclamation regulation, which impose, and will continue to impose, significant costs and liabilities. In addition, future regulations, or more stringent enforcement of existing regulations, could increase those costs and liabilities, which could adversely affect our results of operations.

In addition to the regulatory matters described above, we and our customers are subject to extensive governmental regulation on matters such as permitting and licensing requirements, plant and wildlife protection, wetlands protection, reclamation and restoration of mining properties after mining is completed, the discharge of materials into the environment and the effects that mining and hydraulic fracturing have on groundwater quality and availability.

Our future success depends, among other things, on the quantity of our commercial silica and other mineral deposits and our ability to extract these deposits profitably, and our customers being able to operate their businesses as they currently do.

In order to obtain permits and renewals of permits in the future, we may be required to prepare and present data to governmental authorities pertaining to the impact that any proposed exploration or production activities may have on the environment. Certain approval procedures may require preparation of archaeological surveys, endangered species studies and other studies to assess the environmental impact of new sites or the expansion of existing sites. Compliance with these regulatory requirements is expensive and significantly lengthens the time needed to develop a site. Finally, obtaining or renewing required permits is sometimes delayed or prevented due to community opposition and other factors beyond our control. The denial of a permit essential to our operations or the imposition of conditions with which it is not practicable or feasible to comply could impair or prevent our ability to develop or expand a site. Significant opposition to a permit by neighboring property owners, members of the public or other third parties or delay in the environmental review and permitting process also could impair or delay our ability to develop or expand a site. New legal requirements, including those related to the protection of the environment, could be adopted that could materially adversely affect our mining operations (including our ability to extract mineral deposits), our cost structure or our customers' ability to use our commercial silica products. Such current or future regulations could have a material adverse effect on our business and we may not be able to obtain or renew permits in the future.

Our trucking services are highly regulated, and increased direct and indirect costs of compliance with, or liability for violation of, existing or future regulations could have a material adverse effect on our business.

The DOT and various state agencies exercise broad powers over our trucking services, generally governing matters including authorization to engage in motor carrier service, equipment operation, safety, and financial reporting. In the future, we may become subject to new or more restrictive regulations, such as regulations relating to engine exhaust

emissions, hours of service that our drivers may provide in any one-time period, security and other matters, which could substantially impair equipment productivity and increase our costs. In addition, our operations most comply with the Fair Labor Standard Act, which governs such matters as wages and overtime, and which is administered by the Department of Labor ("DOL"). We may be audited periodically by the DOT or the DOL to ensure that we are in compliance with various safety, hours-of-service, wage and other rules and regulations. If we were found to be out of compliance, the DOT or the DOL could restrict or otherwise impact our trucking services, which would adversely affect our profitability and results of operations.

Silica-related health issues and litigation could have a material adverse effect on our business, reputation or results of operations.

The inhalation of respirable crystalline silica is associated with the lung disease silicosis. There is evidence of an association between crystalline silica exposure or silicosis and lung cancer and a possible association with other diseases, including immune system disorders such as scleroderma. These health risks have been, and may continue to be, a significant issue confronting the commercial silica industry. Concerns over silicosis and other potential adverse health effects, as well as concerns regarding potential liability from the use of silica, may have the effect of discouraging our customers' use of our silica products. The actual or perceived health risks of mining, processing and handling silica could materially and adversely affect silica producers, including us, through reduced use of silica products, the threat of product liability or employee lawsuits, increased scrutiny by federal, state and local regulatory authorities of us and our customers or reduced financing sources available to the commercial silica industry.

Since at least 1975, we and/or our predecessors have been named as a defendant, usually among many defendants, in numerous products liability lawsuits brought by or on behalf of current or former employees of our customers alleging damages caused by silica exposure. As of December 31, 2018, there were 74 active silica-related products liability claims pending in which U.S. Silica is a defendant. Almost all of the claims pending against us arise out of the alleged use of our silica products in foundries or as an abrasive blast media, involve various other defendants and have been filed in the states of Texas, Louisiana and Mississippi, although some cases have been brought in many other jurisdictions over the years.

Prior to the fourth quarter of 2012, we had insurance policies for both our predecessors that covered certain claims for alleged silica exposure for periods prior to certain dates in 1985 and 1986 (with respect to various insurance). As a result of a settlement with a former owner and its insurers in the fourth quarter of 2012, some of these policies are no longer available to us and we will not seek reimbursement for any defense costs or claim payments from these policies. Other insurance policies, however, continue to remain available to us and will continue to make such payments on our behalf. The silica-related litigation brought against us to date and associated litigation costs, settlements and verdicts have not resulted in a material liability to us to date. However, we continue to have silica exposure claims filed against us, including claims that allege silica exposure for periods not covered by insurance, and the costs, outcome and impact to us of any pending or future claims is not certain. Any such pending or future claims or inadequacies of our insurance coverage could have a material adverse effect on our business, reputation, financial condition, results of operations, cash flows and prospects. For further information, see Item 3. Legal Proceedings.

Due to the international nature of our business we could be adversely affected by violations of the U.S. Foreign Corrupt Practices Act, similar worldwide anti-bribery laws, and various international trade and import/export laws.

The U.S. Foreign Corrupt Practices Act ("FCPA") and similar anti-bribery laws in other jurisdictions generally prohibit U.S. based companies and their intermediaries from making improper payments to non-U.S. officials for the purpose of obtaining or retaining business. We operate in parts of the world that experience government corruption to some degree, and, in certain circumstances, compliance with anti-corruption laws may conflict with those local customs and practices. Although we maintain policies, procedures and controls, and deliver training, designed to ensure compliance with anti-corruption laws, such efforts will not always protect us from reckless or criminal acts committed by our employees or agents. If we are found to be liable for FCPA or other regulatory violations (either due to our own acts or our inadvertence, or due to the acts or inadvertence of others), we could suffer from criminal or civil penalties or other sanctions, which could have a material adverse effect on our business and results of operations.

We may be exposed to certain regulatory and financial risks related to climate change.

Growing concerns about climate change may result in the imposition of additional regulations or restrictions to which we may become subject. Climate changes include changes in rainfall and in storm patterns and intensities, water shortages, significantly changing sea levels and increasing atmospheric and water temperatures, among others. A number of governments or governmental bodies have introduced or are contemplating regulatory changes in response to climate change, including regulating greenhouse gas emissions. Potentially, additional U.S. federal regulation will be forthcoming with respect to greenhouse gas emissions (including carbon dioxide) and/or "cap and trade" legislation that could impact our operations.

We are subject to foreign government regulation that could negatively impact our business.

We are subject to government regulation in non-U.S. jurisdictions in which we conduct our business. The requirements for compliance with these laws and regulations may be unclear or indeterminate and may involve significant costs, including additional capital expenditures or increased operating expenses, or require changes in business practice, in each case that could result in reduced profitability for our business. Our having to comply with these foreign laws or regulations may provide a competitive advantage to competitors who are not subject to comparable restrictions or prevent us from taking advantage of

growth opportunities. Determination of noncompliance can result in penalties or sanctions that could also adversely impact our operating results and financial condition.

Strategic & General Business Risks

We may not be able to successfully implement capacity expansion plans within our projected timetable, the actual costs of any capacity expansion may exceed our estimated costs, and we may not be able to secure demand for the incremental production capacity. In addition, actual operating costs once we have completed the capacity expansion may be higher than anticipated.

We undertake projects from time to time to expand our production capacity. The completion of these projects may be affected by market conditions and demand for our products. In addition, under our current business plan, we expect to fund any expansion plans through a combination of cash on our balance sheet and cash generated from our operating and financing activities. If the assumptions on which we base our estimated capital expenditures change or are inaccurate, we may require additional funding. Such funding may not be available on terms acceptable to us, or at all. Moreover, actual operating costs once we have completed a capacity expansion may be higher than initially anticipated. We also may not secure off-take commitments for the incremental production from our capacity expansion plans, and we may not be able to secure adequate demand for the incremental production. Furthermore, substantial investments in transportation infrastructure may be required to effectively execute the capacity expansion, and we may not be successful in expanding our logistical capabilities to accommodate the additional production capacity.

Any failure to successfully implement capacity expansion plans due to an inability to obtain necessary permits, insufficient funding, delays, unanticipated costs, adverse market conditions or other factors, or failure to realize the anticipated benefits of our capacity expansion plans, including securing demand for the incremental production, could have a material adverse effect on our business, financial condition and results of operations.

If we cannot successfully complete acquisitions or integrate acquired businesses, our growth may be limited, and our financial condition may be adversely affected.

Our business strategy includes supplementing internal growth by pursuing acquisitions of complementary businesses. Any acquisition involves potential risks, including, among other things:

•the validity of our assumptions about mineral reserves, future production, sales, capital expenditures, operating expenses and costs, including synergies;
•an inability to successfully integrate the businesses we acquire;
•the use of a significant portion of our available cash or borrowing capacity to finance acquisitions and the subsequent decrease in our liquidity;
•a significant increase in our interest expense or financial leverage if we incur additional debt to finance acquisitions;
•the assumption of unknown liabilities, losses or costs for which we are not indemnified or for which our indemnity is inadequate;
•the diversion of management’s attention from other business concerns;
•an inability to hire, train or retain qualified personnel both to manage and to operate our growing business and assets;
•the incurrence of other significant charges, such as impairment of goodwill or other intangible assets, asset devaluation or restructuring charges;
•unforeseen difficulties encountered in operating in new geographic areas;
•customer or key employee losses at the acquired businesses; and
•the accuracy of data obtained from production reports and engineering studies, geophysical and geological analyses and other information used when deciding to acquire a property, the results of which are often inconclusive and subject to various interpretations.

If we cannot successfully complete acquisitions or integrate acquired businesses, our growth may be limited, and our financial condition may be adversely affected.

We may continue to expand our business through acquisitions and we may incur additional indebtedness, including indebtedness related to acquisitions.

Our business strategy includes supplementing internal growth by pursuing acquisitions of complementary businesses. As a result, we may incur substantial additional indebtedness in connection with acquisitions. Any such additional

indebtedness

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and the related debt service obligations could have important consequences and risks for us, including:
•reducing flexibility in planning for, or reacting to, changes in our businesses, the competitive environment and the industries in which we operate, and to technological and other changes;
•reducing access to capital and increasing borrowing costs generally or for any additional indebtedness to finance future operating and capital expenses and for general corporate purposes;
•reducing funds available for operations, capital expenditures and other activities;
•creating competitive disadvantages relative to other companies with lower debt levels; and
•lowering credit ratings.

Anti-takeover provisions in our charter documents and Delaware law might discourage or delay acquisition attempts for us that you might consider favorable.

Our certificate of incorporation and bylaws contain provisions that may make the acquisition of our company more difficult without the approval of our Board. These provisions:
•authorize the issuance of undesignated preferred stock, the terms of which may be established and the shares of which may be issued without stockholder approval, and which may include super voting, special approval, dividend, or other rights or preferences superior to the rights of the holders of common stock;
•prohibit stockholder action by written consent, which requires all stockholder actions to be taken at a meeting of our stockholders;
•provide that the Board is expressly authorized to make, alter or repeal our bylaws; and
•establish advance notice requirements for nominations for elections to our Board or for proposing matters that can be acted upon by stockholders at stockholder meetings.

Our certificate of incorporation also contains a provision that provides us with protections similar to Section 203 of the Delaware General Corporation Law (the "DGCL"), and will prevent us from engaging in a business combination with a person who acquires at least 15% of our common stock for a period of three years from the date such person acquired such common stock, unless Board or stockholder approval is obtained prior to the acquisition. These anti-takeover provisions and other provisions under Delaware law could discourage, delay or prevent a transaction involving a change in control of our company, even if doing so would benefit our stockholders. These provisions could also discourage proxy contests and make it more difficult for you and other stockholders to elect directors of your choosing and to cause us to take other corporate actions you desire.

We rely upon patents, trade secrets and contractual restrictions to protect our proprietary rights. Failure to protect our intellectual property rights may undermine our competitive position and protecting our rights or defending against third-party allegations of infringement may be costly.

Our commercial success depends on our proprietary information and technologies, know-how and other intellectual property. Because of the technical nature of our business, we rely primarily on patents, trade secrets, trademarks and contractual restrictions to protect our intellectual property rights. The measures we take to protect our patents, trade secrets and other intellectual property rights may be insufficient. Failure to protect, monitor and control the use of our existing intellectual property rights could cause us to lose our competitive advantage and incur significant expenses. It is possible that our competitors or others could independently develop the same or similar technologies or otherwise obtain access to our unpatented technologies. In such case, our patents and trade secrets would not prevent third parties from competing with us. As a result, our results of operations may be adversely affected. Furthermore, third parties or employees may infringe or misappropriate our proprietary technologies or other intellectual property rights, which could also harm our business and results of operations. Policing unauthorized use of intellectual property rights can be difficult and expensive, and adequate remedies may not be available.

In addition, third parties may claim that our products infringe or otherwise violate their patents or other proprietary rights and seek corresponding damages or injunctive relief. Defending ourselves against such claims, with or without merit, could be time-consuming and result in costly litigation. An adverse outcome in any such litigation could subject us to significant liability to third parties (potentially including treble damages) or temporary or permanent injunctions prohibiting the manufacture or sale of our products, the use of our technologies or the conduct of our business. Any adverse outcome could also require us to seek licenses from third parties (which may not be available on acceptable terms, or at all) or to make substantial one-time or ongoing royalty payments. Protracted litigation could also result in

our customers or potential customers deferring or limiting their purchase or use of our products until resolution of such litigation. In addition, we may not have insurance coverage in connection with such litigation and may have to bear all costs arising from any such litigation to the extent we are unable to

recover them from other parties. Any of these outcomes could have a material adverse effect on our business, financial condition, results of operations, cash flows and prospects.

A terrorist attack or armed conflict could harm our business.

Terrorist activities, anti-terrorist efforts and other armed conflicts involving the United States could adversely affect the U.S. and global economies and could prevent us from meeting financial and other obligations. We could experience loss of business, delays or defaults in payments from payors or disruptions of fuel supplies and markets if pipelines, production facilities, processing plants or refineries are direct targets or indirect casualties of an act of terror or war. Such activities could reduce the overall demand for oil and natural gas, which, in turn, could also reduce the demand for our products and services. Terrorist activities and the threat of potential terrorist activities and any resulting economic downturn could adversely affect our results of operations, impair our ability to raise capital or otherwise adversely impact our ability to realize certain business strategies.

Our insurance may not fully cover all potential exposures.

We maintain property, general liability, business interruption, casualty, and other insurance, but such insurance may not cover all risks associated with the hazards of our business and is subject to limitations, including deductibles and coverage limits. We may incur losses beyond the limits, or outside the coverage, of our insurance policies, including liabilities for environmental remediation. We are potentially at additional risk if one or more of our insurance carriers fail. Additionally, severe disruptions in the domestic and global financial markets could adversely impact the ratings and survival of some insurers. Future downgrades in the ratings of enough insurers could adversely impact both the availability of appropriate insurance coverage and its cost. In the future, we may not be able to obtain coverage at current levels, if at all, and our premiums may increase significantly on coverage that we maintain.

Capital Resources & Stock Ownership Risks

We will be required to make substantial capital expenditures to maintain, develop and increase our asset base. The inability to obtain needed capital or financing on satisfactory terms, or at all, could have an adverse effect on our growth and profitability.

Although we currently use a significant amount of our cash reserves and cash generated from our operations to fund the maintenance and development of our existing mineral reserves and our acquisitions of new mineral reserves, we may need to depend on external sources of capital to fund future capital expenditures. Our ability to obtain bank financing or to access the capital markets for future equity or debt offerings may be limited by our financial condition at the time of any such financing or offering, the covenants contained in our existing credit facilities or future debt agreements, adverse market conditions or other contingencies and uncertainties that are beyond our control. Our failure to obtain the funds necessary to maintain, develop and increase our asset base could adversely impact our growth and profitability.

Even if we are able to obtain financing or access the capital markets, incurring additional debt may significantly increase our interest expense and financial leverage, and our level of indebtedness could restrict our ability to fund future development and acquisition activities. In addition, the issuance of additional common stock in an equity offering may result in significant stockholder dilution. Further, we may incur substantial costs in pursuing any capital-raising transactions, including investment banking, legal and accounting fees, which may not be adequately offset by the proceeds from the transaction.

Our substantial indebtedness and pension obligations could adversely affect our financial flexibility and our competitive position.

We have, and we expect to maintain in the near term, a significant amount of indebtedness. On May 1, 2018, we entered into the Credit Agreement. The Credit Agreement increased our existing senior debt by entering into a new $1.380 billion Credit Facility, consisting of a $1.280 billion Term Loan and a $100 million Revolver that may also be used for swingline loans or letters of credit, and we may elect to increase the Term Loan in accordance with the terms of the Credit Agreement.

As of December 31, 2018, we had $1.270 billion of outstanding indebtedness. Under our Credit Agreement, as of December 31, 2018, we had a $100.0 million line-of-credit, of which $4.8 million is being used for outstanding letters of credit, leaving $95.2 million of borrowing availability. Our substantial level of indebtedness increases the risk that we may be unable to generate cash sufficient to pay amounts due in respect of our indebtedness. We also have, and

will continue to have, significant pension obligations. As of December 31, 2018, our unfunded pension and post-retirement benefit obligations totaled $36.5 million and $21.6 million, respectively. Our substantial indebtedness and pension and post-retirement benefit obligations could have other important consequences to you and significant effects on our business. For example, they could:

•increase our vulnerability to adverse changes in general economic, industry and competitive conditions;

•require us to dedicate a substantial portion of our cash flow from operations to make payments on our indebtedness and pension obligations, thereby reducing the availability of our cash flow to fund working capital, capital expenditures and other general corporate purposes;
•limit our flexibility in planning for, or reacting to, changes in our business and the industry in which we operate;
•restrict us from exploiting business opportunities;
•make it more difficult to satisfy our financial obligations, including payments on our indebtedness;
•place us at a disadvantage compared to our competitors that have less debt and pension obligations; and
•limit our ability to borrow additional funds for working capital, capital expenditures, acquisitions, debt service requirements, execution of our business strategy or other general corporate purposes.

In addition, the amounts owed under the Credit Agreement use LIBOR as a benchmark for establishing the rate at which interest accrues. LIBOR is the subject of recent national, international and other regulatory guidance and proposals for reform. These reforms and other pressures may cause LIBOR to disappear entirely or to perform differently than in the past. The consequences of these developments cannot be entirely predicted, but could include an increase in the cost to us of this indebtedness.

Our Credit Agreement contains certain restrictions and financial covenants that may restrict our business and financing activities.

Our existing Credit Agreement contains, and any future financing agreements that we may enter into will likely contain, operating and financial restrictions and covenants that may restrict our ability to finance future operations or capital needs or to engage in, expand or pursue our business activities.

Our ability to comply with these restrictions and covenants is uncertain and will be affected by the levels of cash flow from our operations and events or circumstances beyond our control. If market or other economic conditions deteriorate, our ability to comply with these covenants may be impaired. If we violate any of the restrictions, covenants, ratios or tests in our Credit Agreement, a significant portion of our indebtedness may become immediately due and payable and our lenders' commitment to make further loans to us may terminate. We might not have, or be able to obtain, sufficient funds to make these accelerated payments. In addition, our obligations under our Credit Agreement are secured by substantially all of our assets, and if we are unable to repay our indebtedness under our Credit Agreement, the lenders could seek to foreclose on our assets.

We may incur substantial debt in the future to enable us to maintain or increase our production levels and to otherwise pursue our business plan. This debt may impair our ability to operate our business.

Our business plan requires a significant amount of capital expenditures to maintain and grow our production levels. If commercial silica prices were to decline for an extended period of time, if the costs of our acquisition and development operations were to increase substantially or if other events were to occur which reduced our sales or increased our costs, we may be required to borrow significant amounts in the future to enable us to finance the expenditures necessary to replace the reserves we produce. The cost of the borrowings and our obligations to repay the borrowings could have important consequences to us, including:

•our ability to obtain additional financing, if necessary, for working capital, capital expenditures, acquisitions or other purposes may be impaired, or such financing may not be available on favorable terms, or at all;
•covenants contained in our existing and future credit and debt arrangements will require us to meet financial tests that may affect our flexibility in planning for, and reacting to, changes in our business, including possible acquisition opportunities;
•we will need a substantial portion of our cash flow to make principal and interest payments on our indebtedness and to improve the funded status of our defined benefit pension plan, reducing the funds that would otherwise be available for operations and future business opportunities; and
•our debt level will make us more vulnerable than our less leveraged competitors to competitive pressures or a downturn in our business or the economy generally.

Our ability to service our indebtedness will depend on, among other things, our future financial and operating performance, which will be affected by prevailing economic conditions and financial, business, regulatory and other factors, some of which are beyond our control. If our operating results are not sufficient to service our current or future indebtedness, we will be forced to take actions such as reducing or delaying business activities, acquisitions,

investments and/or capital expenditures; selling assets; restructuring or refinancing our indebtedness; or seeking additional equity capital or bankruptcy protection. We may not be able to affect any of these remedies on satisfactory terms or at all.

We may have to utilize significant cash to meet our unfunded pension obligations and post-retirement health care liabilities and these obligations are subject to increase.

Many of our employees participate in our defined benefit pension plans. In 2018, we made contribution payments totaling $3.4 million toward reducing the unfunded liability of our defined benefit pension plans. Declines in interest rates or the market values of the securities held by the plans, or other adverse changes, could materially increase the underfunded status of our plans and affect the level and timing of required cash contributions. To the extent we use cash to reduce these unfunded liabilities, the amount of cash available for our working capital needs would be reduced. In addition, under the Employee Retirement Income Security Act of 1974, as amended ("ERISA"), the Pension Benefit Guaranty Corporation ("PBGC") has the authority to institute proceedings to terminate a pension plan if (1) the plan has not met the minimum funding requirements, (2) the plan cannot pay current benefits when due, (3) a lump sum payment has been made to a participant who is a substantial owner of the sponsoring company (and certain other technical conditions exist) or (4) the loss to the PBGC is reasonably expected to increase unreasonably over time if the plan is not terminated. In the event our tax-qualified pension plans are terminated by the PBGC, we could be liable to the PBGC for the underfunded amount, which could trigger default provisions in our credit facilities. As of December 31, 2018 and 2017, our pension obligation was $138.9 million and $122.1 million, respectively, with plan assets of $102.4 million and $92.1 million, respectively. The amount of cash ultimately required to fund these obligations will vary based on a number of factors including future return on assets, mortality rates and other such actuarial assumptions. Based on current assumptions, we expect to pay $10.0 million in the year 2019, a total of $18.4 million for the two-year period from 2020 through 2021, a total of $18.8 million for the two-year period from 2022 through 2023 and a total of $47.7 million thereafter.

We also have a post-retirement health and life insurance plan for many of our employees. The post-retirement benefit plan is unfunded. We derive post-retirement benefit expense from an actuarial calculation based on the provisions of the plan and a number of assumptions provided by us including information about employee demographics, retirement age, future health care costs, turnover, mortality, discount rate, amount and timing of claims and a health care inflation trend rate. We previously maintained a Voluntary Employees' Beneficiary Association trust that was used to partially fund health care benefits for future retirees. Benefits were funded to the extent contributions were tax deductible, which under current legislation is limited. In 2017, the trust terminated upon depletion of its assets, which were used in accordance with trust terms. In general, retiree health benefits are paid as covered expenses are incurred. Our post-retirement healthcare obligations were $21.6 million and $22.8 million as of December 31, 2018 and 2017, respectively. Based on current assumptions, we expect to pay $1.4 million in the year 2019, a total of $2.9 million for the two-year period from 2020 through 2021, a total of $3.1 million for the two-year period from 2022 through 2023 and a total of $7.4 million thereafter.

See Part II, Item 8. Management's Discussion and Analysis of Financial Condition and Results of Operations - Contractual Obligations, in this Annual Report on Form 10-K.

Our inability to acquire, maintain or renew financial assurances related to the reclamation and restoration of mining property could have a material adverse effect on our business, financial condition and results of operations.

We are generally obligated to restore property in accordance with regulatory standards and our approved reclamation plan after it has been mined. We are required under federal, state and local laws to maintain financial assurances, such as surety bonds, to secure such obligations. The inability to acquire, maintain or renew such assurances, as required by federal, state and local laws, could subject us to fines and penalties as well as the revocation of our operating permits. Such inability could result from a variety of factors, including:

•the lack of availability, higher expense or unreasonable terms of such financial assurances;
•the ability of current and future financial assurance counterparties to increase required collateral; and
•the exercise by financial assurance counterparties of any rights to refuse to renew the financial assurance instruments.

Our inability to acquire, maintain or renew necessary financial assurances related to the reclamation and restoration of mining property could have a material adverse effect on our business, financial condition and results of operations.

Our stock price and trading volume could be volatile, and you may not be able to resell shares of your common stock at or above the price you paid, if at all.

The stock market has and continues to experience extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of the underlying businesses. These broad market fluctuations may adversely affect the market price of our common stock, regardless of our actual operating performance.

In addition to the other risks described in this section, the market price of our common stock may fluctuate significantly in response to a number of factors, many of which we cannot control, including:

- quarterly variations in our operating results compared to market expectations;
- announcements of acquisitions of or investments in other businesses and properties or dispositions;
- changes in preferences of our customers;
- announcements of new services or products or significant price reductions by us or our competitors;
- size of the public float;
- stock price performance of our competitors;
- fluctuations in general stock market prices and volumes;
- default on our indebtedness or foreclosure on our properties;
- actions by competitors;
- changes in our management team or key personnel;
- changes in ratings and financial estimates by securities analysts;
- negative earnings or other announcements by us or other industrial companies;
- downgrades in our credit ratings or the credit ratings of our competitors;
- changes in investor sentiment towards companies in the oil and gas industries;
- changes in prices of oil and gas;
- issuances of capital stock; and
- global economic, legal and regulatory factors unrelated to our performance.

Numerous factors affect our business and cause variations in our operating results and affect our sales levels, including overall economic trends, our ability to identify and respond effectively to customer preferences, actions by competitors, pricing, the level of customer service that we provide, changes in product mix or sales channels, our ability to source and distribute products effectively and weather conditions.

Volatility in the market price or trading volume of our common stock may prevent investors from being able to sell their common stock at or above the price at which you purchased the stock. As a result, you may suffer a loss on your investment.

Securities class action litigation has often been instituted against companies following periods of volatility in the overall market and in the market price of a company’s securities. This litigation, if instituted against us, could result in substantial costs, reduce our profits, divert our management’s attention and resources and harm our business.

If securities or industry analysts do not publish research or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.

The trading market for our common stock depends in part on the research and reports that securities or industry analysts publish about us or our business. If one or more of the analysts who covers us downgrades our stock or publishes inaccurate or unfavorable research about our business, our stock price would likely decline. If one or more of these analysts ceases coverage of us or fails to publish reports on us regularly, demand for our stock could decrease, which could cause our stock price and trading volume to decline.

Holders of our common stock may not receive dividends on our common stock.

Holders of our common stock are entitled to receive only such dividends as our Board may declare out of funds legally available for such payments. We are incorporated in Delaware and are governed by the DGCL. The DGCL allows a corporation to pay dividends only out of a surplus, as determined under Delaware law or, if there is no surplus, out of net profits for the fiscal year in which the dividend was declared and for the preceding fiscal year. Under the DGCL, however, we cannot pay

dividends out of net profits if, after we pay the dividend, our capital would be less than the capital represented by the outstanding stock of all classes having a preference upon the distribution of assets. Any determination to pay dividends and other distributions in cash, stock or property by us in the future will be at the discretion of our Board and will be dependent on then-existing conditions, including business conditions, our financial condition, results of operations, liquidity, capital requirements, the ability of our subsidiaries to pay us dividends or make other distributions to us, contractual restrictions including restrictive covenants contained in debt agreements and other factors. We are not required to declare future cash dividends on our common stock.

Future sales of our common stock could lower our share price, and any additional capital raised by us through the sale of equity or convertible debt securities may dilute your ownership in us and may adversely affect the market price of our common stock.

We may sell additional shares of common stock in subsequent offerings. We may also issue additional common stock or convertible debt securities. As of February 14, 2019, we had 500,000,000 shares of common stock authorized, and 81,927,736 and 73,152,701 common stock issued and outstanding, respectively.

We cannot predict the size of future issuances or sales of shares of our common stock or the effect, if any, that future issuances and sales of shares of our common stock will have on the market price of our common stock. Sales of substantial amounts of our common stock (including sales by members of management and shares that may be issued in connection with an acquisition), or the perception that such sales could occur, may adversely affect prevailing market prices for our common stock.

U.S. Silica Holdings, Inc. is a holding company with no operations of its own. Because our operations are conducted almost entirely through our subsidiaries, we are largely dependent on our receipt of distributions and dividends or other payments from our subsidiaries for cash to fund all of our operations and expenses, including to make future dividend payments, if any.

Our operations are conducted almost entirely through our subsidiaries and our ability to generate cash to meet our debt service obligations or to make future dividend payments, if any, is highly dependent on the earnings and the receipt of funds from our subsidiaries in the form of dividends, loans or advances and through repayment of loans or advances from us. Payments to us by our subsidiaries will be contingent upon our subsidiaries' earnings and other business considerations and may be subject to statutory or contractual restrictions. To the extent that we determine in the future to pay dividends on our common stock, the Credit Agreement imposes certain restrictions on the ability of our subsidiaries to pay dividends or otherwise transfer assets to us. In addition, Delaware law imposes requirements that may restrict our ability to pay dividends to holders of our common stock.

We may need to recognize impairment charges related to goodwill, identifiable intangible assets and fixed assets, in which case our net earnings and net worth could be materially adversely affected.

Under the acquisition method of accounting, net assets acquired are recorded at fair value as of the acquisition date, with any excess purchase price allocated to goodwill. Our acquisitions have resulted in significant balances of goodwill and identifiable intangible assets. There is significant judgment required in the analysis of a potential impairment of goodwill, identified intangible assets and fixed assets. If, as a result of a general economic slowdown, deterioration in one or more of the markets in which we operate, impairment in our financial performance and/or future outlook or decline in our market capitalization for other factors, the estimated fair value of our long-lived assets or goodwill decreases, we may determine that one or more of our long-lived assets or our goodwill is impaired. An impairment charge would be determined based on the estimated fair value of the assets, and any such impairment charge could have a material adverse effect on our results of operations and financial position.

Labor & Employment Risks

A shortage of skilled labor together with rising labor costs in the mining industry may further increase operating costs, which could adversely affect our results of operations.

Efficient mining using modern techniques and equipment requires skilled laborers, preferably with several years of experience and proficiency in multiple mining tasks, including processing of mined minerals. If the shortage of experienced labor continues or worsens or if we are unable to train the necessary number of skilled laborers, there could be an adverse impact on our labor productivity and costs and our ability to grow our business may be limited.

Our business may suffer if we are unable to attract and retain key personnel.

We depend to a large extent on the services of our senior management team and other key personnel. Members of our

senior management and other key employees have extensive experience and expertise in evaluating and analyzing industrial mineral properties, maximizing production from such properties, marketing industrial mineral production and developing and executing financing and hedging strategies. Competition for management and key personnel is intense, and the pool of qualified candidates is limited. The loss of any of these individuals or the failure to attract additional personnel, as needed, could have a material adverse effect on our operations and could lead to higher labor costs or the use of less-qualified personnel. In addition, if any of our executives or other key employees were to join a competitor or form a competing company, we could lose customers, suppliers, know-how and key personnel. We do not maintain key-man life insurance with respect to any of our employees. Our success will be dependent on our ability to continue to attract, employ and retain highly skilled personnel.

Difficulty in truckload driver and independent contractor recruitment and retention may have a materially adverse effect on our business.

With respect to our trucking services, difficulty in attracting or retaining qualified drivers and independent contractors could have a materially adverse effect on our growth and profitability. The truckload transportation industry periodically experiences a shortage of qualified drivers, particularly during periods of economic expansion, in which alternative employment opportunities are more plentiful and freight demand increases, or during periods of economic downturns, in which unemployment benefits might be extended and financing is limited for independent contractors who seek to purchase equipment or for students who seek financial aid for driving school. Our independent contractors are responsible for paying for their own equipment, fuel, and other operating costs, and significant increases in these costs could cause them to seek higher compensation from us or seek other opportunities within or outside the trucking industry. The trucking industry suffers from a high driver turnover rate, which requires us to continually recruit a substantial number of drivers to operate our equipment. If we were unable to attract qualified drivers and contract with independent contractors, we could be forced to, among other things, limit our growth, decrease the number of our tractors in service, adjust our driver compensation package or independent contractor compensation, or pay higher rates to third-party truckload carriers, which could adversely affect our profitability and results of operations if not offset by a corresponding increase in customer rates.

Our profitability could be negatively affected if we fail to maintain satisfactory labor relations.

As of December 31, 2018, various labor unions represented approximately 17% of our hourly employees. If we are unable to renegotiate acceptable collective bargaining agreements with these labor unions in the future, we could experience, among other things, strikes, work stoppages or other slowdowns by our workers and increased operating costs as a result of higher wages, health care costs or benefits paid to our employees. An inability to maintain good relations with our workforce could cause a material adverse effect on our business and results of operations.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Our corporate headquarters is located in Katy, Texas. In addition, we maintain corporate support centers and sales offices in Frederick, Maryland, Reno, Nevada, Chicago, Illinois and Houston, Texas.

As of December 31, 2018, we operate 27 production facilities located primarily in the eastern half of the United States, with operations in Alabama, Illinois (2), Louisiana, Michigan, Missouri (2), New Jersey, Oklahoma, Mississippi, Nebraska, Nevada (3), Oregon, Pennsylvania, South Carolina, Tennessee (2), Texas (5), Virginia, West Virginia and Wisconsin. We own a brownfield site under development in Georgia. We also operate several transload sites via service contracts with our transload operating partners.

Additionally, we operate corporate laboratories located at our Berkeley Springs, West Virginia and Reno, Nevada locations that provide critical technical expertise, analytical testing resources and application development to promote product value and cost savings.

We generally own our principal production properties, although some land is leased. Substantially all of our owned assets are pledged as security under the Credit Agreement; for additional information regarding our indebtedness see Note K - Debt to our Consolidated Financial Statements in Part II, Item 8. of this Annual Report on Form 10-K.

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Corporate offices, including sales locations are leased. In general, we consider our facilities, taken as a whole, to be suitable and adequate for our current operations.

Our Production Facilities

The following is a detailed description of our 27 production facilities.

Crane County, Texas

Our Crane County facility is a fully automated, state-of-the-art facility that features a 4 million ton per year plant with a wet plant, intermediate stockpile, dry plant, screening plant, and loadout. The facility uses natural gas and electricity to produce whole grain silica through surface mining methods. The reserves at Crane County contain windblown dune sand lying above ancient dunes of clayey sand, all of the Quaternary age. The facility is located approximately 25 miles southwest of Odessa, Texas in Crane County and is located 5 miles south of U.S. Interstate 20 on a main Farm-to-Market Road. The facility's location in West Texas allows it to ship local in-basin sand by truck.

We purchased 3200 acres of ranch land in May 2017, on which the Crane County facility was built and became operational during the first quarter of 2018. The facility primarily produces a range of API/ISO certified frac sand grades. The total net book value of the Crane County facility's real property and fixed assets as of December 31, 2018 was $233.8 million.

Lamesa, Texas

Our Lamesa facility is a fully-automated, state-of-the-art facility that currently features a 6 million ton per year plant with a wet plant, intermediate stockpile, dry plant, screening plant, and loadout. The facility uses natural gas and electricity to produce whole grain silica through surface mining methods. The reserves at Lamesa contain windblown dune sand lying above ancient dunes of clayey sand, all of the Quaternary age. The facility is located in Dawson County, approximately 55 miles north of Midland, Texas and 60 miles south of Lubbock, Texas. The site is located 13 miles north and west of Lamesa, Texas using state, farm-to-market and private roads. U.S. Route 87 runs through Lamesa and directly leads north to Lubbock and south to Midland. The facility's location in West Texas allows it to ship local in-basin sand by truck.

We purchased 3500 acres of ranch land in July 2017, on which the Lamesa facility was built and became operational during the third quarter 2018. The facility primarily produces a range of API/ISO certified frac sand grades. The total net book value of the Lamesa facility's real property and fixed assets as of December 31, 2018 was $186.9 million.

Festus, Missouri

The Festus facility uses natural gas and electricity to produce whole grain silica from a sandstone reserve that we lease, subject to the lease's expiration on June 30, 2048. The ore is mined by a contractor using both surface and underground hard-rock mining methods. The reserves are part of the St. Peter Sandstone Formation that stretches north-south from Minnesota to Missouri and east-west from Illinois to Nebraska and South Dakota. The facility is located approximately 30 miles south of St. Louis and is accessible by major highways including U.S. Interstate 55. Once the product is processed, it is packaged in bulk and shipped by truck to either barge or rail.

We acquired the Festus facility in August 2017 in connection with the closing of our MS Sand acquisition in August 2017. Since acquiring the facility, we completed an expansion to increase capacity. While the Festus facility's production techniques and distribution model enable it to serve all major silica markets, the primarily production has been frac sand for oil and gas proppants. The total net book value of the Festus facility's real property and fixed assets as of December 31, 2018 was $35.0 million.

Ottawa, Illinois

Our surface mines in Ottawa use natural gas and electricity to produce whole grain and ground silica through a variety of mining methods, including hard rock mining, mechanical mining and hydraulic mining. The reserves are part of the St. Peter Sandstone Formation that stretches north-south from Minnesota to Missouri and east-west from Illinois to Nebraska and South Dakota. The facility is located approximately 80 miles southwest of Chicago and is accessible by major highways including U.S. Interstate 80. Once the product is appropriately processed, it is shipped either in bulk or packaged form by rail by either the CSX Corporation or the BNSF Railway Company (via the Illinois Railway short line), truck or barge.

We acquired the Ottawa facility in 1987 by merger with the Ottawa Silica Company, which historically used the property to produce whole grain and ground silica for customers in industrial and specialty products end markets.

Since acquiring the facility, we renovated and upgraded its production capabilities to enable it to produce multiple products through various

processing methods, including washing, hydraulic sizing, grinding, screening and blending. These production techniques allow the Ottawa facility to meet a wide variety of focused specifications on product composition from customers. As such, the Ottawa facility services multiple end markets, such as glass, building products, foundry, fillers and extenders, chemicals and oil and gas proppants. In November 2009, we expanded the frac sand capacity by 500,000 tons. During the fourth quarter of 2011, we completed a follow-on expansion project that added an additional 900,000 tons of frac sand capacity. The total net book value of the Ottawa facility's real property and fixed assets as of December 31, 2018 was $105.8 million.

Voca, Texas

Our surface mines at the Voca facility use propane and electricity to produce whole grain silica through hard rock mining. The majority of reserves in Voca are sandstones of the Middle and Lower Hickory members of the Riley Formation in central Texas. The facility is located approximately 110 miles northwest of Austin, Texas in McCulloch County and is accessible by state highways. Once product is processed, it is shipped by truck.

We acquired the Voca facility upon the completion of our Cadre Services, Inc. ("Cadre") acquisition in July 2014. We are experiencing a declining shift in demand on our Voca facility, caused by their largest customer not renewing its contract. As a result, management decided to close the Voca facility within the coming months. The total net book value of the Voca facility's real property and fixed assets as of December 31, 2018 was $5.8 million.

Tyler, Texas

Our Tyler facility uses natural gas and electricity to produce whole grain silica through surface mining methods. The reserves at Tyler contain mostly unconsolidated sand of the Queen City Sand formation (Eocene Age). The facility is located approximately 9 miles north of Tyler, Texas in Smith County and is located immediately adjacent to U.S. Interstate 20. Once product is processed, it is shipped by truck.

We acquired the Tyler facility upon the completion of our NBI acquisition in August 2016. The fully automated, state-of-the-art facility became operational in 2011 and features one of the industry’s largest on-site storage capacities. The plant was recently expanded in 2014 and produces a range of API/ISO certified frac sand grades. The Tyler plant's location in Northeast Texas allows it to ship regional sand directly to the wellheads in the Texas and Louisiana basins by truck. The total net book value of the Tyler facility's real property and fixed assets as of December 31, 2018 was $207.2 million.

Mill Creek, Oklahoma

Our surface mines in Mill Creek use natural gas and electricity to produce whole grain, ground and fine ground silica through hydraulic mining. The reserves are part of the Oil Creek Formation in south central Oklahoma. The facility is located approximately 100 miles southeast of Oklahoma City and is accessible by major highways including U.S. Interstate 35. Once the product is appropriately processed, it is packaged in bulk and shipped either by rail by BNSF Railway Company or by truck.

We acquired the Mill Creek facility in 1987 by merger with the Pennsylvania Glass Sand Corporation, which had historically used the property to produce whole grain silica for customers in industrial and specialty products end markets. Since acquiring the facility, we renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including hydraulic sizing, fluid bed drying, grinding and air sizing. These production techniques allow the Mill Creek facility to meet a wide variety of focused specifications on product composition from customers. As such, the Mill Creek facility services multiple end markets, such as glass, foundry, fillers and extenders, building products and oil and gas proppants. The total net book value of the Mill Creek facility's real property and fixed assets as of December 31, 2018 was $23.1 million.

Sparta, Wisconsin

Our facility at Sparta uses natural gas and electricity to produce whole grain silica products through dredging. The reserve geology is that of high purity alluvial sands with the primary erosional source being the Wonewoc Formation. The Wonewoc Sandstone Formation is known for its round, coarse grains and superior crush strength properties, which makes it an ideal substrate for oil and gas proppants. The Sparta property was acquired on December 30, 2011, and site development began in April 2012. The property is located 25 miles northeast of La Crosse; approximately 120 miles northwest of Madison, Wisconsin; and is readily accessible by both U.S. Interstate 90 and the Canadian Pacific railroad. The total net book value of the Sparta facility's real property and fixed assets as of December 31, 2018 was

$37.8 million.

Utica, Illinois

Our surface mine at the Utica facility uses natural gas and electricity to produce whole grain silica products through surface mining. The reserves are part of the St. Peter Formation sandstone, which stretches north-south from Minnesota to Missouri and east-west from Illinois to Nebraska and South Dakota. We acquired the Utica property and plant in 2015 from Quality Sand Products LLC. The facility is located approximately 80 miles southwest of Chicago and is accessible by major highways including U.S. Interstate 80. Once the product is appropriately processed, it is shipped by truck or on the nearby Union Pacific Railroad. The total net book value of the Utica facility's real property and fixed assets as of December 31, 2018 was $26.0 million.

Mapleton Depot, Pennsylvania

Our surface mines in Mapleton Depot use natural gas, fuel oil and electricity to produce whole grain silica through hard rock mining. The reserves are part of the Ridgeley (sometimes called the Oriskany) Sandstone Formation in central Pennsylvania. The facility is located approximately 40 miles northwest of Harrisburg and is accessible by major highways including U.S. Interstates 99, 80 and 76 and U.S. Routes 22 and 322. Once the product is appropriately processed, it is packaged in bulk and shipped either by rail by Norfolk Southern Corporation or by truck.

We acquired the Mapleton Depot facility in 1987 by merger with the Pennsylvania Glass Sand Corporation, which had historically used the property to produce whole grain silica for customers in industrial and specialty products end markets. Since acquiring the facility, we have renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including hydraulic sizing, fluid bed drying, scalping and a low iron circuit. These production techniques allow the Mapleton Depot facility to meet a wide variety of focused specifications on product composition from customers. As such, the Mapleton Depot facility services multiple end markets, such as glass, specialty glass, building products, recreation, and oil and gas proppants. The total net book value of the Mapleton Depot facility's real property and fixed assets as of December 31, 2018 was $14.8 million.

Pacific, Missouri

Our surface mines at the Pacific facility use natural gas and electricity to produce whole grain, ground and fine ground silica through a variety of mining methods, including hard rock and hydraulic mining. The reserves are part of the St. Peter Sandstone Formation that stretches north-south from Minnesota to Missouri and east-west from Illinois to Nebraska and South Dakota. The facility is located approximately 50 miles southwest of St. Louis and is accessible by major highways including U.S. Interstate 44. Once the product is appropriately processed, it is packaged in bulk and shipped either by rail directly by Union Pacific Corporation and through open switching on the same line by BNSF Railway Company or by truck.

We acquired the Pacific facility in 1987 by merger with the Pennsylvania Glass Sand Corporation, which had historically used the property to produce whole grain silica for customers in industrial and specialty products end markets. Since acquiring the facility we renovated and upgraded its production capabilities to enable it to produce multiple products through

various processing methods, including hydraulic sizing, fluid bed drying, grinding, dry screening, classifying and microsizing. In August 2010, we expanded this facility’s processing capabilities to include the processing of frac sand. These production techniques allow the Pacific facility to meet a wide variety of focused specifications on product composition from customers. As such, the Pacific facility services multiple end markets, such as glass, foundry, fillers and extenders and oil and gas proppants. The total net book value of the Pacific facility's real property and fixed assets as of December 31, 2018 was $61.3 million.

Kosse, Texas

Our surface mine in Kosse uses mechanical mining to extract sand ore from the reserve. The plant uses natural gas and electricity to produce whole grain silica. The reserves are part of the Simsboro member of the Rockdale Formation in central Texas. The facility is located approximately 90 miles south of Dallas and is accessible by major highways including U.S. Interstates 45 and 35. Once the product is appropriately processed, it is shipped by truck.

We acquired the Kosse facility in 1987 by merger with the Ottawa Silica Company, which had historically used the property to produce whole grain silica for customers in industrial and specialty products end markets. Since acquiring the facility, we have renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including washing, hydraulic sizing, fluid bed drying, and dry screening. These

production techniques allow the Kosse facility to meet a wide variety of focused specifications on product composition from customers. As such, the Kosse facility services multiple end markets, such as building products, recreation, and oil and gas proppants. The total net book value of the Kosse facility's real property and fixed assets as of December 31, 2018 was $14.8 million.

Berkeley Springs, West Virginia

Our surface mines at the Berkeley Springs facility use hard rock mining methods to produce high-purity sandstone. The plant uses propane, fuel oil and electricity to make whole grain, ground, and fine ground silica. Berkeley Springs also produces a synthetic magnesium-silica product called Florisil.

The reserves are part of the Ridgeley Sandstone Formation along the Warm Springs Ridge in eastern West Virginia. The facility is located approximately 100 miles northwest of Baltimore and is accessible by major highways including U.S. Interstate 70. Once the product is appropriately processed, it is packaged in bulk and shipped by rail by the CSX Corporation or truck.

We acquired the Berkeley Springs facility in 1987 by merger with the Pennsylvania Glass Sand Corporation, which had historically used the property to produce whole grain silica for customers in industrial and specialty products end markets. Since acquiring the facility we have renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including primary, secondary and tertiary crushing, grinding, flotation, dewatering, fluid bed drying, mechanical screening and rotary drying processing. These production techniques allow the Berkeley Springs facility to meet a wide variety of focused specifications from customers producing specialty epoxies, resins and polymers, geothermal energy equipment and fiberglass. As such, the Berkeley Springs facility services multiple end markets, such as glass, building products, foundry, chemicals and fillers and extenders. The total net book value of the Berkeley Springs facility's real property and fixed assets as of December 31, 2018 was $22.3 million.

Columbia, South Carolina

Our surface mines in Columbia use natural gas, fuel oil and electricity to produce whole grain, ground and fine ground silica. The reserves are part of the Tuscaloosa Formation in central South Carolina. The facility is located approximately 10 miles southwest of Columbia and is accessible by major highways including U.S. Interstates 26 and 20. Once the product is appropriately processed, it is bagged or shipped in bulk either by rail by Norfolk Southern Corporation or by truck.

We acquired the Columbia facility in 1987 by merger with the Pennsylvania Glass Sand Corporation, which had historically used the property to produce whole grain silica for customers in industrial and specialty products end markets. Since acquiring the facility, we have renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including hydraulic sizing, fluid bed drying, scalping and grinding. These production techniques allow the Columbia facility to meet a wide variety of focused specifications on product composition from customers. As such, the Columbia facility services multiple end markets, such as glass, building products, fillers and extenders, filtration and oil and gas proppants. The total net book value of the Columbia facility's real property and fixed assets as of December 31, 2018 was $32.8 million.

Dubberly, Louisiana

Our surface mines in Dubberly use natural gas and electricity to produce whole grain silica through dredge mining. The reserves are part of the Sparta Formation. The facility is located approximately 30 miles east of Shreveport and is accessible by major highways including U.S. Interstate 20 and state Highway 532. Once the product is appropriately processed, it is bagged or shipped in bulk by truck.

We acquired the Dubberly facility in 1987 by merger with the Ottawa Silica Company, which had historically used the property to produce whole grain silica for customers in industrial and specialty products end markets. Since acquiring the facility, we renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including screening, washing, fluid bed drying and conditioning to remove heavy and iron bearing minerals. These production techniques allow the Dubberly facility to meet a wide variety of focused specifications on product composition from customers. As such, the Dubberly facility services multiple end markets, such as glass, foundry and building products. The total net book value of the Dubberly facility's real property and fixed assets as of December 31, 2018 was $3.6 million.

Montpelier, Virginia

Our surface mines in Montpelier use fuel oil and electricity to produce aplite through hard rock mining. The reserves are part of an igneous rock complex that is unique to this location. The facility is located approximately 20 miles northwest of Richmond and is accessible by major highways including U.S. Interstates 64 and 95. Once the product is appropriately processed, it is packaged in bulk and shipped either by rail by Norfolk Southern Corporation or CSX Corporation or by truck.

We acquired the Montpelier facility in 1993 from The Feldspar Company, which had historically used the property to produce aplite for customers in industrial and specialty products end markets. Since acquiring the facility, we have renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including hydraulic crushing and sizing, washing, fluid bed drying and grinding. These production techniques allow the Montpelier facility to meet a wide variety of focused specifications on product composition from customers. As such, the Montpelier facility services multiple end markets, such as glass, building products and recreation. The total net book value of the Montpelier facility's real property and fixed assets as of December 31, 2018 was $14.4 million.

Hurtsboro, Alabama

Our surface mines in Hurtsboro use propane and electricity, to produce whole grain silica. Sand feed for processing is trucked in from surrounding mine locations. The reserves are mined from the Cusseta member of the lower Ripley Formation. The facility is located approximately 75 miles east of Montgomery and is accessible by major highways including U.S. Interstate 85 and state Highway 431. Once the product is appropriately processed, it is shipped in bulk by truck.

We acquired the Hurtsboro facility in 1988 from Warrior Sand & Gravel Company, which had historically used the property to produce whole grain silica for customers in industrial and specialty products end markets. Since acquiring the facility, we renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including trucking in sand from surrounding locations, hydraulic sizing, screening and fluid bed drying. These production techniques allow the Hurtsboro facility to meet a wide variety of focused specifications on product composition from customers. As such, the Hurtsboro facility services multiple end markets, such as foundry, building products and recreation. The total net book value of the Hurtsboro facility's real property and fixed assets as of December 31, 2018 was $0.5 million.

Jackson, Tennessee

Our surface mines in Jackson use natural gas and electricity to produce whole grain and ground silica. Sand is purchased from a local dredging company whose reserves are alluvial sands associated with an ancient river system. The facility is located approximately 75 miles east of Memphis and is accessible by major highways including U.S. Interstate 40. Once the product is appropriately processed, it is shipped in bulk by truck.

We acquired the Jackson facility in 1997 from Nicks Silica Company, which had historically used the property to produce whole grain and ground silica for customers in industrial and specialty products end markets. Since acquiring the facility, we renovated and upgraded its production capabilities, turning it into one of our premier grinding facilities and enabling it to produce multiple products through various processing methods, including rotary drying, screening and grinding. These production techniques allow the Jackson facility to meet a wide variety of focused specifications on product composition from customers. As such, the Jackson facility services multiple end markets, such as fiberglass, building products, ceramics, fillers and extenders and recreation. The total net book value of the Jackson facility's real property and fixed assets as of December 31, 2018 was $1.7 million.

Mauricetown, New Jersey

Our surface mines near the Mauricetown facility use natural gas, fuel oil and electricity, to produce whole grain silica through dredge mining. The reserves are mined from alluvial sands in the Maurice River Valley and are similar to those found in the Cohansey, Bridgeton and Cape May deposits. The facility is located approximately 50 miles south of Philadelphia and is accessible by major highways including U.S. Interstate 295 and state Highway 55. Once the product is appropriately processed, it is packaged in bags or bulk and shipped either by rail by Winchester & Western Railroad or by truck.

We acquired the Mauricetown facility in 1999 from Unimin Corporation, which had historically used the property to produce whole grain silica for customers in industrial and specialty products end markets. Since acquiring the facility, we renovated and upgraded its production capabilities, including the construction of a new wet processing plant, to enable it to produce multiple products through various processing methods, including washing, hydraulic sizing, fluid bed drying, rotary drying and scalping. These production techniques allow the Mauricetown facility to meet a wide variety of focused specifications on product composition from customers. As such, the Mauricetown facility services multiple end markets, such as foundry, filtration, building products and recreation. The total net book value of the

Mauricetown facility's real property and fixed assets as of December 31, 2018 was $15.5 million.
Rockwood, Michigan

Our Rockwood facility uses natural gas and electricity to produce whole grain silica. Rockwood's own surface mining reserves are part of the Sylvania Formation and are notable for their low iron content, making them particularly valuable to customers producing specialty glass for architectural or alternative energy applications. Currently sandstone ore is purchased from a local construction material company from that company's surface mining operation. The facility is located approximately 30 miles southwest of Detroit and is accessible by major highways including U.S. Interstate 75. Once the product is appropriately processed, it is packaged in bulk and shipped by rail via the Canadian National Railway or truck.

We acquired the Rockwood facility in 1987 by merger with the Ottawa Silica Company, which had historically used the property to produce whole grain and ground silica for customers in industrial and specialty products end markets. Since acquiring the facility we renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including fluid bed drying, dry screening and classifying. These production techniques allow the Rockwood facility to meet a wide variety of focused specifications on product composition from customers. As such, the Rockwood facility services multiple end markets, such as glass, building products, oil and gas proppants and chemicals. The total net book value of the Rockwood facility's real property and fixed assets as of December 31, 2018 was $15.6 million.

Rochelle, Illinois

Our Rochelle site contains a transloading facility where sand can be received and shipped both by truck and by the BNSF and Union Pacific railroads to help meet customer requirements. The resin coated sand processing plant on the Rochelle site was closed during 2018. The Rochelle property was purchased in 2011. The total net book value of the Rochelle facility's real property and fixed assets as of December 31, 2018 was $5.5 million.

Millen, Georgia

On December 31, 2018, we completed the acquisition of a manufacturing facility located in Millen, Georgia, which is southeast of Atlanta in Jenkins County and in close proximity to high quality kaolin and silica deposits. The facility has a kiln that will enable the production of specialty industrial products that require high temperature heat treatments. It is expected to become fully operational by the end of 2019. The total net book value of the Millen facility's real property and fixed assets as of December 31, 2018 was $23.3 million.

Lovelock, Nevada

Our Lovelock facility is the world's largest producing diatomaceous earth (DE) plant. The facility is 90 miles northeast of Reno, next to Interstate 80. The plant has full rail service on the UPRR, but primarily produces packaged products. The plant’s proximity to the port of Oakland allows it to be the primary export plant for filter aid and fillers. Its three kilns produce calcined and flux-calcined filter aids and functional additives. It has an annual capacity of approximately 156,000 tons. A perlite expander was installed in 1994, and the site crushes and screens perlite ore from our open-pit Popcorn Mine as a raw material for the Blair, Nebraska facility as well as selling expanded perlite ore for use as a filter aid and has an annual capacity of approximately 15,000 tons.

The facility uses DE ore from the open-pit Colado mine, soda ash, natural gas, and electricity to manufacture products used as filtration media across many industries including brewing, corn wet milling, oil and gas, wineries, potable water, swimming pools and petrochemicals. In addition, filler products are used as an anti-block in polyethylene film and flattening agents in paint.

The Lovelock facility was initially commissioned in 1959. We acquired the Lovelock facility in connection with the completion of the acquisition of EPMH in May 2018. The total net book value of the Lovelock facility's real property and fixed assets as of December 31, 2018 was $42.6 million.

Vale, Oregon

Our Vale facility is the world’s third largest DE facility. Two kilns can produce calcined and flux-calcined diatomaceous earth for use as filter aids, functional additives, and low iron brewing grades of filter aids. It has an annual capacity of approximately 120,000 tons and uses DE ore from the open-pit Celatom mine, natural gas, electricity and soda ash.

The facility was originally commissioned in 1985, with the second kiln added in 1997. We acquired the Vale facility in connection with the completion of the acquisition of EPMH in May 2018. The total net book value of the Vale facility's real property and fixed assets as of December 31, 2018 was $29.1 million.

Clark, Nevada

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The Clark facility utilizes a rotary kiln to produce granular DE products utilized in the soil amendment, absorbent, and carrier markets. In addition, a flash dryer process is utilized in producing natural DE powders in support of the functional additive and natural insecticide/animal feed markets. The Clark facility has an annual capacity of approximately 70,000 tons and utilizes DE ore from its surface mining, natural gas and electricity. It is located adjacent to the Truckee River, immediately accessible by Interstate 80 and serviced via the Union Pacific Railroad. In 1945, EPM (Eagle-Picher at that time) acquired the DE deposits 20 miles east of Reno, Nevada in what is known today as Clark, Nevada. We acquired the Clark facility in connection with the completion of the acquisition of EPMH in May 2018. The total net book value of the Clark facility's real property and fixed assets as of December 31, 2018 was $27.4 million.

Fernley, Nevada

Our Fernley facility surface-mines DE and has a rotary kiln for granular DE products. The facility utilizes electricity and recycled oil to manufacture granular products used in absorbent products, soil amendments, fertilizer and pet litter. It has an annual capacity of approximately 50,000 tons and is located near Interstate 80, fifteen miles east of Fernley, Nevada.

EPM purchased the facility from Moltan Corporation in 2013. We acquired the Fernley facility in connection with the completion of the acquisition of EPMH in May 2018. The total net book value of the Fernley facility's real property and fixed assets as of December 31, 2018 was $4.8 million.

Blair, Nebraska

Our Blair facility uses natural gas, electricity, and perlite ore from our open-pit Popcorn mine that has been initially processed at our Lovelock facility. Products produced are used in the industry as a filter media in the manufacturing of bio-fuels food grade oils.

Our Blair facility began producing perlite in 2014. We acquired the Blair facility in connection with the completion of the acquisition of EPMH in May 2018. The total net book value of the Blair facility's real property and fixed assets as of December 31, 2018 was $3.8 million.

Jackson, Mississippi

Our Jackson facility, located approximately at the intersection of Interstate 20 and Interstate 55, uses natural gas, electricity, water, and sulfuric acid to process calcium bentonite from our open-pit mine (Fowlkes Mine) located in Monroe County, approximately 170 miles from the Jackson facility. Once the calcium bentonite is processed into finished product, the product is shipped to the animal feed, oleo bleaching/filtration or refinery catalyst/purification markets The products are shipped via bulk truck and rail leaving Jackson on the CN Railway. Packaged shipments are also made by common carriers for the North/South American markets and intermodal carriers to the ports of New Orleans, Louisiana or Mobile, Alabama for shipments to multiple overseas countries.

The processing facility sits on land leased from BASF, the former owner of the site. EPM purchased the facility and associated mining operations from BASF in July 2017. We acquired the Jackson facility in connection with the completion of the acquisition of EPMH in May 2018. The total net book value of the Jackson facility's real property and fixed assets as of December 31, 2018 was $29.1 million.

Middleton, Tennessee

The Middleton facility surface-mines montmorillonite clay, a high calcium bentonite, and has two rotary kilns that have a capacity of roughly 150,000 tons. The facility uses natural gas, electricity, and sulfuric acid to process ore. With on-site milling, screening, and multiple packaging capabilities, this plant serves several different industries including agriculture, sports fields, and absorbents. This facility is located 80 miles east of Memphis, Tennessee and 60 miles south of Jackson, Tennessee.

EPM purchased the mines and processing facility from the Moltan Company in early 2013. We acquired the Middleton facility in connection with the completion of the acquisition of EPMH in May 2018. The total net book value of the Middleton facility's real property and fixed assets as of December 31, 2018 was $9.2 million.

Our Reserves

We believe we have a broad and high-quality mineral reserves base due to our strategically located mines and facilities. “Reserves” are defined by SEC Industry Guide 7 as that part of a mineral deposit which could be economically and legally

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extracted or produced at the time of the reserve determination. Industry Guide 7 divides reserves between “proven (measured) reserves” and “probable (indicated) reserves” which are defined as follows:

- Proven (measured) reserves. Reserves for which (1) 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 and (2) the sites for inspection, sampling and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth and mineral content of reserves are well-established.
- Probable (indicated) reserves. Reserves for which quantity and grade and/or quality are computed from information similar to that used for proven (measured) reserves, but the sites for inspection, sampling, and measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for proven (measured) reserves, is high enough to assume continuity between points of observation.

We categorize our reserves as proven or probable in accordance with these SEC definitions. We estimate that we had a total of approximately 683 million tons of proven and probable mineable mineral reserves as of December 31, 2018. Compared to 765 million tons of proven and probable mineable mineral reserves we had as of December 31, 2017, the decrease of 82 million tons was due to adjustments and mining, partly offset by the addition of diatomaceous earth, clay, and perlite reserves during the year ended December 31, 2018.

The quantity and nature of the mineral reserves at each of our properties are estimated by our internal Geology and Mine Planning departments. Our geology and mining staff updates our reserve estimates annually, making necessary adjustments for operations at each location during the year and additions or reductions due to property acquisitions and dispositions, quality adjustments and mine plan updates. Before acquiring new reserves, we perform surveying, drill core analysis and other tests to confirm the quantity and quality of the to-be acquired reserves. In some instances, we acquire the mineral rights to reserves without taking ownership of the properties.

Description of Deposits

The following is a description of the nature of our silica sand and aplite deposits for each of our reserve locations:

Crane County, Texas

The deposit has a minimum silica (SiO_2) content of 98%. The controlling attributes are grain crush strength and size distribution. All areas of the deposit are characterized by clean, low-clay content sand in windblown dunes. In many areas, a more clayey sand lies beneath the clean sand. In all cases the sand is unconsolidated.

Lamesa, Texas

The deposit has a minimum silica (SiO_2) content of 98%. The controlling attributes are grain crush strength and size distribution. All areas of the deposit are characterized by clean, low-clay content sand in windblown dunes. In many areas, a more clayey sand lies beneath the clean sand. In all cases the sand is unconsolidated.

Festus, Missouri

The deposit has a minimum silica (SiO_2) content of 98%. The controlling attributes are grain crush strength and size distribution. The top half of the deposit tends to have a coarser grain size distribution and exhibits stronger rock.

Ottawa, Illinois

The deposit has a minimum silica (SiO_2) content of 99%. The controlling attributes are grain crush strength, iron (Fe_2O_3) content and grain size distribution. Iron is concentrated near the surface, where orange iron staining is evident and also increases where the bottom contact becomes concentrated in iron pyrite. Maximum average full face iron content is 0.045%. The deposit tends to exhibit a coarser grain size distribution in the top half of deposit.

Voca, Texas

The deposit has a minimum silica (SiO_2) content of 99%. The controlling attributes are sand grain crush strength and size distribution. The majority of the sand reserves are hosted within the Hickory Sandstone, the basal member of the Riley Formation. The Cambrian age Hickory sandstone member consists chiefly of yellow, brown, or red sandstone overlying Pre-Cambrian granites.

Tyler, Texas
The deposit has a minimum silica (SiO2) content of 98%. The controlling attributes are crush strength and size distribution of the sand grains. The Queen City Sand formation, an Eocene Age unconsolidated sand deposit, makes up the Tyler reserves. The Queen City Sand consists mainly of white, brown, and grayish-green sand found mostly as loose particles.
Mill Creek, Oklahoma
The deposit has a minimum silica (SiO2) content of 99%. The controlling attributes are iron (Fe2O3) content, calcium (CaO) content and grain size distribution. The sand/overburden contact is occasionally concentrated in calcium and any sand with greater than 0.03% CaO is removed during the overburden removal process. Sand with iron greater than 0.03% Fe2O3 is not mined.
Sparta, Wisconsin
The deposit has a minimum silica (SiO2) content of 99%. The controlling attributes are sand grain crush strength and size distribution. A thin layer of silt overlies the 50 to 100 foot thick sand deposit. The deposit is unconsolidated and well graded and can be used to manufacture three main API product grades, 40/70, 30/50, and 20/40 as well as the non-API 100-mesh product.
Utica, Illinois
The deposit has a minimum silica (SiO2) content of 99%. The controlling attributes are sand grain crush strength and size distribution. The deposit is well graded and can produce a variety of products.
Mapleton Depot, Pennsylvania
The deposit has a minimum silica (SiO2) content of 99%. The controlling attribute is iron (Fe2O3) as most sales have low iron specifications. Higher-iron ore is stockpiled and used when oil and gas proppant production is required or is blended when very low iron ore is available.
Pacific, Missouri
The deposit has a minimum silica (SiO2) content of 99%. The controlling attributes are iron (Fe2O3) and calcium (CaO) content. Calcium can be concentrated at the upper sand contact with overlying carbonate cap rock. This enriched calcium zone is known from drill sample results and is stripped during the overburden removal process. Average full mining face washed sand samples are less than 0.03% iron and 0.05% calcium.
Kosse, Texas
The deposit has a minimum silica (SiO2) content of 99%. The controlling attributes are iron content (Fe2O3), sand grain crush strength and size distribution. Multiple areas of deposit can be mined at any one time to assure consistency of ore and to smooth out variability of attributes. Maximum sand irons are 0.045%.
Berkeley Springs, West Virginia
The deposit has a minimum silica (SiO2) content of 99%. The controlling attribute is iron (Fe2O3). Ore that is higher than 0.06% iron is not mined. Ore less than 0.06% iron is mined and blended for feed to plant.
Columbia, South Carolina
The deposit has a minimum silica (SiO2) content of 99%. The controlling attributes are iron content (Fe2O3) and percentage of clay/slimes. Clay content increases at depth and generally the pit bottom follows a marker bed at 250-foot elevation where clay content is in excess of 11%. Generally, sand having iron values greater than 0.03% is not mined.
Dubberly, Louisiana
The deposit has a minimum silica (SiO2) content of 99%. The controlling attributes are iron (Fe2O3) content and grain size distribution. Mining full-face average for iron is 0.045%. Fine and coarse areas are blended to meet the grain size average.

Montpelier, Virginia
The Montpelier anorthosite contains andesine feldspar which is mined and processed to create an alumina rich product. The general term aplite is used to denote the product. The controlling attributes are titanium (TiO2), aluminum (AI2O3), iron (Fe2O3) and phosphorous (P2O5).
The Montpelier anorthosite is approximately 1,000 million years in age and intruded into the older Precambrian Sabot Gneiss. The overall dome shape of the orebody has been altered by multiple structural and metamorphic events that result in the present day foliated and folded deposit. The deposit is highly weathered and soft near the surface. Hardness and strength increase with depth.
Aplite is used as a flux agent in glass making and is sold to the same glass end markets and used in the same processes and in a similar manner as our silica product.
Hurtsboro, Alabama
The deposit has a minimum silica (SiO2) content of 99%. The controlling attribute is grain size distribution. Sand reserves are located on the crests of rolling hills and mining occurs from multiple pits and faces within pits to assure optimum grain size distribution is available to meet the market product mix.
Jackson, Tennessee
The deposit has a minimum silica (SiO2) content of 99%. The controlling attribute of iron (Fe2O3) content is managed through keeping clay overburden from intermixing with the sand and maintaining adequate washing of sand in the wet processing of the sand.
Mauricetown, New Jersey
The deposit has a minimum silica (SiO2) content of 99%. The controlling attribute is grain size distribution. Occasional zones high in clay are avoided in the course of dredge mining.
Rockwood, Michigan
The deposit has a minimum silica (SiO2) content of 99%. The controlling attribute is iron content (Fe2O3). Mineable sand must have less than 0.01% Fe2O3.
Middleton, Tennessee and Mississippi
The deposits are calcium montmorillonite clays hosted in the Porters Creek formation (a deltaic clay deposit on the east flank of the Mississippi embayment) with ore types of low to high density black and brown clay interbedded with sand and silt laminations.
Clark, Nevada
The deposits are composed of freshwater diatomaceous earth, capped with basalt, and interbedded with volcanic ash and tephra units. The deposits are primarily amorphous silicate (SiO2) composition with controlling trace attributes.
Lovelock, Nevada
The deposits are composed of freshwater diatomaceous earth with the primary diatom species of Melosira granulata, typically capped with basalt, and interbedded with volcanic ash and tephra units. The deposits are primarily amorphous silicate (SiO2) composition with controlling trace attributes.
Fernley, Nevada
The deposits are composed of freshwater diatomaceous earth interbedded with minor volcanic ash and tephra units. The deposits are primarily amorphous silicate (SiO2) composition with controlling trace attributes.
Fowlkes Mine, Mississippi

The deposit occurs in the Tombigbee Sand in Mississippi and is composed of 90% clay, 100% of which is montmorillonite. It holds approximately 1/3 bound water by volume and is dark gray in color, frequently with a greenish tint. It is primarily of the calcium/magnesium type of bentonite. Tombigbee Sand bentonite contains byproducts of volcanic ash degradation and leading evidence suggests the ash came from volcanic vents on the Sharkey Platform, 130 miles to the southwest. The clay deposit contains calcareous concretions that have to be removed as part of the mining operations.

Hazen Mine, Nevada

The deposits are primarily amorphous silicate (SiO_2) composition with controlling trace attributes.

Popcorn Mine, Nevada

Perlite is an aqueous rich volcanic glass which was deposited beneath sea water and quenched. Upon crushing and heating, perlite's high-water saturation permits rapid expansion or popping.

Colado Mine, Nevada

The deposits are composed of freshwater diatomaceous earth with the primary diatom species of Melosira granulata, typically capped with basalt, and interbedded with volcanic ash and tephra units. The deposits are primarily amorphous silicate (SiO_2) composition with controlling trace attributes.

Celatom Mine, Oregon

The deposits are composed of freshwater diatomaceous earth with the primary diatom species of Melosira granulata, interbedded with volcanic ash and clay units. The deposits are primarily amorphous silicate (SiO_2) composition with controlling trace attributes.

Cheto Mine, Arizona

The deposit has a silica content (SiO_2) of 68%, alumina content (Al_2O_3) of 17%, calcium (CaO) content of around 3%, and magnesium (MgO) content of around 5%. It is classified of the montmorillonite type, primarily of the calcium/magnesium type of bentonite.

Fallon, Nevada

The deposit is a greenfield diatomite deposit currently in the process of permitting. This a deposit of fresh water diatoms deposits. Melosira granulata is the primary species of dia tom present with minor traces of volcanic ash and basalt detritus.

Mineral Rights

The mineral rights and access to mineral reserves for the majority of our operations are secured through land that is owned in fee. There are no underlying agreements and/or royalties associated with our locations other than those listed below. None of our operations, except as listed below, are on government land and, accordingly, we do not have any other government leases or associated mining claims.

The mineral rights and access to mineral reserves at our Mill Creek operation are a combination of land owned in fee and one mineral lease. A non-participating royalty is paid to the original sellers of the fee property that covers almost all of the reserves. The lease agreements involve an annual minimum payment and a non-participating per-ton production royalty payment expiring on December 31, 2019.

The Columbia operation mineral reserves and rights are secured under a long-term mineral lease. The lease includes an annual minimum payment and a production royalty based on gross revenue expiring on April 24, 2021.

The Hurtsboro operation mineral reserves and rights are secured under three mineral leases. They are long-term leases that include an annual minimum payment and a production royalty payment based on average selling price expiring from May 2019 through March 2027. These mineral leases are renewed for 2 to 10 year periods and have been renewed in the past, and it is expected that if mining is still occurring on these properties the leases can be extended again.

The mineral rights and access to mineral reserves at our Kosse operation are a combination of land owned in fee and one long-term mineral lease. The lease is for 25 acres and a minimum royalty is paid annually expiring on November 26, 2042.

The Mapleton Depot operation mineral reserves and rights are secured under three long-term mineral leases. One of the leases is with a Commission of the Pennsylvania State government. Annual minimum royalty is nominal, and production royalty payments are based on selling price with a minimum per-ton royalty expiring from June 2021 through August 2025.

The Festus operation leases its reserves from another company that is also the mining contractor for those reserves. There is a royalty associated with the mineral lease agreement expiring on December 31, 2048.

When Crane County reserves were acquired, we entered into a royalty agreement with the company that sold us the land. The non-participating royalty interest is perpetual and based on tons of frac sand sold. Currently, the Crane County site is in development.

The Clark operation mineral reserves and rights are secured by a combination of land owned in fee, unpatented placer claims and a mineral lease. A federal lease covers unpatented placer claims expiring on December 12, 2022, and includes a minimum royalty and production royalty clause with credits.

The Fernley operation mineral reserves and rights are secured by a combination of land owned in fee and unpatented placer claims.

The Fowlkes operation mineral reserves and rights are secured by a combination of land leased, for which royalty obligations expired in November 2018, and land owned in fee simple.

The Hazen Mine’s mineral reserves and rights are secured by a combination of land owned in fee and unpatented placer claims. A mineral lease covers unpatented placer claims on federal lands expiring September 12, 2020, with royalty obligations.

The Popcorn Mine mineral reserves and rights are secured by lode claims.

The Colado Mine mineral reserves and rights are secured by owned claims on federal land and an evergreen land lease.

The Celatom Mine mineral reserves and rights are secured by a combination of land owned in fee, unpatented placer claims, unpatented mill site claims and mineral leases. Some of the leased unpatented mineral rights are state owned.

The Cheto Mine mineral reserves and rights consist of leased private land for which a minimum annual royalty is owed as well as a per ton royalty with a credit back against the minimum annual royalty.

The Fallon Mine’s mineral reserves and rights are secured by unpatented placer claims on federal lands.

Summary of Reserves

We follow SEC Industry Guide 7 in determining our mineral reserves. Exploration samples are evaluated in our laboratory facilities to assess product quality and mining/processing parameters. Members of our sales management team assess the salability of the product(s). Geologic, topographic and site data are used to create a geologic model and mining plan. We prepare an analysis of operating costs, capital costs and long-term anticipated sales volume and price to ensure the economic viability of the reserve. In performing feasibility economic analysis for purposes of categorizing proven and probable reserves, we considered a range of average sales price assumptions: for commercial silica, from $30 per ton for some of our Oil & Gas Proppants sands to $80 per ton for high-quality glass sand in our Industrial & Specialty Products segment; for diatomaceous earth, from $65 to $1015 per ton; for clay, from $60 to $1625 per ton; and for perlite, $70 to $1600 per ton. Reserve estimates are updated when necessary to account for new geologic, mining, sales or cost data.

The following table provides information on our production facilities that have reserves as of December 31, 2018. Included is the location and area of the facility; the type, amount and ownership status of its reserves; and the primary end markets that it serves.

Mine/Plant Location	Acreage Owned/Leased	Proven Reserves	Probable Reserves	Combined Proven and Probable Reserves	Estimated Processing Recovery Percentages		2018 Tons Mined	Primary End Markets Served
	(in acres)	(tonnage data in thousands)						
Crane County, TX	3200 owned	122,777	47,500	170,277	73	%	1,123	Oil and gas proppants[3]
Lamesa, TX	3523 owned	101,695	16,300	117,995	58	%	1,205	Oil and gas proppants[3]
Festus, MO	635 leased	16,318	7,411	23,729	84	%	1,796	Oil and gas proppants[3]
Ottawa, IL	2,100 owned	123,778	—	123,778	89	%	4,093	Oil and gas proppants[3], glass, chemicals, foundry[4]
Voca, TX	1,061 owned	22,793	19,080	41,873	30	%	2,669	Oil and gas proppants[3]
Tyler, TX	1356 owned	—	17,898	17,898	72	%	1,932	Oil and gas proppants[3]
Mill Creek, OK	2,174 owned 16 mineral lease	—	13,550	13,550	61	%	2,437	Oil and gas proppants[3], glass, foundry, building products[4]
Sparta, WI	660 owned	22,930	2,740	25,670	85	%	1,996	Oil and gas proppants[3]
Utica, IL	148 owned	7,363	—	7,363	88	%	2,152	Oil and gas proppants[3]
Mapleton Depot, PA	1,761 owned 194 mineral lease 98 access lease	1,989	2,100	4,089	81	%	683	Glass, building products[4]
Pacific, MO	524 owned	13,175	7,994	21,169	83	%	1,255	Oil and gas proppants[3], glass, foundry, fillers and extenders[4]
Kosse, TX	1,053 owned 25 mineral lease	10,830	—	10,830	40	%	—	Oil and gas proppants[3], building products, recreational products[4]
Berkeley Springs, WV	4,435 owned	1,223	6,000	7,223	72	%	504	Glass, building products, fillers and extenders[4]
Columbia, SC	648 lease 204 owned	4,208	—	4,208	72	%	534	Glass, building products, fillers and extenders[4]
Dubberly, LA	356 owned	4,300	—	4,300	82	%	225	Glass, foundry, building products[4]
Montpelier[1], VA	824 owned	—	12,774	12,774	39	%	191	Glass, building products[4]
Hurtsboro, AL		322	—	322	83	%	156	Foundry, building products[4]

	117 owned 1,108 mineral lease							
Mauricetown, NJ	1,279 owned	11,554	—	11,554	55	%	260	Filtration, foundry, building products[4]

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Rockwood [2], MI	872 owned	8,363	—	8,363	—	%	—	Glass, building products[4]
Middleton, TN	1,178 owned	1,528	11,657	13,185	66	%	182	Absorbent for automotive, industrial[4]
Clark, NV	1,730 owned 70 leased	2,338	973	3,311	78	%	72	Absorbents, catalysts, supports filtration[4]
Fernley, NV	5,668 owned	1,616	—	1,616	60	%	55	Absorbent for automotive, industrial[4]
Fowlkes Mine, MS	502 owned / 146 leased	—	1,222	1,222	100	%	74	Edible oil, petro chemical, animal feed[4]
Hazen Mine, NV	120 owned 1135 leased	358	84	442	90	%	38	Calcium silicate insulation[4]
Popcorn Mine, NV	200 owned	4,662	—	4,662	93	%	17	Filtration for wine, sugar, enzymes[4]
Colado Mine, NV	3,067 owned 3,799 leased	1,066	3,273	4,339	83	%	279	Filtration for brewing, wine, swimming pools, sweeteners; additives for coatings, LDPE film[4]
Celatom Mine, OR	4,998 owned 2,120 leased	—	25,381	25,381	90	%	102	Filtration for brewing, wine, swimming pools, sweeteners; additives for coatings[4]
Cheto Mine, AZ	10,240 lease	—	579	579	100	%	1	Static desiccant[4]
Fallon, NV	840 owned	—	935	935	70	%	1	Filtration for brewing, wine, swimming pools, sweeteners; additives for coatings, LDPE film[4]
Total		485,186	197,451	682,637			24,032	

(1) Montpelier’s reserves are comprised entirely of the mineral aplite.
(2) Rockwood's products were produced, or sourced, from a third party. It did not mine any of its reserves in 2018.
(3) Oil & Gas Proppants segment
(4) Industrial & Specialty Products segment

Our Properties and Logistics Network

We continue to strategically position our supply chain in order to deliver sand according to our customers' needs, whether at a plant, a transload, or at the wellhead. We believe that our supply chain network and logistics capabilities are a competitive advantage that enables us to provide superior service for our customers and positions us to take advantage of opportunistic spot market sales. As of December 31, 2018, we have 51 transload facilities strategically located near all the major shale basins in the United States. Most of our transloads are operated by third-party transload service providers via service agreements, which include both longer term contracts (generally 2 to 5 years) and month-to-month arrangements.

We lease a significant number of railcars for shipping purposes and for short-term storage of our products, particularly our frac sand products. As of December 31, 2018, we have a leased fleet of 7,823 railcars, of which 1,461 cars were in storage.

Our acquisition of Sandbox extends our delivery capability directly to our customers' wellhead locations. Sandbox provides “last mile” logistics to companies in the oil and gas industry, which increases efficiency and provides a lower cost logistics solution for our customers. Sandbox has operations in the major United States oil and gas producing regions, including Texas, New Mexico, Oklahoma, the Rocky Mountains and the Northeast, where its largest customers are located. We expect we will continue to make strategic investments and develop partnerships with transload operators and transportation providers that will enhance our portfolio of supply chain services that we can provide to customers.

The map below shows the location of our production facilities, transload facilities, Sandbox operation sites and Corporate offices:

ITEM 3. LEGAL PROCEEDINGS

In addition to the matters described below, we are subject to various legal proceedings, claims, and governmental inspections, audits or investigations incidental to our business, which can cover general commercial, governmental regulations, antitrust and trade regulations, product liability, environmental, intellectual property, employment and other matters. Although the outcomes of these ordinary routine claims cannot be predicted with certainty, in the opinion of management, the ultimate resolution of these matters will not have a material adverse effect on our financial position or results of operations.

Prolonged inhalation of excessive levels of respirable crystalline silica dust can result in silicosis, a disease of the lungs. Breathing large amounts of respirable silica dust over time may injure a person's lungs by causing scar tissue to form. Crystalline silica in the form of quartz is a basic component of soil, sand, granite and most other types of rock. Cutting, breaking, crushing, drilling, grinding and abrasive blasting of or with crystalline silica containing materials can produce fine silica dust, the inhalation of which may cause silicosis, lung cancer and possibly other diseases including immune system disorders such as scleroderma. Sources of exposure to respirable crystalline silica dust include sandblasting, foundry manufacturing, crushing and drilling of rock, masonry and concrete work, mining and tunneling, and cement and asphalt pavement manufacturing.

Since at least 1975, we and/or our predecessors have been named as a defendant, usually among many defendants, in numerous lawsuits brought by or on behalf of current or former employees of our customers alleging damages caused by silica exposure. Prior to 2001, the number of silicosis lawsuits filed annually against the commercial silica industry remained relatively stable and was generally below 100, but between 2001 and 2004 the number of silicosis lawsuits filed against the commercial silica industry substantially increased. This increase led to greater scrutiny of the nature of the claims filed, and in June 2005 the U.S. District Court for the Southern District of Texas issued an opinion in the former federal silica multi-district litigation remanding almost all of the 10,000 cases then pending in the multi-district litigation back to the state courts from which they originated for further review and medical qualification, leading to a number of silicosis case dismissals across the United States. In conjunction with this and other favorable court rulings establishing "sophisticated user" and "no duty to warn" defenses for silica producers, several states, including Texas, Ohio and Florida, have passed medical criteria legislation that requires proof of actual impairment before a lawsuit can be filed.

As a result of the above developments, the filing rate of new claims against us over the past few years has decreased to below pre-2001 levels, and we were named as a defendant in 20, zero and two new silicosis cases filed in 2018, 2017 and 2016, respectively. The main driver of the increase in cases filed in 2018 is 16 claims arising out of a single location in Mississippi. As of December 31, 2018, there were 74 active silica-related product liability claims pending in which U.S. Silica is a defendant. Almost all of the claims pending against us arise out of the alleged use of our silica products in foundries or as an abrasive blast media and involve various other defendants. Prior to the fourth quarter of 2012, we had insurance policies for both our predecessors that cover certain claims for alleged silica exposure for periods prior to certain dates in 1985 and 1986 (with respect to certain insurance). As a result of a settlement with a former owner and its insurers in the fourth quarter of 2012, some of these policies are no longer available to us and we will not seek reimbursement for any defense costs or claim payments from these policies. Other insurance policies, however, continue to remain available to us and will continue to make such payments on our behalf.

The silica-related litigation brought against us to date has not resulted in material liability to us. However, we continue to have silica-related product liability claims filed against us, including claims that allege silica exposure for periods for which we do not have insurance coverage. Any such pending or future claims or inadequacies of our insurance coverage could have a material adverse effect on our business, reputation or results of operations. For more information regarding silica-related litigation, see Part I, Item 1A. Risk Factors of this Annual Report on Form 10-K.

ITEM 4. MINE SAFETY DISCLOSURES

Safety is one of our core values and we strive to achieve a workplace free of injuries and occupational illnesses. Our health and safety leadership team has developed comprehensive safety policies and standards, which include detailed standards and procedures for safe production and address topics such as employee training, risk management, workplace inspection, emergency response, accident investigation and program auditing. We place special emphasis

on the importance of continuous improvement in occupational health, personal injury avoidance and prevention, emergency preparedness, and property damage elimination. In addition to strong leadership and involvement from all levels of the organization, these programs and procedures form the cornerstone of our safety initiatives and are intended as a means to reduce workplace accidents, incidents and losses, comply with all mining-related regulations and provide support for both regulators and the industry to improve mine

safety. While we want to have productive operations in full regulatory compliance, we know it is equally essential that we motivate and train our people to think, practice and feel a personal responsibility for health and safety on and off the job.

All of our production facilities, with the exception of our EPM's, Blair, Nebraska, facility, are classified as mines and are subject to regulation by MSHA under the Mine Act. MSHA inspects our mines on a regular basis and issues various citations and orders when it believes a violation has occurred under the Mine Act. Following passage of The Mine Improvement and New Emergency Response Act of 2006, MSHA significantly increased the numbers of citations and orders charged against mining operations. The dollar penalties assessed for citations issued has also increased in recent years. Information concerning mine safety violations or other regulatory matters required by Section 1503(a) of the Dodd-Frank Wall Street Reform and Consumer Protection Act and Item 104 of Regulation S-K (17 CFR 229.104) is included in Exhibit 95.1 to this Annual Report filed on Form 10-K.

PART II.

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Market Information

Shares of our common stock, traded under the symbol "SLCA," have been listed and publicly traded on the New York Stock Exchange since February 1, 2012.

The following table sets forth for the indicated periods, the high and low sales prices, per share, for our common stock on the New York Stock Exchange:

	Sales Price	
	High	Low
Fiscal 2018		
First Quarter	$38.70	$24.15
Second Quarter	$34.34	$23.75
Third Quarter	$27.91	$17.92
Fourth Quarter	$20.82	$9.30
Fiscal 2017		
First Quarter	$61.49	$42.27
Second Quarter	$50.39	$31.79
Third Quarter	$37.00	$24.26
Fourth Quarter	$36.55	$27.42

Holders of Record

On February 14, 2019, there were 73,152,701 shares of our common stock outstanding, which were held by approximately 172 stockholders of record. Because many of our shares of common stock are held by brokers and other institutions on behalf of beneficial owners, we are unable to estimate the total number of stockholders represented by these record holders. For additional information related to ownership of our stock by certain beneficial owners and management, refer to Part III, Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

Dividend

We pay dividends on our common stock after the Board declares them. Management and the Board remain committed to evaluating additional ways of creating shareholder value. Any determination to pay dividends and other distributions in cash, stock, or property by U.S. Silica in the future will be at the discretion of the Board and will be dependent on then-existing conditions, including our business conditions, our financial condition, results of operations, liquidity, capital requirements, contractual restrictions including restrictive covenants contained in debt agreements and other factors.

In 2017 and 2018, we declared dividends as follows:

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Declaration date	Dividends per common share
February 16, 2017	$ 0.0625
May 4, 2017	$ 0.0625
July 21, 2017	$ 0.0625
November 2, 2017	$ 0.0625
February 16, 2018	$ 0.0625
May 14, 2018	$ 0.0625
July 16, 2018	$ 0.0625
November 13, 2018	$ 0.0625

Purchase of Equity Securities by the Issuer

From time to time, we repurchase our common stock in the open market pursuant to programs approved by our Board of Directors, or the Board. We may repurchase our common stock for a variety of reasons, such as to offset dilution related to equity-based incentives and to optimize our capital structure.

We consider several factors in determining when to make share repurchases including, among other things, our cash needs, the availability of funding, our future business plans and the market price of our stock. We expect that cash provided by future operating activities, as well as available liquidity, will be the sources of funding for our share repurchase program. For more information see Note D - Capital Structure and Accumulated Comprehensive Income (Loss) to our Consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K.

The following table presents the total number of shares of our common stock that we purchased during the fourth quarter of 2018, the average price paid per share, the number of shares that we purchased as part of our publicly announced repurchase program, and the approximate dollar value of shares that still could have been purchased at the end of the applicable fiscal period pursuant to our publicly announced share repurchase program:

Period	Total Number of Shares Purchased	Average Price Paid Per Share	Total Number of Shares Purchased as Part of Publicly Announced Program[1]	Maximum Dollar Value of Shares that May Yet Be Purchased Under the Program[1]
October 1, 2018 - October 31, 2018	1,000,000	$ 13.70	1,000,000	170,800,060
November 1, 2018 - November 30, 2018	1,511,837 [2]	$ 14.52	1,500,000	149,020,060
December 1, 2018 - December 31, 2018	2,000,336 [2]	$ 11.24	2,000,000	126,540,060
Total	4,512,173	$ 12.88	4,500,000	

(1) In May 2018, our Board of Directors authorized and announced the repurchase of up to $200 million of our common stock.

(2) Includes 11,837 and 336 shares

withheld by U.S. Silica to pay taxes due upon the vesting of employee restricted stock and restricted stock units for the months ended November 30, and December 31, 2018, respectively.

Securities Authorized for Issuance under Equity Compensation Plans

The table below contains information about securities authorized for issuance under our Amended and Restated 2011 Incentive Compensation Plan (the “2011 Plan”) as of December 31, 2018. The features of the 2011 Plan are disclosed further in Note P - Equity-based Compensation to our consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K.

	Number of securities to be issued upon exercise of outstanding options, warrants and rights (A)	Weighted-average exercise price of outstanding options, warrants and rights (B)	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column A) (C)
Equity compensation plans approved by security holders	901,996	$ 28.52	3,447,363
Equity compensation plans not approved by security holders	—	—	—
Total	901,996	28.52	3,447,363

U.S. Silica Holdings, Inc. Comparative Stock Performance Graph

The information contained in this U.S. Silica Holdings, Inc. Comparative Stock Performance Graph section shall not be deemed to be "soliciting material" or "filed" or incorporated by reference in future filings with the SEC, or subject to the liabilities of Section 18 of the Exchange Act, except to the extent that we specifically incorporate it by reference into a document filed under the Securities Act or the Exchange Act.

The graph below compares the cumulative total shareholder return on our common stock to the cumulative total return on the Russell 3000 index and the Standard and Poor’s SmallCap 600 Energy Sector index, in each case assuming $100 was invested on December 31, 2013 and the reinvestment of all dividends. We elected to include the Standard and Poor’s SmallCap 600 Energy Sector index because this index is used in relative total shareholder return performance share units that we have granted to employees.

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ITEM 6. SELECTED FINANCIAL DATA

The following selected financial data should be read in conjunction with Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations and Item 8. Financial Statements and Supplementary Data. Additionally, see Item 1A. Risk Factors and Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations for discussions of material uncertainties that might cause the data reflected in this table not to be indicative of our future financial condition or results of operations.

	Year Ended December 31,				
	2018[4]	2017[5]	2016[5]	2015	2014[2]
	(amounts in thousands, excluding per share and per ton figures)				
Statement of Operations Data:					
Sales	$1,577,298	$1,240,851	$559,625	$642,989	$876,741
Operating income (loss)	(163,533)	169,742	(52,491)	26,672	176,167
Income (loss) before income taxes	(229,953)	136,526	(77,745)	117	158,723
Net income (loss) attributable to U.S. Silica Holdings, Inc.	(200,808)	145,206	(41,056)	11,868	121,540
Earnings (loss) per share - basic	$(2.63)	$1.79	$(0.63)	$0.22	$2.26
Earnings (loss) per share - diluted	$(2.63)	$1.77	$(0.63)	$0.22	$2.24
Cash dividends declared per common share	$0.25	$0.25	$0.25	$0.44	$0.50
Statement of Cash Flows Data:					
Net cash provided by (used in):					
Operating activities	$310,706	$222,013	$381	$61,492	$171,411
Investing activities	(1,066,879)	(491,529)	(201,657)	49	(190,906)
Financing activities	$574,104	$(57,142)	$635,424	$(47,530)	$208,964
Other Financial Data:					
Capital expenditures	$339,815	$368,479	$46,450	$53,646	$92,609
Operating Data:					
Total tons sold	18,059	15,128	9,875	10,025	10,927
Average selling price (per ton)	$87.34	$82.02	$56.67	$64.14	$80.24
Segment cost of goods sold (per ton)[1]	58.94	56.19	47.51	48.27	51.20
Oil & Gas Proppants:					
Sales	$1,182,991	$1,020,365	$362,550	$430,435	$662,770
Segment contribution margin[6]	357,846	301,972	11,445	88,928	256,137
Industrial & Specialty Products:					
Sales	$394,307	$220,486	$197,075	$212,554	$213,971
Segment contribution margin[6]	155,084	88,781	78,988	70,137	61,102
Balance Sheet Data:					
Cash and cash equivalents [3]	$202,498	$384,567	$711,225	$298,926	$338,209
Total assets [3]	2,900,840	2,307,283	2,073,220	1,108,619	1,226,727
Total long-term debt, including current portion	1,270,400	489,075	494,175	491,705	495,086
Total liabilities [3]	1,848,536	910,777	799,930	724,452	822,911
Total stockholders’ equity	$1,052,304	$1,396,506	$1,273,290	$384,167	$403,816

(1) Segment cost of goods sold (per ton) equals segment cost of goods sold, divided by total tons sold.

(2) We acquired Cadre on July 31, 2014 and included Cadre's financial position and results of operations in our 2014 financial information above.

(3) In 2015, we changed the presentation of book overdraft from being classified as a liability to a reduction to our cash and cash equivalents. 2014 cash and cash equivalents amount presented is recasted to reflect this change.

(4)

We acquired EP Minerals Holdings, Inc. on May 1, 2018, and have included their financial position and results of operations in our 2018 financial information above. As a result, our 2018 financial information may not be comparable to prior years. See Note E - Business Combinations to our Consolidated Financial Statements in Item 8. of this Annual Report on Form 10-K for more information.

(5) We acquired White Armor and MS Sand on April 1, 2017 and August 16, 2017, respectively, and NBI and Sandbox on August 16, 2016 and August 22, 2016, respectively, and have included their financial position and results of operations in our 2017 and 2016 financial information above. As a result, our 2017 and 2016 financial information may not be comparable to prior years. See Note E - Business Combinations.

(6) Segment contribution margin is a financial measure that is not included or defined under generally accepted accounting principles in the United States ("GAAP"). For a detailed description of segment contribution margin and a reconciliation to its most comparable GAAP measure, please see the discussion under "How We Evaluate Our Business" in Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations.

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion and analysis of our financial condition and results of operations should be read together with Item 6. Selected Financial Data, the description of the business appearing in Item 1. Business and the Consolidated Financial Statements in Item 8. Financial Statements and Supplementary Data.

This discussion contains forward-looking statements, as discussed under "Forward-Looking Statements" above. These statements are based on current expectations and assumptions and are subject to risks and uncertainties. Actual results could differ materially from those discussed in or implied by forward-looking statements. Factors that could cause or contribute to these differences include those discussed below and elsewhere in this report, particularly under "Forward-Looking Statements" and in Item 1A. Risk Factors.

Adjusted EBITDA and segment contribution margin as used herein are non-GAAP measures. For a detailed description of Adjusted EBITDA and segment contribution margin and reconciliations to their most comparable GAAP measures, please see the discussion below under "How We Evaluate Our Business."

Overview

We are a performance materials company and one of the largest domestic producers of commercial silica, a specialized mineral that is a critical input into a variety of end markets. Through our acquisition of EPM, we are also an industry leader in the production of industrial minerals, including diatomaceous earth, clay (calcium bentonite and calcium montmorillonite) and perlite used as filter aids, absorbents and functional additives for a variety of industries. During our 119-year history, we have developed core competencies in mining, processing, logistics and materials science that enable us to produce and cost-effectively deliver over 400 diversified product types to customers across our end markets. As of December 31, 2018, we operate 27 production facilities across the United States. We control 627 million tons of reserves of commercial silica, which can be processed to make 297 million tons of finished products that meet API frac sand specifications, and 56 million tons of reserves of diatomaceous earth, perlite, and clays.

Our operations are organized into two reportable segments based on end markets served and the manner in which we analyze our operating and financial performance: (1) Oil & Gas Proppants and (2) Industrial & Specialty Products. We believe our segments are complementary because our ability to sell to a wide range of customers across end markets in these segments allows us to maximize recovery rates in our mining operations, optimize our asset utilization and reduce the cyclicality of our earnings.

Acquisitions

For a description of our key business acquisitions during the past three years, see the discussion under "Our Company-Business Overview-Acquisitions" in Item 1. Business and Note E - Business Combinations to our Consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K for more information.

Recent Trends and Outlook

Oil and gas proppants end market trends

Increased demand for frac sand has historically been driven by the growth in the use of hydraulic fracturing as a means to extract hydrocarbons from shale formations. According to Rystad Energy's Proppant Market report - 1Q 2019, published on December 10, 2018, U.S. raw sand proppant demand was 38% higher in 2018 than 2017, and is expected to continue to grow assuming a per barrel oil price higher than $50. Oil and gas horizontal rig count increased during 2017 and 2018, leading to more well completion activity. We continue to expect long-term growth in

oil and gas drilling in North American shale basins.

During the three months ended December 31, 2018, frac sand demand and tons sold declined sequentially compared to the three months ended September 30, 2018, as summarized below. Average selling price per ton also declined sequentially, mainly driven by more tons sold from local in-basin plants and increased proppant supply causing decreased sand pricing.

Amounts in thousands, except per ton data					Percentage Change for the Three Months Ended		
Oil & Gas Proppants	December 31, 2018	September 30, 2018	June 30, 2018	March 31, 2018	December 31, 2018 vs. September 30, 2018	September 30, 2018 vs. June 30, 2018	June 30, 2018 vs. March 31, 2018
Sales	$243,546	$302,452	$324,063	$312,930	(19)%	(7)%	4%
Tons Sold	3,704	3,821	3,465	3,252	(3)%	10%	7%
Average Selling Price per Ton	$65.75	$79.16	$93.52	$96.23	(17)%	(15)%	(3)%

If oil and gas drilling and completion activity does not continue to grow, demand for frac sand may decline, which could result in us selling fewer tons, selling tons at lower prices, or both. If we sell less frac sand, or sell frac sand at lower prices, our revenue, net income, cash generated from operating activities, and liquidity would be adversely affected. We could incur additional asset impairments. If these events occur, we may evaluate actions to reduce cost and improve liquidity. For instance, depending on market conditions, we could implement additional cost improvement projects or reduce our capital spending by delaying or canceling capital projects.

Oil and natural gas exploration and production companies' and oilfield service providers’ preferences and expectations have been evolving in recent years. A proppant supplier's logistics capabilities have become an important differentiating factor when competing for business, on both a spot and contract basis. Many of our customers increasingly seek convenient in-basin and wellhead proppant delivery capability from their proppant supplier. We believe that, over time, proppant customers will prefer to consolidate their purchases across a smaller group of suppliers with robust logistics capabilities and a broad offering of proppants.

We believe fluctuations in frac sand demand and price may occur as the market adjusts to changing supply and demand due to energy pricing fluctuations. Fluctuations in price may also occur as the supply of local in-basin sand changes. Over the past year, this trend of customers preferring local in-basin sand has accelerated.

Industrial and specialty products end market trends

Demand in the industrial and specialty products end markets has been relatively stable in recent years and is primarily influenced by key macroeconomic drivers such as housing starts, population growth, light vehicle sales, beer and wine production, repair and remodel activity and industrial production. The primary end markets served by our Industrial & Specialty Products segment are building and construction products, fillers and extenders, filtration, glassmaking, absorbents, foundry, and sports and recreation. We have been increasing our value-adding product offerings in the industrial and specialty products end markets organically as well as through acquisitions, such as White Armor and EPM. Sales of these new higher margin products have increased our Industrial & Specialty Products segment's profitability in recent periods.

Our Business Strategy

The key drivers of our growth strategy include:

- increasing our presence and product offering in specialty products end markets
- optimizing our product mix and further developing value-added capabilities to maximize margins
- effectively positioning our Oil & Gas Proppants facilities to optimally serve our customers
- optimizing our supply chain network and leveraging our logistics capabilities to meet our customers’ needs
- evaluating both Greenfield and Brownfield expansion opportunities and other acquisitions; and maintaining financial strength and flexibility.

For additional information about our key business strategies, see the discussion under “Our Company-Our Business Strategy” in Item 1. Business.”

How We Generate Our Sales

Products

We derive our product sales by mining and processing minerals that our customers purchase for various uses. Our product sales are primarily a function of the price per ton and the number of tons sold. We primarily sell our products through individual purchase orders executed under short-term price agreements or at prevailing market rates. The amount invoiced reflects product, transportation and / or additional handling services as applicable, such as storage, transloading the product from railcars to trucks and last mile logistics to the customer site. We invoice most of our product customers on a per shipment basis, although for some larger customers, we consolidate invoices weekly or monthly. Standard collection terms are net 30 days, although extended terms are offered in competitive situations.

Services

We derive our service sales primarily through the provision of transportation, equipment rental, and contract labor services to companies in the oil and gas industry. Transportation services typically consist of transporting customer proppant from storage facilities to proximal well-sites and are contracted through work orders executed under established pricing agreements. The amount invoiced reflects transportation services rendered. Equipment rental services provide customers with use of either dedicated or nonspecific wellhead proppant delivery equipment solutions for contractual periods defined either through formal lease agreements or executed work orders under established pricing agreements. The amounts invoiced reflect the length of time the equipment set was utilized in the billing period. Contract labor services provide customers with proppant delivery equipment operators through work orders executed under established pricing agreements. The amounts invoiced reflect the amount of time our labor services were utilized in the billing period. We typically invoice our customers on a weekly or monthly basis; however, some customers receive invoices upon well-site operation completion. Standard collection terms are net 30 days, although extended terms are offered in competitive situations.

Our ten largest customers accounted for approximately 48%, 58%, and 52% of total sales during the years ended December 31, 2018, 2017 and 2016, respectively. Sales to one of our customers accounted for 15% of our total sales during the year ended December 31, 2018. Sales to two of our customers accounted for 15% and 12% of our total sales during the year ended December 31, 2017. Sales to one of our customers accounted for 13% of our total sales during the year ended December 31, 2016. No other customers accounted for 10% or more of our total sales. At December 31, 2018, one of our customer's accounts receivable represented 18% of our total trade accounts receivable, net of allowance. At December 31, 2017, two of our customers' accounts receivable represented 19% and 11% of our total trade accounts receivable, net of allowance. No other customers accounted for 10% or more of our total trade accounts receivable.

For a limited number of customers, we sell under long-term, minimum purchase supply agreements. These agreements define, among other commitments, the volume of product that our customers must purchase, the volume of product that we must provide and the price that we will charge and that our customers will pay for each product. Prices under these agreements are generally fixed and subject to certain contractual adjustments. Sometimes these agreements may undergo negotiations regarding pricing and volume requirements, which may occur in volatile market conditions. When these negotiations are occuring, we may deliver sand at prices or at volumes below the requirements in our existing supply agreements. We do not consider these agreements solely representative of contracts with customers. An executed order specifying the type and quantity of product to be delivered, in combination with the noted agreements, comprise our contracts in these arrangements. Selling more tons under supply contracts enables us to be more efficient from a production, supply chain and logistics standpoint. As discussed in Part I, Item 1A., Risk Factors of this Annual Report on Form 10-K, these customers may not continue to purchase the same levels of product in the future due to a variety of reasons, contract requirements notwithstanding.

As of December 31, 2018, we have twenty-one minimum purchase supply agreements in the Oil & Gas Proppants segment with initial terms expiring between 2019 and 2034. As of December 31, 2017, we had twenty-three minimum purchase supply agreements in the Oil & Gas Proppants segment with initial terms expiring between 2018 and 2022. Collectively, sales to customers with minimum purchase supply agreements accounted for 52% and 32% of Oil & Gas Proppants segment sales during the years ended December 31, 2018 and 2017, respectively. Although sales under minimum purchase supply agreements may result in us realizing lower margins than we otherwise might during

periods of high market prices, we believe such lower margins are offset by the benefits derived from the product mix and sales volume stability afforded by such supply agreements, which helps us lower market risk arising from adverse changes in spot prices and market conditions.

In the industrial and specialty products end markets we have not historically entered into long-term minimum purchase supply agreements with our customers because of the high cost to our customers of switching providers. We may periodically do so when capital or other investment is required to meet customer needs. Instead, we often enter into supply agreements with our customers with targeted volumes and terms of one to five years. Prices under these agreements are generally fixed and subject to annual increases.

The Costs of Conducting Our Business

The principal expenses involved in conducting our business are transportation costs, labor costs, electricity and drying fuel costs, and maintenance and repair costs for our mining and processing equipment and facilities. Transportation and related costs include freight charges, fuel surcharges, transloading fees, switching fees, railcar lease costs, demurrage costs, storage fees and labor costs. We believe the majority of our operating costs are relatively stable in price, but they can vary significantly based on the volume of product produced. We benefit from owning the majority of the mineral deposits that we mine and having long-term mineral rights leases or supply agreements for our other primary sources of raw material, which limits royalty payments.

Additionally, we incur expenses related to our corporate operations, including costs for sales and marketing; research and development; and the finance, legal, environmental, health and safety functions of our organization. These costs are principally driven by personnel expenses.

How We Evaluate Our Business

Our management team evaluates our business using a variety of financial and operating metrics. We evaluate the performance of our two segments based on their tons sold, average selling price and contribution margin earned. Additionally, we consider a number of factors in evaluating the performance of our business as a whole, including total tons sold, average selling price, total segment contribution margin, and Adjusted EBITDA. We view these metrics as important factors in evaluating our profitability and review these measurements frequently to analyze trends and make decisions, and we believe the presentation of these metrics provides useful information to our investors regarding our financial condition and results of operations for the same reasons.

Segment Contribution Margin

Segment contribution margin, a non-GAAP measure, is a key metric that management uses to evaluate our operating performance and to determine resource allocation between segments. Segment contribution margin excludes certain corporate costs not directly related to the operations of the segment. These unallocated costs include costs that are related to corporate functional areas such as operations management, corporate purchasing, accounting, treasury, information technology, legal and human resources.

Segment contribution margin is not a measure of our financial performance under GAAP and should not be considered an alternative to measures derived in accordance with GAAP. For more information about segment contribution margin, including a reconciliation of this measure to its most directly comparable GAAP financial measure, net income (loss), see Note W - Segment Reporting to our Consolidated Financial Statements in Part II, Item 8. of this Annual Report on Form 10-K.

Adjusted EBITDA

Adjusted EBITDA, a non-GAAP measure, is included in this report because it is a key metric used by management to assess our operating performance and by our lenders to evaluate our covenant compliance. Adjusted EBITDA excludes certain income and/or costs, the removal of which improves comparability of operating results across reporting periods. Our target performance goals under our incentive compensation plan are tied, in part, to our Adjusted EBITDA.

Adjusted EBITDA is not a measure of our financial performance or liquidity under GAAP and should not be considered as an alternative to net income (loss) as a measure of operating performance, cash flows from operating activities as a measure of liquidity or any other performance measure derived in accordance with GAAP. Additionally, Adjusted EBITDA is not intended to be a measure of free cash flow for management’s discretionary use, as it does not consider certain cash requirements such as interest payments, tax payments and debt service requirements. Adjusted EBITDA contains certain other limitations, including the failure to reflect our cash expenditures, cash requirements for working capital needs and cash costs to replace assets being depreciated and amortized, and excludes certain charges that may recur in the future. Management compensates for these limitations by relying primarily on our GAAP results and by using Adjusted EBITDA only supplementally. Our measure of Adjusted EBITDA is not necessarily comparable to other similarly titled captions of other companies due to potential inconsistencies in the methods of calculation.

The following table sets forth a reconciliation of net income (loss), the most directly comparable GAAP financial measure, to Adjusted EBITDA.

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(amounts in thousands)	Year ended December 31,		
	2018	2017	2016
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$(200,808)	$145,206	$(41,056)
Total interest expense, net of interest income	64,689	25,871	25,779
Provision for taxes	(29,132)	(8,680)	(36,689)
Total depreciation, depletion and amortization expenses	148,832	97,233	68,134
EBITDA	(16,419)	259,630	16,168
Non-cash incentive compensation [1]	22,337	25,050	12,107
Post-employment expenses (excluding service costs) [2]	2,206	1,231	1,040
Merger and acquisition related expenses [3]	34,098	9,010	8,206
Plant capacity expansion expenses [4]	59,112	5,667	—
Contract termination expenses [5]	2,491	325	—
Goodwill and other asset impairments [6]	281,899	—	—
Business optimization projects [7]	1,980	—	—
Other adjustments allowable under the Credit Agreement [8]	4,819	6,790	2,033
Adjusted EBITDA	$392,523	$307,703	$39,554

(1) Reflects equity-based, non-cash compensation expense.

(2) Includes net pension cost and net post-retirement cost relating to pension and other post-retirement benefit obligations during the applicable period, but in each case excluding the service cost relating to benefits earned during such period. Non-service net periodic benefit costs are not considered reflective of our operating performance because these costs do not exclusively originate from employee services during the applicable period and may experience periodic fluctuations as a result of changes in non-operating factors, including

changes in discount rates, changes in expected returns on benefit plan assets, and other demographic actuarial assumptions. See Note P - Pension and Post-Retirement Benefits to our Consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K for more information.

(3) Merger and acquisition related expenses include legal fees, consulting fees, bank fees, severance costs, certain purchase accounting items such as the amortization of inventory fair value step-up, information technology integration costs and similar charges. 2018 expenses were higher than 2017 expenses, mainly due to the amortization of inventory fair value step-up. While these costs are not operational in nature and are

not expected to continue for any singular transaction on an ongoing basis, similar types of costs, expenses and charges have occurred in prior periods and may recur in the future as we continue to integrate prior acquisitions and pursue any future acquisitions.

(4) Plant capacity expansion expenses include expenses that are not inventoriable or capitalizable as related to plant expansion projects greater than $5 million in capital expenditures or plant start up projects. While these expenses are not operational in nature and are not expected to continue for any singular project on an ongoing basis, similar types of expenses have occurred in prior periods and may recur in the future as we continue to pursue future

plant capacity expansion.

(5) Reflects contract termination expenses related to strategically exiting a service contract and losses related to sub-leases. While these expenses are not operational in nature and are not expected to continue for any singular event on an ongoing basis, similar types of expenses have occurred in prior periods and may recur in the future as we continue to strategically evaluate our contracts.

(6) Reflects $164.2 million of goodwill impairments, $97.0 million of long-lived asset impairments and $4.5 million of intangible asset impairments for 2018 in our Oil & Gas Proppants reporting segment due to a declining shift in demand for Northern White sand caused by some of our

customers shifting to local in-basin frac sands with lower logistics costs. It also reflects a $16.2 million asset impairment related to the closure of our resin coating facility and associated product portfolio during the second quarter of 2018. See Note I - Goodwill and Intangible Assets and Note H - Property, Plant and Mine Development for additional information.

(7) Reflects costs incurred related to business optimization projects within our corporate center, which aim to measure and improve the efficiency, productivity and performance of our organization. While these costs are not operational in nature and are not expected to continue for any singular project on an ongoing basis, similar types of expenses may

recur in the future.

(8) Reflects miscellaneous adjustments permitted under the Credit Agreement. For 2018, includes storm damage costs, recruiting fees and relocation costs, and a net loss of $0.7 million on divestitures of assets, consisting of $5.2 million of contract termination costs and $1.3 million of divestiture related expenses such as legal fees and consulting fees, partially offset by a $5.8 million gain on sale of assets. For 2017, includes a contract restructuring cost of $6.3 million. For 2016, includes restructuring costs of $3.5 million and a gain on insurance settlement of $1.5 million. While these gains and costs are not operational in nature and are

not expected to continue for any singular event on an ongoing basis, similar types of gains and expenses have occurred in prior periods and may recur in the future.

Adjusted EBITDA-Trailing Twelve Months

Our Revolver contains a consolidated total net leverage ratio that we must meet as of the last day of any fiscal quarter whenever usage of the Revolver (other than certain undrawn letters of credit) exceeds 30% of the Revolver commitment, which is calculated based on our Adjusted EBITDAfor the trailing twelve months. Noncompliance with this financial ratio covenant could result in the acceleration of our obligations to repay all amounts outstanding under the Revolver and the Term Loan. Moreover, the Revolver and the Term Loan contain covenants that restrict, subject to certain exceptions, our ability to make permitted acquisitions, incur additional indebtedness, make restricted payments (including dividends) and retain excess cash flow based, in some cases, on our ability to meet leverage ratios calculated based on our Adjusted EBITDA for the trailing twelve months.

See the description under “Adjusted EBITDA” above for certain important information about Adjusted EBITDA-trailing twelve months, including certain limitations and management’s use of this metric in light of its status as a non-GAAP measure.

As of December 31, 2018, we are in compliance with all covenants in accordance with our Revolver and Term Loan. The Revolver and Term Loan require us to maintain a consolidated leverage ratio of no more than 3.75:1.00 as of the last day of any fiscal quarter whenever usage of the Revolver (other than certain undrawn letters of credit) exceeds 30% of the Revolver commitment. As of December 31, 2018, our Revolver usage was zero (other than certain undrawn letters of credit). Since the Revolver usage did not exceed 30% of the Revolver commitment, the consolidated leverage ratio covenant did not apply. The calculation of the consolidated leverage ratio incorporates the Adjusted EBITDA-trailing twelve months as follows:

(All amounts in thousands)	December 31, 2018
Total debt	$1,259,411
Capital leases	344
Total consolidated debt	$1,259,755
Adjusted EBITDA-trailing twelve months	$392,523
Pro forma Adjusted EBITDA including impact of acquisitions [(1)]	18,117
Other adjustments for covenant calculation [(2)]	254
Total Adjusted EBITDA-trailing twelve months for covenant calculation	$410,894
Consolidated leverage ratio[(3)]	3.07

(1) Covenant calculation allows for the Adjusted EBITDA-trailing twelve months to include the impact of acquisitions on a pro forma basis.

(2) Covenant calculation excludes activity at legal entities

above the operating company, which is mainly interest income offset by public company operating expenses.

(3) Calculated by dividing Total consolidated debt by Total Adjusted EBITDA-trailing twelve months for covenant calculation.

Results of Operations for the Years Ended December 31, 2018, 2017 and 2016

Sales

(In thousands except per ton data)	Year ended December 31,			Percent Change	
	2018	2017	2016	'18 vs. '17	'17 vs. '16
Sales:					
Oil & Gas Proppants	$1,182,991	$1,020,365	$362,550	16 %	181 %
Industrial & Specialty Products	394,307	220,486	197,075	79 %	12 %
Total sales	$1,577,298	$1,240,851	$559,625	27 %	122 %
Tons:					
Oil & Gas Proppants	14,242	11,595	6,442	23 %	80 %
Industrial & Specialty Products	3,817	3,533	3,433	8 %	3 %
Total Tons	18,059	15,128	9,875	19 %	53 %
Average Selling Price per Ton:					
Oil & Gas Proppants	$83.06	$88.00	$56.28	(6)%	56 %
Industrial & Specialty Products	103.30	62.41	57.41	66 %	9 %
Overall Average Selling Price per Ton	$87.34	$82.02	$56.67	6 %	45 %

2018 vs. 2017

Total sales increased 27% for the year ended December 31, 2018 compared to the year ended December 31, 2017, driven by a 19% increase in total tons sold and a 6% increase in overall average selling price. Tons sold in-basin represented 51% and 49% of total company tons sold for the year ended December 31, 2018 and 2017, respectively. The increase in total sales was partly driven by Oil & Gas Proppants sales, which increased 16% for the year ended December 31, 2018 compared to the year ended December 31, 2017. Oil & Gas Proppants tons sold increased 23% and average selling price decreased 6%. The increase in tons sold was driven by year over year growth in demand for our frac sand. The decrease in average selling price was mainly driven by more tons sold from local in-basin plants, increased proppant supply, and decreased sand pricing.

The increase in total sales was also driven by Industrial & Specialty Products sales, which increased 79% for the year ended December 31, 2018 compared to the year ended December 31, 2017. Industrial & Specialty Products tons sold increased 8% and average selling price increased 66%. The increase in tons sold was due to the acquisition of EPM and additional business with existing customers. The increase in average selling price was due to the acquisition of EPM, additional higher-margin product sales and price increases.

2017 vs. 2016

Total sales increased 122% for the year ended December 31, 2017 compared to the year ended December 31, 2016, driven by a 53% increase in total tons sold and a 45% increase in overall average selling price. Tons sold in-basin represented 49% and 41% of total company tons sold for the year ended December 31, 2017 and 2016, respectively. The increase in total sales was driven by Oil & Gas Proppants sales, which increased 181% for the year ended December 31, 2017 compared to the year ended December 31, 2016. Oil & Gas Proppants tons sold increased 80% and average selling price increased 56%. These increases were driven by growth in demand for our frac sand and the acquisition of Sandbox, NBI and MS Sand.

Industrial & Specialty Products sales increased 12% for the year ended December 31, 2017 compared to the year ended December 31, 2016, driven by a 3% increase in tons sold and a 9% increase in average selling price. The increase in tons sold is mainly due to additional business with existing customers. The increase in average selling price was primarily a result of new higher-margin product sales and price increases.

Cost of Sales

2018 vs. 2017

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Cost of sales increased by $296.3 million, or 34%, to $1.163 billion for the year ended December 31, 2018 compared to $866.8 million for the year ended December 31, 2017. These changes result from the main components of cost of sales as discussed below. As a percentage of sales, cost of sales represented 74% for the year ended December 31, 2018 compared to 70% for the same period in 2017, mainly due to plant capacity expansion expenses.

We incurred $545.8 million and $490.8 million of transportation and related costs for the year ended December 31, 2018 and 2017, respectively. This increase was mainly due to costs related to additional Sandbox operations. As a percentage of sales, transportation and related costs decreased to 35% for the year ended December 31, 2018 compared to 40% for the same period in 2017.

We incurred $184.4 million and $137.2 million of operating labor costs for the year ended December 31, 2018 and 2017, respectively. The $47.2 million increase in labor costs incurred was due to more tons sold, costs related to additional Sandbox operations and the acquisition of EPM. As a percentage of sales, operating labor costs represented 12% for the year ended December 31, 2018 compared to 11% for the same period in 2017.

We incurred $48.7 million and $35.6 million of electricity and drying fuel (principally natural gas) costs for the year ended December 31, 2018 and 2017, respectively. The $13.1 million increase in electricity and drying fuel costs incurred was due to more tons sold and the acquisition of EPM. As a percentage of sales, electricity and drying fuel costs represented 3% for the year ended December 31, 2018 compared to 3% for the same period in 2017.

We incurred $105.5 million and $60.9 million of maintenance and repair costs for the year ended December 31, 2018 and 2017, respectively. The increase in maintenance and repair costs incurred was due to plant capacity expansion expenses, higher production volume, additional Sandbox operations and the acquisition of EPM. As a percentage of sales, maintenance and repair costs represented 7% for the year ended December 31, 2018 compared to 5% for the same period in 2017.

2017 vs. 2016

Cost of sales increased $390.0 million, or 82%, to $866.8 million for the year ended December 31, 2017 compared to $476.8 million for the year ended December 31, 2016. As a percentage of sales, cost of sales decreased to 70% for the year ended December 31, 2017 compared to 85% for the same period in 2016. These changes result from the main components of cost of sales as discussed below.

We incurred $490.8 million and $249.7 million of transportation and related costs for the year ended December 31, 2017 and 2016, respectively. This increase was due to increased tons sold through our transloads and the Sandbox acquisition. As a percentage of sales, transportation and related costs decreased to 40% for the year ended December 31, 2017 compared to 45% for the same period in 2016.

We incurred $137.2 million and $83.2 million of operating labor costs for the year ended December 31, 2017 and 2016, respectively. The $54.0 million increase in labor costs incurred was primarily due to more tons sold and incremental costs related to Sandbox operations. As a percentage of sales, operating labor costs represented 11% for the year ended December 31, 2017 compared to 15% for the same period in 2016.

We incurred $35.6 million and $26.7 million of electricity and drying fuel (principally natural gas) costs for the year ended December 31, 2017 and 2016, respectively. The increase in electricity and drying fuel costs incurred was due to more tons sold. As a percentage of sales, electricity and drying fuel costs represented 3% for the year ended December 31, 2017 compared to 5% for the same period in 2016.

We incurred $60.9 million and $34.3 million of maintenance and repair costs for the year ended December 31, 2017 and 2016, respectively. The increase in maintenance and repair costs incurred was mainly due to higher production volume and incremental costs related to Sandbox operations and the addition of our Tyler, Texas facility. As a percentage of sales, maintenance and repair costs represented 5% for the year ended December 31, 2017 compared to 6% for the same period in 2016.

Segment Contribution Margin

2018 vs. 2017

Oil & Gas Proppants contribution margin increased by $55.9 million to $357.8 million for the year ended December 31, 2018 compared to $302.0 million for the year ended December 31, 2017, driven by a $162.6 million increase in sales, partially offset by $106.8 million in higher cost of sales. The increase in segment contribution margin was driven by year over year growth in demand for our frac sand and for our Sandbox last mile logistics solution, as well as the acquisition of MS Sand, partly offset by lower sand pricing.

Industrial & Specialty Products contribution margin increased by $66.3 million, or 75%, to $155.1 million for the year ended December 31, 2018 compared to $88.8 million for the year ended December 31, 2017, driven by a $173.8 million increase in revenue, partially offset by $107.5 million in higher cost of sales. The increase in segment contribution margin was due to the acquisition of EPM as well as additional business with existing customers, new higher-margin product sales and price increases.

2017 vs. 2016

Oil & Gas Proppants contribution margin increased by $290.5 million to $302.0 million for the year ended December 31, 2017 compared to $11.4 million for the year ended December 31, 2016, driven by a $657.8 million increase in sales, partially offset by 105% higher cost of sales.

Industrial & Specialty Products contribution margin increased by $9.8 million, or 12%, to $88.8 million for the year ended December 31, 2017 compared to $79.0 million for the year ended December 31, 2016, driven by a $23.4 million increase in revenue, partially offset by 12% higher cost of sales.

Selling, General and Administrative Expenses

2018 vs. 2017

Selling, general and administrative expenses increased by $39.9 million, or 37%, to $147.0 million for the year ended December 31, 2018 compared to $107.1 million for the year ended December 31, 2017. The increase was due to the following factors:

- Compensation related expense increased by $22.7 million for the year ended December 31, 2018 compared to the year ended December 31, 2017, due to the acquisition of EPM, higher employee headcount, and increased equity-based compensation.
- Merger and acquisition related expense increased by $9.5 million to $13.9 million for the year ended December 31, 2018 compared to $4.4 million for the year ended December 31, 2017. The increase was mainly due to costs related to the acquisition of EPM.
- Business optimization project expenses within our corporate center, which aim to measure and improve the efficiency, productivity and performance of our organization, were $2.0 million for the year ended December 31, 2018.
- A net loss of $0.7 million on divestitures of assets, consisting of $5.2 million of contract termination costs and $1.3 million of divestiture related expenses such as legal fees and consulting fees, partially offset by a $5.8 million gain on sales of assets during the first quarter of 2018.

In total, our selling, general and administrative expenses represented approximately 9% of our sales for the years ended December 31, 2018 and 2017.

2017 vs. 2016

Selling, general and administrative expenses increased by $39.9 million, or 59%, to $107.1 million for the year ended December 31, 2017 compared to $67.2 million for the year ended December 31, 2016. The increase was due to the following factors:

- Compensation related expense increased by $30.8 million for the year ended December 31, 2017 compared to 2016, primarily due to increased equity-based compensation and higher employee headcount due to our acquisitions of NBI, Sandbox and MS Sand.
- Bad debt expense increased by $2.8 million for the year ended December 31, 2017 compared to the year ended December 31, 2016, mainly due to increased sales.

Merger and acquisition related expense decreased by $1.2 million to $4.4 million for the year ended December 31, 2017 compared to $5.6 million for the year ended December 31, 2016. The decrease was due to lower MS Sand merger and acquisition expenses compared to the NBI and Sandbox acquisitions.

In total, our selling, general and administrative expenses represented approximately 9% and 12% of our sales for the year ended December 31, 2017 and 2016, respectively.

Depreciation, Depletion and Amortization

Depreciation, depletion and amortization expense increased by $51.6 million, or 53%, to $148.8 million for the year ended December 31, 2018 compared to $97.2 million for the year ended December 31, 2017. The increase was mainly driven by our plant capacity expansions and our acquisitions, including the acquisition of EPM, as well as other continued capital spending. Depreciation, depletion and amortization expense represented approximately 9% and 8% of our sales for the year ended December 31, 2018 and 2017, respectively.

Depreciation, depletion and amortization expense increased by $29.1 million, or 43%, to $97.2 million for the year ended December 31, 2017 compared to $68.1 million for the year ended December 31, 2016. This increase was driven by our acquisitions as well as other capital spending. Depreciation, depletion and amortization expense represented approximately 8% and 12% of our sales for the year ended December 31, 2017 and 2016, respectively.

Goodwill and Other Asset Impairments

During the year ended December 31, 2018, we recorded $164.2 million in goodwill impairments, $97.0 million of long-lived asset impairments and $4.5 million of intangible impairments in our Oil & Gas Proppants reportable segment due to a declining shift in demand for Northern White sand caused by some of our customers shifting to local in-basin frac sands with lower logistics costs. We also recorded a $16.2 million asset impairment related to the closure of our resin coating facility and associated product portfolio during the second quarter of 2018.

Operating Income (Loss)

Operating income decreased by $333.3 million to an operating loss of $163.5 million for the year ended December 31, 2018 compared to operating income of $169.7 million for the year ended December 31, 2017. The decrease was driven by goodwill and other asset impairments as discussed above, a 34% increase in cost of sales, a 37% increase in selling, general and administrative expense and a 53% increase in depreciation, depletion and amortization expense, partially offset by a 27% increase in total sales.

Operating income increased by $222.2 million, or 423%, to $169.7 million for the year ended December 31, 2017, compared to a $52.5 million operating loss for the year ended December 31, 2016. The increase was due to a 122% increase in sales, partially offset by an 82% increase in cost of sales, a 59% increase in selling, general and administrative expense, and a 43% increase in depreciation, depletion and amortization expense.

Interest Expense

Interest expense increased by $39.2 million, or 125%, to $70.6 million for the year ended December 31, 2018 compared to $31.3 million for the year ended December 31, 2017, mainly driven by an increase in our new Credit Facility to finance the acquisition of EPM.

Interest expense increased by $3.4 million, or 12%, to $31.3 million for the year ended December 31, 2017 compared to $28.0 million for the year ended December 31, 2016, driven by additional long-term liabilities assumed in connection with our acquisitions of NBI and Sandbox.

Other Income (Expense), net, including interest income

Other income increased by $6.0 million, or 321%, to $4.1 million for the year ended December 31, 2018 compared to $1.9 million in other expense for the year ended December 31, 2017. The increase was mainly due to contract restructuring charges in 2017 that did not recur in 2018.

Other expense increased by $4.6 million, or 169%, to $1.9 million for the year ended December 31, 2017 compared to $2.7 million in other income for the year ended December 31, 2016. The increase was mainly due to contract restructuring charges in 2017.

Provision for Income Taxes

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (the “Tax Act”). The Tax Act reduces the corporate tax rate to 21 percent, effective January 1, 2018. Because ASC 740-10-25-47 requires the effect of a change in tax laws or rates to be recognized as of the date of enactment, we were required to adjust our deferred tax assets and liabilities as of December 22, 2017. Accordingly, we recorded a deferred income tax benefit of $35.8 million for the year ended December 31, 2017.

Our income tax benefit increased by $20.5 million to $29.1 million for the year ended December 31, 2018 compared to an $8.7 million income tax benefit for the year ended December 31, 2017. The increase was mainly due to decreased profit before income tax during the year ended December 31, 2018. The effective tax rate was 13% and (6)% for the year ended December 31, 2018 and 2017, respectively. For the year ended December 31, 2018, the tax effect of goodwill impairments described in Note I - Goodwill and Intangible Assets is a significant permanent item in the effective tax rate calculation. The effective tax rate for the year ended December 31, 2018 and 2017 would have been 32% and 22%, respectively, without the discrete tax items and the tax effect of goodwill impairments. See Note T - Income Taxes to our Consolidated Financial Statements in Part II, Item 8. of this Annual report on Form 10-K for more information.

Our provision for income taxes decreased $28.0 million, or 76%, to an $8.7 million income tax benefit for the year ended December 31, 2017, compared to a $36.7 million income tax benefit for the year ended December 31, 2016. The decrease was due to increased profit before income taxes, offset primarily by the deferred income tax benefit of the Tax Act for the year ended December 31, 2017. The tax rate for the year ended December 31, 2017 is not predictive of future tax rates due to the deferred income tax benefit of the Tax Act. The tax rate would have been 22% without the tax effects of the deferred income tax benefit of the Tax Act, equity compensation tax benefits and the prior year tax return reconciliation which were all recorded discretely for the year ended December 31, 2017. The tax rate for the year ended December 31, 2016 would have been 44% without equity compensation and the prior year tax return reconciliation which were all recorded discretely.

Historically, our actual effective tax rates have differed from the statutory effective rate primarily due to the benefit received from statutory percentage depletion allowances. The deduction for statutory percentage depletion does not necessarily change proportionately to changes in income before income taxes.

Net Income (Loss)

Net income (loss) attributable to U.S. Silica Holdings, Inc., was $(200.8) million, $145.2 million and $(41.1) million for the year ended December 31, 2018, 2017 and 2016, respectively. The year over year changes were due to the factors noted above.

Liquidity and Capital Resources

Overview

Our principal liquidity requirements have historically been to service our debt, to meet our working capital, capital expenditure and mine development expenditure needs, to return cash to our stockholders, and to finance acquisitions. We have historically met our liquidity and capital investment needs with funds generated through operations. We have historically funded our acquisitions through cash on hand, borrowings under our credit facilities, or equity issuances. In March 2016, we completed a public offering of 10,000,000 shares of our common stock for total net cash proceeds of $186.2 million. In November 2016, we executed another offering of 10,350,000 shares of common stock raising net cash proceeds of $467.0 million. Our working capital is the amount by which current assets exceed current liabilities and is a measure of our ability to pay our liabilities as they become due. As of December 31, 2018, our working capital was $338.9 million and we had $95.2 million of availability under the Revolver.

In connection with the EPMH acquisition, on May 1, 2018, we entered into the Credit Agreement with BNP Paribas, as administrative agent, and the lenders named therein. The Credit Agreement increases our existing senior debt by entering into a new $1.380 billion senior secured Credit Facility, consisting of a $1.280 billion Term Loan and a $100 million Revolver that may also be used for swingline loans or letters of credit, and we may elect to increase the Term Loan in accordance with the terms of the Credit Agreement. The amounts owed under the Credit Agreement use LIBOR as a benchmark for establishing the rate at which interest accrues. LIBOR is the subject of recent national, international and other regulatory guidance and proposals for reform. These reforms and other pressures may cause LIBOR to disappear entirely or to perform differently than in the past. The consequences of these developments cannot be entirely predicted but could include an increase in the cost to us of this indebtedness. For more information on the Credit Agreement see Note K - Debt to our Consolidated Financial Statements in Part II, Item 8. of this Annual Report on Form 10-K.

We believe that cash on hand, cash generated through operations and cash generated from financing arrangements will be sufficient to meet our working capital requirements, anticipated capital expenditures, scheduled debt payments and any dividends declared for at least the next 12 months.

Management and our Board remain committed to evaluating additional ways of creating shareholder value. Any determination to pay dividends or other distributions in cash, stock, or property in the future or otherwise return capital to our stockholders, including decisions about existing or new share repurchase programs, will be at the discretion of our Board and will be dependent on then-existing conditions, including industry and market conditions, our financial condition, results of operations, liquidity and capital requirements, contractual restrictions including restrictive covenants contained in debt agreements, and other factors. Additionally, because we are a holding company, our ability to pay dividends on our common stock may be limited by restrictions on the ability of our subsidiaries to pay dividends or make distributions to us, including restrictions under the terms of the agreements governing our indebtedness.

Cash Flow Analysis

A summary of operating, investing and financing activities (in thousands) is shown in the following table:

	Year ended December 31,		
	2018	2017	2016
Net cash provided by (used in):			
Operating activities	$310,706	$222,013	$ 381
Investing activities	(1,066,879)	(491,529)	(201,657)
Financing activities	574,104	(57,142)	635,424

Net Cash Provided by / Used in Operating Activities

Operating activities consist primarily of net income adjusted for certain non-cash and working capital items. Adjustments to net income for non-cash items include depreciation, depletion and amortization, deferred revenue, deferred income taxes, equity-based compensation and bad debt provision. In addition, operating cash flows include the effect of changes in operating assets and liabilities, principally accounts receivable, inventories, prepaid expenses and other current assets, income taxes payable and receivable, accounts payable and accrued expenses.

Net cash provided by operating activities was $310.7 million for the year ended December 31, 2018. This was mainly due to a $200.8 million net loss adjusted for non-cash items, including $148.8 million in depreciation, depletion and amortization, $281.9 million in goodwill and other asset impairments in our Oil & Gas Proppants reportable segment due to a

declining shift in demand for Northern White sand caused by some of our customers shifting to local in-basin frac sands with lower logistics costs, and the closure of our resin coating facility and associated product portfolio, $31.1 million in deferred income taxes, $22.3 million in equity-based compensation, $36.7 million in deferred revenue, $5.2 million mainly related to the gain on sale of three transload facilities, and $8.3 million in other miscellaneous non-cash items. Also contributing to the change was a $56.8 million decrease in accounts receivable, a $13.1 million decrease in inventories, a $2.7 million increase in prepaid expenses and other current assets, a $3.8 million decrease in income taxes, a $26.9 million increase in accounts payable and accrued liabilities, $52.8 million in short-term and long-term vendor incentives, and $3.4 million in other operating assets and liabilities.

Net cash provided by operating activities was $222.0 million for the year ended December 31, 2017. This was mainly due to $145.2 million in net income adjusted for non-cash items, including $97.2 million in depreciation, depletion and amortization, $20.6 million in deferred income taxes, $25.1 million in equity-based compensation, $28.4 million in deferred revenue, and $17.6 million in other miscellaneous non-cash items. Also contributing to the change was a $110.9 million increase in accounts receivable, a $4.8 million increase in inventories, an $8.8 million decrease in prepaid expenses and other current assets, a $43.7 million increase in accounts payable and accrued liabilities, a $1.5 million increase in income taxes, and $9.1 million in other operating assets and liabilities.

Net cash provided by operating activities was $0.4 million for the year ended December 31, 2016. This was mainly due to a $41.1 million net loss adjusted for non-cash items, including $68.1 million in depreciation, depletion and amortization, $36.9 million in deferred income taxes, $12.1 million in equity-based compensation, $9.0 million in deferred revenue, and $6.4 million in other miscellaneous non-cash items; Also contributing to the change was a $13.0 million increase in accounts receivable, a $10.2 million increase in inventories, a $13.2 million increase in accounts payable and accrued liabilities, an $11.6 million increase in income taxes, and $0.9 million in other operating assets and liabilities.

Net Cash Provided by / Used in Investing Activities

Investing activities consist primarily of cash consideration paid to acquire businesses and capital expenditures for growth and maintenance.

Net cash used in investing activities was $1.067 billion for the year ended December 31, 2018. This was mainly due to capital expenditures of $339.8 million, cash consideration of $743.2 million paid for the EPMH acquisition, and capitalized intellectual property costs of $10.0 million, partially offset by proceeds from the sale of property, plant and equipment, mainly three transload facilities, of $26.2 million. Capital expenditures for the year ended December 31, 2018 were mainly for engineering, procurement and construction of our growth projects, primarily Crane and Lamesa, equipment to expand our Sandbox operations, and other maintenance and cost improvement capital projects.

Net cash used in investing activities was $491.5 million for the year ended December 31, 2017. This was mainly due to capital expenditures of $368.5 million, cash consideration of $119.8 million paid for the acquisition of businesses, and capitalized intellectual property costs of $3.6 million. Capital expenditures for the year ended December 31, 2017 were approximately $49.6 million for a purchase of reserves in Lamesa, Texas, $94.4 million for a purchase of reserves in Crane County, Texas, and $224.5 million for engineering, procurement and construction of our growth projects and other maintenance and cost improvement capital projects.

Net cash used in investing activities was $201.7 million for the year ended December 31, 2016. This was due to $176.6 million of cash consideration paid for our NBI and Sandbox acquisitions and capital expenditures of $46.5 million, partially offset by $21.9 million in proceeds from sales and maturities of short-term investments. Capital expenditures in 2016 were made primarily for a purchase of reserves adjacent to our Ottawa, Illinois facility, engineering, procurement and construction of our growth projects and other maintenance and cost improvement capital projects.

Subject to our continuing evaluation of market conditions, we anticipate that our capital expenditures in 2019 will be in the range of approximately $100 million to $125 million, which is primarily associated with previously announced growth projects and other maintenance and cost improvement capital projects. We expect to fund our capital expenditures through cash on our balance sheet, cash generated from our operations and cash generated from financing activities.

Net Cash Provided by / Used in Financing Activities

Financing activities consist primarily of equity issuances, dividend payments, share repurchases, borrowings and repayments related to the Revolver and Term Loan, as well as fees and expenses paid in connection with our credit facilities.

Net cash provided by financing activities was $574.1 million for the year ended December 31, 2018. This was mainly due to $1.280 billion of proceeds from long-term debt borrowings and $38.7 million of fees paid to finance the EPMH acquisition, $501.4 million of long-term debt payments, $148.5 million of common stock repurchases, $19.9 million of dividends paid, $4.4 million of tax payments related to shares withheld for vested restricted stock and stock units, and a $7.5 million capital contribution from a non-controlling interest.

Net cash used in financing activities was $57.1 million for the year ended December 31, 2017. This was mainly due to $25.0 million in common stock repurchases, $20.4 million of dividends paid, $7.2 million of long-term debt payments, $4.4 million of tax payments related to shares withheld for vested restricted stock and restricted stock units, and $1.0 million of capital lease repayments.

Net cash provided by financing activities was $635.4 million for the year ended December 31, 2016, driven by $678.8 million of cash received from common stock issuances and $4.8 million of proceeds from options exercised, partially offset by $25.7 million of common stock issuances costs, $15.1 million of dividends paid, $5.2 million of long-term debt payments and $1.6 million of tax payments related to shares withheld for vested restricted stock.

Share Repurchase Program

See Purchase of Equity Securities by the Issuer in Part II, Item 5. and Note D - Capital Structure and Accumulated Comprehensive Income (Loss) to our Consolidated Financial Statements in Part II, Item 8. of this Annual Report on Form 10-K for information related to our share repurchase program.

Credit Facilities

See Note K - Debt to our Consolidated Financial Statements in Part II, Item 8. of this Annual Report on Form 10-K for information related to our credit facilities.

Off-Balance Sheet Arrangements

We have no off-balance sheet arrangements that have a current material effect or are reasonably likely to have a future material effect on our financial condition, changes in financial condition, sales, expenses, results of operations, liquidity, capital expenditures or capital resources.

Contractual Obligations

As of December 31, 2018, the total of our future contractual cash commitments, including the repayment of our debt obligations under the Term Loan, is summarized as follows

	Total	Less than 1 year	1-3 years	3-5 years	More than 5 years
	(amounts in thousands)				
Principal payments on long-term debt[1]	$1,270,400	$12,800	$25,600	$25,600	$1,206,400
Estimated interest payments on long-term debt[4]	517,326	83,842	164,384	158,704	110,396
Minimum payments on note payable secured by royalty interest	26,511	1,750	3,500	3,500	17,761
Retirement plans	110,874	11,531	21,560	22,062	55,721
Capital lease obligations	344	344	—	—	—
Operating lease obligations	269,273	74,884	99,792	54,449	40,148
Minimum purchase obligations[2]	63,595	23,243	23,713	10,555	6,084
Total Contractual Cash Obligations[3]:	$2,258,323	$208,394	$338,549	$274,870	$1,436,510

(1) Excludes the unamortized debt issuance costs and original issue discount.

(2) Includes estimated future minimum purchase obligations related to transload service agreements and transportation service agreements. As of December 31, 2018, we accrued $1.6 million in shortfall fees under these service agreements.

(3) The above table excludes discounted asset retirement obligations in the amount of $18.4 million at December 31, 2018, the majority of which have a settlement date beyond 2025, as well as indemnification for surety bonds issued on our behalf discussed in Note S - Obligations Under Guarantees to our Consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K.

(4) Estimated interest payment amounts are computed using forecasted three-month LIBOR rates as of December 31, 2018.

Environmental Matters

We are subject to various federal, state and local laws and regulations governing, among other things, hazardous materials, air and water emissions, environmental contamination and reclamation and the protection of the environment and natural resources. We have made, and expect to make in the future, expenditures to comply with such laws and regulations, but we cannot estimate or predict the full amount of such future expenditures. As of December 31, 2018, we had $18.4 million accrued for future reclamation costs, as compared to $19.0 million as of December 31, 2017.

We discuss certain environmental matters relating to our various production and other facilities, certain regulatory requirements relating to human exposure to crystalline silica and our mining activity and how such matters may affect our business in the future under Item 1. Business, Item 1A. Risk Factors and Item 3. Legal Proceedings.

Critical Accounting Policies and Estimates

Our discussion and analysis of our financial condition and results of operations are based upon our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of these financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the dates of the financial statements and the reported revenues and expenses during the reporting periods. We evaluate these estimates and assumptions on an ongoing basis and base our estimates on historical experience, current conditions and various other assumptions that are believed to be reasonable under the circumstances. The results of these estimates form the basis for making judgments about the carrying values of assets and liabilities as well as identifying and assessing the accounting treatment with respect to commitments and contingencies. Our actual results may materially differ from these estimates.

A summary of our significant accounting policies is included in Note B - Summary of Significant Accounting Policies to the Consolidated Financial Statements in Item 8. of this Annual Report on Form 10-K. Management believes that

the application of these policies on a consistent basis enables us to provide the users of the Consolidated Financial Statements with useful and reliable information about our operating results and financial condition.

Described below are the accounting policies we believe are critical to our financial statements due to the degree of uncertainty regarding the estimates or assumptions involved, and that we believe are critical to the understanding of our operations and our performance.

Revenue Recognition

Products

We derive our product sales by mining and processing minerals that our customers purchase for various uses. Our product sales are primarily a function of the price per ton and the number of tons sold. We primarily sell our products through individual purchase orders executed under short-term price agreements or at prevailing market rates. The amount invoiced reflects product, transportation and / or additional handling services as applicable, such as storage, transloading the product from railcars to trucks and last mile logistics to the customer site. We invoice most of our product customers on a per shipment basis, although for some larger customers, we consolidate invoices weekly or monthly. Standard collection terms are net 30 days, although extended terms are offered in competitive situations.

We recognize revenue for products and materials at a point in time following the transfer of control of such items to the customer, which typically occurs upon shipment or delivery depending on the terms of the underlying contracts. We account for shipping and handling activities related to product and material sales contracts with customers as costs to fulfill our promise to transfer the associated products pursuant to the accounting policy election allowed under ASC 606-10-25-10b. Accordingly, we record amounts billed for shipping and handling costs as a component of net sales and accrue and classify related costs as a component of cost of sales at the time revenue is recognized.

For a limited number of customers, we sell under long-term, minimum purchase supply agreements. These agreements define, among other commitments, the volume of product that our customers must purchase, the volume of product that we must provide and the price that we will charge and that our customers will pay for each product. Prices under these agreements are generally fixed and subject to certain contractual adjustments. Sometimes these agreements may undergo negotiations regarding pricing and volume requirements, which may often occur in volatile market conditions. While these negotiations continue, we may deliver sand at prices or at volumes below the requirements in our existing supply agreements. We do not consider these agreements solely representative of contracts with customers. An executed order specifying the type and quantity of product to be delivered, in combination with the noted agreements, comprise our contracts in these arrangements.

Service

We derive our service revenues primarily through the provision of transportation, equipment rental, and contract labor services to companies in the oil and gas industry. Transportation services typically consist of transporting customer proppant from storage facilities to proximal well-sites and are contracted through work orders executed under established pricing agreements. The amount invoiced reflects the transportation services rendered. Equipment rental services provide customers with use of either dedicated or nonspecific wellhead proppant delivery equipment solutions for contractual periods defined either through formal lease agreements or executed work orders under established pricing agreements. The amounts invoiced reflect the length of time the equipment set was utilized in the billing period. Contract labor services provide customers with proppant delivery equipment operators through work orders executed under established pricing agreements. The amounts invoiced reflect the amount of time our labor services were utilized in the billing period.

We typically invoice our customers on a weekly or monthly basis; however, some customers receive invoices upon well-site operation completion. Standard collection terms are net 30 days, although extended terms are offered in competitive situations. We typically recognize revenue for specific, dedicated equipment set rental arrangements under ASC 840, Leases. For the remaining components of service revenue, we have applied the practical expedient allowed under ASC 606-10-55-18 to recognize transportation revenues in proportion to the amount we have the right to invoice.

Contracts with Multiple Performance Obligations

For contracts that contain multiple performance obligations, such as work orders containing a combination of product, transportation, equipment rentals, and contract labor services, we allocate the transaction price to each performance obligation identified in the contract based on relative standalone selling prices, or estimates of such prices, and recognize the related revenue as control of each individual product or service is transferred to the customer, in

satisfaction of the corresponding performance obligations. We typically invoice our customers on a weekly or monthly basis; however, some customers receive invoices upon well-site operation completion. Standard collection terms are net 30 days, although extended terms are offered in competitive situations.

Taxes Collected from Customers and Remitted to Governmental Authorities

We exclude from our measurement of transaction prices all taxes assessed by governmental authorities that are both (i) imposed on and concurrent with a specific revenue-producing transaction and (ii) collected from customers. Accordingly, such tax amounts are not included as a component of net sales or cost of sales.
See Note U - Revenue.

Deferred Revenues

For a limited number of customers, we enter into supply agreements which give customers the right to make advanced payments toward the purchase of certain products at specified volumes over an average initial period of one to fifteen years. These payments represent consideration that is unconditional for which we have yet to transfer the related product. These payments are recorded as contract liabilities referred to as “deferred revenues” upon receipt and recognized as revenue upon delivery of the related product.

Unbilled Receivables

Revenues recognized in advance of invoice issuance create assets referred to as “unbilled receivables.” Any portion of our unbilled receivables for which our right to consideration is conditional on a factor other than the passage of time is considered a contract asset. These assets are presented on a combined basis with accounts receivable and are converted to accounts receivable once billed.

Accounts Receivable

The majority of our accounts receivable are due from companies in the oil and natural gas drilling, glass, building products, filler and extenders, foundries and other major industries. Credit is extended based on evaluation of a customer’s financial condition and, generally, collateral is not required. Accounts receivable are stated at amounts due from customers net of an allowance for doubtful accounts. Accounts outstanding longer than the payment terms are considered past due. We determine our allowance by considering a number of factors, including the length of time trade accounts receivable are past due, our previous loss history, the customer’s current ability to pay its obligation to us, and the condition of the general economy and the industry as a whole. Ongoing credit evaluations are performed. We write-off accounts receivable when they are deemed uncollectible, and payments subsequently received on such receivables are credited to the allowance for doubtful accounts. See Note F - Accounts Receivable and Note U - Revenue.

Impairment or Disposal of Property, Plant and Mine Development

We periodically evaluate whether current events or circumstances indicate that the carrying value of our property, plant and equipment assets may not be recoverable. If circumstances indicate that the carrying value may not be recoverable, we estimate future undiscounted net cash flows using estimates of proven and probable sand reserves, estimated future sales prices (considering historical and current prices, price trends and related factors) and operating costs and anticipated capital expenditures. If the undiscounted cash flows are less than the carrying value of the assets, we recognize an impairment loss equal to the amount by which the carrying value exceeds the fair value of the assets. The recoverability of the carrying value of our mineral properties is dependent upon the successful development, start-up and commercial production of our mineral deposit and the related processing facilities. Our evaluation of mineral properties for potential impairment primarily includes assessing the existence or availability of required permits and evaluating changes in our mineral reserves, or the underlying estimates and assumptions, including estimated production costs. Assessing the economic feasibility requires certain estimates, including the prices of products to be produced and processing recovery rates, as well as operating and capital costs.
Gains on the sale of property, plant and mine development are included in income when the assets are disposed of provided there is more than reasonable certainty of the collectability of the sales price and any future activities required to be performed by us relating to the disposal of the assets are complete or insignificant. Upon retirement or disposal of assets, all costs and related accumulated depreciation or amortization are written-off.

Mine Reclamation Costs and Asset Retirement Obligations

We recognize the fair value of any liability for conditional asset retirement obligations, including environmental remediation liabilities when incurred, which is generally upon acquisition, construction or development and/or through the normal operation of the asset, if sufficient information exists to reasonably estimate the fair value of the liability. These obligations generally include the estimated net future costs of dismantling, restoring and reclaiming

operating mines and related

mine sites, in accordance with federal, state, local regulatory and land lease agreement requirements. The liability is accreted over time through periodic charges to earnings. In addition, the asset retirement cost is capitalized as part of the asset's carrying value and amortized over the life of the related asset. Reclamation costs are periodically adjusted to reflect changes in the estimated present value resulting from the passage of time and revisions to the estimates of either the timing or amount of the reclamation and abandonment costs. The reclamation obligation is based on when spending for an existing environmental disturbance will occur. If the asset retirement obligation is settled for other than the carrying amount of the liability, a gain or loss is recognized on settlement. We review, on an annual basis, unless otherwise deemed necessary, the reclamation obligation at each mine site in accordance with ASC guidance for accounting reclamation obligations.

Future remediation costs for inactive mines are accrued based on management's best estimate at the end of each period of the costs expected to be incurred at a site. Such cost estimates include, where applicable, ongoing care, maintenance and monitoring costs. Changes in estimates at inactive mines are reflected in earnings in the period an estimate is revised.

See Note M - Asset Retirement Obligations.

Goodwill and Other Intangible Assets and Related Impairment

Our intangible assets consist of goodwill, which is not being amortized, indefinite-lived intangibles, which consist of certain trade names that are not subject to amortization, intellectual property and customer relationships.

Intellectual property mainly consists of patents and technology, and it is amortized on a straight-line basis over an average useful life of 15 years. Customer relationships are amortized on a straight-line basis over their useful life of 20, 15 or 13 years.

Goodwill represents the excess of the purchase price of business combinations over the fair value of net assets acquired. Goodwill and trade names are reviewed for impairment annually as of October 31, or more frequently when indicators of impairment exist. An impairment exists if the fair value of a reporting unit to which goodwill has been allocated, or the fair value of indefinite-lived intangible assets, is less than their respective carrying values. Prior to conducting a formal impairment test, we have an option to assess qualitative factors to determine whether the existence of events or circumstances leads to a determination that is more likely than not (more than 50%) that the fair value of a reporting unit is less than its carrying amount. Such qualitative factors may include the following: macroeconomic conditions; industry and market considerations; cost factors; overall financial performance; and other relevant entity-specific events. If the qualitative assessment determines that an impairment is more likely than not, or if we choose to bypass the qualitative assessment, we perform a quantitative assessment by comparing the fair value of a reporting unit with its carrying amount and recognize an impairment charge for the amount by which the carrying amount exceeds the reporting unit's fair value; however, the loss recognized should not exceed the total amount of goodwill allocated to that reporting unit.

See Note I - Goodwill and Intangible Assets.

Self-Insurance

We are self-insured for various levels of employee health insurance coverage, workers' compensation and third-party product liability claims alleging occupational disease. We purchase insurance coverage for claim amounts which exceed our self-insured retentions. Depending on the type of insurance, these self-insured retentions range from $0.1 million to $0.5 million per occurrence. Our insurance reserves are accrued based on estimates of the ultimate cost of claims expected to occur during the covered period. Our insurance reserves are accrued based on estimates of the ultimate cost of claims expected to occur during the covered period. These estimates are prepared with the assistance of outside actuaries and consultants. Our actuaries periodically review the volume and amount of claims activity, and based upon their findings, we adjust our insurance reserves accordingly. The ultimate cost of claims for a covered period may differ from our original estimates. The current portion of our self-insurance reserves is included in accrued liabilities and the non-current portion is included in other long-term obligations in our Balance Sheets. As of December 31, 2018 and 2017, our self-insurance reserves totaled $5.4 million and $5.5 million, respectively, of which $2.6 million and $1.7 million, respectively, was classified as current.

Employee Benefit Plans

We provide a range of benefits to our employees and retired employees, including pensions and post-retirement healthcare and life insurance benefits. We record annual amounts relating to these plans based on calculations specified by generally accepted accounting principles, which include various actuarial assumptions, including discount rates, assumed rates of returns, compensation increases, turnover rates, mortality table, and healthcare cost trend rates. We review the actuarial assumptions on an annual basis and make modifications to the assumptions based on current rates and trends when it is deemed

appropriate to do so. As required by U.S. generally accepted accounting principles, the effect of the modifications is generally recorded or amortized over future periods. We believe that the assumptions utilized in recording our obligations under the plans, which are presented in Note R - Pension and Post-Retirement Benefits to our Consolidated Financial Statements in Item 8. of this Annual Report on Form 10-K, are reasonable based on advice from our actuaries and information as to assumptions used by other employers.

Equity-based Compensation

We grant stock options, restricted stock, restricted stock units and performance share units to certain of our employees and directors under the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan. We recognize the cost of employee services rendered in exchange for awards of equity instruments.

Vesting of restricted stock and restricted stock units is based on the individual continuing to render service over a three-year vesting schedule. Cash dividend equivalents are accrued and paid to the holders of time based restricted stock units and restricted stock. The fair value of the restricted stock awards is equal to the market price of our stock at date of grant. The restricted award-related compensation expense is recognized, on a straight-line basis, over the vesting period.

We grant performance share units to certain employees in which the number of shares of common stock ultimately received is determined based on achievement of certain performance thresholds over a specified performance period (generally three years) in accordance with the stock award agreement. Cash dividend equivalents are not accrued or paid on performance share units. We recognize expense based on the estimated vesting of our performance share units granted and the grant date market price. The estimated vesting of the performance share units is principally based on the probability of achieving certain financial performance levels during the vesting periods. In the period it becomes probable that the minimum performance criteria specified in the award agreement will be achieved, we recognize expense for the proportionate share of the total fair value of the award related to the vesting period that has already lapsed. The remaining fair value of the award is expensed on a straight-line basis over the remaining vesting period.

We grant certain employees performance share units, the vesting of which is based on the Company’s total shareholder return (“TSR”) ranking among a peer group over a three-year period. The number of units that will vest will depend on the percentage ranking of the Company's TSR compared to the TSRs for each of the companies in the peer group over the performance period. For these awards subject to market conditions, a binomial-lattice model (i.e., Monte Carlo simulation model) is used to fair value these awards at grant date. The related compensation expense is recognized, on a straight-line basis, over the vesting period.

We grant stock options to certain employees and directors. Stock options vest on a vesting schedule and the related compensation expense is recognized over the vesting period, usually over 3 or 4 years. In calculating the compensation expense for stock options granted, we estimate the fair value of each grant using the Black-Scholes option-pricing model.

The fair value of stock options granted is based on the exercise price of the option and certain assumptions, which are evaluated and revised, as necessary, to reflect market conditions and experience. Our expected forfeiture rate is the estimated percentage of options granted that are expected to be forfeited or canceled on an annual basis before becoming fully vested. Our expected term is the period of time over which the options are expected to remain outstanding. An increase in the expected term will increase compensation expense. The computation of the expected term is based on the simplified method, under which the expected term is presumed to be the mid-point between the average vesting date and the end of the contractual term. The assumptions for expected volatility are based on historical experience for the same periods as our expected lives. Risk-free interest rates are set using grant-date U.S. Treasury yield curves for the same periods as our expected lives. The expected dividend yield is based on our future dividend expectations for the same periods as our expected lives. See Note P - Equity-based Compensation.

Income Taxes

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (the “Tax Act”). The Tax Act makes broad and complex changes to the U.S. tax code including, but not limited to, (1) bonus depreciation that will allow for full expensing of qualified property; (2) reduction of the U.S. federal corporate tax rate; (3) elimination of the corporate alternative minimum tax; (4) a new limitation on deductible interest expense; (5) the repeal of the domestic production activity deduction; (6) limitations on the deductibility of

certain executive compensation; and (7) limitations on net operating losses generated after December 31, 2017, to 80 percent of taxable income.

The SEC staff issued SAB 118, which provides guidance on accounting for the tax effects of the Tax Act. SAB 118 provides a measurement period that should not extend beyond one year from the Tax Act enactment date for companies to

complete the accounting under ASC 740. In accordance with SAB 118, a company must reflect the income tax effects of those aspects of the Act for which the accounting under ASC 740 is complete. December 22, 2018 marked the end of the measurement period for purposes of SAB 118. As such, we have completed the accounting for the tax effects of the Tax Act. In August 2018, the Internal Revenue Service released Tax Act guidance on limitations on executive compensation which clarified transition rules for certain compensation agreements in existence on November 2, 2017. Based on the issued guidance, we recorded a discrete tax expense of $0.7 million to remove deferred tax assets on certain executive compensation agreements that were not eligible for transition relief.

The Tax Act reduces the corporate tax rate to 21 percent, effective January 1, 2018. Because ASC 740-10-25-47 requires the effect of a change in tax laws or rates to be recognized as of the date of enactment, we were required to adjust deferred tax assets and liabilities as of December 22, 2017. Accordingly, for the year ended December 31, 2017, we recorded a decrease related to deferred tax assets and liabilities of $45.0 million and $80.8 million, respectively, with a corresponding net adjustment to deferred income tax benefit of $35.8 million.

Under the Tax Act, net operating loss (NOL) deductions arising in tax years beginning after December 31, 2017 can only offset up to 80 percent of future taxable income. The Act also prohibits NOL carrybacks, but allows indefinite carryforwards for NOLs arising in tax years beginning after December 31, 2017. Net operating losses arising before January 1, 2018 are accounted for under the previous tax rules that imposed no limit on the amount of the taxable income that can be set off using NOLs and that can be carried back 2 years and carried forward 20 years.

The Tax Act repeals the corporate alternative minimum tax (AMT), effective for tax years beginning after December 31, 2017, but allows an entity to claim portions of any unused AMT credits over the next four years to offset its regular tax liability. An entity with unused AMT credits as of December 31, 2017 can first use these credits to offset its regular tax for 2017 and can then claim up to 50 percent of the remaining AMT credits in 2018, 2019, and 2020, with all remaining AMT credits refundable in 2021.

Deferred taxes are provided on the liability method whereby deferred tax assets are recognized for deductible temporary differences and operating loss and tax credit carry forwards and deferred tax liabilities are recognized for taxable temporary differences. This approach requires recognition of deferred tax liabilities and assets for the expected future tax consequences of events that have been included in the financial statements or tax returns. Under this method, deferred tax liabilities and assets are determined based upon the difference between the financial statement and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the expenses are expected to reverse. Valuation allowances are provided if, based on the weight of available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized.

We recognize a tax benefit associated with an uncertain tax position when, in management’s judgment, it is more likely than not that the position will be sustained upon examination by a taxing authority. For a tax position that meets the more-likely-than-not recognition threshold, we initially and subsequently measure the tax benefit as the largest amount that we judge to have a greater than 50% likelihood of being realized upon ultimate settlement with a taxing authority. The liability associated with unrecognized tax benefits is adjusted periodically due to changing circumstances, such as the progress of tax audits, case law developments and new or emerging legislation. Such adjustments are recognized entirely in the period in which they are identified. The effective tax rate includes the net impact of changes in the liability for unrecognized tax benefits and subsequent adjustments as considered appropriate by management.

The largest permanent item in computing both our effective tax rate and taxable income is the deduction allowed for statutory depletion. The deduction for statutory depletion does not necessarily change proportionately to changes in income before income taxes. See Note T - Income Taxes.

Recent Accounting Pronouncements

New accounting guidance that has been recently issued is described in Note B - Summary of Significant Accounting Policies to our Consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Market Risk

We are exposed to certain market risks, which exist as a part of our ongoing business operations. Such risks arise from adverse changes in market rates, prices and conditions. We address such market risks in “Recent Trends and Outlook” and "How We Generate Our Sales" in Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations.

Interest Rate Risk

We are exposed to interest rate risk arising from adverse changes in interest rates. In connection with the acquisition of EPMH on May 1, 2018, we entered into the Credit Agreement. The Credit Agreement increased our existing senior debt by entering into a new $1.380 billion senior secured Credit Facility, consisting of a $1.280 billion Term Loan and a $100 million Revolver that may also be used for swingline loans or letters of credit, and we may elect to increase the Term Loan in accordance with the terms set forth in the Credit Agreement. As of December 31, 2018, we had $1.270 billion of debt outstanding under the Credit Agreement. Assuming LIBOR is greater than the 1.0% minimum base rate on the Term Loan, a hypothetical increase in interest rates by 1.0% would have changed our interest expense by $12.7 million per year.

We use interest rate derivatives in the normal course of our business to manage both our interest cost and the risks associated with changing interest rates. We do not use derivatives for trading or speculative purposes. As of December 31, 2018, the fair value of our interest rate swaps was $1.5 million and $0.7 million and classified within other long-term obligations on our balance sheet, and the fair value of our interest rate cap was zero. At December 31, 2017, the fair value of our interest rate cap was zero. For more information see Note O - Derivative Instruments to our Consolidated Financial Statements in Part II, Item 8. of this Annual Report on Form 10-K.

Credit Risk

We are subject to risks of loss resulting from nonpayment or nonperformance by our customers. We examine the creditworthiness of third-party customers to whom we extend credit and manage our exposure to credit risk through credit analysis, credit approval, credit limits and monitoring procedures, and for certain transactions, we may request letters of credit, prepayments or guarantees, although collateral is generally not required.

Despite enhancing our examination of our customers' creditworthiness, we may still experience delays or failures in customer payments. Some of our customers have reported experiencing financial difficulties. With respect to customers that may file for bankruptcy protection, we may not be able to collect sums owed to us by these customers and we also may be required to refund pre-petition amounts paid to us during the preference period (typically 90 days) prior to the bankruptcy filing.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

The following Consolidated Financial Statements are filed as part of this Annual Report on Form 10-K:
U.S. SILICA HOLDINGS, INC.

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM
Board of Directors and Shareholders
U.S. Silica Holdings, Inc.

Opinion on the financial statements

We have audited the accompanying consolidated balance sheets of U.S. Silica Holdings, Inc. (a Delaware corporation) and subsidiaries (the "Company") as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income, stockholders' equity, and cash flows for each of the three years in the period ended December 31, 2018, and the related notes and financial statement schedule (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in the 2013 Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"), and our report dated February 19, 2019 expressed "an unqualified opinion".

Basis for opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ GRANT THORNTON LLP

We have served as the Company's auditor since 2004.
Houston, Texas
February 19, 2019

U.S. SILICA HOLDINGS, INC.
CONSOLIDATED BALANCE SHEETS
(in thousands)

	December 31,	
	2018	2017
ASSETS		
Current Assets:		
Cash and cash equivalents	$202,498	$384,567
Accounts receivable, net	215,486	212,586
Inventories, net	162,087	92,376
Prepaid expenses and other current assets	17,966	13,715
Income tax deposits	2,200	—
Total current assets	600,237	703,244
Property, plant and mine development, net	1,826,303	1,169,155
Goodwill	261,340	272,079
Intangible assets, net	194,626	150,007
Other assets	18,334	12,798
Total assets	$2,900,840	$2,307,283
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current Liabilities:		
Accounts payable and accrued expenses	$216,400	$171,041
Current portion of long-term debt	13,327	6,867
Current portion of deferred revenue	31,612	36,128
Income tax payable	—	1,566
Total current liabilities	261,339	215,602
Long-term debt, net	1,246,428	505,075
Deferred revenue	81,707	82,286
Liability for pension and other post-retirement benefits	57,194	52,867
Deferred income taxes, net	137,239	29,856
Other long-term obligations	64,629	25,091
Total liabilities	1,848,536	910,777
Commitments and Contingencies (Note Q)		
Stockholders' Equity:		
Preferred stock, $0.01 par value, 10,000,000 shares authorized; zero issued and outstanding at December 31, 2018 and 2017	—	—
Common stock, $0.01 par value, 500,000,000 shares authorized; 81,811,977 issued and 73,148,853 outstanding at December 31, 2018; 81,267,205 issued and 80,524,255 outstanding at December 31, 2017	818	812
Additional paid-in capital	1,169,383	1,147,084
Retained earnings	67,854	287,992
Treasury stock, at cost, 8,663,124 and 742,950 shares at December 31, 2018 and 2017, respectively	(178,215)	(25,456)
Accumulated other comprehensive loss	(15,020)	(13,926)
Total U.S. Silica Holdings, Inc. stockholders' equity	1,044,820	1,396,506
Non-controlling interest	7,484	—
Total stockholders' equity	1,052,304	1,396,506
Total liabilities and stockholders' equity	$2,900,840	$2,307,283

The accompanying notes are an integral part of these financial statements.

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U.S. SILICA HOLDINGS, INC.
CONSOLIDATED STATEMENTS OF OPERATIONS
(in thousands, except per share amounts)

	Year Ended December 31,		
	2018	2017	2016
Sales:			
Product	$1,282,799	$1,010,394	$524,137
Service	294,499	230,457	35,488
Total sales	1,577,298	1,240,851	559,625
Cost of sales (excluding depreciation, depletion and amortization):			
Product	955,469	714,521	456,783
Service	207,660	152,299	20,027
Total cost of sales (excluding depreciation, depletion and amortization)	1,163,129	866,820	476,810
Operating expenses:			
Selling, general and administrative	146,971	107,056	67,172
Depreciation, depletion and amortization	148,832	97,233	68,134
Goodwill and other asset impairments	281,899	—	—
Total operating expenses	577,702	204,289	135,306
Operating income (loss)	(163,533)	169,742	(52,491)
Other (expense) income:			
Interest expense	(70,564)	(31,342)	(27,972)
Other income (expense), net, including interest income	4,144	(1,874)	2,718
Total other expense	(66,420)	(33,216)	(25,254)
Income (loss) before income taxes	(229,953)	136,526	(77,745)
Income tax benefit	29,132	8,680	36,689
Net income (loss)	$(200,821)	$145,206	$(41,056)
Less: Net income (loss) attributable to non-controlling interest	(13)	—	—
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$(200,808)	$145,206	$(41,056)
Earnings (loss) per share attributable to U.S. Silica Holdings, Inc.:			
Basic	$(2.63)	$1.79	$(0.63)
Diluted	$(2.63)	$1.77	$(0.63)
Weighted average shares outstanding:			
Basic	76,453	81,051	65,037
Diluted	76,453	81,960	65,037
Dividends declared per share	$0.25	$0.25	$0.25

The accompanying notes are an integral part of these financial statements.

U.S. SILICA HOLDINGS, INC.
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
(in thousands)

	Year Ended December 31,		
	2018	2017	2016
Net income (loss)	$(200,821)	$145,206	$(41,056)
Other comprehensive income (loss):			
Unrealized gain (loss) on derivatives (net of tax of $(470) $(27) and $29 for 2018, 2017, and 2016, respectively)	(1,545)	(44)	49
Foreign currency translation adjustment (net of tax of $(196) $2 and zero for 2018, 2017 and 2016, respectively)	(614)	(6)	—
Unrealized gain (loss) on investments (net of tax of zero, zero, and $(4) for 2018, 2017 and 2016, respectively)	—	—	(6)
Pension and other post-retirement benefits liability adjustment (net of tax of $339, $1,205 and $152 for 2018, 2017 and 2016, respectively)	1,065	2,000	252
Comprehensive income (loss)	$(201,915)	$147,156	$(40,761)
Less: Comprehensive income (loss) attributable to non-controlling interest	(13)	—	—
Comprehensive income (loss) attributable to U.S. Silica Holdings, Inc.	$(201,902)	$147,156	$(40,761)

The accompanying notes are an integral part of these financial statements.

U.S. SILICA HOLDINGS, INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands, except per share amounts)

	Common Stock	Treasury Stock	Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Loss	Total U.S. Silica Holdings Inc., Stockholders' Equity	Non-controlling Interest	Total Stockholders' Equity
Balance at January 1, 2016	$ 539	$(15,845)	$194,670	$220,974	$ (16,171)	$ 384,167	$ —	$ 384,167
Net loss	—	—	—	(41,056)	—	(41,056)	—	(41,056)
Issuance of common stock (stock offerings net of issuance costs of $25,732)	272	—	931,016	—	—	931,288	—	931,288
Unrealized gain on derivatives	—	—	—	—	49	49	—	49
Unrealized loss on short-term investments	—	—	—	—	(6)	(6)	—	(6)
Pension and post-retirement liability	—	—	—	—	252	252	—	252
Cash dividend declared ($0.25 per share)	—	—	—	(16,893)	—	(16,893)	—	(16,893)
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	12,107	—	—	12,107	—	12,107
Excess tax benefit from equity-based compensation	—	—	—	148	—	148	—	148
Proceeds from options exercised	—	8,465	(3,640)	—	—	4,825	—	4,825
Issuance of restricted stock	—	1,437	(1,437)	—	—	—	—	—
Shares withheld for tax payments related to vested restricted stock and stock units	—	2,074	(3,665)	—	—	(1,591)	—	(1,591)
Balance at December 31, 2016	811	(3,869)	1,129,051	163,173	(15,876)	1,273,290	—	1,273,290
Net income	—	—	—	145,206	—	145,206	—	145,206
Unrealized loss on derivatives	—	—	—	—	(44)	(44)	—	(44)
Foreign currency translation adjustment	—	—	—	—	(6)	(6)	—	(6)
Pension and post-retirement liability	—	—	—	—	2,000	2,000	—	2,000
Cash dividend declared ($0.25 per share)	—	—	—	(20,387)	—	(20,387)	—	(20,387)
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	25,050	—	—	25,050	—	25,050
Proceeds from options exercised	—	1,190	(392)	—	—	798	—	798
Issuance of restricted stock	—	1,859	(1,859)	—	—	—	—	—

Shares withheld for tax payments related to vested restricted stock and stock units	1	386	(4,766)	—	—	(4,379)	—	(4,379)
Repurchase of common stock	—	(25,022)	—	—	—	(25,022)	—	(25,022)
Balance at December 31, 2017	812	(25,456)	1,147,084	287,992	(13,926)	1,396,506	—	1,396,506
Net loss	—	—	—	(200,808)	—	(200,808)	(13)	(200,821)
Unrealized loss on derivatives	—	—	—	—	(1,545)	(1,545)	—	(1,545)
Foreign currency translation adjustment	—	—	—	—	(614)	(614)	—	(614)
Pension and post-retirement liability	—	—	—	—	1,065	1,065	—	1,065
Cash dividend declared ($0.25 per share)	—	—	—	(19,330)	—	(19,330)	—	(19,330)
Contributions from non-controlling interest	—	—	—	—	—	—	7,497	7,497
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	22,337	—	—	22,337	—	22,337
Proceeds from options exercised	—	93	(32)	—	—	61	—	61
Shares withheld for tax payments related to vested restricted stock and stock units	6	(4,383)	(6)	—	—	(4,383)	—	(4,383)
Repurchase of common stock	—	(148,469)	—	—	—	(148,469)	—	(148,469)
Balance at December 31, 2018	$818	$(178,215)	$1,169,383	$67,854	$(15,020)	$1,044,820	$7,484	$1,052,304

The accompanying notes are an integral part of these financial statements.

U.S. SILICA HOLDINGS, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	Year Ended December 31,		
	2018	2017	2016
Operating activities:			
Net income (loss)	$(200,821)	$145,206	$(41,056)
Adjustments to reconcile net income (loss) to net cash provided by operating activities:			
Depreciation, depletion and amortization	148,832	97,233	68,134
Goodwill and other asset impairments	281,899	—	—
Debt issuance amortization	4,044	1,382	1,392
Original issue discount amortization	832	372	378
Deferred income taxes	(31,070)	(20,601)	(36,903)
Deferred revenue	(36,720)	28,438	(9,026)
(Gain) loss on disposal of property, plant and equipment	(5,170)	415	563
Equity-based compensation	22,337	25,050	12,107
Bad debt provision, net of recoveries	315	1,529	(1,232)
Other	(13,536)	13,929	5,300
Changes in operating assets and liabilities, net of effects of acquisitions:			
Accounts receivable	56,815	(110,920)	(12,996)
Inventories	13,085	(4,825)	(10,211)
Prepaid expenses and other current assets	(2,678)	8,787	(509)
Income taxes	(3,764)	1,469	11,558
Accounts payable and accrued expenses	26,907	43,654	13,232
Short-term and long-term obligations-vendor incentives	52,806	—	—
Liability for pension and other post-retirement benefits	4,608	(705)	1,307
Other noncurrent assets and liabilities	(8,015)	(8,400)	(1,657)
Net cash provided by operating activities	310,706	222,013	381
Investing activities:			
Capital expenditures	(339,815)	(368,479)	(46,450)
Capitalized intellectual property costs	(10,046)	(3,586)	(959)
Maturities of short-term investments	—	—	21,872
Acquisition of businesses, net of cash acquired	(743,249)	(119,801)	(176,617)
Proceeds from sale of property, plant and equipment	26,231	337	497
Net cash used in investing activities	(1,066,879)	(491,529)	(201,657)
Financing activities:			
Issuance of common stock	—	—	678,791
Common stock issuance costs	—	—	(25,732)
Dividends paid	(19,912)	(20,377)	(15,125)
Repurchase of common stock	(148,469)	(25,022)	—
Proceeds from options exercised	61	798	4,825
Tax payments related to shares withheld for vested restricted stock and stock units	(4,383)	(4,379)	(1,591)
Proceeds from long-term debt	1,280,000	—	—
Payments on long-term debt	(501,425)	(7,211)	(5,202)
Financing fees paid	(38,701)	—	—
Contributions from non-controlling interest	7,497	—	—
Principal payments on capital lease obligations	(564)	(951)	(542)

Net cash provided by (used in) financing activities	574,104	(57,142)	635,424
Net (decrease) increase in cash and cash equivalents	(182,069)	(326,658)	434,148
Cash and cash equivalents, beginning of period	384,567	711,225	277,077

Cash and cash equivalents, end of period	$202,498	$384,567	$711,225
Supplemental cash flow information:			
Cash paid (received) during the period for:			
Interest	$66,769	$24,490	$21,994
Taxes, net of refunds	$5,373	$8,958	$(11,322)
Related party purchases	$2,958	$4,942	$446
Non-cash Items:			
Common stock issued in connection with acquisitions	$—	$—	$278,229
Capital lease obligations incurred to acquire assets	$—	$—	$165
Equipment received	$—	$18,185	$—
Accrued capital expenditures	$36,008	$16,534	$391
Capital lease assumed by third-party	$119	$—	$—
Asset retirement obligation assumed by third-party	$2,116	$—	$—

The accompanying notes are an integral part of these financial statements.

U.S. SILICA HOLDINGS, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

NOTE A—ORGANIZATION

U.S. Silica Holdings, Inc. (“Holdings,” and together with its subsidiaries “we,” “us” or the “Company”) is a performance materials company and one of the largest domestic producers of commercial silica. We manufacture frac sand used to stimulate and maintain the flow of hydrocarbons in oil and natural gas wells. Our products are also used as a raw material in a wide range of industrial applications. Through our acquisition of EP Minerals, LLC ("EPM") and its affiliated companies, we are an industry leader in the production of industrial minerals, including diatomaceous earth, clay (calcium bentonite and calcium montmorillonite) and perlite. During our 119-year history, we have developed core competencies in mining, processing, logistics and materials science that enable us to produce and cost-effectively deliver products to customers across our end markets. Our operations are organized into two reportable segments based on end markets served: (1) Oil & Gas Proppants and (2) Industrial & Specialty Products. See Note W - Segment Reporting for more information on our reportable segments.

On May 1, 2018, we completed the acquisition of all of the outstanding capital stock of EP Acquisition Parent, Inc., a Delaware corporation (“EPAP”), and the ultimate parent of EPM. Contemporaneous with the merger, EPAP was renamed EP Minerals Holdings, Inc. ("EPMH"). The consideration paid consisted of $743.2 million of cash, net of cash acquired of $19.1 million, including $0.5 million of post-closing adjustments. EPM is a global producer of engineered materials derived from industrial minerals, including diatomaceous earth, clay (calcium bentonite) and perlite. EPM's industrial minerals are used as filter aids, absorbents and functional additives for a variety of industries including food and beverage, biofuels, recreational water, oil and gas, farm and home, landscape, sports turf, paint, plastics, and insecticides. The acquisition of EPM increased our industrial materials product offering in our Industrial & Specialty Products segment.

On August 16, 2017, we completed the acquisition of Mississippi Sand, LLC ("MS Sand"). MS Sand is a frac sand mining and logistics company based in St. Louis, Missouri.

On April 1, 2017, we completed the acquisition of White Armor, a product line of cool roof granules used in industrial roofing applications.

On August 22, 2016, we completed the acquisition of Sandbox Enterprises, LLC ("Sandbox") as a “last mile” logistics solution for frac sand in the oil and gas industry.

On August 16, 2016, we completed the acquisition of New Birmingham, Inc. (“NBI”), the ultimate parent company of NBR Sand, LLC (“NBR”), a regional sand producer located near Tyler, Texas. The acquisition of NBI increased our regional frac sand product offering in our Oil & Gas Proppants segment.

See Note E - Business Combinations for more information.

NOTE B—SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation and Consolidation

The accompanying Consolidated Financial Statements have been prepared in accordance with generally accepted accounting principles in the United States (“GAAP”). In the opinion of management, all adjustments necessary for a fair presentation of the Consolidated Financial Statements have been included. Such adjustments are of a normal, recurring nature.

Certain reclassifications of prior year's amounts have been made to conform to the current year presentation. In conforming to the current year's presentation, the Company identified and corrected an amount in its statement of cash flows for the year ended December 31, 2017. The correction reduced Capital Expenditures within Net Cash Used in Investing Activities with a corresponding decrease to Accounts Payable and Accrued Expenses within Net Cash Used in Operating Activities. The amount is presented as Non-cash Accrued Capital Expenditures and had no impact in the Company's Balance Sheet, Income Statement or Net Change in Cash and Cash Equivalents in the Statement of Cash Flows.

Throughout this report we refer to (i) our Consolidated Balance Sheets as our “Balance Sheets,” (ii) our Consolidated Statements of Operations as our “Income Statements,” and (iii) our Consolidated Statements of Cash Flows as our “Cash Flows.”

Consolidation

The Consolidated Financial Statements include the accounts of Holdings and its direct and indirect wholly-owned subsidiaries. All significant intercompany balances and transactions have been eliminated in consolidation.

We follow FASB Accounting Standards Codification (“ASC”) guidance for identification and reporting of entities over which control is achieved through means other than voting rights. The guidance defines such entities as Variable Interest Entities (“VIEs”). We consolidate VIEs when we have variable interests and are the primary beneficiary. We continually evaluate our involvement with VIEs to determine when these criteria are met.

During the third quarter of 2018 we finalized a shareholders' agreement with unrelated parties to form a limited liability company with the purpose of constructing and operating a water pipeline to transport and sell water. In connection with the shareholders’ agreement, we acquired a 50% equity ownership for $3.2 million, with a maximum capital contribution of $7.0 million, and a water rights intangible asset for $0.7 million. Based on our evaluation, we determined that we are the primary beneficiary of this VIE and therefore we are required to consolidate it, including the current construction work in progress of $12.0 million. During the fourth quarter of 2018 we contributed an additional $3.8 million for a total of $7.0 million in capital contributions for the year ended December 31, 2018.

Use of Estimates and Assumptions

The preparation of Consolidated Financial Statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the related disclosure of contingent assets and liabilities at the date of the Consolidated Financial Statements and the reported amounts of revenues and expenses during the reporting period. The more significant areas requiring the use of management estimates and assumptions relate to the purchase price allocation for businesses acquired; mineral reserves that are the basis for future cash flow estimates utilized in impairment calculations and units-of-production amortization calculations; environmental, reclamation and closure obligations; estimates of recoverable minerals; estimates of allowance for doubtful accounts; estimates of fair value for certain reporting units and asset impairments (including impairments of goodwill, intangible assets and other long-lived assets); write-downs of inventory to net realizable value; equity-based compensation expense; post-employment, post-retirement and other employee benefit liabilities; valuation allowances for deferred tax assets; contingent considerations; reserves for contingencies and litigation and the fair value and accounting treatment of financial instruments, including derivative instruments. We base our estimates on historical experience and on various other assumptions that are believed to be reasonable under the circumstances. Accordingly, actual results may differ significantly from these estimates under different assumptions or conditions.

Cash and Cash Equivalents

Cash and cash equivalents consist of all highly liquid investments with a maturity of three months or less when purchased. Because of the short maturity of these investments, the carrying amounts approximate their fair value. Cash and cash equivalents are invested primarily in money market securities held by financial institutions with high credit ratings. Accounts at each institution are insured by the Federal Deposit Insurance Corporation. Cash balances at times may exceed federally-insured limits. We have not experienced any losses in such accounts and believe we are not exposed to any significant credit risk on cash.

Accounts Receivable

The majority of our accounts receivable are due from companies in the oil and natural gas drilling, glass, building products, filler and extenders, foundries and other major industries. Credit is extended based on evaluation of a customer’s financial condition and, generally, collateral is not required. Accounts receivable are stated at amounts due from customers net of an allowance for doubtful accounts. Accounts outstanding longer than the payment terms are considered past due. We determine our allowance by considering a number of factors, including the length of time trade accounts receivable are past due, our previous loss history, the customer’s current ability to pay its obligation to us, and the condition of the general economy and the industry as a whole. Ongoing credit evaluations are performed. We write-off accounts receivable when they are deemed uncollectible, and payments subsequently received on such receivables are credited to the allowance for doubtful accounts. See Note F - Accounts Receivable and Note U - Revenue.

Inventories

Inventories include raw stockpiles, in-process product and finished product available for shipment, as well as spare parts and supplies for routine facility maintenance. We value inventory at the lower of cost and net realizable value. Cost is determined using the first-in, first-out and average cost methods. Our inventoriable costs include production

costs and transportation and additional service costs as applicable. See Note G - Inventories.

Property, Plant and Mine Development

Plant and equipment

Plant and equipment is recorded at cost and depreciated over their estimated useful lives. Interest incurred during construction of facilities is capitalized and depreciated over the life of the asset. Costs for normal repairs and maintenance that do not extend economic life or improve service potential are expensed as incurred. Costs of improvements that extend economic life or improve service potential are capitalized and depreciated over the estimated remaining useful life.

Depreciation is recorded using the straight-line method over the assets' estimated useful lives as follows: buildings (15 years); land improvements (10 years); machinery and equipment, including computer equipment and software (3-10 years); furniture and fixtures (8 years). Leasehold improvements are depreciated over the shorter of the asset life or lease term. Construction-in-progress is primarily comprised of machinery and equipment which have not yet been placed in service.

Mining property and development

Mining property and development includes mineral deposits and mine exploration and development. Mineral deposits are initially recognized at cost, which approximates the estimated fair value on the date of purchase. Mine exploration and development costs include engineering and mineral studies, drilling and other related costs to delineate an ore body, and the removal of overburden to initially expose an ore body for production. Costs incurred before mineralization are classified as proven and probable reserves are expensed and classified as exploration or advanced projects, research and development expense. Capitalization of mine development project costs, that meet the definition of an asset, begins once mineralization is classified as proven and probable reserves.

The cost of removing overburden and waste materials to access the ore body at an open pit mine prior to the production phase are referred to as "pre-stripping costs." Pre-stripping costs are capitalized during the development of an open pit mine. The production phase of an open pit mine commences when saleable minerals, beyond a de minimis amount, are produced. Stripping costs incurred during the production phase of a mine are variable production costs that are included as a component of inventory to be recognized in costs applicable to sales in the same period as the revenue from the sale of inventory.

Depletion and amortization of mineral deposits and mine development costs are recorded as the minerals are extracted, based on units of production and engineering estimates of mineable reserves. The impact of revisions to reserve estimates is recognized on a prospective basis.

See Note H - Property, Plant and Mine Development.

Mine reclamation costs and asset retirement obligations

We recognize the fair value of any liability for conditional asset retirement obligations, including environmental remediation liabilities when incurred, which is generally upon acquisition, construction or development and/or through the normal operation of the asset, if sufficient information exists to reasonably estimate the fair value of the liability. These obligations generally include the estimated net future costs of dismantling, restoring and reclaiming operating mines and related mine sites, in accordance with federal, state, local regulatory and land lease agreement requirements. The liability is accreted over time through periodic charges to earnings. In addition, the asset retirement cost is capitalized as part of the asset's carrying value and amortized over the life of the related asset. Reclamation costs are periodically adjusted to reflect changes in the estimated present value resulting from the passage of time and revisions to the estimates of either the timing or amount of the reclamation and abandonment costs. The reclamation obligation is based on when spending for an existing environmental disturbance will occur. If the asset retirement obligation is settled for other than the carrying amount of the liability, a gain or loss is recognized on settlement. We review, on an annual basis, unless otherwise deemed necessary, the reclamation obligation at each mine site in accordance with ASC guidance for accounting for reclamation obligations.

Future remediation costs for inactive mines are accrued based on management's best estimate at the end of each period of the costs expected to be incurred at a site. Such cost estimates include, where applicable, ongoing care, maintenance and monitoring costs. Changes in estimates at inactive mines are reflected in earnings in the period an estimate is revised.

See Note M - Asset Retirement Obligations.

Impairment or Disposal of Property, Plant and Mine Development

We periodically evaluate whether current events or circumstances indicate that the carrying value of our property, plant and equipment assets may not be recoverable. If circumstances indicate that the carrying value may not be recoverable, we estimate future undiscounted net cash flows using estimates of proven and probable sand reserves, estimated future sales prices (considering historical and current prices, price trends and related factors) and operating costs and anticipated capital

expenditures. If the undiscounted cash flows are less than the carrying value of the assets, we recognize an impairment loss equal to the amount by which the carrying value exceeds the fair value of the assets.

The recoverability of the carrying value of our mineral properties is dependent upon the successful development, start-up and commercial production of our mineral deposit and the related processing facilities. Our evaluation of mineral properties for potential impairment primarily includes assessing the existence or availability of required permits and evaluating changes in our mineral reserves, or the underlying estimates and assumptions, including estimated production costs. Assessing the economic feasibility requires certain estimates, including the prices of products to be produced and processing recovery rates, as well as operating and capital costs.

Gains on the sale of property, plant and mine development are included in income when the assets are disposed of provided there is more than reasonable certainty of the collectability of the sales price and any future activities required to be performed by us relating to the disposal of the assets are complete or insignificant. Upon retirement or disposal of assets, all costs and related accumulated depreciation or amortization are written-off.

Goodwill and Other Intangible Assets and Related Impairment

Our intangible assets consist of goodwill, which is not being amortized, indefinite-lived intangibles, which consist of certain trade names that are not subject to amortization, intellectual property and customer relationships.

Intellectual property mainly consists of patents and technology, and it is amortized on a straight-line basis over an average useful life of 15 years. Customer relationships are amortized on a straight-line basis over their useful life of 20, 15 or 13 years.

Goodwill represents the excess of the purchase price of business combinations over the fair value of net assets acquired. Goodwill and trade names are reviewed for impairment annually as of October 31, or more frequently when indicators of impairment exist. An impairment exists if the fair value of a reporting unit to which goodwill has been allocated, or the fair value of indefinite-lived intangible assets, is less than their respective carrying values. Prior to conducting a formal impairment test, we have an option to assess qualitative factors to determine whether the existence of events or circumstances leads to a determination that is more likely than not (more than 50%) that the fair value of a reporting unit is less than its carrying amount. Such qualitative factors may include the following: macroeconomic conditions; industry and market considerations; cost factors; overall financial performance; and other relevant entity-specific events. If the qualitative assessment determines that an impairment is more likely than not, or if we choose to bypass the qualitative assessment, we perform a quantitative assessment by comparing the fair value of a reporting unit with its carrying amount and recognize an impairment charge for the amount by which the carrying amount exceeds the reporting unit’s fair value; however, the loss recognized should not exceed the total amount of goodwill allocated to that reporting unit.

See Note I - Goodwill and Intangible Assets.

Revenue Recognition

Products

We derive our product sales by mining and processing minerals that our customers purchase for various uses. Our product sales are primarily a function of the price per ton and the number of tons sold. We primarily sell our products through individual purchase orders executed under short-term price agreements or at prevailing market rates. The amount invoiced reflects product, transportation and / or additional handling services as applicable, such as storage, transloading the product from railcars to trucks and last mile logistics to the customer site. We invoice most of our product customers on a per shipment basis, although for some larger customers, we consolidate invoices weekly or monthly. Standard collection terms are net 30 days, although extended terms are offered in competitive situations.

We recognize revenue for products and materials at a point in time following the transfer of control of such items to the customer, which typically occurs upon shipment or delivery depending on the terms of the underlying contracts. We account for shipping and handling activities related to product and material sales contracts with customers as costs to fulfill our promise to transfer the associated products pursuant to the accounting policy election allowed under ASC 606-10-25-18b. Accordingly, we record amounts billed for shipping and handling costs as a component of net sales and accrue and classify related costs as a component of cost of sales at the time revenue is recognized.

For a limited number of customers, we sell under long-term, minimum purchase supply agreements. These agreements define, among other commitments, the volume of product that our customers must purchase, the volume of product

that we must provide and the price that we will charge and that our customers will pay for each product. Prices under these agreements

are generally fixed and subject to certain contractual adjustments. Sometimes these agreements may undergo negotiations regarding pricing and volume requirements, which may often occur in volatile market conditions. While these negotiations continue, we may deliver sand at prices or at volumes below the requirements in our existing supply agreements. We do not consider these agreements solely representative of contracts with customers. An executed order specifying the type and quantity of product to be delivered, in combination with the noted agreements, comprise our contracts in these arrangements.

Service

We derive our service revenues primarily through the provision of transportation, equipment rental, and contract labor services to companies in the oil and gas industry. Transportation services typically consist of transporting customer proppant from storage facilities to proximal well-sites and are contracted through work orders executed under established pricing agreements. The amount invoiced reflects the transportation services rendered. Equipment rental services provide customers with use of either dedicated or nonspecific wellhead proppant delivery equipment solutions for contractual periods defined either through formal lease agreements or executed work orders under established pricing agreements. The amounts invoiced reflect the length of time the equipment set was utilized in the billing period. Contract labor services provide customers with proppant delivery equipment operators through work orders executed under established pricing agreements. The amounts invoiced reflect the amount of time our labor services were utilized in the billing period.

We typically invoice our customers on a weekly or monthly basis; however, some customers receive invoices upon well-site operation completion. Standard collection terms are net 30 days, although extended terms are offered in competitive situations. We typically recognize revenue for specific, dedicated equipment set rental arrangements under ASC 840, Leases. For the remaining components of service revenue, we have applied the practical expedient allowed under ASC 606-10-55-18 to recognize transportation revenues in proportion to the amount we have the right to invoice.

Contracts with Multiple Performance Obligations

For contracts that contain multiple performance obligations, such as work orders containing a combination of product, transportation, equipment rentals, and contract labor services, we allocate the transaction price to each performance obligation identified in the contract based on relative standalone selling prices, or estimates of such prices, and recognize the related revenue as control of each individual product or service is transferred to the customer, in satisfaction of the corresponding performance obligations. We typically invoice our customers on a weekly or monthly basis; however, some customers receive invoices upon well-site operation completion. Standard collection terms are net 30 days, although extended terms are offered in competitive situations.

Taxes Collected from Customers and Remitted to Governmental Authorities.

We exclude from our measurement of transaction prices all taxes assessed by governmental authorities that are both (i) imposed on and concurrent with a specific revenue-producing transaction and (ii) collected from customers. Accordingly, such tax amounts are not included as a component of net sales or cost of sales.

Foreign Operations

Foreign operations constituted approximately $44.0 million of our consolidated sales; $7.3 million of consolidated assets; $2.6 million of pre-tax income and $2.4 million of net income as of and for the year ended December 31, 2018. We had no significant foreign operations during the years ended December 31, 2017 and 2016.

See Note U - Revenue.

Deferred Revenues

For a limited number of customers, we enter into supply agreements which give customers the right to make advanced payments toward the purchase of certain products at specified volumes over an average initial period of one to fifteen years. These payments represent consideration that is unconditional for which we have yet to transfer the related product. These payments are recorded as contract liabilities referred to as “deferred revenues” upon receipt and recognized as revenue upon delivery of the related product.

Unbilled Receivables

Revenues recognized in advance of invoice issuance create assets referred to as “unbilled receivables.” Any portion of our unbilled receivables for which our right to consideration is conditional on a factor other than the passage of time is considered a contract asset. These assets are presented on a combined basis with accounts receivable and are converted to accounts receivable once billed.

Debt Issuance Costs

The Company defers costs directly associated with acquiring third-party financing, primarily loan origination costs and related professional expenses. Debt issuance costs are deferred and amortized using the effective interest rate method over the term of our senior secured Term Loan facility and the straight-line method for our Revolver facility. Debt issuance costs related to long-term debt are reflected as a direct deduction from the carrying amount of the debt. Amortization included in interest expense was $4.0 million for the year ended December 31, 2018, and $1.4 million for each of the years ended December 31, 2017 and 2016. See Note K - Debt.

Employee Benefit Plans

We provide a range of benefits to our employees and retired employees, including pensions and post-retirement healthcare and life insurance benefits. We record annual amounts relating to these plans based on calculations specified by generally accepted accounting principles, which include various actuarial assumptions, including discount rates, assumed rates of returns, compensation increases, turnover rates, mortality table, and healthcare cost trend rates. We review the actuarial assumptions on an annual basis and make modifications to the assumptions based on current rates and trends when it is deemed appropriate to do so. As required by U.S. generally accepted accounting principles, the effect of the modifications is generally recorded or amortized over future periods. We believe that the assumptions utilized in recording our obligations under the plans are reasonable based on advice from our actuaries and information as to assumptions used by other employers. See Note R - Pension and Post-Retirement Benefits.

Environmental Costs

Environmental costs, other than qualifying capital expenditures, are accrued at the time the exposure becomes known and costs can be reasonably estimated. Costs are accrued based upon management’s estimates of all direct costs, after taking into account expected reimbursement by third parties (primarily the sellers of acquired businesses) and are reviewed by outside consultants. Environmental costs are charged to expense unless a settlement with an indemnifying party has been reached.

Self-Insurance

We are self-insured for various levels of employee health insurance coverage, workers’ compensation and third-party product liability claims alleging occupational disease. We purchase insurance coverage for claim amounts which exceed our self-insured retentions. Depending on the type of insurance, these self-insured retentions range from $0.1 million to $0.5 million per occurrence. Our insurance reserves are accrued based on estimates of the ultimate cost of claims expected to occur during the covered period. Our insurance reserves are accrued based on estimates of the ultimate cost of claims expected to occur during the covered period. These estimates are prepared with the assistance of outside actuaries and consultants. Our actuaries periodically review the volume and amount of claims activity, and based upon their findings, we adjust our insurance reserves accordingly. The ultimate cost of claims for a covered period may differ from our original estimates. The current portion of our self-insurance reserves is included in accrued liabilities and the non-current portion is included in other long-term obligations in our Balance Sheets. As of December 31, 2018 and 2017, our self-insurance reserves totaled $5.4 million and $5.5 million, respectively, of which $2.6 million and $1.7 million, respectively, was classified as current.

Research and Development Costs

We may incur immaterial internal research and development (“R&D”) expenditures, and research and development conducted for others, all of which are expensed as incurred, and included in selling, general and administrative expense. R&D costs may include, but are not limited to, research and administrative salaries, contractor fees, building costs, utilities, administrative expenses, and allocations of corporate costs.

Advertising Costs

We recognize advertising expense when incurred as selling, general and administrative expense.

Equity-based Compensation

We grant stock options, restricted stock, restricted stock units and performance share units to certain of our employees and directors under the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan. We recognize the cost of employee services rendered in exchange for awards of equity instruments.

Vesting of restricted stock and restricted stock units is based on the individual continuing to render service over a pre-defined vesting schedule, generally three years. Cash dividend equivalents are accrued and paid to the holders of time-based restricted stock units and restricted stock. The fair value of the restricted stock awards is equal to the market price of our stock at date of grant. The restricted award-related compensation expense is recognized, on a straight-line basis, over the vesting period.

We grant performance share units to certain employees in which the number of shares of common stock ultimately received is determined based on achievement of certain performance thresholds over a specified performance period (generally three years) in accordance with the stock award agreement. Cash dividend equivalents are not accrued or paid on performance share units. We recognize expense based on the estimated vesting of our performance share units granted and the grant date market price. The estimated vesting of the performance share units is principally based on the probability of achieving certain financial performance levels during the vesting periods. In the period it becomes probable that the minimum performance criteria specified in the award agreement will be achieved, we recognize expense for the proportionate share of the total fair value of the award related to the vesting period that has already lapsed. The remaining fair value of the award is expensed on a straight-line basis over the remaining vesting period.

We grant certain employees performance share units, the vesting of which is based on the Company’s total shareholder return (“TSR”) ranking among a peer group over a three-year period. The number of units that will vest will depend on the percentage ranking of the Company's TSR compared to the TSRs for each of the companies in the peer group over the performance period. For these awards subject to market conditions, a binomial-lattice model (i.e., Monte Carlo simulation model) is used to fair value these awards at grant date. The related compensation expense is recognized, on a straight-line basis, over the vesting period.

We grant stock options to certain employees and directors. Stock options vest on a vesting schedule and the related compensation expense is recognized over the vesting period, usually over 3 or 4 years. In calculating the compensation expense for stock options granted, we estimate the fair value of each grant using the Black-Scholes option-pricing model.

The fair value of stock options granted is based on the exercise price of the option and certain assumptions, which are evaluated and revised, as necessary, to reflect market conditions and experience. Our expected forfeiture rate is the estimated percentage of options granted that are expected to be forfeited or canceled on an annual basis before becoming fully vested. Our expected term is the period of time over which the options are expected to remain outstanding. An increase in the expected term will increase compensation expense. The computation of the expected term is based on the simplified method, under which the expected term is presumed to be the mid-point between the average vesting date and the end of the contractual term. The assumptions for expected volatility are based on historical experience for the same periods as our expected lives. Risk-free interest rates are set using grant-date U.S. Treasury yield curves for the same periods as our expected lives. The expected dividend yield is based on our future dividend expectations for the same periods as our expected lives. See Note P - Equity-based Compensation.

Income Taxes

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (the “Tax Act”). The Tax Act makes broad and complex changes to the U.S. tax code including, but not limited to, (1) bonus depreciation that will allow for full expensing of qualified property; (2) reduction of the U.S. federal corporate tax rate; (3) elimination of the corporate alternative minimum tax; (4) a new limitation on deductible interest expense; (5) the repeal of the domestic production activity deduction; (6) limitations on the deductibility of certain executive compensation; and (7) limitations on net operating losses generated after December 31, 2017, to 80 percent of taxable income.

The SEC staff issued SAB 118, which provides guidance on accounting for the tax effects of the Tax Act. SAB 118 provides a measurement period that should not extend beyond one year from the Tax Act enactment date for companies to complete the accounting under ASC 740. In accordance with SAB 118, a company must reflect the income tax effects of those aspects of the Act for which the accounting under ASC 740 is complete. December 22, 2018 marked the end of the measurement period for purposes of SAB 118. As such, we have completed the accounting for the tax effects of the Tax Act. In August 2018, the Internal Revenue Service released Tax Act guidance on limitations on executive compensation which clarified transition rules for certain compensation agreements in

existence on November 2, 2017. Based on the issued guidance, we recorded a discrete tax expense of $0.7 million to remove deferred tax assets on certain executive compensation agreements that were not eligible for transition relief. The Tax Act reduces the corporate tax rate to 21 percent, effective January 1, 2018. Because ASC 740-10-25-47 requires the effect of a change in tax laws or rates to be recognized as of the date of enactment, we were required to adjust deferred tax assets and liabilities as of December 22, 2017. Accordingly, for the year ended December 31, 2017, we recorded a decrease

related to deferred tax assets and liabilities of $45.0 million and $80.8 million, respectively, with a corresponding net adjustment to deferred income tax benefit of $35.8 million.

Under the Tax Act, net operating loss (NOL) deductions arising in tax years beginning after December 31, 2017 can only offset up to 80 percent of future taxable income. The Act also prohibits NOL carrybacks, but allows indefinite carryforwards for NOLs arising in tax years beginning after December 31, 2017. Net operating losses arising before January 1, 2018 are accounted for under the previous tax rules that imposed no limit on the amount of the taxable income that can be set off using NOLs and that can be carried back 2 years and carried forward 20 years.

The Tax Act repeals the corporate alternative minimum tax (AMT), effective for tax years beginning after December 31, 2017, but allows an entity to claim portions of any unused AMT credits over the next four years to offset its regular tax liability. An entity with unused AMT credits as of December 31, 2017 can first use these credits to offset its regular tax for 2017 and can then claim up to 50 percent of the remaining AMT credits in 2018, 2019, and 2020, with all remaining AMT credits refundable in 2021.

Deferred taxes are provided on the liability method whereby deferred tax assets are recognized for deductible temporary differences and operating loss and tax credit carry forwards and deferred tax liabilities are recognized for taxable temporary differences. This approach requires recognition of deferred tax liabilities and assets for the expected future tax consequences of events that have been included in the financial statements or tax returns. Under this method, deferred tax liabilities and assets are determined based upon the difference between the financial statement and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the expenses are expected to reverse. Valuation allowances are provided if, based on the weight of available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized.

We recognize a tax benefit associated with an uncertain tax position when, in management’s judgment, it is more likely than not that the position will be sustained upon examination by a taxing authority. For a tax position that meets the more-likely-than-not recognition threshold, we initially and subsequently measure the tax benefit as the largest amount that we judge to have a greater than 50% likelihood of being realized upon ultimate settlement with a taxing authority. The liability associated with unrecognized tax benefits is adjusted periodically due to changing circumstances, such as the progress of tax audits, case law developments and new or emerging legislation. Such adjustments are recognized entirely in the period in which they are identified. The effective tax rate includes the net impact of changes in the liability for unrecognized tax benefits and subsequent adjustments as considered appropriate by management.

The largest permanent item in computing both our effective tax rate and taxable income is the deduction allowed for statutory depletion. The deduction for statutory depletion does not necessarily change proportionately to changes in income before income taxes. See Note T - Income Taxes.

Financial Instruments

We currently use interest rate hedge agreements to manage interest costs and the risk associated with changing interest rates. Amounts to be paid or received under these hedge agreements are accrued as interest rates change and are recognized over the life of the hedge agreements as an adjustment to interest expense. Our policy is to not hold or issue derivative financial instruments for trading or speculative purposes. When entered into, these financial instruments are designated as hedges of underlying exposures, associated with our long-term debt, and are monitored to determine if they remain effective hedges. Gains and losses on derivatives designated as cash flow hedges are recorded in other comprehensive income (loss), net of tax, and reclassified to earnings in a manner that matches the timing of the earnings impact of the hedged transactions. The ineffective portion of all hedges, if any, is recognized currently in income. See Note O - Derivative Instruments.

Foreign Currency Translation

For our operations in countries where the functional currency is other than the U.S. dollar, balance sheet amounts are translated using the exchange rate in effect at the balance sheet date. Income statement amounts are translated monthly using the average exchange rate for the respective month. The gains and losses resulting from the changes in exchange rates from year-to-year are recorded as a component of accumulated other comprehensive income or loss as currency translation adjustments, net of tax. Any gains or losses on transactions in currencies other than the functional currency are included in other income (expense), net, including interest income. For the year ended December 31, 2018, other

income (expense), net, including interest income, includes a net realized foreign currency transaction loss of $0.6 million.

Comprehensive Income (loss)

In addition to net income (loss), comprehensive income (loss) includes all changes in equity during a period, such as adjustments to minimum pension liabilities and the effective portion of changes in fair value of derivative instruments that qualify as cash flow hedges.

Business Combinations

The Company accounts for business combinations using the acquisition method of accounting. Under this method, acquired assets, including separately identifiable intangible assets and any assumed liabilities, are recorded at their acquisition date estimated fair value. The excess of purchase price over the fair value amounts assigned to the assets acquired and liabilities assumed represents the goodwill amount resulting from the acquisition. Determining the fair value of assets acquired and liabilities assumed involves the use of significant estimates and assumptions. See Note E - Business Combinations.

New Accounting Pronouncements Recently Adopted

In May 2014, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update (“ASU”) 2014-09, Revenue from Contracts with Customers (Topic 606), which supersedes previous revenue recognition guidance. The new guidance introduces a new principles-based framework for revenue recognition and disclosure. Since its issuance, the FASB has issued additional ASUs, amending the guidance and the effective dates of amendments, and the SEC has rescinded certain related SEC guidance.

On January 1, 2018, we adopted the new accounting standard and all of the related amendments (“new revenue standard”) to all contracts using the modified retrospective method. Adoption of the new revenue standard did not result in a material cumulative effect adjustment to the opening balance of retained earnings. The comparative information has not been restated and continues to be reported under the accounting standards in effect for those periods. Adoption of the new revenue standard will not have material impact to our net income on an ongoing basis. See Note U - Revenue.

In January 2017, the FASB issued ASU 2017-04, Intangibles - Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment, which removes Step 2 from the goodwill impairment test. It is effective for annual and interim periods beginning after December 15, 2019. Early adoption is permitted for interim or annual goodwill impairment tests performed with a measurement date after January 1, 2017. We early adopted this standard on a prospective basis in the fourth quarter of 2018 for our annual impairment test. We performed a quantitative assessment by comparing the fair value of our reporting units with their carrying amount and determined that the goodwill of our Oil & Gas Sand reporting unit was impaired. We recognized a goodwill impairment charge of $164.2 million during the fourth quarter of 2018. See Note I - Goodwill and Intangible Assets.

In March 2017, the FASB issued ASU 2017-07, Compensation-Retirement Benefits (Topic 715), Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit. The update required companies to include the service cost component of net periodic benefit costs in the same line item or items as compensation costs arising from services rendered by the associated employees during the period. The update disallowed capitalization of the other components of net periodic benefit costs and required those costs to be presented in the income statement separately from the service cost component and outside of a subtotal of income from operations. The update was effective for fiscal years beginning after December 15, 2017, including interim periods within those annual periods for public business entities. Companies were required to retrospectively apply the requirement for a separate presentation in the income statement of service costs and other components of net benefit cost and prospectively adopt the requirement to limit the capitalization of benefit costs to the service component. Application of a practical expedient was allowed permitting an employer to use the amounts disclosed in its pension and other postretirement benefit plan note for the prior comparative periods as the estimation basis for applying the retrospective presentation requirements. We implemented the update on January 1, 2018 and utilized the practical expedient to estimate the impact on the prior comparative period information presented in the interim and annual financial statements. We previously capitalized all net periodic benefit costs incurred for plant personnel in inventory and recorded the majority of net periodic benefit costs incurred by corporate personnel and retirees into selling, general, and administrative expenses.

The following is a reconciliation of the effect of the reclassification (in thousands) of the net benefit cost in the Company’s Income Statements for the years ended December 31, 2017 and 2016. In addition, the table reflects the effect of the reclassification between product sales and services sales to conform to the current year's presentation for

the years ended December 31, 2017 and 2016:

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	Year ended December 31, 2017			
	As Previously Reported	Services Reclassifications	ASU 2017-07 Adjustments	As Revised
Product Sales	$1,057,553	$ (47,159)	$ —	$1,010,394
Service Sales	183,298	47,159	—	230,457
Total sales	1,240,851	—	—	1,240,851
Product cost of sales	720,312	(5,096)	(695)	714,521
Service cost of sales	147,203	5,096	—	152,299
Total cost of sales (excluding depreciation, depletion and amortization)	867,515	—	(695)	866,820
Selling, general and administrative expenses	107,592	—	(536)	107,056
Operating income	168,511	—	1,231	169,742
Other income (expense)	(643)	—	(1,231)	(1,874)

	Year ended December 31, 2016			
	As Previously Reported	Services Reclassifications	ASU 2017-07 Adjustments	As Revised
Product Sales	$523,900	$ 237	$ —	$524,137
Service Sales	35,725	(237)	—	35,488
Total sales	559,625	—	—	559,625
Product cost of sales	455,189	2,079	(485)	456,783
Service cost of sales	22,106	(2,079)	—	20,027
Total cost of sales (excluding depreciation, depletion and amortization)	477,295	—	(485)	476,810
Selling, general and administrative expenses	67,727	—	(555)	67,172
Operating income	(53,531)	—	1,040	(52,491)
Other income (expense)	3,758	—	(1,040)	2,718

In October 2018, the FASB issued ASU 2018-16, Derivatives and Hedging (Topic 815): Inclusion of the Secured Overnight Financing Rate (SOFR) Overnight Index Swap (OIS) Rate as a Benchmark Interest Rate for Hedge Accounting Purposes. The amendments in this ASU permit the use of the Overnight Index Swap ("OIS") rate based on the Secured Overnight Financing Rate ("SOFR") as a U.S. benchmark interest rate for hedge accounting purposes under Topic 815 in addition to the U.S. government ("UST"), the London Interbank Offered Rate ("LIBOR") swap rate, the OIS rate based on the Fed Funds Effective Rate and the Securities Industry and Financial Markets Association ("SIFMA") Municipal Swap Rate. For public entities, the amendments in this Update are effective for fiscal years beginning after December 15, 2018, and interim periods within those fiscal years. Early application is permitted in any interim period after issuance of this ASU. We early adopted this standard with no impact to our consolidated financial statements.

New Accounting Pronouncements Not Yet Adopted

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842) and issued ASU 2018-11 Leases (Topic 842): Targeted Improvements. The new standard(s) established a right-of-use ("ROU") model that requires a lessee to record an ROU asset and a corresponding lease liability on the balance sheet for all leases with terms greater than 12 months. Leases will be classified as either finance or operating, with classification affecting the pattern of expense recognition. Similarly, lessors will be required to classify leases as sales-type, finance or operating, with classification affecting the pattern of income recognition. Classification for both lessees and lessors will be based on an assessment of whether the lease risks and rewards, as well as substantive control, have been transferred through a lease contract. This update is effective for public entities for financial statements issued for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years, and early adoption is permitted. The new transition method

allows companies to use the effective date of the new lease standard as the date of initial application on transition. We established a project team in order to analyze the standard and have reviewed our current accounting policies and procedures to identify potential differences and changes which would result from applying the requirements of the new standard to our lease contracts. We selected a lease software to help us account for the new lease standard. We identified our population of lease agreements and assessed the impact of other arrangements for embedded leases. Using the modified retrospective approach, we evaluated the effect of the standard and expect to recognize right-of-use assets

of $223.0 million and lease liabilities of $222.7 million as of January 1, 2019, and determined that the standard will not have a material impact on our consolidated statements of operations or cash flows.

In February 2018, the FASB issued Accounting Standards Update ASU 2018-02, Income Statement-Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income. The ASU provides that the stranded tax effects from the Tax Act in accumulated other comprehensive loss may be reclassified to retained earnings. The ASU is effective January 1, 2019, with early adoption permitted. We are currently evaluating the effect that the transition guidance will have on our financial statements and related disclosures.

In August 2018, the FASB issued ASU 2018-15, Intangibles-Goodwill and Other-Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract. The new guidance requires a customer in a cloud computing arrangement (i.e., hosting arrangement) that is a service contract to follow the internal-use software guidance in ASC 350-40 to determine which implementation costs to capitalize as assets or expense as incurred. Capitalized implementation costs related to a hosting arrangement that is a service contract will be amortized over the term of the hosting arrangement, beginning when the module or component of the hosting arrangement is ready for its intended use. The update is effective for calendar-year public business entities in 2020. For all other calendar-year entities, it is effective for annual periods beginning in 2021 and interim periods in 2022. Early adoption is permitted. We are currently evaluating the effect that the guidance will have on our financial statements and related disclosures.

In October 2018, FASB issued ASU 2018-17, Consolidation (Topic 810): Targeted Improvements to Related Party Guidance for Variable Interest Entities. This ASU is intended to reduce the cost and complexity of financial reporting associated with consolidation of VIEs. This ASU affects organizations that are required to determine whether they should consolidate a legal entity under the guidance within Subtopic 810-10, Consolidation. The update is effective for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years. Early adoption is permitted. We are currently evaluating the adoption of this standard and the impact to our consolidated financial statements.

In November 2018, the FASB issued 2018-18, Collaborative Arrangements (Topic 808), Clarifying the Interaction between Topic 808 and Topic 606. The amendments in this ASU provide clarification and guidance on whether certain transactions between collaborative arrangement participants should be accounting for with revenue under Topic 606 (Revenue from Contracts with Customers). The amendments provide narrow scope improvements for lessors. The amendments in this ASU are effective for fiscal years beginning after December 15, 2019 and interim periods within those fiscal years. We are currently evaluating the adoption of this standard and the impact to our consolidated financial statements.

In November 2018, FASB issued ASU 2018-19, Codification Improvements to Topic 326, Financial Instruments-Credit Losses. The amendments in this ASU clarified issues related to Topic 326. In Issue 1, the amendment in this ASU mitigate transition complexity by requiring that for nonpublic business entities the amendments in ASU 2016-13 are effective for fiscal years after December 15, 2021, including interim periods within those fiscal years. In Issue 2, the amendment clarifies that receivable arising from operating leases are not within the scope of Subtopic 326-20. Impairment of receivables arising from operating leases should be accounting for in accordance with Topic 842, Leases. The ASU is effective for all entities for fiscal years beginning after December 15, 2019, including interim periods therein. Early adoption is permitted for any eliminated or modified disclosures upon issuance of this ASU. We are currently evaluating the adoption of this standard and the impact to our consolidated financial statements.

NOTE C—EARNINGS PER SHARE

Basic earnings per common share is computed by dividing income available to common stockholders by the weighted average number of common shares outstanding for the period. Diluted earnings per common share is computed similarly to basic earnings per common share except that the weighted average number of common shares outstanding is increased to include the number of additional common shares that would have been outstanding if the potentially dilutive common shares had been issued.

The following table shows the computation of basic and diluted earnings per share for the years ended December 31, 2018, 2017 and 2016:

In thousands, except per share amounts	Year ended December 31,		
	2018	2017	2016
Numerator:			
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$(200,808)	$145,206	$(41,056)
Denominator:			
Weighted average shares outstanding	76,453	81,051	65,037
Diluted effect of stock awards	—	909	—
Weighted average shares outstanding assuming dilution	76,453	81,960	65,037
Earnings (loss) per share attributable to U.S. Silica Holdings, Inc.:			
Basic earnings (loss) per share	$(2.63)	$1.79	$(0.63)
Diluted earnings (loss) per share	$(2.63)	$1.77	$(0.63)

Potentially dilutive shares of 443 and 732 for the year ended December 31, 2018 and 2016, respectively, were excluded from the calculation of diluted weighted average shares outstanding and diluted earnings per share because we were in a loss position. Certain stock options, restricted stock awards and performance share units were excluded from the computation of diluted earnings per share because their effect would have been anti-dilutive. Stock awards (in thousands) excluded from the calculation of diluted earnings per common share were as follows:

	Year ended December 31,		
	2018	2017	2016
Stock options excluded	574	195	573
Restricted stock and performance share units awards excluded	155	305	166

NOTE D—CAPITAL STRUCTURE AND ACCUMULATED OTHER COMPREHENSIVE INCOME (LOSS)

Common Stock

Our Amended and Restated Certificate of Incorporation authorizes up to 500,000,000 shares of common stock, par value of $0.01. Subject to the rights of holders of any series of preferred stock, all of the voting power of the stockholders of Holdings shall be vested in the holders of the common stock. There were 81,811,977 shares issued and 73,148,853 shares outstanding at December 31, 2018. There were 81,267,205 shares issued and 80,524,255 shares outstanding at December 31, 2017.

During the year ended December 31, 2018, our Board of Directors declared quarterly cash dividends as follows:

Dividends per Common Share	Declaration Date	Record Date	Payable Date
$0.0625	February 16, 2018	March 15, 2018	April 5, 2018
$0.0625	May 14, 2018	June 15, 2018	July 6, 2018
$0.0625	July 16, 2018	September 14, 2018	October 3, 2018
$0.0625	November 13, 2018	December 14, 2018	January 4, 2019

All dividends were paid as scheduled.

Any determination to pay dividends and other distributions in cash, stock, or property by Holdings in the future will be at the discretion of our Board of Directors and will be dependent on then-existing conditions, including our business and financial condition, results of operations, liquidity, capital requirements, contractual restrictions including restrictive covenants contained in our debt agreements, and other factors. Additionally, because we are a holding company, our ability to pay dividends on our common stock may be limited by restrictions on the ability of our subsidiaries to pay dividends or make distributions to us, including restrictions under the terms of the agreements governing our indebtedness.

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Preferred Stock

Our Amended and Restated Certificate of Incorporation authorizes our Board of Directors to issue up to 10,000,000 shares, in the aggregate, of preferred stock, par value of $0.01 in one or more series, to fix the powers, preferences and other rights of such series, and any qualifications, limitations or restrictions thereof, including the dividend rate, conversion rights, voting rights, redemption rights and liquidation preference, and to fix the number of shares to be included in any such series, without any further vote or action by our stockholders.

There were no shares of preferred stock issued or outstanding at December 31, 2018 or December 31, 2017. At present, we have no plans to issue any preferred stock.

Share Repurchase Program

We are authorized by our Board of Directors to repurchase shares of our outstanding common stock from time to time on the open market or in privately negotiated transactions. Stock repurchases, if any, will be funded using our available liquidity. The timing and amount of stock repurchases will depend on a variety of factors, including the market conditions as well as corporate and regulatory considerations.

In May 2018, our Board of Directors authorized the repurchase of up to $200 million of our common stock. As of December 31, 2018, we have repurchased a total of 5,036,139 shares of our common stock at an average price of $14.59 and have $126.5 million of remaining availability under this program.

In October 2017, our Board of Directors authorized us to repurchase up to $100 million of our common stock by December 11, 2018. As of March 31, 2018, we had repurchased a total of 3,555,104 shares of our common stock at an average price of $28.13, and fully utilized our shares authorized to be repurchased at such time.

Our Board of Directors previously had authorized the repurchase of up to $50.0 million of our common stock. This program expired on December 11, 2017. We repurchased a total of 706,093 shares of our common stock at an average price of $23.83 under this program.

Accumulated Other Comprehensive Loss

Accumulated other comprehensive loss consists of fair value adjustments associated with cash flow hedges, accumulated adjustments for net experience losses and prior service cost related to employee benefit plans and foreign currency translation adjustments, net of tax. The following table presents the changes in accumulated other comprehensive loss by component (in thousands) during the year ended December 31, 2018:

	For the Year Ended December 31, 2018			
	Unrealized gain/(loss) on cash flow hedges	Foreign currency translation adjustments	Pension and other post-retirement benefits liability	Total
Beginning Balance	$(76)	$ (6)	$ (13,844)	$(13,926)
Other comprehensive gain (loss) before reclassifications	(1,622)	(614)	(879)	(3,115)
Amounts reclassed from accumulated other comprehensive loss	77	—	1,944	2,021
Ending Balance	$(1,621)	$ (620)	$ (12,779)	$(15,020)

Amounts reclassified from accumulated other comprehensive loss related to cash flow hedges are included in interest expense in our Income Statements and amounts reclassified related to pension and other post-retirement benefits are included in the computation of net periodic benefit costs at their pre-tax amounts.

NOTE E—BUSINESS COMBINATIONS

Goodwill

Goodwill represents the excess of the purchase price over the fair value of the underlying net assets acquired.

Trade Names

A trade name is a legally protected trade or similar mark. Acquired trade names are valued using an income method approach, generally the relief-from-royalty valuation method. The method uses a royalty rate based on comparable marketplace royalty agreements for similar types of trade names and applies it to the after-tax discounted free cash flow attributed to the trade name. The discount rate used is based on an estimated weighted average cost of capital and the anticipated risk for intangible assets.
The valued trade names have an indefinite life based on our plans and expectations for the trade names going forward and is reviewed for impairment under ASC 360-10.

Intellectual Property and Technology
Intellectual property and technology (“IP”) is a design, work or invention that is the result of creativity to which one has ownership rights that may be protected through a patent, copyright, trademark or service mark. IP is valued using the relief from royalty valuation method. The method uses a royalty rate based on comparable market-place royalty agreements for similar types of IP and applies it to the after-tax discounted free cash flow attributed to the IP. The discount rate used is based on an estimated weighted average cost of capital and the anticipated risk for intangible assets.
The IP is amortized following the pattern in which the expected benefits will be consumed or otherwise used up over each component’s useful life, based on our plans and expectations for the IP going forward, which is generally the underlying IP’s legal expiration dates. IP is reviewed for impairment under ASC 360-10.

Customer Relationships
Customer relationships are intangible assets that consist of historical and factual information about customers and contacts collected from repeat transactions with customers, with or without any underlying contracts. The information is generally organized as customer lists or customer databases. We have the expectation of repeat patronage from these customers based on the customers’ historical purchase activity, which creates the intrinsic value over a finite period of time and translates into the expectation of future revenue, income, and cash flow.
Customer relationships are valued using projected operating income, adjusted for estimated future existing customer growth less estimated future customer attrition, net of charges for net tangible assets, IP charge, trade name charge and work force. The concluded value is the after-tax discounted free cash flow. Customer relationships are reviewed for impairment under ASC 360-10.

2018 Acquisition:
On May 1, 2018, we completed the acquisition of all of the outstanding capital stock of EP Acquisition Parent, Inc., a Delaware corporation (“EPAP”), and the ultimate parent of EP Minerals, LLC ("EPM"). Contemporaneous with the merger, EPAP was renamed EP Minerals Holdings, Inc. ("EPMH"). The consideration paid consisted of $743.2 million of cash, net of cash acquired of $19.1 million, including $0.5 million of post-closing adjustments. EPM is a global producer of engineered materials derived from industrial minerals, including diatomaceous earth, clay (calcium bentonite and calcium montmorillonite) and perlite. EPM's industrial minerals are used as filter aids, absorbents and functional additives for a variety of industries including food and beverage, biofuels, recreational water, oil and gas, farm and home, landscape, sports turf, paint, plastics, and insecticides. The acquisition of EPM increased our industrial materials product offering in our Industrial & Specialty Products business segment.
We have accounted for the acquisition of EPMH under the acquisition method of accounting in accordance with ASC 805, Business Combinations. Estimates of fair value included in the Consolidated Financial Statements represent our best estimates and valuations. In accordance with the acquisition method of accounting, the allocation of consideration value is subject to adjustment until we complete our analysis, within a period of time not to exceed one year after the date of acquisition, or May 1, 2019, in order to provide us with the time to complete the valuation of its assets and liabilities. We are still completing our analysis of the fair value of property, plant and mine development, mineral rights and intangible assets.
The following table sets forth the preliminary allocation of the purchase price to EPMH's identifiable tangible and intangible assets acquired and liabilities assumed, including measurement period adjustments (in thousands):

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Preliminary allocation of purchase price:	Estimate as of May 1, 2018	Measurement Period Adjustments	Purchase Price Allocation
Accounts receivable, net	$43,354	$ (49)	$ 43,305
Inventories	84,395	1,717	86,112
Property, plant and mine development	123,086	25,409	148,495
Mineral rights	462,050	(42,581)	419,469
Identifiable intangible assets - finite lived	21,050	(10,780)	10,270
Identifiable intangible assets - indefinite lived	25,050	13,000	38,050
Prepaids and deposits	2,054	18	2,072
Other assets	4,088	3,386	7,474
Goodwill	139,787	10,841	150,628
Total assets acquired	904,914	961	905,875
Accounts payable	13,435	—	13,435
Accrued expenses and other current liabilities	8,255	2,049	10,304
Deferred tax liabilities	130,209	(7,398)	122,811
Long term obligations	9,766	6,310	16,076
Total liabilities assumed	$161,665	$ 961	$ 162,626
Net assets acquired	$743,249	$ —	$ 743,249

The acquired intangible assets and the related estimated useful lives consist of the following:

	Approximate Fair Value (in thousands)	Estimated Useful Life (in years)
Technology and intellectual property	$ 2,900	15
Customer relationships	7,370	15
Total identifiable intangible assets - finite lived	$ 10,270	
Trade names	$ 38,050	
Total identifiable intangible assets - indefinite lived	$ 38,050	

Goodwill represents the excess of the purchase price over the fair value of the underlying net assets acquired. Goodwill in this transaction is attributable to planned growth in our industrial materials product offering in our Industrial & Specialty Products business segment. Intangibles and goodwill are not expected to be deductible for tax purposes.

Our Income Statement included revenue of $158.8 million and a net loss of $0.6 million for the year ended December 31, 2018, associated with EPMH following the date of acquisition. We incurred $13.6 million of acquisition-related charges, excluding debt issuance costs, for the year ended December 31, 2018, which are included in selling, general and administrative expenses on our Income Statement.

The acquisition of EPMH was accounted for using the acquisition method of accounting. The purchase price and purchase price allocation are subject to customary post-closing adjustments and changes in the fair value of assets and liabilities. The above estimated fair values of net assets acquired are based on the information that was available as of the reporting date. We believe that the information provides a reasonable basis for estimating the fair values of the acquired assets and assumed liabilities, but the potential for measurement period adjustments exists based on our continuing review of matters related to the acquisition. As a result, our final purchase price allocation may be significantly different than reflected above. We expect to complete the purchase price allocation as soon as practicable, but no later than one year from the acquisition date.

Unaudited Pro Forma Results

The results of EPMH's operations have been included in the Consolidated Financial Statements subsequent to the acquisition date. EPMH's fiscal year end was November 30 and the Company's fiscal year end was December 31. Under SEC regulations, if a target's fiscal year end varies by more than 93 days from the acquirer's fiscal year end, it is required to adjust interim periods until it is within 93 days. Since EPMH’s fiscal year end was within 93 days of the Company's fiscal year end,

no adjustment is necessary and EPMH’s fiscal year end and interim period ends are used as if they coincided with the Company's fiscal year end and interim period end. The following unaudited pro forma consolidated financial information reflects the results of operations as if the EPMH acquisition had occurred on January 1, 2017, after giving effect to certain purchase accounting adjustments. Material non-recurring transaction costs attributable to the business combination were $15.2 million. Pro forma net income includes incremental interest expense due to the related debt financing, incremental depreciation and depletion expense related to the fair value adjustment of property, plant and mine development, amortization expense related to identifiable intangible assets, and tax expense related to the combined tax provisions. This information does not purport to be indicative of the actual results that would have occurred if the acquisition had actually been completed on the date indicated, nor is it necessarily indicative of the future operating results or the financial position of the combined company (in thousands, except per share amounts):

	For the year ended December 31,	
	2018	2017
Sales	$1,659,775	$1,454,070
Net income (loss)	$(179,220)	$116,899
Basic earnings (loss) per share	$(2.34)	$1.44
Diluted earnings (loss) per share	$(2.34)	$1.43

2017 Acquisitions:

White Armor Acquisition:
On April 1, 2017, we completed the acquisition of White Armor, a product line of cool roof granules used in industrial roofing applications, for cash consideration of $18.6 million. The final purchase price was allocated to goodwill of approximately $3.9 million, identifiable intangible assets of $12.8 million and other net assets of approximately $1.9 million.
Goodwill in this transaction is attributable to planned growth in our specialty industrial sand business segment. The goodwill amount is included in our Industrial & Specialty Products business segment. Identifiable definite lived intangibles, including customer relationships, and goodwill are expected to be deductible for tax purposes.
We incurred $0.2 million of acquisition-related charges which are included in selling, general and administrative expenses during the year ended December 31, 2017. Revenue and earnings for White Armor after the acquisition date are not presented as the business was integrated into our operations subsequent to the acquisition and therefore impracticable to quantify.

MS Sand Acquisition:
On August 16, 2017, we completed the acquisition of Mississippi Sand, LLC ("MS Sand"), a Missouri limited liability company, for cash consideration of approximately $95.4 million, net of cash acquired of $2.2 million. As is normal and customary, subsequent adjustments were made including $(0.5) million of net working capital adjustments plus an additional $6.1 million consideration paid related to a pre-existing contracted asset sale, which was entered into prior to our acquisition, for total cash consideration of $101.0 million. MS Sand is a frac sand mining and logistics company based in St. Louis, Missouri. The acquisition of MS Sand increased our regional frac sand product offering in our Oil & Gas Proppants business segment.
We have accounted for the acquisition of MS Sand under the acquisition method of accounting in accordance with ASC 805, Business Combinations, and have accounted for measurement period adjustments in accordance with ASU 2015-16, Simplifying the Accounting for Measurement-Period Adjustments. In accordance with the acquisition method of accounting, the allocation of consideration value was subject to adjustment until we completed our analysis in the third quarter of 2018.
The following table sets forth the final allocation of the purchase price to MS Sands' identifiable tangible and intangible assets acquired and liabilities assumed, including measurement period adjustments (in thousands):

	Estimate as of December 31, 2017	Measurement Period Adjustments	Purchase Price Allocation
Accounts receivable	$ 11,201	$ —	$ 11,201
Inventories	8,067	—	8,067
Other current assets	362	—	362
Assets held for sale	9,453	—	9,453
Property, plant and mine development	27,458	—	27,458
Mineral rights	26,300	(2,800)	23,500
Other non-current assets	1,136	—	1,136
Goodwill	22,522	2,800	25,322
Customer relationships	1,840	—	1,840
Total assets acquired	108,339	—	108,339
Accounts payable and accrued expenses	3,761	—	3,761
Unfavorable leasehold positions	2,237	—	2,237
Notes Payable	866	—	866
Other long term liabilities	—	—	—
Asset retirement obligations	474	—	474
Total liabilities assumed	7,338	—	7,338
Net assets acquired	$ 101,001	$ —	$ 101,001

The acquired intangible assets and the related estimated useful lives consist of the following:

	Approximate Fair Value (in thousands)	Estimated Useful Life (in years)
Customer relationships	$ 1,840	15

Goodwill in this transaction is attributable to planned growth in our regional frac sand product offering in our Oil & Gas Proppants business segment. The goodwill amount is included in our Oil & Gas Proppants business segment. Identifiable definite lived intangibles, including customer relationships, and goodwill are expected to be deductible for tax purposes.

We incurred $1.0 million of acquisition-related charges which are included in selling, general and administrative expenses. Revenue and earnings for MS Sand after the acquisition date are not presented as the business was integrated into our operations subsequent to the acquisition and therefore impracticable to quantify.

Unaudited Pro Forma Results

The results of MS Sand’s operations have been included in the Consolidated Financial Statements subsequent to the acquisition dates. The following unaudited pro forma consolidated financial information reflects the results of operations as if the MS Sand Acquisition had occurred on January 1, 2016, after giving effect to certain purchase accounting adjustments. These adjustments mainly include incremental depreciation expense related to the fair value adjustment of property, plant, equipment and mine development, amortization expense related to identifiable intangible assets and tax expense related to the combined tax provisions. This information does not purport to be indicative of the actual results that would have occurred if the acquisition had actually been completed on the date indicated, nor is it necessarily indicative of the future operating results or the financial position of the combined company (in thousands, except per share amounts):

	For the year ended December 31,	
	2017	2016
Sales	$1,287,202	$642,951
Net income (loss)	$143,604	$(55,835)

Basic earnings (loss) per share	$1.77	$(0.86)
Diluted earnings (loss) per share	$1.75	$(0.86)

2016 Acquisitions:

NBI Acquisition:

On August 16, 2016, we completed the acquisition of New Birmingham, Inc. ("NBI"), the ultimate parent company of NBR Sand, LLC ("NBR"), by acquiring all of the outstanding capital stock of NBI through the merger of New Birmingham Merger Corp., a Nevada corporation and wholly owned subsidiary of the Company, with and into NBI, followed immediately by the merger of NBI with and into NBI Merger Subsidiary II, Inc., a Delaware corporation and wholly owned subsidiary of the Company, which subsequently changed its name to Tyler Silica Company (the "NBI Acquisition"). NBR is a regional sand producer located near Tyler, Texas. The acquisition of NBI increased our regional frac sand product offering in our Oil & Gas Proppants business segment.

The consideration paid to the stockholders of NBI at the closing of the NBI Acquisition was approximately $213.7 million, consisting of $107.2 million in cash (net of $9.0 million cash acquired) and 2,630,513 shares of common stock valued at $106.6 million.

We have accounted for the acquisition of NBI under the acquisition method of accounting in accordance with ASC 805, Business Combinations, and have accounted for measurement period adjustments in accordance with ASU 2015-16, Simplifying the Accounting for Measurement-Period Adjustments. In accordance with the acquisition method of accounting, the allocation of consideration value was subject to adjustment until we completed our analysis in the third quarter of 2017

The following table sets forth the final allocation of the purchase price to NBI's identifiable tangible and intangible assets acquired and liabilities assumed, including measurement period adjustments (in thousands):

	Initial Estimate	Measurement Period Adjustments	Purchase Price Allocation
Accounts receivable	$2,680	$ —	$2,680
Inventories	3,494	—	3,494
Other current assets	428	—	428
Income tax deposits	6,657	(217)	6,440
Property, plant and mine development	210,913	(4,281)	206,632
Identifiable intangible assets	1,600	—	1,600
Goodwill	86,228	4,670	90,898
Total assets acquired	312,000	172	312,172
Accounts payable, accrued expenses and other current liabilities	1,938	726	2,664
Deferred revenue	500	—	500
Notes payable	24,361	243	24,604
Capital lease liabilities	3,331	—	3,331
Asset retirement obligations	710	—	710
Deferred tax liabilities	67,435	(797)	66,638
Total liabilities assumed	98,275	172	98,447
Net assets acquired	$213,725	$ —	$213,725

In addition to the changes in the balances reflected above, we recorded an adjustment to depreciation expense of $(0.6) million during the year ended December 31, 2017.

The acquired intangible assets and the related estimated useful lives consist of the following:

	Approximate Fair Value (in thousands)	Estimated Useful Life (in years)
Customer relationships	$ 1,600	13

Goodwill in this transaction is attributable to planned growth in regional frac sand markets and synergies expected to be achieved from integrating the operations of our operating subsidiary, U.S. Silica Company ("U.S. Silica"), and NBI. The goodwill amount is included in our Oil & Gas Proppants business segment. Both customer relationships and goodwill are not expected to be deductible for tax purposes.

We incurred $1.4 million of acquisition-related charges which are included in selling, general and administrative expenses during the year ended December 31, 2016. Additionally, we incurred $1.7 million related to the inventory write-up values in cost of goods sold during the year ended December 31, 2016.
Revenue and earnings for NBR after the acquisition date are not presented as the business was integrated into our operations subsequent to the acquisition and therefore impracticable to quantify.

Sandbox Acquisition:
On August 22, 2016, we completed the purchase of all of the outstanding units of membership interest of Sandbox Enterprises, LLC, a Texas limited liability company ("Sandbox" or the “Sandbox Acquisition”). Sandbox earns revenues from providing “last mile” transportation services to companies in the oil and gas industry. Sandbox has operations in Texas (Midland/Odessa, Kenedy, Dallas/Fort Worth, Tyler); Morgantown, West Virginia; western North Dakota; northeast of Denver, Colorado; Oklahoma City, Oklahoma; Cambridge, Ohio and Mansfield, Pennsylvania, where its major customers are located.
The consideration paid to the unit-holders was approximately $241.1 million, consisting of $69.5 million in cash (net of $1.3 million cash acquired) and 4,195,180 shares of our common stock valued at $171.7 million.

The following table sets forth the allocation of the purchase price to Sandbox’s identifiable tangible and intangible assets acquired and liabilities assumed (in thousands):

Allocation of Purchase price:	(in thousands)
Accounts receivable	$ 13,392
Prepaid expenses and other	1,465
Property, plant and mine development	32,336
Identifiable intangible assets	120,144
Goodwill	86,100
Total assets acquired	253,437
Accounts payable	4,122
Deferred revenue	4,902
Accrued expenses and other current liabilities	3,292
Total liabilities assumed	12,316
Net assets acquired	$ 241,121

The acquired intangible assets and the related estimated useful lives consist of the following:

	Approximate Fair Value (in thousands)	Estimated Useful Life (in years)
Indefinite lived intangible assets - Trade names	$ 17,844	Indefinite
Definite lived intangible assets - Technology and intellectual property	57,700	15
Definite lived intangible asset - Customer relationships	44,600	13
Total fair value of identifiable intangible assets	$ 120,144	

Goodwill in this transaction is attributable to expected growth in frac sand demand at the wellhead and synergies expected to be achieved from integrating the operations of U.S. Silica and Sandbox. The goodwill amount is included in our Oil & Gas Proppants business segment. Goodwill and all intangible assets identified above are expected to be deductible for tax purposes.
Our 2016 Income Statement included revenue of $31.0 million associated with Sandbox following the date of acquisition. Sandbox's impact on our net loss was not significant for the year ended December 31, 2016. We incurred $3.0 million of acquisition-related charges which are included in selling, general and administrative expenses on the Income Statement for the year ended December 31, 2016.

The cost related to the issuance of the 6,825,693 shares of common stock to complete the two acquisitions totaled $0.3 million, which is included in additional paid-in capital on our Consolidated Statements of Stockholders' Equity for the year ended December 31, 2016.

Combined Unaudited Pro Forma Results

The results of NBI's and Sandbox's operations have been included in the consolidated financial statements subsequent to the acquisition dates. The following unaudited pro forma consolidated financial information reflects the results of operations as if the NBI Acquisition and Sandbox Acquisition had occurred on January 1, 2015, after giving effect to certain purchase accounting adjustments. These adjustments mainly include incremental depreciation expense related to the fair value adjustment of property, plant, equipment and mine development, amortization expense related to identifiable intangible assets and tax expense related to the combined tax provisions. This information does not purport to be indicative of the actual results that would have occurred if the acquisition had actually been completed on the date indicated, nor is it necessarily indicative of the future operating results or the financial position of the combined company (in thousands, except per share amounts):

	For the year ended December 31, 2016
Sales	$615,552
Net income (loss)	$(45,161)
Basic earnings (loss) per share	$(0.69)
Diluted earnings (loss) per share	$(0.69)

NOTE F—ACCOUNTS RECEIVABLE

At December 31, 2018 and December 31, 2017, accounts receivable (in thousands) consisted of the following:

	December 31, 2018	December 31, 2017
Trade receivables	$198,435	$217,649
Less: Allowance for doubtful accounts	(6,751)	(7,100)
Net trade receivables	191,684	210,549
Other receivables[1]	23,802	2,037
Total accounts receivable	$215,486	$212,586

(1) At December 31, 2018, other receivables include $16.0 million of refundable alternative minimum tax credits.

Changes in our allowance for doubtful accounts (in thousands) during the years ended December 31, 2018 and 2017 are as follows:

	December 31,	December 31,

	2018	2017
Beginning balance	$ 7,100	$ 7,042
Bad debt provision	315	1,529
Write-offs	(664)	(1,471)
Ending balance	$ 6,751	$ 7,100

Our ten largest customers accounted for approximately 48%, 58% and 52% of total sales during the year ended December 31, 2018, 2017 and 2016, respectively. Sales to one of our customers accounted for 15% of our total sales during the year ended December 31, 2018. Sales to two of our customers accounted for 15% and 12% of our total sales during the year ended December 31, 2017. Sales to one of our customers accounted for 13% of our total sales during the year ended December 31, 2016. No other customers accounted for 10% or more of our total sales. At December 31, 2018, one of our customers' accounts receivable represented 18% of our total trade accounts receivable, net of allowance. At December 31, 2017, two of our customers' accounts receivable represented 19% and 11% of our total trade accounts receivable, net of allowance. No other customers accounted for 10% or more of our total trade accounts receivable.

NOTE G—INVENTORIES

At December 31, 2018 and December 31, 2017, inventories (in thousands) consisted of the following:

	December 31, 2018	December 31, 2017
Supplies	$41,453	$21,277
Raw materials and work in process	68,474	28,034
Finished goods	52,160	43,065
Total inventories	$162,087	$92,376

NOTE H—PROPERTY, PLANT AND MINE DEVELOPMENT

At December 31, 2018 and December 31, 2017, property, plant and mine development (in thousands) consisted of the following:

	December 31, 2018	December 31, 2017
Mining property and mine development	$995,759	$586,242
Asset retirement cost	12,732	14,184
Land	55,502	36,552
Land improvements	67,729	45,878
Buildings	64,515	56,330
Machinery and equipment	958,357	590,566
Furniture and fixtures	3,599	2,953
Construction-in-progress	167,933	189,970
	2,326,126	1,522,675
Accumulated depletion, depreciation and amortization	(499,823)	(353,520)
Total property, plant and mine development, net	$1,826,303	$1,169,155

At December 31, 2018 and December 31, 2017, the aggregate cost of machinery and equipment acquired under capital leases was $0.5 million and $0.9 million, respectively, reduced by accumulated depreciation of $0.2 million and $0.2 million, respectively. The amount of interest costs capitalized in property, plant and mine development was $6.7 million and $1.6 million for the year ended December 31, 2018 and 2017, respectively.

On March 21, 2018, we completed the sale of three transload facilities located in the Permian, Eagle Ford, and Marcellus Basins to CIG Logistics (“CIG”) for total consideration of $86.1 million, including the assumption by CIG of $2.2 million of Company obligations. Total cash consideration was $83.9 million. The consideration includes receipt of a vendor incentive from CIG to enter into master transloading service arrangements. Of the total consideration, $25.8 million was allocated to the fair value of the transload facilities, which had a net book value of $20.0 million and resulted in a gain on sale of $5.8 million. The consideration included a related asset retirement obligation of $2.1 million and an equipment note of $0.1 million assumed by CIG. In addition, $60.3 million of the consideration received in excess of the facilities' fair value was allocated to vendor incentives to be recognized as a reduction of costs using a service-level methodology over the contract lives of the transloading service arrangements. At December 31, 2018, vendor incentives of $12.5 million and $33.8 million were classified in accounts payable and accrued expenses and in other long-term obligations, respectively, on our balance sheet.

Separately, on March 21, 2018, we accrued $7.9 million in contract termination costs for facilities contracts operated by third-parties, which will not transfer to CIG. During the second quarter of 2018, as a result of the final settlement of these contracts, we recorded a $2.7 million credit in selling, general and administrative expenses on our Income Statement.

During the second quarter of 2018, we recorded a $16.2 million asset impairment related to the closure of our resin coating facility and associated product portfolio.

During the fourth quarter of 2018, we experienced a declining shift in demand for Northern White sand caused by some of our customers shifting to local in-basin frac sands with lower logistics costs. Our largest customer at our Voca, Texas plant did not renew their contract, instead opting to sign a new contract with us for local in-basin frac

sand. Additionally, Northern White Sand operations and reserves in Fairchild, Wisconsin and Peru, Illinois experienced a similar significant fourth quarter decline in demand due to customers' shift to local in-basin sand closer to their operations. Due to the resulting decline in

demand for our Northern White sand, we recognized $97.0 million and $4.5 million in long-lived asset and intangible impairments in our Oil & Gas Proppants business segment.

NOTE I—GOODWILL AND INTANGIBLE ASSETS

The changes in the carrying amount of goodwill (in thousands) by business segment consisted of the following:

	Oil & Gas Proppants Segment	Industrial & Specialty Products Segment	Total
Goodwill	$47,947	$20,700	$68,647
Impairment losses	—	—	—
Balance at January 1, 2016	$47,947	$20,700	$68,647
NBI acquisition	86,228	—	86,228
Sandbox acquisition	86,100	—	86,100
Goodwill	220,275	20,700	240,975
Impairment losses	—	—	—
Balance at December 31, 2016	220,275	20,700	240,975
White Armor acquisition	—	3,912	3,912
NBI acquisition measurement period adjustment	4,670	—	4,670
MS Sand acquisition	52,187	—	52,187
MS Sand acquisition measurement period adjustment	(29,665)	—	(29,665)
Goodwill	247,467	24,612	272,079
Impairment losses	—	—	—
Balance at December 31, 2017	247,467	24,612	272,079
MS Sand acquisition measurement period adjustment	2,800	—	2,800
EPMH acquisition	—	139,787	139,787
EPMH acquisition measurement period adjustment	—	10,841	10,841
Oil & Gas Sand impairment	(164,167)	—	(164,167)
Goodwill	250,267	175,240	425,507
Impairment losses	(164,167)	—	(164,167)
Balance at December 31, 2018	$86,100	$175,240	$261,340

Goodwill and trade names are evaluated for impairment annually as of October 31, or more frequently when indicators of impairment exist. We performed our annual impairment test by performing a qualitative assessment of goodwill. In performing this qualitative assessment, we evaluated events and circumstances since the date of our last qualitative assessment, including macroeconomic conditions, industry and market conditions, and our overall financial performance. After assessing the totality of the events and circumstances, we determined that it was not more likely than not that the fair value of our reporting units was less than their carrying amount and no impairment existed.

Subsequent to our annual impairment test, we experienced a declining shift in demand for Northern White sand caused by some of our customers shifting to local in-basin frac sands with lower logistics costs. Our largest customer

at our Voca, Texas plant did not renew their contract, instead opting to sign a new contract with us for local in-basin frac sand. Additionally, Northern White Sand operations and reserves in Fairchild, Wisconsin and Peru, Illinois experienced a similar significant fourth quarter decline in demand due to customers' shift to local in-basin sand closer to their operations.

As a result of these triggering events, we performed a quantitative analysis and determined that the goodwill of our Oil & Gas Sand reporting unit was impaired. We recognized goodwill impairment charges of $164.2 million and intangible

impairment charges of $4.5 million during the fourth quarter of 2018. The fair value of our reporting units was determined using a combination of the discounted cash flow method and the market multiples approach.

The changes in the carrying amount of intangible assets (in thousands) consisted of the following:

		December 31, 2018			December 31, 2017		
	Estimated Useful Life	Gross Carrying Amount	Accumulated Amortization	Net	Gross Carrying Amount	Accumulated Amortization	Net
	(in years)						
Technology and intellectual property	15	$83,616	$ (11,168)	$72,448	$70,703	$ (5,917)	$64,786
Customer relationships	13 - 15	68,379	(13,541)	54,838	61,229	(9,076)	52,153
Total definite-lived intangible assets:		$151,995	$ (24,709)	$127,286	$131,932	$ (14,993)	$116,939
Trade names		66,640	—	66,640	33,068	—	33,068
Other		700	—	700	—	—	—
Total intangible assets:		$219,335	$ (24,709)	$194,626	$165,000	$ (14,993)	$150,007

Measurement period adjustments related to the Company's EPMH acquisition impacted the gross carrying amounts of the technology and intellectual property and customer relationship intangibles by $0.9 million and $(11.7) million, respectively, and the trade names by $13.0 million. See Note E - Business Combinations.

Amortization expense was $9.7 million, $8.8 million and $3.2 million for the year ended December 31, 2018, 2017, and 2016, respectively.

The estimated amortization expense related to definite-lived intangible assets (in thousands) for the five succeeding years is as follows:

2019	$12,396
2020	12,397
2021	12,396
2022	12,381
2023	12,376

NOTE J—ACCOUNTS PAYABLE AND ACCRUED LIABILITIES

At December 31, 2018 and 2017, accounts payable and accrued liabilities (in thousands) consisted of the following:

	December 31,	
	2018	2017
Trade payables	$178,804	$148,772
Accrued salaries and wages	12,291	6,126
Accrued vacation liability	3,503	2,906
Current portion of liability for pension and post-retirement benefits	2,708	1,524
Accrued healthcare liability	2,702	1,837
Accrued property taxes and sales taxes	4,490	2,720
Other accrued liabilities	11,902	7,156
Accounts payable and accrued liabilities	$216,400	$171,041

Other accrued liabilities consist of customer rebates, royalties payable, employer related expenses, dividends payable and other items.

NOTE K—DEBT

At December 31, 2018 and 2017, debt (in thousands) consisted of the following:

	December 31, 2018	December 31, 2017
Senior secured credit facility:		
Revolver expiring May 1, 2023 (8.50% at December 31, 2018 and 5.75% at December 31, 2017)	$—	$—
Term Loan facility—final maturity May 1, 2025 (6.56% at December 31, 2018 and 4.75%-5.25% December 31, 2017)	1,270,400	489,075
Less: Unamortized original issue discount	(6,511)	(944)
Less: Unamortized debt issuance cost	(31,310)	(3,099)
Note payable secured by royalty interest	26,511	24,740
Customer note payable	—	745
Equipment notes payable	321	719
Capital leases	344	706
Total debt	1,259,755	511,942
Less: current portion	(13,327)	(6,867)
Total long-term portion of debt	$1,246,428	$505,075

Revolving Line-of-Credit

We have a $100.0 million Revolver with zero drawn and $4.8 million allocated for letters of credit as of December 31, 2018, leaving $95.2 million available under the Revolver.

Senior Secured Credit Facility

At December 31, 2018, contractual maturities of our senior secured Credit Facility (in thousands) are as follows:

2019	$12,800
2020	12,800
2021	12,800
2022	12,800
2023	12,800
Thereafter	1,206,400
Total	$1,270,400

On May 1, 2018, we entered into the Credit Agreement, which increases our existing senior debt by entering into a new $1.380 billion senior secured Credit Facility, consisting of a $1.280 billion Term Loan and a $100 million Revolver that may also be used for swingline loans or letters of credit, and we may elect to increase the term loan in accordance with the terms of the Credit Agreement. Borrowings under the Credit Agreement will bear interest at variable rates as determined at our election, at LIBOR or a base rate, in each case, plus an applicable margin. In addition, under the Credit Agreement, we are required to pay a per annum facility fee and fees for letters of credit. The Credit Agreement is secured by substantially all of our assets and of our domestic subsidiaries' assets and a pledge of the equity interests in such entities. The Term Loan matures on May 1, 2025, and the Revolver expires May 1, 2023. We capitalized $38.7 million in debt issuance costs and original issue discount as a result of the new Credit Agreement.

The Credit Facility contains covenants that, among other things, govern our ability, and certain of our subsidiaries' abilities, to create, incur or assume indebtedness and liens, to make acquisitions or investments, to sell assets and to pay dividends. The Credit Agreement also requires us to maintain a consolidated leverage ratio of no more than 3.75:1.00 as of the last day of any fiscal quarter whenever usage of the Revolver (other than certain undrawn letters of credit) exceeds 30% of the Revolver commitment. These covenants are subject to a number of important exceptions and qualifications. The Credit Agreement includes events of default and other affirmative and negative covenants that are usual for facilities and transactions of this type. As of December 31, 2018, and 2017, we are in compliance with all covenants in accordance with our senior secured Credit Facility.

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Note Payable Secured by Royalty Interest

In conjunction with the acquisition of NBI in August 2016, we assumed a note payable secured by a royalty interest. The monthly royalty payment is calculated based on future tonnages and sales related to the sand shipped from our Tyler, Texas facility. The note payable is due by June 30, 2032. The note does not provide a stated interest rate. The minimum payments (in thousands) for the next five years required by the note are as follows:

2019	$1,750
2020	1,750
2021	1,750
2022	1,750
2023	1,750

Under this agreement once a certain number of tons have been shipped from the Tyler facility, the minimum payments will decrease to $0.5 million per year, subject to proration in the period this threshold is met.

The royalty note payable fair value was estimated to be $22.5 million on the acquisition date. The estimate was made using a discounted cash flow model, which calculated the present value of projected future cash payments required under the agreement using a discounted rate of 14%. As of December 31, 2018, the note payable had a balance of $26.5 million. The increase in the note payable amount is due to interest paid-in-kind. The effective interest rate based on the updated projected future cash payments was 20% at December 31, 2018.

NOTE L—DEFERRED REVENUE

We enter into certain customer supply agreements which give the customers the right to purchase certain products for a discounted price at certain volumes over an average initial contract term of one to fifteen years. The advance payments represent future purchases and are recorded as deferred revenue, recognized as revenue over the contract term of each supply agreement. During the year ended December 31, 2018 we received advances of $31.6 million, including a customer's purchase of an interest in our sand reserves in Lamesa, Texas, which secured them a long-term supply of sand. At December 31, 2018 and 2017, the total deferred revenue balance was $113.3 million and $118.4 million, respectively, of which $31.6 million and $36.1 million was classified as current on our Balance Sheets.

NOTE M—ASSET RETIREMENT OBLIGATIONS

Mine reclamation or future remediation costs for inactive mines are accrued based on management’s best estimate at the end of each period of the costs expected to be incurred at a site. Such cost estimates include, where applicable, ongoing care, maintenance and monitoring costs. Changes in estimates at inactive mines are reflected in earnings in the period an estimate is revised.

As of December 31, 2018 and 2017, we had a liability of $18.4 million and $19.0 million, respectively, in other long-term obligations related to our asset retirement obligations. Changes in the asset retirement obligations (in thousands) during the years ended December 31, 2018 and 2017 are as follows:

	December 31, 2018	December 31, 2017
Beginning balance	$ 19,032	$ 11,159
Accretion	1,214	879
Additions and revisions of prior estimates	(319)	6,994
Addition related to EPMH acquisition	2,733	—
EPMH measurement period adjustment	(2,131)	—
Disposal related to sale of transloads	(2,116)	—
Ending balance	$ 18,413	$ 19,032

During the year ended December 31, 2017, in connection with the annual review of our reclamation obligations, we determined that some of our estimates required revision due primarily to the additions of new plant and transload facilities and other changes in cost estimates and settlement dates at various sites. These additions and changes in estimates resulted in an additional $7.0 million of asset retirement obligations.

NOTE N—FAIR VALUE ACCOUNTING

Fair value is defined as the exchange price that would be received for an asset or paid to transfer a liability (an exit price) in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants on the measurement date. Fair value is estimated by applying the following hierarchy, which prioritizes the inputs used to measure fair value into three levels and bases the categorization within the hierarchy upon the lowest level of input that is available and significant to the fair value measurement:

Level 1—Quoted prices in active markets for identical assets or liabilities.

Level 2—Observable inputs other than quoted prices in active markets for identical assets and liabilities, quoted prices for identical or similar assets or liabilities in inactive markets, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities.

Level 3—Inputs that are generally unobservable and typically reflect management’s estimate of assumptions that market participants would use in pricing the asset or liability.

Cash Equivalents

Due to the short-term maturity, we believe our cash equivalent instruments at December 31, 2018 and 2017, approximate their reported carrying values.

Long-Term Debt, Including Current Maturities

We believe that the fair values of our long-term debt, including current maturities, approximate their carrying values based on their effective interest rates compared to current market rates.

Derivative Instruments

The estimated fair value of our derivative instruments are recorded at each reporting period and are based upon widely accepted valuation techniques, including discounted cash flow analysis on the expected cash flows of each derivative contract. This analysis reflects the contractual terms of the derivatives, including the period to maturity, and uses observable market-based inputs, including interest rate curves and implied volatilities. We also incorporate credit valuation adjustments to appropriately reflect both our nonperformance risk as well as that of the respective counterparty in the fair value measurements.

Although we have determined that the majority of the inputs used to value our derivatives fall within Level 2 of the fair value hierarchy, the credit valuation adjustments associated with our derivatives utilize Level 3 inputs, such as estimates of current credit spreads to evaluate the likelihood of default of ourselves and our counterparties. However, as of December 31, 2018, we have assessed that the impact of the credit valuation adjustments on the overall valuation of our derivative positions is not significant. As a result, we have determined that our derivative valuations in their entirety are classified in Level 2 of the fair value hierarchy. See Note O - Derivative Instruments for more information.

NOTE O—DERIVATIVE INSTRUMENTS

Cash Flow Hedges of Interest Rate Risk

We enter into interest rate swap agreements in connection with our Term Loan facility to add stability to interest expense and to manage our exposure to interest rate movements. The derivative instruments are recorded on the balance sheet within other long-term assets or liabilities at their fair values. As of December 31, 2018, the fair value of our interest rate swaps was $1.5 million and $0.7 million and classified within other long-term obligations on our balance sheet, and the fair value of our interest rate cap was zero. At December 31, 2017, the fair value of our interest rate cap was zero. We have designated the interest rate swap agreements as qualified cash flow hedges. Accordingly, the effective portion of the gain or loss on the derivative instrument is reported as a component of other comprehensive income and recognized in earnings in the same period or periods during which the hedged transaction affects earnings.

The following table summarizes the fair value of our derivative instruments (in thousands, except contract/notional amount). See Note N - Fair Value Accounting for more information regarding the estimated fair values of our derivative instruments at December 31, 2018 and 2017.

	December 31, 2018			December 31, 2017			
	Maturity Date	Contract/Notional Amount	Carrying Amount	Fair Value	Maturity Date	Contract/Notional Amount	Carrying Amount	Fair Value
LIBOR[(1)] interest rate swap agreement	2020	$440 million	$(1,475)	$(1,475)	—	$—	$—	$—
LIBOR[(1)] interest rate swap agreement	2020	$200 million	$(663)	$(663)	—	$—	$—	$—
LIBOR interest rate cap agreement	2019	$249 million	$—	$—	2019	$249 million	$—	$—

[(1)] Agreements fix the LIBOR interest rate base to 2.74%

On May 1, 2018, as a result of entering into the new Credit Agreement, we determined the existing interest rate cap derivative no longer qualified for hedge accounting. During the year ended December 31, 2018 we recognized $76 thousand of deferred losses in accumulated other comprehensive loss into earnings.

During the year ended December 31, 2018, we had no ineffectiveness for the interest rate swap derivatives.

The following table summarizes the effect of derivative instruments (in thousands) on our income statements and our consolidated statements of comprehensive income for the years ended December 31, 2018, 2017 and 2016.

	2018	2017	2016
Deferred losses from derivatives in OCI, beginning of period	$(76)	$(32)	$(81)
Gain (loss) recognized in OCI from derivative instruments	(1,622)	(45)	(32)
Loss reclassified from Accumulated OCI	77	1	81
Deferred losses from derivatives in OCI, end of period	$(1,621)	$(76)	$(32)

NOTE P—EQUITY-BASED COMPENSATION

In July 2011, we adopted the U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan (the “2011 Plan”), which was amended and restated in May 2015. The 2011 Plan provides for grants of stock options, restricted stock, performance share units and other incentive-based awards. We believe our 2011 Plan aligns the interests of our employees and directors with those of our common stockholders. At December 31, 2018, we have 3,447,363 shares of common stock that may be issued under the 2011 Plan. We use a combination of treasury stock and new shares if necessary to satisfy option exercises or vesting of restricted awards and performance share units.

Stock Options

The following table summarizes the status of, and changes in, our stock option awards during the year ended December 31, 2018:

	Number of Shares	Weighted Average Exercise Price	Aggregate Intrinsic Value	Weighted Average Remaining Contractual Term in Years
Outstanding at December 31, 2017	908,919	$ 28.46	$ 7,008	6.1 years
Granted	—	—	—	
Exercised	(4,167)	14.65	—	
Forfeited	(918)	31.30	—	
Expired	(1,838)	$ 31.30	$ —	
Outstanding at December 31, 2018	901,996	$ 28.52	$ 18,566	4.8 years
Exercisable at December 31, 2018	901,996	$ 28.52	$ 18,566	4.8 years

There were no grants of stock options during the years ended December 31, 2018, 2017 and 2016.

There were 4,167, 43,774 and 326,884 stock options exercised during the year ended December 31, 2018, 2017 and 2016, respectively. The total intrinsic value of stock options exercised was $0.1 million, $1.2 million and $7.6 million for the year ended December 31, 2018, 2017 and 2016, respectively. Cash received from stock options exercised during the year ended December 31, 2018, 2017 and 2016 was $0.1 million, $0.8 million and $4.8 million, respectively. The tax benefit realized from stock option exercises was $14 thousand, $0.4 million and $2.9 million for the year ended December 31, 2018, 2017 and 2016, respectively.

We recognized $1.4 million, $2.5 million and $3.0 million of equity-based compensation expense related to options during the year ended December 31, 2018, 2017 and 2016, respectively. As of December 31, 2018, there was $34 thousand of unrecognized compensation expense related to these options. We account for forfeitures as they occur.

Restricted Stock and Restricted Stock Unit Awards

The following table summarizes the status of, and changes in, our unvested restricted stock awards during the year ended December 31, 2018:

	Number of Shares	Grant Date Weighted Average Fair Value
Unvested, December 31, 2017	461,346	$ 30.76
Granted	415,110	21.57
Vested	(256,012)	28.66
Forfeited	(32,867)	30.82
Unvested, December 31, 2018	587,577	$ 25.18

We granted 415,110, 156,164 and 364,710 restricted stock and restricted stock unit awards during the year ended December 31, 2018, 2017 and 2016, respectively. The fair value of the awards was based on the market price of our stock at date of grant.

We recognized $7.6 million, $7.1 million and $5.7 million of equity-based compensation expense related to restricted stock awards during the year ended December 31, 2018, 2017 and 2016, respectively. As of December 31, 2018, there was $9.5 million of unrecognized compensation expense related to these restricted stock awards, which is expected to be recognized over a weighted-average period of 2.0 years.

Performance Share Unit Awards

The following table summarizes the status of, and changes in, our performance share unit awards during the year ended December 31, 2018:

	Number of Shares	Grant Date Weighted Average Fair Value
Unvested, December 31, 2017	881,416	$ 42.16
Granted	261,500	31.24
Vested	(225,000)	41.99
Forfeited	(79,728)	40.45
Unvested, December 31, 2018	838,188	$ 39.44

We granted 261,500, 90,501 and 850,143 of performance share unit awards during the year ended December 31, 2018, 2017 and 2016, respectively. The grant date weighted average fair value of these awards was estimated to be $31.24, $67.69 and $39.36 for the year ended December 31, 2018, 2017 and 2016, respectively, and the number of units that will vest will depend on the percentage ranking of the Company's total shareholder return ("TSR") compared to the TSRs for each of the companies in the peer group over the three year period from January 1, 2018 through December 31, 2020 for the 2018 grant, from January 1, 2017 through December 31, 2019 for the 2017 grant, and from January 1, 2016 through December 31, 2018 for the 2016 grant. The related compensation expense is recognized on a straight-line basis over the vesting period.

The grant date fair value for these awards was estimated using a Monte Carlo simulation model. The Monte Carlo simulation model requires the use of highly subjective assumptions. Our key assumptions in the model included the price and the expected volatility of our common stock and our self-determined peer group companies' stock, risk-free rate of interest, dividend yields and cross-correlations between our common stock and our self-determined peer group companies' stock.

We recognized $13.3 million, $15.5 million and $3.3 million of compensation expense related to performance share unit awards during the year ended December 31, 2018, 2017 and 2016, respectively. As of December 31, 2018, there was $7.5 million of unrecognized compensation expense related to these performance share unit awards, which is expected to be recognized over a weighted-average period of 1.7 year.

NOTE Q—COMMITMENTS AND CONTINGENCIES

Future Minimum Annual Commitments at December 31, 2018 (in thousands):

Year ending December 31,	Operating Lease Minimum Rental Payments	Minimum Purchase Commitments
2019	$ 74,884	$ 23,243
2020	59,490	15,406
2021	40,302	8,307
2022	31,853	5,640
2023	22,596	4,915
Thereafter	40,148	6,084
Total future lease and purchase commitments	$ 269,273	$ 63,595

Operating Leases

We are obligated under certain operating leases for railroad cars, office space, mining property, mining/processing equipment and transportation and other equipment. Certain operating lease agreements include options to purchase the equipment for fair market value at the end of the original lease term. In general, the above leases include renewal options and provide that we pay for all utilities, insurance, taxes and maintenance. Expense related to operating leases and rental agreements totaled approximately $100.2 million, $68.3 million and $54.1 million for the years ended December 31, 2018, 2017 and 2016, respectively.

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Minimum Purchase Commitments

We enter into service agreements with our transload and transportation service providers. Some of these agreements require us to purchase a minimum amount of services over a specific period of time. Any inability to meet these minimum contract requirements requires us to pay a shortfall fee, which is based on the difference between the minimum amount contracted for and the actual amount purchased.

Contingent Liability on Royalty Agreement

On May 17, 2017, we purchased reserves in Crane County, Texas, for $94.4 million cash consideration plus contingent consideration. The contingent consideration is a royalty that is based on the tonnage shipped to third-parties. Because the contingent consideration is dependent on future tonnage sold, the amounts of which are uncertain, it is not currently possible to estimate the fair value of these future payments. The contingent consideration will be capitalized at the time a payment is probable and reasonably estimable, and the related depletion expense will be adjusted prospectively.

Other Commitments and Contingencies

Our operating subsidiary, U.S. Silica Company ("U.S. Silica"), has been named as a defendant in various product liability claims alleging silica exposure causing silicosis. During the year ended December 31, 2018, 2017 and 2016, twenty, zero and two claims, respectively, were brought against U.S. Silica. As of December 31, 2018, there were 74 active silica-related products liability claims pending in which U.S. Silica is a defendant. Although the outcomes of these claims cannot be predicted with certainty, in the opinion of management, it is not reasonably possible that the ultimate resolution of these matters will have a material adverse effect on our financial position or results of operations that exceeds the accrual amounts.

We have recorded estimated liabilities for these claims in other long-term obligations as well as estimated recoveries under the indemnity agreement and an estimate of future recoveries under insurance in other assets on our consolidated balance sheets. As of both December 31, 2018 and 2017, other non-current assets included zero for insurance for third-party products liability claims and other long-term obligations included $0.9 million and $1.0 million, respectively, for third-party products liability claims.

NOTE R— PENSION AND POST-RETIREMENT BENEFITS

We maintain single-employer noncontributory defined benefit pension plans covering certain employees. There have been no new entrants to the US Silica Company plan since May 2009 and to the EP Management Corporation plan since January 2007 for salaried participants and January 2010 for hourly participants when the plans were frozen to all new employees. The plans provide benefits based on each covered employee's years of qualifying service. Our funding policy is to contribute amounts within the range of the minimum required and maximum deductible contributions for the plans consistent with a goal of appropriate minimization of the unfunded projected benefit obligations. The pension plans use a benefit level per year of service for covered hourly employees and a final average pay method for covered salaried employees. The plans use the projected unit credit cost method to determine the actuarial valuation.

We employ a total rate of return investment approach whereby a mix of equities and fixed income investments are used to maximize the long-term return of plan assets for a prudent level of risk. Risk tolerance is established through careful consideration of plan liabilities, plan funded status, and corporate financial condition. The investment portfolio contains a diversified blend of equity and fixed-income investments. Furthermore, equity investments are diversified across U.S. and non-U.S. stocks, as well as growth, value and small and large capitalizations. Investment risk is measured and monitored on an ongoing basis through quarterly investment portfolio reviews, annual liability measurements, and periodic asset/liability studies.

We employ a building block approach in determining the long-term rate of return for plan assets. Historical markets are studied and long-term historical relationships between equities and fixed-income are preserved consistent with the widely accepted capital market principle that assets with higher volatility generate a greater return over the long run. Current market factors such as inflation and interest rates are evaluated before long-term capital market assumptions are determined. The long-term portfolio return is established via a building block approach with proper consideration of diversification and rebalancing. Peer data and historical returns are reviewed to check for reasonability and appropriateness.

In addition, we provide defined benefit post-retirement health care and life insurance benefits to some employees. Covered employees become eligible for these benefits at retirement after meeting minimum age and service requirements. The projected future cost of providing post-retirement benefits, such as healthcare and life insurance, is recognized as an expense as employees render services. We previously maintained a Voluntary Employees' Beneficiary Association trust that was used to

partially fund health care benefits for future retirees. Benefits were funded to the extent contributions were tax deductible, which under current legislation is limited. In 2017, the trust terminated upon depletion of its assets, which were used in accordance with trust terms. In general, retiree health benefits are paid as covered expenses are incurred. Net pension benefit cost (in thousands) consisted of the following for the years ended December 31, 2018, 2017 and 2016:

	Year Ended December 31,		
	2018	2017	2016
Service cost	$1,307	$1,037	$1,078
Interest cost	4,632	3,971	4,067
Expected return on plan assets	(5,969)	(5,265)	(5,495)
Net amortization and deferral	2,526	1,773	1,592
Net pension benefit costs	$2,496	$1,516	$1,242

Net post-retirement benefit cost (in thousands) consisted of the following for the years ended December 31, 2018, 2017 and 2016:

	Year Ended December 31,		
	2018	2017	2016
Service cost	$102	$107	$132
Interest cost	740	753	876
Expected return on plan assets	—	(1)	(1)
Special termination benefit	—	—	21
Net post-retirement benefit costs	$842	$859	$1,028

The changes in benefit obligations and plan assets (in thousands), as well as the funded status (in thousands) of our pension and post-retirement plans at December 31, 2018 and 2017 are as follows:

	Pension Benefits		Post-retirement Benefits	
	2018	2017	2018	2017
Benefit obligation at January 1,	$122,052	$116,145	$22,771	$24,393
Service cost	1,307	1,037	102	107
Interest cost	4,632	3,971	740	753
Actuarial (gain) loss	(10,263)	6,824	(965)	(1,576)
Benefits paid	(8,202)	(6,685)	(1,499)	(1,280)
Amendments	—	760	—	—
Other[1]	29,374	—	421	374
Benefit obligation at December 31,	$138,900	$122,052	$21,570	$22,771
Fair value of plan assets at January 1,	$92,067	$83,850	$—	$14
Actual return on plan assets	(6,204)	12,757	—	(1)
Employer contributions	3,350	2,145	1,078	893
Benefits paid	(8,202)	(6,685)	(1,499)	(1,280)
Other[1]	21,385	—	421	374
Fair value of plan assets at December 31,	$102,396	$92,067	$—	$—
Plan assets less than benefit obligations at December 31 recognized as liability for pension and other post-retirement benefits	$(36,504)	$(29,985)	$(21,570)	$(22,771)

(1) Includes opening pension benefit obligation and plan assets balances related to the May 1, 2018, EPMH acquisition.

The accumulated benefit obligation for the defined benefit pension plans, which excludes the assumption of future salary increases, totaled $138.9 million and $122.1 million at December 31, 2018 and 2017, respectively.

The amendments in 2018 and 2017 reflect plan changes, including increases in the benefit multiplier for certain participants.

We also sponsor unfunded, nonqualified pension plans. The projected benefit obligation, accumulated benefit obligation and fair value of plan assets for these plans were $1.5 million, $1.5 million and zero, respectively, at December 31, 2018 and $1.6 million, $1.6 million and zero. respectively, at December 31, 2017.

Future estimated annual benefit payments (in thousands) for pension and post-retirement benefit obligations at December 31, 2018 are as follows:

	Benefits		
		Post-retirement	
	Pension	Before Medicare Subsidy	After Medicare Subsidy
2019	$10,022	$1,553	$ 1,394
2020	9,166	1,592	1,433
2021	9,236	1,653	1,496
2022	9,394	1,691	1,535
2023	9,380	1,686	1,528
2024-2028	47,737	8,262	7,442

Our best estimate of expected contributions to the pension and post-retirement medical benefit plans for the 2019 fiscal year are $4.5 million and $1.4 million, respectively.

The amounts in accumulated other comprehensive income (loss) expected to be recognized as components of net periodic benefit cost (in thousands) during the following fiscal year are as follows:

	Benefits		
	Pension	Post-retirement	Total
Net actuarial loss	$1,034	$ —	$1,034
Prior service cost	534	—	534
	$1,568	$ —	$1,568

The total amounts in accumulated other comprehensive income (loss) related to net actuarial loss, net of tax, for the pension and post-retirement plans was $17.6 million and $13.5 million as of December 31, 2018 and 2017, respectively. The total amounts in accumulated other comprehensive income (loss) related to prior service cost, net of tax, for the pension and post-retirement plans, was $2.8 million and $0.5 million as of December 31, 2018 and 2017, respectively.

The following weighted-average assumptions were used to determine our obligations under the plans:

	Pension Benefits		Post-retirement Benefits	
	2018	2017	2018	2017
Discount rate	4.4 %	3.7 %	4.3 %	3.7 %
Long-term rate of compensation increase	3.0%-3.5%	3.5 %	N/A	N/A
Long-term rate of return on plan assets	6.25%-7.15%	6.8 %	N/A	7.0 %
Health care cost trend rate:				
Pre-65 initial rate/ultimate rate	N/A	N/A	7.3%/4.5%	7.3%/4.5%
Pre-65 ultimate year	N/A	N/A	—	—
Post-65 initial rate/ultimate rate	N/A	N/A	8.0%/4.5%	8.0%/4.5%
Post-65 ultimate year	N/A	N/A	2026/2027	2025/2026

The weighted average discount rate used to determine the projected pension and post-retirement obligations was updated to 4.4% at December 31, 2018 from 3.7% at December 31, 2017. The discount rate reflects the expected long-term rates of return with maturities comparable to payments for the plan obligations utilizing Aon Hewitt's AA Above Medium Curve.

In 2016, we changed the method utilized to estimate the service cost and interest cost components of net periodic benefit costs for our defined benefit pension and other post-retirement benefit plans. Historically, we estimated the service cost and interest cost components using a single weighted average discount rate derived from the yield curve used to measure the benefit obligation at the beginning of the period. We have elected to use a spot rate approach in the estimation of these components of benefit cost by applying the specific rates along the yield curve to the relevant projected cash flows, as we believe this provides a better estimate of service and interest costs. We consider this a change in estimate and, accordingly, have accounted for it prospectively starting in 2016. This change does not affect the measurement of our total benefit obligation.

Mortality tables used for pension benefits and post-retirement benefits plans are the following:

	Pension and Post-retirement Benefits	
	2018	2017
Healthy Lives	RP-2014 mortality table, adjusted back to 2006 base rates, with generational mortality improvements using Scale MP-2018	RP-2014 mortality table, adjusted back to 2006 base rates, with generational mortality improvements using Scale MP-2017
Disabled Lives	RP-2014 disabled retiree mortality table, adjusted back to 2006 base rates, with generational mortality improvements using Scale MP-2018	RP-2014 disabled retiree mortality table, adjusted back to 2006 base rates, with generational mortality improvements using Scale MP-2017

Assumed health care cost trend rates have a significant effect on the amounts reported for the health care plans. A one-percentage-point change in assumed health care cost trend rates would have the following effects (in thousands):

	One-Percentage-Point	
	Increase	Decrease
Effect on total of service and interest cost	$ 109	$ (92)
Effect on post-retirement benefit obligation	2,291	(1,967)

The major investment categories and their relative percentage of the fair value of total plan assets as invested at December 31, 2018, and 2017 are as follows:

	Pension Benefits		Post-retirement Benefits[1]	
	2018	2017	2018	2017
Equity securities	42.1 %	51.8 %	–%	–%
Debt securities	55.5 %	46.3 %	–%	–%
Cash	2.4 %	1.9 %	–%	–%

(1) Retiree health benefits are paid by the Company as covered expenses are incurred.

The fair values of the pension plan assets (in thousands) at December 31, 2018, by asset category, are as follows:

	Level 1	Level 2	Level 3	Total
Cash and cash equivalents	$—	$2,449	$ —	$2,449
Mutual funds:				
Diversified emerging markets	6,638	—	—	6,638
Foreign large blend	11,689	—	—	11,689
Large-cap blend	14,226	—	—	14,226
Mid-cap blend	6,819	—	—	6,819
Small-cap blend	522	—	—	522
Real estate	3,192	—	—	3,192
Fixed income securities:				
Corporate notes and bonds	43,745	—	—	43,745
U.S. Treasuries	8,486	—	—	8,486
Mortgage-backed securities	—	3,578	—	3,578
Asset-backed securities	—	1,052	—	1,052
Net asset	$95,317	$7,079	$ —	$102,396

The fair values of the pension plan assets (in thousands) at December 31, 2017, by asset category, are as follows:

	Level 1	Level 2	Level 3	Total
Cash and cash equivalents	$—	$1,727	$ —	$1,727
Mutual funds:				
Diversified emerging markets	8,300	—	—	8,300
Foreign large blend	11,856	—	—	11,856
Large-cap blend	15,643	—	—	15,643
Mid-cap blend	8,334	—	—	8,334
Real estate	3,591	—	—	3,591
Fixed income securities:				
Corporate notes and bonds	28,108	—	—	28,108
U.S. Treasuries	10,846	—	—	10,846
Mortgage-backed securities	—	2,615	—	2,615
Asset-backed securities	—	1,047	—	1,047
Net asset	$86,678	$5,389	$ —	$92,067

We contribute to three multiemployer defined benefit pension plans under the terms of collective-bargaining agreements for union-represented employees. A multiemployer plan is subject to collective bargaining for employees of two or more unrelated companies. These plans allow multiple employers to pool their pension resources and realize efficiencies associated with the daily administration of the plan. Multiemployer plans are generally governed by a board of trustees composed of management and labor representatives and are funded through employer contributions. However, in most cases, management is not directly represented.

The risks of participating in multiemployer plans differ from single employer plans as follows: 1) assets contributed to a multiemployer plan by one employer may be used to provide benefits to employees of other participating employers, 2) if a participating employer stops contributing to the plan, the unfunded obligations of the plan may be borne by the remaining participating employers, and 3) if we cease to have an obligation to contribute to one or more of the multiemployer plans to which we contribute, we may be required to pay those plans an amount based on the underfunded status of the plan, referred to as a withdrawal liability.

A summary of each multiemployer pension plan for which we participate is presented below:

Pension Fund	EIN/ Pension Plan No.	Pension Protection Act Zone Status[1]		FIP/RP Status Pending/ Implemented	Company Contributions (in thousands)			Surcharge Imposed	Expiration Date of CBA
		2018	2017		2018	2017	2016		
LIUNA	52-6074345/001	Red	Red	Yes	$573	$223	$167	Yes	5/31/2020
IUOE	36-6052390/001	Green	Green	No	1,385	40	28	No	7/31/2022
CSSS[2]	36-6044243/001	Red	Red	Yes	51	51	51	NA	NA

(1) The Pension Protection Act of 2006 defines the zone status as follows: green—healthy, yellow—endangered, orange—seriously endangered and red—critical.

(2) In 2011, we withdrew from the Central States, Southeast and Southwest Areas Pension Plan. The withdrawal liability of $1.0 million will be paid in monthly installments of $4,000 until 2031.

Our contributions to individual multiemployer pension funds did not exceed 5% of the fund's total contributions for the years ended December 31, 2018, 2017 and 2016. Additionally, our contributions to multiemployer post-retirement benefit plans were immaterial for all periods presented in the accompanying consolidated financial statements.

We also sponsor a defined contribution plan covering certain employees. We contribute to the plan in two ways. For certain employees not covered by the defined benefit plan, we make a contribution equal to 4% of their salary. We may also contribute an employee discretionary match of 50 cents for each dollar contributed by an employee, up to 4% of their earnings. Finally, for some employees, we make a catch-up match of one dollar for each dollar contributed by an employee, up to 6% of catch-up contributions. Contributions were $2.6 million, $3.0 million and$2.4 million for the years ended December 31, 2018, 2017 and 2016, respectively.

NOTE S— OBLIGATIONS UNDER GUARANTEES

We have indemnified our insurers against any loss they may incur in the event that holders of surety bonds, issued on our behalf, execute the bonds. As of December 31, 2018, there was $34.4 million in bonds outstanding. The majority of these bonds, $29.8 million, relate to reclamation requirements issued by various governmental authorities. Reclamation bonds remain outstanding until the mining area is reclaimed and the authority issues a formal release. The remaining bonds relate to such indefinite purposes as licenses, permits, and tax collection.

NOTE T— INCOME TAXES

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (the "Tax Act"). The Tax Act makes broad and complex changes to the U.S. tax code including, but not limited to, (1) bonus depreciation that will allow for full expensing of qualified property; (2) reduction of the U.S. federal corporate tax rate; (3) elimination of the corporate alternative minimum tax; (4) a new limitation on deductible interest expense; (5) the repeal of the domestic production activity deduction; (6) limitations on the deductibility of certain executive compensation; and (7) limitations on net operating losses generated after December 31, 2017, to 80 percent of taxable income.

The SEC staff issued SAB 118, which provides guidance on accounting for the tax effects of the Tax Act. SAB 118 provides a measurement period that should not extend beyond one year from the Tax Act enactment date for companies to complete the accounting under ASC 740. In accordance with SAB 118, a company must reflect the income tax effects of those aspects of the Act for which the accounting under ASC 740 is complete. December 22, 2018 marked the end of the measurement period for purposes of SAB 118. As such, we have completed the accounting for the tax effects of the Tax Act. In August 2018, the Internal Revenue Service released Tax Act guidance on limitations on executive compensation which clarified transition rules for certain compensation agreements in existence on November 2, 2017. Based on the issued guidance, we recorded a discrete tax expense of $0.7 million to remove deferred tax assets on certain executive compensation agreements that were not eligible for transition relief.

The Tax Act reduced the corporate tax rate to 21 percent, effective January 1, 2018. Because ASC 740-10-25-47 requires the effect of a change in tax laws or rates to be recognized as of the date of enactment, we were required to adjust deferred tax assets and liabilities as of December 22, 2017. Accordingly, for the year ended December 31, 2017, we recorded a decrease related to deferred tax assets and liabilities of $45.0 million and $80.8 million,

respectively, with a corresponding net adjustment to deferred income tax benefit of $35.8 million.

Under the Tax Act, net operating loss (NOL) deductions arising in tax years beginning after December 31, 2017 can only offset up to 80 percent of future taxable income. The Act also prohibits NOL carrybacks, but allows indefinite carryforwards for NOLs arising in tax years beginning after December 31, 2017. Net operating losses arising before January 1, 2018 are accounted for under the previous tax rules that imposed no limit on the amount of the taxable income that can be set off using NOLs and that can be carried back 2 years and carried forward 20 years.

The Tax Act repeals the corporate alternative minimum tax (AMT), effective for tax years beginning after December 31, 2017, but allows an entity to claim portions of any unused AMT credits over the next four years to offset its regular tax liability. An entity with unused AMT credits as of December 31, 2017 can first use these credits to offset its regular tax for 2017 and can then claim up to 50 percent of the remaining AMT credits in 2018, 2019, and 2020, with all remaining AMT credits refundable in 2021.

We evaluate our deferred tax assets periodically to determine if valuation allowances are required. Ultimately, the realization of deferred tax assets is dependent upon generation of future taxable income during those periods in which temporary differences become deductible and/or credits can be utilized. To this end, management considers the level of historical taxable income, the scheduled reversal of deferred tax liabilities, tax-planning strategies and projected future taxable income. Based on these considerations, and the carry-forward availability of a portion of the deferred tax assets, management believes it is more likely than not that we will realize the benefit of the deferred tax assets.

Income (loss) before income taxes (in thousands) consisted of the following:

	Year ended December 31,		
	2018	2017	2016
United States	$(232,597)	$136,526	$(77,745)
Foreign	2,644	—	—
Total	$(229,953)	$136,526	$(77,745)

Income tax (expense) benefit (in thousands) consisted of the following for the years ended December 31, 2018, 2017 and 2016:

	Year ended December 31,		
	2018	2017	2016
Current:			
Federal	$1,076	$(10,754)	$60
State	(2,496)	(1,167)	(274)
Foreign	(518)	—	—
	(1,938)	(11,921)	(214)
Deferred:			
Federal	25,578	22,641	32,944
State	5,492	(2,040)	3,959
Foreign	—	—	—
	31,070	20,601	36,903
Income tax benefit	$29,132	$8,680	$36,689

Income tax (expense) benefit (in thousands) differed from the amount that would be provided by applying the U.S. federal statutory rate for the years ended December 31, 2018, 2017 and 2016 due to the following:

	Year ended December 31,		
	2018	2017	2016
Income tax (expense) benefit computed at U.S. federal statutory rate	$48,290	$(47,784)	$27,211
Decrease (increase) resulting from:			
Statutory depletion	12,090	20,259	4,734
Goodwill impairment	(29,157)	—	—
Prior year tax return reconciliation	530	219	435
State income taxes, net of federal benefit	2,592	(2,267)	2,369
Adjustment to deferred taxes from the Tax Act rate reduction	—	35,772	—
Equity compensation	(653)	2,602	2,003
Other, net	(4,560)	(121)	(63)
Income tax benefit	$29,132	$8,680	$36,689

The largest permanent item in computing both our effective tax rate and taxable income is the deduction allowed for statutory percentage depletion. The deduction for statutory percentage depletion does not necessarily change proportionately to changes in income before income taxes. For the year ended December 31, 2018, the tax effect of the goodwill impairment described in Note I - Goodwill and Intangible Assets is a significant permanent item in the effective tax rate calculation.

Deferred tax assets and liabilities are recognized for the estimated future tax effects, based on enacted tax laws, of temporary differences between the values of assets and liabilities recorded for financial reporting and for tax purposes and of net operating loss and other carry forwards.

The tax effects of the types of temporary differences and carry forwards that gave rise to deferred tax assets and liabilities (in thousands) at December 31, 2018 and 2017 consisted of the following:

	December 31,	
	2018	2017
Gross deferred tax assets:		
Net operating loss carry forward and state tax credits	$11,089	$22,783
Pension and post-retirement benefit costs	13,303	13,710
Alternative minimum tax credit carry forward	15,971	30,401
Property, plant and equipment	5,474	5,750
Accrued expenses	27,025	10,755
Inventories	774	4,354
Third-party products liability	231	249
Stock-based compensation expense	8,199	8,785
Note payable	3,724	3,133
Other	8,116	5,095
Total deferred tax assets	93,906	105,015
Gross deferred tax liabilities:		
Land and mineral property basis difference	(165,002)	(78,520)
Fixed assets and depreciation	(55,596)	(51,556)
Intangibles	(10,346)	(4,795)
Other	(201)	—
Total deferred tax liabilities	(231,145)	(134,871)
Net deferred tax liabilities	$(137,239)	$(29,856)

We have federal net operating loss carry forwards of approximately $41.9 million at December 31, 2018. The losses will expire in years 2027 through 2036. The losses are subject to an annual limitation under Internal Revenue Code Section 382, but are expected to be fully realized. Under the Tax Act, net operating loss (NOL) deductions arising in tax years beginning after

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December 31, 2017 can only offset up to 80 percent of future taxable income. The Act also prohibits NOL carrybacks, but allows indefinite carryforwards for NOLs arising in tax years beginning after December 31, 2017. Net operating losses arising before January 1, 2018 are accounted for under the previous tax rules that imposed no limit on the amount of the taxable income that can be set off using NOLs (except for a 90 percent limit for AMT carryforwards) and that can be carried back 2 years and carried forward 20 years.

At December 31, 2018 and 2017, we have an alternative minimum tax credit carry forward of approximately $16.0 million and $30.4 million, respectively. The Tax Act repeals the corporate alternative minimum tax (AMT), effective for tax years beginning after December 31, 2017, but allows an entity to claim portions of any unused AMT credits over the next four years to offset its regular tax liability. An entity with unused AMT credits as of December 31, 2017 can first use these credits to offset its regular tax for 2017 and can then claim up to 50 percent of the remaining AMT credits in 2018, 2019, and 2020, with all remaining AMT credits refundable in 2021. Based on the Tax Act repeal of AMT, $16.0 million was reclassified from deferred tax assets to other receivables. See Note F - Accounts Receivable.

At the end of each reporting period as presented, there were no material amounts of interest and penalties recognized in the statement of operations or balance sheets. We have no material unrecognized tax benefits or any known material tax contingencies at December 31, 2018 or December 31, 2017 and do not expect this to change significantly within the next twelve months. Tax returns filed with the IRS for the years 2015 through 2017 along with tax returns filed with numerous state entities remain subject to examination.

NOTE U— REVENUE

We consider sales disaggregated at the product and service level by business segment to depict how the nature, amount, timing and uncertainty of revenues and cash flow are impacted by changes in economic factors. The following table disaggregates our sales by major source for the year ended December 31, 2018 (in thousands):

	Year Ended December 31, 2018		
Category	Oil & Gas Proppants	Industrial & Specialty Products	Total Sales
Product	$888,509	$394,290	$1,282,799
Service	294,482	17	294,499
Total Sales	$1,182,991	$394,307	$1,577,298

The following tables reflect the changes in our contract assets, which we classify as unbilled receivables and our contract liabilities, which we classify as deferred revenues, for the year ended December 31, 2018 (in thousands):

	Unbilled Receivables
December 31, 2017	$ 5,245
Reclassifications to billed receivables	(11,157)
Revenues recognized in excess of period billings	6,002
December 31, 2018	$ 90

	Deferred Revenue
December 31, 2017	$118,414
Revenues recognized from balances held at the beginning of the period	(33,381)
Revenues deferred from period collections on unfulfilled performance obligations	31,625
Revenues recognized from period collections	(3,339)
December 31, 2018	$113,319

We have elected to use the practical expedients allowed under ASC 606-10-50-14, pursuant to which we have excluded disclosures of transaction prices allocated to remaining performance obligations and when we expect to

recognize such revenue. The majority of our remaining performance obligations are primarily comprised of unfulfilled product, transportation

service, and labor service orders, all of which hold a remaining duration of less than one year. The long term portion of deferred revenue primarily represents a combination of refundable and nonrefundable customer prepayments for which related current performance obligations do not yet exist, but are expected to arise, before the expiration of the contract. Our residual unfulfilled performance obligations are comprised primarily of long-term equipment rental arrangements in which we recognize revenues equal to what we have a right to invoice. Generally, no variable consideration exists related to our remaining performance obligations and no consideration is excluded from the associated transaction prices.

NOTE V— RELATED PARTY TRANSACTIONS

An employee, who was an officer of one of our operating subsidiaries prior to the third quarter of 2018, holds an ownership interest in a transportation brokerage and logistics services vendor, from which we made purchases of approximately $2.9 million, $4.7 million, and $0.8 million for the year ended December 31, 2018, 2017, and 2016, respectively.

NOTE W— SEGMENT REPORTING

Our business is organized into two reportable segments, Oil & Gas Proppants and Industrial & Specialty Products, based on end markets. The reportable segments are consistent with how management views the markets that we serve and the financial information reviewed by the chief operating decision maker. We manage our Oil & Gas Proppants and Industrial & Specialty Products businesses as components of an enterprise for which separate information is available and is evaluated regularly by the chief operating decision maker in deciding how to allocate resources and assess performance.

In the Oil & Gas Proppants segment, we serve the oil and gas recovery market primarily by providing and delivering fracturing sand, or “frac sand,” which is pumped down oil and natural gas wells to prop open rock fissures and increase the flow rate of oil and natural gas from the wells.

The Industrial & Specialty Products segment consists of over 400 product types and materials used in a variety of industries, including container glass, fiberglass, specialty glass, flat glass, building products, fillers and extenders, foundry products, chemicals, recreation products and filtration products.

An operating segment’s performance is primarily evaluated based on segment contribution margin, which excludes certain corporate costs not directly related to the operations of the segment. These corporate costs are separately stated below and include costs that are related to functional areas such as operations management, corporate purchasing, accounting, treasury, information technology, legal and human resources. We believe that segment contribution margin, as defined above, is an appropriate measure for evaluating the operating performance of our segments. However, segment contribution margin is a non-GAAP measure and should be considered in addition to, not a substitute for, or superior to, net income (loss) or other measures of financial performance prepared in accordance with GAAP. The other accounting policies of each of the two reportable segments are the same as those in Note B - Summary of Significant Accounting Policies to these Consolidated Financial Statements.

The following table presents sales and segment contribution margin (in thousands) for the reportable segments and other operating results not allocated to the reported segments for the years ended December 31, 2018, 2017 and 2016:

	Year Ended December 31,		
	2018	2017	2016
Sales:			
Oil & Gas Proppants	$1,182,991	$1,020,365	$362,550
Industrial & Specialty Products	394,307	220,486	197,075
Total sales	1,577,298	1,240,851	559,625
Segment contribution margin:			
Oil & Gas Proppants	357,846	301,972	11,445
Industrial & Specialty Products	155,084	88,781	78,988
Total segment contribution margin	512,930	390,753	90,433
Operating activities excluded from segment cost of sales[(1)]	(98,761)	(16,722)	(7,618)
Selling, general and administrative	(146,971)	(107,056)	(67,172)
Depreciation, depletion and amortization	(148,832)	(97,233)	(68,134)
Goodwill and other asset impairments	(281,899)	—	—
Interest expense	(70,564)	(31,342)	(27,972)
Other income (expense), net, including interest income	4,144	(1,874)	2,718
Income tax benefit (expense)	29,132	8,680	36,689
Net income (loss)	$(200,821)	$145,206	$(41,056)
Less: Net income (loss) attributable to non-controlling interest	(13)	—	—
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$(200,808)	$145,206	$(41,056)

(1) 2018 increase driven by plant capacity expansion expenses and amortization of purchase accounting inventory fair value step-up.

Asset information, including capital expenditures and depreciation, depletion, and amortization, by segment is not included in reports used by management in its monitoring of performance and, therefore, is not reported by segment. At December 31, 2018, goodwill of $261.3 million has been allocated to these segments with $86.1 million assigned to Oil & Gas Proppants and $175.2 million to Industrial & Specialty Products. At December 31, 2017, goodwill of $272.1 million had been allocated to these segments with $247.5 million assigned to Oil & Gas Proppants and $24.6 million to Industrial & Specialty Products.

NOTE X— UNAUDITED SUPPLEMENTARY DATA

The following table sets forth our unaudited quarterly consolidated statements of operations (in thousands, except per share data) for each of the four quarters in the years ended December 31, 2018 and 2017. This unaudited quarterly information has been prepared on the same basis as our annual audited financial statements and includes all adjustments, consisting only of normal recurring adjustments that are necessary to present fairly the financial information for the fiscal quarters presented.

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2018	(Unaudited)			
Sales:				
Product	$294,788	$345,957	$348,635	$293,419
Service	74,525	81,476	74,537	63,961
Cost of sales (excluding depreciation, depletion and amortization):				
Product	207,239	236,236	270,370	241,624
Service	53,671	56,609	51,966	45,414
Operating expenses:				
Selling, general and administrative	34,591	42,232	37,980	32,168
Depreciation, depletion and amortization	28,592	36,563	37,150	46,527

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Goodwill and other asset impairments	—	16,184	—	265,715
Total operating expenses	63,183	94,979	75,130	344,410
Operating income (loss)	45,220	39,609	25,706	(274,068)
Other (expense) income:				
Interest expense	(7,070)	(20,214)	(21,999)	(21,281)
Other income (expense), net, including interest income	665	1,081	1,062	1,336
Total other expense	(6,405)	(19,133)	(20,937)	(19,945)
Income (loss) before income taxes	38,815	20,476	4,769	(294,013)
Income tax benefit	(7,521)	(2,832)	1,547	37,938
Net income (loss)	31,294	17,644	6,316	(256,075)
Less: Net income (loss) attributable to non-controlling interest	—	—	—	(13)
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$31,294	$17,644	$6,316	$(256,062)
Earnings (loss) per share, basic	$0.39	$0.23	$0.08	$(3.44)
Earnings (loss) per share, diluted	$0.39	$0.22	$0.08	$(3.44)
Weighted average shares outstanding, basic	79,496	77,784	77,365	74,485
Weighted average shares outstanding, diluted	80,309	78,480	77,859	74,485
Dividends declared per share	$0.06	$0.06	$0.06	$0.06

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2017	(Unaudited)			
Sales:				
Product	$203,251	$235,891	$281,138	$290,114
Service	41,546	54,574	63,885	70,452
Cost of sales (excluding depreciation, depletion and amortization):				
Product	162,183	162,238	187,634	202,466
Service	25,292	34,726	40,155	52,126
Operating expenses:				
Selling, general and administrative	22,341	25,839	29,542	29,334
Depreciation, depletion and amortization	21,599	23,626	24,673	27,335
Total operating expenses	43,940	49,465	54,215	56,669
Operating income (loss)	13,382	44,036	63,019	49,305
Other (expense) income:				
Interest expense	(7,646)	(8,105)	(8,347)	(7,244)
Other income (expense), net, including interest income	(4,928)	638	1,308	1,108
Total other expense	(12,574)	(7,467)	(7,039)	(6,136)
Income (loss) before income taxes	808	36,569	55,980	43,169
Income tax benefit	1,714	(7,110)	(14,707)	28,783
Net income (loss)	2,522	29,459	41,273	71,952
Less: Net income (loss) attributable to non-controlling interest	—	—	—	—
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$2,522	$29,459	$41,273	$71,952
Earnings (loss) per share, basic	$0.03	$0.36	$0.51	$0.95
Earnings (loss) per share, diluted	$0.03	$0.36	$0.50	$0.95
Weighted average shares, basic	80,983	81,087	81,121	75,539
Weighted average shares, diluted	82,244	81,945	81,783	75,539

Dividends declared per share	$0.06	$0.06	$0.06	$0.06

NOTE Y— PARENT COMPANY FINANCIALS

U.S. SILICA HOLDINGS, INC.
(PARENT COMPANY ONLY)
CONDENSED BALANCE SHEETS

	December 31,	
	2018	2017
	(in thousands)	
ASSETS		
Current Assets:		
Cash and cash equivalents	$107,151	$230,647
Due from affiliates	100,094	146,683
Total current assets	207,245	377,330
Investment in subsidiaries	850,099	1,024,511
Total assets	$1,057,344	$1,401,841
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current Liabilities:		
Accrued expenses and other current liabilities	$217	$106
Dividends payable	4,823	5,229
Total current liabilities	5,040	5,335
Deferred income taxes, net	—	—
Total liabilities	5,040	5,335
Stockholders' Equity:		
Preferred stock	—	—
Common stock	818	812
Additional paid-in capital	1,169,383	1,147,084
Retained earnings	67,854	287,992
Treasury stock, at cost	(178,215)	(25,456)
Accumulated other comprehensive loss	(15,020)	(13,926)
Total U.S. Silica Holdings, Inc. stockholders' equity	1,044,820	1,396,506
Non-controlling interest	7,484	—
Total stockholders' equity	1,052,304	1,396,506
Total liabilities and stockholders' equity	$1,057,344	$1,401,841

U.S. SILICA HOLDINGS, INC.
(PARENT COMPANY ONLY)
CONDENSED STATEMENTS OF OPERATIONS AND COMPREHENSIVE INCOME (LOSS)

	Year ended December 31,		
	2018	2017	2016
	(in thousands, except per share amounts)		
Sales	$ —	$ —	$ —
Cost of sales	—	—	—
Operating expenses			
Selling, general and administrative	254	252	184
Other	—	—	10
Total operating expenses	254	252	194
Operating loss	(254)	(252)	(194)
Other income (expense)			
Interest income	2,784	3,854	1,046
Other income, net, including interest income	—	—	—
Total other income (expense)	2,784	3,854	1,046
Income before income taxes and equity in net earnings of subsidiaries	2,530	3,602	852
Income tax benefit (expense)	(696)	(1,453)	(344)
Income before equity in net earnings of subsidiaries	1,834	2,149	508
Equity in earnings of subsidiaries, net of tax	(202,655)	143,057	(41,564)
Net income (loss)	(200,821)	145,206	(41,056)
Less: Net income (loss) attributable to non-controlling interest	(13)	—	—
Net income (loss) attributable to U.S. Silica Holdings, Inc.	(200,808)	145,206	(41,056)
Net income (loss)	(200,821)	145,206	(41,056)
Other comprehensive income (loss)			
Unrealized gain (loss) on investments (net of tax of zero, zero, and $(4) for 2018, 2017 and 2016, respectively)	—	—	(6)
Unrealized gain (loss) on derivatives (net of tax of $(470) $(27) and $29 for 2018, 2017, and 2016, respectively)	(1,545)	(44)	49
Foreign currency translation adjustment (net of tax of $(196) $2 and zero for 2018, 2017 and 2016, respectively)	(614)	(6)	—
Pension and other post-retirement benefits liability adjustment (net of tax of $339, $1,205 and $152 for 2018, 2017 and 2016, respectively)	1,065	2,000	252
Comprehensive income (loss)	(201,915)	147,156	(40,761)
Less: Comprehensive income (loss) attributable to non-controlling interest	$ (13)	$ —	$ —
Comprehensive income (loss) attributable to U.S. Silica Holdings, Inc.	$ (201,902)	$ 147,156	$ (40,761)

U.S. SILICA HOLDINGS, INC.
(PARENT COMPANY ONLY)
CONDENSED STATEMENTS OF STOCKHOLDERS' EQUITY

	Par Value	Treasury Stock	Additional Paid-In Capital	Retained Earnings - Present	Accumulated Other Comprehensive Income (Loss)	Total U.S. Silica, Inc., Stockholders' Equity	Non-controlling Interest	Total Stockholders' Equity
Balance at January 1, 2016	$ 539	$ (15,845)	$ 194,670	$ 220,974	$ (16,171)	$ 384,167	$ —	$ 384,167
Net loss	—	—	—	(41,056)	—	(41,056)	—	(41,056)
Issuance of common stock (stock offerings net of issuance costs of $25,732)	272	—	931,016	—	—	931,288	—	931,288
Unrealized gain on derivatives	—	—	—	—	49	49	—	49
Unrealized loss on short-term investments	—	—	—	—	(6)	(6)	—	(6)
Pension and post-retirement liability	—	—	—	—	252	252	—	252
Cash dividend declared ($0.25 per share)	—	—	—	(16,893)	—	(16,893)	—	(16,893)
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	12,107	—	—	12,107	—	12,107
Excess tax benefit from equity-based compensation	—	—	—	148	—	148	—	148
Proceeds from options exercised	—	8,465	(3,640)	—	—	4,825	—	4,825
Issuance of restricted stock	—	1,437	(1,437)	—	—	—	—	—
Shares withheld for employee taxes related to vested restricted stock and stock units	—	2,074	(3,665)	—	—	(1,591)	—	(1,591)
Balance at December 31, 2016	$ 811	$ (3,869)	$ 1,129,051	$ 163,173	$ (15,876)	$ 1,273,290	$ —	$ 1,273,290
Net Income	—	—	—	145,206	—	145,206	—	145,206
Unrealized loss on derivatives	—	—	—	—	(44)	(44)	—	(44)
Foreign currency translation adjustment	—	—	—	—	(6)	(6)	—	(6)
Pension and post-retirement liability	—	—	—	—	2,000	2,000	—	2,000
	—	—	—	(20,387)	—	(20,387)	—	(20,387)

Cash dividend declared ($0.25 per share)								
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	25,050	—	—	25,050	—	25,050
Proceeds from options exercised	—	1,190	(392)	—	—	798	—	798
Issuance of restricted stock	—	1,859	(1,859)	—	—	—	—	—
Shares withheld for employee taxes related to vested restricted stock and stock units	1	386	(4,766)	—	—	(4,379)	—	(4,379)
Repurchase of common stock	—	(25,022)	—	—	—	(25,022)	—	(25,022)
Balance at December 31, 2017	$812	$(25,456)	$1,147,084	$287,992	$(13,926)	$1,396,506	$—	$1,396,506
Net loss	—	—	—	(200,808)	—	(200,808)	(13)	(200,821)
Unrealized loss on derivatives	—	—	—	—	(1,545)	(1,545)	—	(1,545)

Foreign currency translation adjustment	—	—	—	—	(614)	(614)	—	(614)
Pension and post-retirement liability	—	—	—	—	1,065	1,065	—	1,065
Cash dividend declared ($0.25 per share)	—	—	—	(19,330)	—	(19,330)	—	(19,330)
Contributions from non-controlling interest	—	—	—	—	—	—	7,497	7,497
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	22,337	—	—	22,337	—	22,337
Proceeds from options exercised	—	93	(32)	—	—	61	—	61
Shares withheld for employee taxes related to vested restricted stock and stock units	6	(4,383)	(6)	—	—	(4,383)	—	(4,383)
Repurchase of common stock	—	(148,469)	—	—	—	(148,469)	—	(148,469)
Balance at December 31, 2018	$818	$(178,215)	$1,169,383	$67,854	$(15,020)	$1,044,820	$7,484	$1,052,304

U.S. SILICA HOLDINGS, INC.
(PARENT COMPANY ONLY)
CONDENSED STATEMENTS OF CASH FLOWS

	Year ended December 31,		
	2018	2017	2016
	(in thousands, except per share amounts)		
Operating activities:			
Net income (loss)	$ (200,821)	$ 145,206	$ (41,056)
Adjustments to reconcile net income (loss) to net cash provided by operating activities:			
Undistributed (Income) loss from equity method investment, net	202,655	(143,057)	41,564
Other	—	—	(30)
Changes in assets and liabilities, net of effects of acquisitions:			
Accounts payable and accrued liabilities	(295)	48	353
Net cash provided by operating activities	1,539	2,197	831
Investing activities:			
Proceeds from sales and maturities of short-term investments	—	—	21,872
Investment in subsidiary	—	(143,654)	(188,177)
Net cash provided by (used in) investing activities	—	(143,654)	(166,305)
Financing activities:			
Dividends paid	(19,912)	(20,377)	(15,125)
Repurchase of common stock	(148,469)	(25,022)	—
Proceeds from options exercised	61	798	4,603
Tax payments related to shares withheld for vested restricted stock and stock units	(4,383)	(4,379)	(1,590)
Issuance of common stock (secondary offering)	—	—	678,791
Issuance of treasury stock	—	—	221
Costs of common stock issuance	—	—	(25,733)
Contributions from non-controlling interest	7,497	—	—
Net financing activities with subsidiaries	40,171	(113,294)	106
Net cash provided by (used in) financing activities	(125,035)	(162,274)	641,273
Net increase (decrease) in cash and cash equivalents	(123,496)	(303,731)	475,799
Cash and cash equivalents, beginning of period	230,647	534,378	58,579
Cash and cash equivalents, end of period	$ 107,151	$ 230,647	$ 534,378
Non-cash financing activities:			
Supplemental cash flow information:			
Cash paid (received) during the period for:			
Interest	$ (2,784)	$ (3,853)	$ (1,046)
Non-cash transactions			
Common stock issued for business acquisitions	$ —	$ —	$ 278,229

Notes to Condensed Financial Statements of Registrant (Parent Company Only)
These condensed parent company only financial statements have been prepared in accordance with Rule 12-04, Schedule I of Regulation S-X, because the restricted net assets of the subsidiaries of U.S. Silica Holdings, Inc. (as defined in Rule 4-08(e)(3) of Regulation S-X) exceed 25% of the consolidated net assets of the Company. The ability of the Company's operating subsidiaries to pay dividends may be restricted due to the terms of the Company's senior Credit Facility, as discussed in Note K - Debt to these financial statements.

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These condensed parent company financial statements have been prepared using the same accounting principles and policies described in the notes to the consolidated financial statements; the only exceptions are that (a) the parent company accounts for its subsidiaries using the equity method of accounting, (b) taxes are allocated to the parent from the subsidiary using the separate return method, and (c) intercompany loans are not eliminated. In the parent company financial statements, the Company's investment in subsidiaries is stated at cost plus equity in undistributed earnings of subsidiaries since the date of acquisition. These condensed parent company financial statements should be read in conjunction with the Company's consolidated financial statements and related notes thereto included elsewhere in this report.

No cash dividends were paid to the parent by its consolidated entities for the years presented in the condensed financial statements.

NOTE Z— SUBSEQUENT EVENTS

On January 4, 2019, we paid a cash dividend of $0.0625 per share to common stockholders of record on December 14, 2018, which had been declared by our Board of Directors on November 13, 2018.

On February 15, 2019, Our Board of Directors declared a quarterly cash dividend of $0.0625 per share to common stockholders of record at the close of business on March 14, 2019, payable on April 4, 2019.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our chief executive officer and chief financial officer, evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2018. The term “disclosure controls and procedures,” as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC’s rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company’s management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Based on the evaluation of our disclosure controls and procedures as of December 31, 2018, our chief executive officer and chief financial officer concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level.

Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable, and not absolute, assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures.

Management’s Annual Report on Internal Control over Financial Reporting

Our management, under the direction of our chief executive officer and chief financial officer, is responsible for establishing and maintaining adequate internal control over financial reporting as defined in Exchange Act Rule 13a-15(f).

Our system of internal control over financial reporting is designed to provide reasonable assurance to our management and Board of Directors regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles in the United States of America.

Our management conducted an evaluation of the effectiveness of our internal control over financial reporting using the framework in 2013 Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of

the Treadway Commission (COSO). As noted in the COSO framework, an internal control system, no matter how well conceived

and operated, can provide only reasonable, not absolute, assurance to management and the Board of Directors regarding achievement of an entity's financial reporting objectives. We acquired the ultimate parent company of EP Minerals, LLC ("EPM") on May 1, 2018 and, in accordance with SEC guidance, have excluded EPM's internal control over financial reporting from the evaluation of the effectiveness of our internal control over financial reporting as of December 31, 2018. This decision is based upon the significance of EPM and the timing of integration efforts underway to transition EPM's processes, information technology systems and other components of internal control over financial reporting to our internal control structure. EPM's total assets and revenue represented 32% and 10%, respectively, of the related consolidated financial statement amounts as of and for the year ended December 31, 2018. We have expanded our consolidation and disclosure controls and procedures to include EPM, and we continue to assess the current internal control over financial reporting. Based upon the evaluation under this framework, management concluded that our internal control over financial reporting was effective as of December 31, 2018.

Our independent registered public accounting firm has audited the effectiveness of our internal control over financial reporting as of December 31, 2018, as stated in its report below.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting identified in management’s evaluation pursuant to Rules 13a-15(d) or 15d-15(d) of the Exchange Act during the quarter ended December 31, 2018 that materially affected, or are reasonably likely to materially affect, our internal control over financial reporting, except as noted above.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Shareholders

U.S. Silica Holdings, Inc.

Opinion on internal control over financial reporting

We have audited the internal control over financial reporting of U.S. Silica Holdings, Inc. (a Delaware corporation) and subsidiaries (the "Company") as of December 31, 2018, based on criteria established in the 2013 Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in the 2013 Internal Control-Integrated Framework issued by COSO.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the consolidated financial statements of the Company as of and for the year ended December 31, 2018, and our report dated February 19, 2019 expressed an unqualified opinion on those financial statements.

Basis for opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Our audit of, and opinion on, the Company's internal control over financial reporting does not include the internal control over financial reporting of EP Minerals Holdings, Inc. (EPM), a wholly-owned subsidiary, whose financial statements reflect total assets of $920 million and revenues of $158 million constituting 32 and 10 percent, respectively, of the related consolidated financial statement amounts as of and for the year ended December 31, 2018. As indicated in Management's Report on Internal Control over Financial Reporting, EPM was acquired during 2018. Management's assertion on the effectiveness of the Company's internal control over financial reporting excluded internal control over financial reporting of EPM.

Definition and limitations of internal control over financial reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ GRANT THORNTON LLP
Houston, Texas
February 19, 2019

ITEM 9B. OTHER INFORMATION

Not applicable.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The information required by this item with respect to directors and corporate governance will be set forth under "Proposal No. 1: Election of Directors" in the 2019 Proxy Statement and is incorporated herein by reference.

The information required by this item with respect to executive officers of U.S. Silica, pursuant to instruction 3 of paragraph (b) of Item 401 of Regulation S-K, is set forth following Part I, Item 1. of this Annual Report on Form 10-K under "Executive Officers of the Registrant".

ITEM 11. EXECUTIVE COMPENSATION

The information required by this item will be set forth under "Executive and Director Compensation" and "Report of Compensation Committee" in the 2019 Proxy Statement and is incorporated herein by reference.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The information required by Item 403 of Regulation S-K regarding security ownership of certain beneficial owners and management will be set forth under "Stock Ownership" in the 2019 Proxy Statement and is incorporated herein by reference.

The information required by Item 201(d) of Regulation S-K regarding securities authorized for issuance under equity compensation plans is furnished as a separate item captioned "Securities Authorized for Issuance Under Equity Compensation Plans" included in Part II, Item 5. of this Annual Report on Form 10-K.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

The information required by this item will be set forth under "Transactions with Related Persons" and "Determination of Independence" in the 2019 Proxy Statement and is incorporated herein by reference.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

The information required by this item will be set forth under "Ratification of Grant Thornton LLP as Independent Registered Public Accounting Firm for 2019" in the 2019 Proxy Statement and is incorporated herein by reference.

PART IV.

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

The following documents are filed as a part of this report:

Consolidated Financial Statements

The Consolidated Financial Statements, together with the report thereon of Grant Thornton LLP, dated February 19, 2019, are included as part of Item 8. Financial Statements and Supplementary Data.

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Consolidated Statements of Operations for the Years Ended December 31, 2018, 2017 and 2016	85
Consolidated Statements of Comprehensive Income for the Years Ended December 31, 2018, 2017 and 2016	86
Consolidated Statements of Stockholders' Equity for the Years Ended December 31, 2018, 2017 and 2016	87
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Notes to the Consolidated Financial Statements	91

Financial Statement Schedules

Schedule I - Condensed Financial Information of Parent (U.S. Silica Holdings, Inc.) at December 31, 2018 and 2017 and for the years ended December 31, 2018, 2017 and 2016 is included in Note Y - Parent Company Financial Statements to the Consolidated Financial Statements, included as part of Item 8. Financial Statements and Supplementary Data.

Exhibits

The information called for by this Item is incorporated herein by reference from the Exhibit Index included in this Annual Report on Form 10-K.

EXHIBIT INDEX

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
2.1#	Agreement and Plan of Merger, dated as of July 15, 2016, by and among U.S. Silica Holdings, Inc., New Birmingham Merger Corp., NBI Merger Subsidiary II, Inc., New Birmingham, Inc. and each of David Durrett and Erik Dall, as representatives of the sellers and optionholders.	10-Q	001-35416	2.1	November 4, 2016
2.2#	Membership Unit Purchase Agreement, dated as of August 1, 2016, by and among U.S. Silica Company, U.S. Silica Holdings, Inc., Sandbox Enterprises, LLC, the members of Sandbox Enterprises, LLC and Sandy Creek Capital, LLC, as representative of the sellers.	10-Q	001-35416	2.2	November 4, 2016
2.3#	Agreement and Plan of Merger, dated as of March 22, 2018, by and among EP Acquisition Parent, Inc. US Silica Company, Tranquility Acquisition Corp., EPMC Parent LLC, as the Stockholders' Representative, and solely for the purposes of Section 11.17, Golden Gate Private Equity, Inc.	10-Q	001-35416	2.1	April 24, 2018

3.1	Third Amended and Restated Certificate of Incorporation of U.S. Silica Holdings, Inc., effective May 4, 2017.	8-K	001-35416	3.1	May 10, 2017
3.2	Third Amended and Restated Bylaws of U.S. Silica Holdings, Inc., effective May 4, 2017.	8-K	001-35416	3.2	May 10, 2017
4.1	Specimen Common Stock Certificate.	S-1/A	333-175636	4.1	December 7, 2011
10.1+	Employment Agreement, dated as of March 22, 2012, by and between U.S. Silica Company and Bryan A. Shinn.	8-K	001-35416	10.11	March 22, 2012
10.2+	Amended and Restated 2011 Incentive Compensation Plan.	8-K	001-35416	10.1	May 11, 2015
10.3+	Form of Incentive Stock Option Agreement.	S-1/A	333-175636	10.15	August 29, 2011
10.4+	Form of Restricted Stock Agreement.	S-1/A	333-175636	10.16	August 29, 2011
10.5+	Form of Nonqualified Stock Option Agreement.	S-1/A	333-175636	10.17	August 29, 2011
10.6+	Form of Stock Appreciation Rights Agreement.	S-1/A	333-175636	10.18	August 29, 2011
10.7+	Form of Restricted Stock Unit Agreement.	S-1/A	333-175636	10.19	August 29, 2011
10.8+	Form of Performance Share Unit Agreement.	10-K	001-35416	10.12	February 26, 2014
10.9+	Form of Indemnification Agreement.	S-1/A	333-175636	10.20	December 29, 2011
10.10+	Letter Agreement, dated as of December 27, 2011, by and between William J. Kacal and U.S. Silica Holdings, Inc.	S-1/A	333-175636	10.24	December 29, 2011
10.11+	Letter Agreement, dated April 27, 2012, by and between Peter Bernard and U.S. Silica Holdings, Inc.	8-K	001-35416	10.10	May 1, 2012
10.12+	Letter Agreement, dated October 8, 2013, by and between J. Michael Stice and U.S. Silica Holdings, Inc.	8-K	001-35416	10.10	October 11, 2013
10.13+	Omnibus Amendment dated February 18, 2016 to Award Agreements.	8-K	001-35416	10.3	February 23, 2016
10.14+	Form of Nonqualified Stock Option Agreement.	10-K	001-35416	10.2	February 25, 2015
10.15+	Change in Control Severance Plan of U.S. Silica Holdings, Inc.	8-K	001-35416	10.1	February 23, 2016
10.16+	Amendment dated February 18, 2016 to Employment Agreement by and between U.S. Silica Holdings, Inc. and Bryan Shinn.	8-K	001-35416	10.2	February 23, 2016
10.17+	Form of Performance Share Unit Agreement (TSR metric).	10-Q	001-35416	10.4	April 27, 2016
10.18+	Omnibus Amendment dated November 3, 2016 to Award Agreements.	10-K	001-35416	10.22	February 23, 2017
10.19+	Amendment No. 1 dated November 3, 2016 to Amended and Restated 2011 Incentive Compensation Plan	10-K	001-35416	10.23	February 23, 2017
10.20+	Letter Agreement, effective August 15, 2017, by and between Diane Duren and U.S. Silica Holdings, Inc.	8-K	001-35416	10.1	August 18, 2017
10.21+	Form of Performance Share Unit Agreement Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan.	10-Q	001-35416	10.1	April 24, 2018
10.22+	Form of Restricted Stock Unit Agreement Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan.	10-Q	001-35416	10.2	April 24, 2018

10.23+	Form of Restricted Stock Agreement Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan.	10-Q	001-35416	10.3	April 24, 2018
10.24+	Form of Restricted Stock Agreement Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan.	10-Q	001-35416	10.4	April 24, 2018
10.25+	Third Amended and Restated Credit Agreement, dated as of May 1, 2018, by and among U.S. Silica Holdings, Inc., through its subsidiaries, USS Holdings, Inc., as guarantor, and U.S. Silica Company, as borrower, and certain of U.S. Silica's subsidiaries as additional guarantors and BNP Paribas, as administrative agent and the lenders named therein.	8-K	001-35416	10.1	May 2, 2018
21.1*	List of subsidiaries of U.S. Silica Holdings, Inc.				
23.1*	Consent of Independent Registered Public Accounting Firm.				
31.1*	Rule 13a-14(a)/15(d)-14(a) Certification by Bryan A. Shinn, Chief Executive Officer.				
31.2*	Rule 13a-14(a)/15(d)-14(a) Certification by Donald A. Merril, Chief Financial Officer.				
32.1*	Section 1350 Certification by Bryan A. Shinn, Chief Executive Officer.				
32.2*	Section 1350 Certification by Donald A. Merril, Chief Financial Officer.				
95.1*	Mine Safety Disclosure.				
99.1*	Consent of Rystad Energy.				
101*	101.INS XBRL Instance 101.SCH XBRL Taxonomy Extension Schema 101.CAL XBRL Taxonomy Extension Calculation 101.LAB XBRL Taxonomy Extension Labels 101.PRE XBRL Taxonomy Extension Presentation 101.DEF XBRL Taxonomy Extension Definition				

Schedules have been omitted pursuant to Item 601(b)(2) of Regulation S-K. We will furnish the omitted schedules to the Securities and Exchange Commission upon request by the Commission.

+ Management contract or compensatory plan/arrangement

* Filed herewith

We will furnish to any of our stockholders a copy of any of the above exhibits upon the written request of such stockholder and the payment to U.S. Silica Holdings, Inc. of the reasonable expenses incurred in furnishing such copy or copies.

ITEM 16. FORM 10-K SUMMARY

Not applicable.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this Report to be signed on its behalf by the undersigned, thereunto duly authorized, this 19 day of February, 2019.

U.S. Silica Holdings, Inc.

/s/ BRYAN A. SHINN
Name: Bryan A. Shinn
Title: Chief Executive Officer

Pursuant to the requirements of the Securities Exchange Act of 1934, this Report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

Name	Capacity	Date
/S/ BRYAN A. SHINN Bryan A. Shinn	President, Chief Executive Officer and Director (Principal Executive Officer)	February 19, 2019
/S/ DONALD A. MERRIL Donald A. Merril	Executive Vice President, Chief Financial Officer (Principal Financial and Accounting Officer)	February 19, 2019
/S/ CHARLES SHAVER Charles Shaver	Chairman of the Board	February 19, 2019
/S/ PETER BERNARD Peter Bernard	Director	February 19, 2019
/s/ DIANE DUREN Diane Duren	Director	February 19, 2019
/S/ WILLIAM J. KACAL William J. Kacal	Director	February 19, 2019
/S/ J. MICHAEL STICE J. Michael Stice	Director	February 19, 2019