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

FORM 10-K

☑ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the Fiscal Year Ended December 31, 2022

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:	**Trading Symbol:**	**Name of each exchange on which registered:**
Common Stock, par value $0.01 per share	SLCA	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 ☑ 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 ☑

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 ☑ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted 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 such files). Yes ☑ No ☐

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	☑	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 has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☑

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant period pursuant to §240.10D-1(b). ☐

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

The aggregate market value of the outstanding common stock held by non-affiliates of the registrant as of June 30, 2022, the last business day of the registrant's most recently completed second fiscal quarter, was $811,859,083 based on the closing price of $11.42 per share, as reported on the New York Stock Exchange, on such date.

As of February 17, 2023, 76,120,988 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 2023 Annual Meeting of Shareholders for U.S. Silica Holdings, Inc. (the "2023 Proxy Statement") are incorporated by reference in Part III of this Annual Report on Form 10-K where indicated.

U.S. Silica Holdings, Inc.
FORM 10-K
For the Fiscal Year Ended December 31, 2022

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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. 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. These statements may include words such as "anticipate," "estimate," "expect," "project," "plan," "intend," "believe," "may," "will," "should," "could," "can have," "likely" and other words and terms of similar meaning.

For example, all statements we make relating to our estimated and projected costs and cost reduction programs; reserve and finished products estimates; demand for our products; the strategies of our customers; 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. These risks and uncertainties include, but are not limited to, those described in Part I, "Item 1A. Risk Factors" and elsewhere in this Annual Report on Form 10-K and those described from time to time in our future reports filed with the Securities and Exchange Commission (the "SEC").

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, 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.

If one or more of the risks described above or other risks or uncertainties materialize (or the consequences of any such development changes), or should our underlying assumptions prove incorrect, actual outcomes may vary materially from those reflected in our forward-looking statements. The forward-looking statements included in this Annual Report on Form 10-K are made only as of the date hereof. We disclaim any intention or obligation to update publicly or revise such statements, whether as a result of new information, future events or otherwise. 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 SEC, and our other public communications.

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," and "our company" refer to U.S. Silica Holdings, Inc. and its consolidated subsidiaries as a combined entity.

Our Company

Business Overview

We are a global performance materials company and a leading producer of commercial silica used in the oil and gas industry and in a wide range of industrial applications. In addition, through our subsidiary EP Minerals, LLC ("EPM") we are an industry leader in the production of industrial minerals, including diatomaceous earth, clay (calcium bentonite and calcium montmorillonite) and perlite.

During our 123-year history, we have developed core competencies in mining, processing, logistics and materials science that enable us to produce and cost-effectively deliver over 600 diversified product types to customers across our end markets. As of December 31, 2022, we had 27 operating mines and processing facilities and two additional exploration stage properties across the United States. We control 468 million tons of reserves of commercial silica, which can be processed to

make 182 million tons of finished products that meet American Petroleum Institute ("API") frac sand specifications, and 82 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 and optimize our asset utilization.

Our Business Strategy and Strengths

We attribute our success to the following strengths:

- ***Large-scale producer with a diverse and high-quality reserve base.*** 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 contribute to our customer retention rates and our ability to reach broader market segments. 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. In our Oil & Gas Proppants segment, our network of frac sand production facilities with access to barge and 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 SandBox Logistics service ("SandBox") extends our delivery capability directly to our customers' wellhead locations and provides a lower cost logistics solution. 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 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 costs to enable us to better manage 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 approximately 0.5% of our sales in 2022;
  - the optimal positioning of our mines and their respective processing plants, enabling cost-efficient and highly automated production processes;
  - the active management of our product mix at each of our plants as we seek to maximize our profit margins which requires us to use our expertise in balancing key variables such as mine geology, processing capacity, transportation availability, customer requirements, and pricing;
  - 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 domestic or overseas; we transport products by truck, rail or barge to meet the needs of our customers, including at in-basin transload locations and directly at wellhead locations via our SandBox operations;
  - 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.
- ***Focus on safety and positive relationships with the communities in which we operate.*** We focus on the safety of our employees and maintain safe and responsible operations. 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.

- ***Strong reputation with our customers.*** We believe we have built a strong reputation during our 123-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. 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 products to improve the performance of their existing applications.
- ***Commitment to innovation.*** Our research and development teams work to enhance our existing products and develop new, patentable products. We expect this 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.
- ***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. We believe we have assembled a flexible, creative and responsive team that can quickly adapt to changing market conditions.
- ***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, 2022, we had $280.8 million of cash on hand and $78.5 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.

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 is used for bleaching, catalysis and adsorption in edible oil processing, aromatics purification, and industrial and chemical applications.

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.

Additionally, we sell ground silica and industrial minerals products for use in a wide variety of products.

Our Industry and Primary End Markets

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.

The special properties of commercial silica such as 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 as high-performance glass, specialty coatings, polymer additives and geothermal energy systems (such as solar panels). Due to the unique properties of commercial silica, we believe it is an economically irreplaceable raw material in a wide range of industrial applications.

EPM's DE, perlite, montmorillonite clay and bentonite clay products are sold globally, where they are used in hundreds of applications. High quality DE possesses superior characteristics 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. 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.

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.

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. 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.

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.

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 63%, 56%, and 49% of our total sales in 2022, 2021 and 2020, respectively.

During most of our 123-year history, our primary markets have been core industrial end markets with customers engaged in the production of building and construction products, fillers and extenders, glass, foundry products, chemicals, and sports and recreation products. 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 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 37%, 44%, and 51% of our total sales in 2022, 2021 and 2020, respectively.

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 2023 publication by the United States Geological Survey, in 2022, there were 122 producers of commercial silica with a combined 201 active operations in 32 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 can be a significant portion of the total cost to customers of commercial

silica, 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. For more information regarding competition, see Item 1A. Risk Factors of this Annual Report on Form 10-K.

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 typically 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 generally 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, patent 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 MIN-U-SIL®, Mystic White II®, Q-ROK®, SIL-CO-SIL®, White Armor®, EP Minerals®, EVERWHITE®, 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 expiration dates ranging from 2027-2040. 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, for example for our ultra-high reflectance cool roofing granules, patent protection for other industrial and specialty products requires a costly federal registration process with an uncertain outcome 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 strive to protect our trade secrets indefinitely through the use of confidentiality agreements and other security measures, understanding that these efforts may prove to be ineffective. See Item 1A. Risk Factors of this Annual Report on Form 10-K 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 of this Annual Report on Form 10-K for more information.

Employees

As of December 31, 2022, we employed a workforce of approximately 2,013 employees, the majority of whom are hourly wage plant workers living in the areas surrounding our mining facilities. Approximately 28% 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.

Human Capital Management

Our Board of Directors believes that our long-term success depends on the talents of our employees, and we work to attract, retain and motivate the highest quality workforce. Our Chief Operating Officer ("COO"), with the support of members of our Human Resources team, is responsible for developing and executing our human capital strategy. This includes talent attraction, acquisition, development and engagement, as well as the design of employee compensation and benefits programs. It also includes developing and implementing our diversity and inclusion framework. Management regularly updates our Board of

Directors and our Compensation Committee on human capital trends and efforts to improve diversity. The Board of Directors in particular has requested updates on the following topics:

Health and Safety: Our health and safety programs are industry leading and resulted in several company records in 2022. We require each of our locations to perform regular safety audits to ensure proper safety policies, program procedures, analyses and trainings are in place. In addition, we receive regular visits from inspectors on behalf of the U.S. Mine Safety and Health Administration ("MSHA") and the U.S. Occupational Safety and Health Act ("OSHA"). We utilize a mixture of leading and lagging indicators to assess the health and safety performance of our operations. Lagging indicators include the OSHA Total Recordable Incident Rate ("TRIR") and the Lost Time (or Lost Workday) Incident Rate ("LTIR") based upon the number of incidents per 200,000 work hours. Leading indicators include reporting and closure of all near miss events and Environmental, Health and Safety ("EHS") coaching and engagement conversations. In 2022, we had a TRIR of 0.61, a LTIR of 0.14 and zero work-related fatalities.

Diversity, Inclusion, and Belonging: We believe that a culture of inclusion, diversity, and belonging enables us to create, develop and fully leverage the strengths of our workforce. Current key initiatives include mandatory unconscious bias training for all employees, partnerships with diversity organizations, improving purchasing from Minority and Women Owned Businesses, utilizing an employee driven resource group, and diverse talent acquisition practices. We have implemented several measures that focus on ensuring accountabilities exist for making progress in diversity, and our senior leaders will have diversity and inclusion objectives embedded in their annual performance goals.

*Training and Talent Developmen*t: We are committed to the continued development of our people. Strategic talent reviews and succession planning occur annually and across all business areas. The Chief Executive Officer ("CEO") and COO convene meetings with senior company leadership and the Board of Directors to review top enterprise talent. We also provide free training courses through LinkedIn Learning to all salaried employees, along with key development programs.

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 2022, see Item 4. Mine Safety Disclosures of this Annual Report on Form 10-K.

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. 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 regulations 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 these regulations.

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.

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.

Federal agencies granting permits for our operations must also 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 must also 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" — "Financial Information" 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.

Information about our Executive Officers

Bryan A. Shinn, age 61, has served as our Chief Executive Officer and a member of the Board since January 2012. He also served as our President from March 2011 to January 2020. 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 58, 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 earned a B.S. in Accounting from Miami University.

Michael L. Winkler, age 58, 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. In January 2023, Mr. Winkler notified us of his plan to retire. Mr. Winkler is expected to remain in his position until mid to late 2023 to assist wth the transition of his responsibilities.

Zach Carusona, age 36, was appointed as our Executive Vice President and President, Industrial & Specialty Products in August 2022. He served as Senior Vice President and President, Specialty Minerals from December 2018 until July 2022, Vice President of SandBox Logistics from August 2016 until December 2018, the Director, Strategic Planning from June 2015 to August 2016, and in various roles in our strategy group from 2011 through 2015. Mr. Carusona earned an MBA from

the Kellogg School of Management at Northwestern University, and a B.S. in Mechanical Engineering from the University of Illinois, Urbana-Champaign.

J. Derek Ussery, age 38, was appointed as our Executive Vice President and President, Oil and Gas in August 2022. He served as the Senior Vice President and President, Oil and Gas from November 2019 to July 2022 and Chief Operating Officer of SandBox Logistics from January 2019 to November 2019. He previously served as Vice President, North America ESG at Tetra Technologies, from May 2018 to December 2018. From April 2013 to May 2018, he served in roles of increasing responsibility with Key Energy Services, culminating in his position as Vice President for the Eastern Region. Mr. Ussery earned a B.B.A. from Texas A&M University.

Stacy Russell, age 52, has served as U.S. Silica's Senior Vice President, General Counsel and Secretary since January 2020. Prior to this role, Ms. Russell was the General Counsel for our Oil & Gas Proppants segment. She was previously Of Counsel at Boyar Millar from July 2018 to May 2019. From October 2010 to January 2018, she served as the Managing Counsel for the Litigation and HSE law groups at Halliburton Company. Ms. Russell earned B.A. in Government from the University of Texas and her J.D. from the University of Houston.

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.

Risks Related to Market, Competition, & Sales

The global economic environment has recently created market uncertainty and volatility.

The global economic environment has recently created market uncertainty and volatility. Global financial conditions remain subject to sudden and rapid destabilization. A slowdown in the financial markets or other economic conditions, including but not limited to, global supply chain issues, inflation, increasing interest rates, fuel and energy costs, business conditions, lack of available credit, the state of the financial markets and tax rates, may adversely affect our business, financial condition and results of operations.

Our frac sand mining and logistics operations depend on the level of activity in the oil and natural gas industries, which experience substantial volatility.

Our operations that produce and transport 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 volatility.

When oil and natural gas prices decrease, exploration and production companies may reduce their exploration, development, production and well completion activities. During such periods, demand for our products and services which supply oil and natural gas wells, including our transportation and logistics solutions, may decline, leading to a decline in the market price of frac sand due to an oversupply of frac sand. When demand for frac sand increases, there may not be a corresponding increase in the prices for our products or our customers may not increase use of our products, which could have a material adverse effect on our business, financial condition and results of operations.

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 oil and natural gas 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. In addition, any future decrease 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, technological innovations that result in new processes for oil and gas production that do not require proppants, or other factors, could adversely affect the demand for our products, even in a stronger natural gas and oil price environment. The continued or future occurrence of any of these risks could have a material adverse effect on our business, financial condition and results of operations.

A public health crisis or global outbreak of disease could materially and adversely affect our business, financial condition and results of operations.

A public health crisis, including the COVID-19 pandemic and the emergence and spread of COVID-19 variants, have previously adversely impacted our business and results of operations. A public health crisis, including a pandemic similar in nature to COVID-19, could affect our business in a number of ways, including but not limited to:

- disruptions or restrictions on our employees' ability to work;
- temporary closures or disruptions at our mines and processing plants or the facilities of our customers could reduce demand for our products or affect our ability to timely meet our customers' orders and negatively impact our supply chain; and
- the failure of third parties on which we rely, including our customers, contractors, commercial banks, transportation service providers and external business partners, to meet their respective obligations to us, or significant disruptions in their ability to do so, which may be caused by their own financial or operational difficulties.

The impact of contagious disease or other adverse public health developments could also exacerbate other risks discussed elsewhere in this section of this report, any of which could have a material adverse effect on us.

Our industrial materials operations are subject to the cyclical nature of our customers' businesses.

The majority of our industrial products customers are engaged in industries that have historically been cyclical, such as glassmaking, building products, foundry products, and paint. During periods of economic slowdown in one or more of the industries or geographic regions we serve or in the worldwide economy, our customers often reduce their production and capital expenditures by deferring or canceling pending projects, even if such customers are not experiencing financial difficulties. These developments can have an adverse effect on sales of our products and our results of operations.

Demand in many of the end markets for our industrial 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 market for foundry silica depends on the rate of automobile, light truck and heavy equipment production as well as construction; and the market for diatomaceous earth, perlite, clay and cellulose is driven by agricultural, food and beverage, chemical industries, filtration, catalyst and absorbent applications. When demand from one of these cyclical industries decreases, demand for the products we sell to customers in that industry may also decrease. When demand from one of these cyclical industries increases, however, there may not be a corresponding increase in the prices for our products or our customers may not increase the use of our products due to factors such as the use of recycled glass in glass production; substitution of our products for other materials; changes in residential and commercial construction demands, driven in part by fluctuating interest rates and demographic shifts; prices, availability and other factors relating to our products; competitors both locally and internationally; and other factors.

Weakness in the industries we serve has had, and may have in the future, an adverse effect on sales and our results of operations. 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 sales, profitability and operations could be materially affected by weather conditions, seasonality and other factors.

Our sales and profitability from period to period are affected by a variety of factors, including 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 in these end markets due to reduced construction and recreational activity largely as a result of adverse weather conditions. 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.

In addition, severe seasonal or weather conditions may impact our operations by causing weather-related damage to our facilities and equipment or preventing us from delivering equipment, personnel or products to job sites, any of which could force us to delay or curtail services and potentially breach our contractual obligations or result in a loss of productivity, an increase in operating costs or other losses that may not be covered by applicable insurance policies. Severe weather conditions may also interfere with our customers' operations, which could reduce our customers' demand for our products. If any of these risks were to occur, it could have a material adverse effect on our business, financial condition and results of operations. Moreover, changing weather patterns, due to climate-warming trends and other effects of climate change or other causes, may lead to the increased frequency, severity or unpredictability of extreme weather events, which could intensify these risks.

A significant portion of our sales is generated at four 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 business, financial condition, and results of operations.

A significant portion of our sales is generated at our plants located in Ottawa, Illinois; Lamesa, Texas; Lovelock, Nevada; and Crane County, Texas. These plants represented a combined 29% of our total sales in 2022. 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, or a decrease in the availability of transportation services or adverse developments affecting our customers, could have a material adverse effect on our business, financial condition and results of operations.

We may be adversely affected by decreased demand for frac sand or the development of 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, the development and use of other effective alternative proppants, or the development of new alternative energy processes to replace hydraulic fracturing altogether, could cause a decline in demand for the frac sand we produce and could have a material adverse effect on our business, 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.

Because the markets for our products are typically local, we also compete with smaller, regional or local producers in addition to the other national 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 may 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.

With regards to our international sales and operations, our performance is also subject to currency exchange fluctuations. In addition, our ability to sell and deliver our products to, and collect payment from, our international customers depends on fund transfer and trade restrictions and import/export duties, the ability to import and export goods, and fluctuating policies on tariffs on a number of goods that could impact our operations. These factors and uncertainties may cause our international customers to seek out producers who are not located in the United States to fulfill their commercial silica requirements or may otherwise make it more difficult for us to compete with international producers.

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

We bill our customers for our products in arrears and are, therefore, subject to credit risks if our customers delay or fail to pay our invoices. In weak economic environments, we have experienced increased delays or failures due to, among other reasons, a reduction in our customers' cash flow from operations and ability to access the credit markets. In addition, some of our customers have experienced financial difficulties, including insolvency or bankruptcy proceedings, in which cases we have not been able to collect sums owed to us or have received significantly less than expected, and we may be required to refund pre-petition amounts paid to us during a specified period prior to the bankruptcy filing. Furthermore, we may experience longer collection cycles with our international customers due to foreign fund transfer restrictions, and we may have difficulty enforcing agreements and collecting accounts receivable from our international customers through a foreign country's legal system. 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 business, liquidity financial condition, and results of operations.

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 results of operations.

Our ten largest customers accounted for approximately 40%, 40% and 34% of total sales during the years ended December 31, 2022, 2021 and 2020, respectively. As a result of market conditions, competition or other factors, these customers may not continue to purchase the same levels of our products in the future, if at all. Substantial reductions in purchase volumes across these customers could have a material adverse effect on our business, financial condition and results of operations.

Operational Risks

Our operations are subject to risks and dangers inherent to mining, some of which are beyond our control, and some of which 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. In addition to the other risks described in these risk factors, these risks include:

- unanticipated ground, grade or water conditions;
- unusual or unexpected geological formations or pressures;
- pit wall failures, underground roof falls or surface rock falls;
- environmental hazards;
- physical plant security breaches;
- inability to acquire or maintain necessary permits or mining or water rights;
- failure to maintain dust controls and meet restrictions on respirable crystalline silica dust;
- restrictions on blasting operations;
- failures in quality control systems or training programs;
- technical difficulties or key equipment failures;
- inability to obtain necessary mining or production equipment or replacement parts;
- fires, explosions or industrial accidents 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 our business, financial condition, and results of operations.

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 our business, financial condition and results of operations.

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 may not be able obtain water rights sufficient to service our current activities or to service any properties we may develop or acquire in the future. Moreover, the amount of water we are entitled to use pursuant to our water rights must be determined by the appropriate regulatory authorities, and these authorities may amend the regulations affecting our water rights, increase the cost of maintaining our water rights or reduce or eliminate our existing water rights, in which case we may be unable to retain these rights. Furthermore, our existing water rights could be disputed. Any such changes in laws, regulations or government policy and related interpretations pertaining to water rights or any successful claim that we lack appropriate water rights may alter our operating costs or the environment in which we do business, which may negatively affect our financial condition and results of operations.

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, financial condition, and results of operations.

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. As a result, if we expand our commercial silica production to new geographic markets, we could need increased transportation services and transload network access and would be subject to higher overall costs for these services. 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, shortages in the railcar leasing market or 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 to new markets. Further, reduced demand for commercial silica sometimes results in railcar over-capacity, requiring us to pay railcar storage fees while, at the same time, continuing to make lease payments for those railcars in storage, which can have a material adverse effect on our business, financial condition and results of operations.

Our operations consume large amounts of natural gas, electricity and diesel fuel. 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 business, financial condition, and results of operations.

Energy costs, primarily natural gas and electricity, represented approximately 5%, 5% and 4% of our total sales in 2022, 2021 and 2020, respectively. Natural gas is the primary fuel source used for drying in the commercial silica production process. In addition, 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. 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, which currently represents less than 1% of total cost of sales. 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. Our profitability is impacted by the price and availability of these energy sources. The price and supply of diesel fuel and 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 or could reduce supply. 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 have hedged natural gas prices through the use of derivative financial instruments and may enter into additional hedges in the future. However, these measures carry different risks (including nonperformance by counterparties) and do not in any event entirely eliminate the risk of decreased margins as a result of energy 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 interruption in the supply of the energy sources we use could have a material adverse effect on our business, financial condition and results of operations.

Certain of our contracts contain provisions requiring us to deliver products that meet certain specifications. Noncompliance with these contractual obligations may result in penalties or termination of the agreements.

In certain instances, we commit to deliver products under penalty of nonperformance. These obligations can require that we deliver products or services 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 amount contracted for and the amount delivered. 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, 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 or services 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, or deficiencies in our title to those deposits, could result in our inability to mine the deposits or require us to pay 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 can be 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, many of which are beyond our control and any of which could cause actual results to differ materially from our expectations. These uncertainties include:

- 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 regarding the effectiveness of our mining, quality control and training programs;
- 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.

In addition, title to, and the area of, mineral properties and water rights may 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. Any inaccuracy in our estimates related to our mineral reserves and non-reserve mineral deposits, or our title to such deposits, could result in our inability to mine the deposits or require us to pay higher than expected costs.

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; cyberattack 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 need 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 have been the target of cyberattacks, and while to date none of these incidents has had a material impact on us, we expect to continue to be targeted in the future. Our management team updates our Board of Directors quarterly on material cybersecurity risks which might impact us. 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 systems we employ to detect and prevent cyberattacks may be insufficient to protect us from an incident or to allow us to minimize the magnitude and effects of such incident for a significant period of time. The occurrence of a cyberattack, breach, unauthorized access, misuse, computer virus or other cybersecurity event could jeopardize our systems 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. Any such event 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.

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 may also involve 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 properties. If we were to reduce the estimated life of any of our mines, the fixed mine closure costs could be applied to a shorter period of production, which would increase production costs per ton produced and could materially and adversely affect our business, 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 the removal of facilities and equipment, re-grading, prevention of erosion and other forms of water pollution, re-vegetation and post-mining land use. Complying with these plans has had, and will continue to have, a significant effect on our business. Some environmental laws impose substantial penalties for noncompliance with a reclamation plan, and others, such as the CERCLA, impose strict, retroactive and joint and several liability for the remediation of releases of hazardous substances. We may be required to post a surety bond or other form of financial assurance equal to the anticipated cost of reclamation as set forth in the approved reclamation plan. The inability to acquire, maintain or renew such financial assurances could subject us to fines or the revocation of our operating permits. 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.

Legal & Compliance Risks

We are subject to numerous environmental regulations that impose significant costs and liabilities, which could increase under potential future regulations or more stringent enforcement of existing regulations.

We are subject to a variety of federal, state and local environmental laws and regulations affecting the mining and mineral processing industry, including, among others, those relating to environmental permitting and licensing, plant and wildlife protection, wetlands protection, 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 and regulations 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.

Environmental requirements, and the interpretation and enforcement of these requirements, change frequently and have tended to become more stringent over time. 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. The costs associated with complying with such requirements, could have a material adverse effect on our business, financial condition and results of operations.

For example, greenhouse gas emissions regulation is becoming more rigorous, and concerns about climate change could cause this trend to continue or intensify. We expect to be required to report annual greenhouse gas emissions from our

operations to the EPA, and additional greenhouse gas emission-related requirements are in various stages of development at the international, federal, state, regional and local levels. 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. Any regulation of greenhouse gas emissions, including, for example, through a cap-and-trade system, technology mandate, emissions tax, reporting requirement, new permit requirement or other program, could curtail our operations, significantly increase our operating costs, impair demand for our products or otherwise adversely affect our business, financial condition, reputation and performance.

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 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. There is significant federal oversight of these operations by the EPA, Bureau of Land Management ("BLM"), and Department of Energy ("DOE"). A number of local municipalities across the United States have also instituted measures resulting in temporary or permanent bans on or otherwise limiting or delaying hydraulic fracturing in their jurisdictions. Additionally, a number of states have enacted legislation or issued regulations that impose various disclosure requirements on hydraulic fracturing operators. Such moratoriums, bans, disclosure obligations, and other regulatory actions 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. 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.

If we or our customers are not able to obtain and maintain necessary permits, our results of operations could suffer.

We hold numerous governmental, environmental, mining and other permits and approvals authorizing operations at each of our facilities. Our future success depends on, among other things, our ability, and the ability of our customers, to obtain and maintain the necessary permits and licenses required to conduct operations. 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. Compliance with these regulatory requirements is expensive and significantly lengthens the time needed to conduct operations. Additionally, obtaining or renewing required permits is sometimes delayed, conditioned or prevented due to community opposition, opposition from other parties, the location of existing or proposed third-party operations, or other factors beyond our control. The denial of a new or renewed permit essential to our operations, delays in the environmental review and permitting process, significant opposition to a permit by third parties or the imposition of conditions in order to acquire the permit could impair our ability to continue operations at the affected facilities, delay those operations, or involve significant unplanned costs, any of which could adversely affect our business, financial condition and results of operations.

We are subject to regulations that impose stringent health and safety standards on numerous aspects of our operations.

Multiple aspects of our operations are subject to health and safety standards, including our mining operations, our trucking operations, and employee exposure to crystalline silica.

Our mining 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 operating locations are regularly inspected by the MSHA for compliance with the Mine Act.

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 addition, our operations must 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 these safety, hours-of-service, wage and other rules and regulations.

We are also 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 to their regulations regarding workplace exposure to crystalline silica, such as permissible exposure limits, required controls and personal protective equipment. Our failure to comply with existing or new health and safety standards, or changes in such standards or the interpretation or

enforcement thereof, could require us or our customers to modify operations or equipment, shut down some or all operating locations, impose significant restrictions on our ability to conduct operations or otherwise have a material adverse effect on our business, financial condition and results of operations.

Silica-related health issues and litigation could have a material adverse effect on our business, reputation and 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 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 product liability lawsuits brought by or on behalf of current or former employees of our customers alleging damages caused by silica exposure. 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. For further information about material pending proceedings, see Item 3. Legal Proceedings of this Annual Report on Form 10-K. 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, and we presently maintain insurance policies where available. However, we continue to have silica exposure claims filed against us, including claims that allege silica exposure for periods or in areas 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 and results of operations.

Due to the international nature of parts of our business, we are subject to both U.S. and foreign regulations that could negatively impact our business.

In addition to U.S. laws and regulations, we are also subject to regulation in non-U.S. jurisdictions in which we conduct business, including with respect to environmental, employee and other matters. 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 need to comply with these foreign laws and regulations may provide an advantage to competitors who are not subject to comparable restrictions or may restrict our ability to take advantage of growth opportunities. In addition, because the laws and regulations in different jurisdictions can vary substantially, we may be required to undertake different steps or otherwise experience increased costs or other challenges in order to comply with the laws and regulations in each of the multiple jurisdictions in which we operate.

In addition, the United States regulates our international operations through various statutes, including the U.S. Foreign Corrupt Practices Act ("FCPA"). The 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 local customs and practices. Although we maintain policies, procedures and controls and deliver training designed to ensure compliance with anti-corruption laws, such efforts may not be sufficient to protect us from liability under these laws.

If we are found to be liable for regulatory violations related to our international operations, we could suffer from criminal or civil penalties or other sanctions, any of which could have a material adverse effect on our business, financial condition, and results of operations.

Strategic & General Business Risks

We must effectively manage our production capacity so that we can appropriately react to fluctuations in demand for our products.

To meet rapidly changing demand in the markets we serve, we must effectively manage our resources and production capacity. During periods of decreasing demand we must be able to appropriately align our cost structure with prevailing market conditions and effectively manage our mining operations. Our ability to rapidly and effectively reduce our cost structure in response to such downturns is limited by the fixed nature of many of our expenses in the near term and by our need to continue to invest in maintaining reserves and production capabilities. Conversely, when upturns occur in the markets we serve, we may have difficulty rapidly and effectively increasing our production capacity or incur substantial costs related to restarting idled facilities or executing other expansion plans. A failure to timely and appropriately adapt our resources, costs and production capacity to changes in our business environment 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, or the use of equity securities to fund an acquisition and the resulting dilution to our existing stockholders;
- 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 to manage and operate any growth in our 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 or other new markets;
- 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.

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 due to 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. Any such impairment charge would be determined based on the estimated fair value of the assets and could have a material adverse effect on our financial condition, and results of operations.

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. In addition, certain non-U.S. jurisdictions where we operate offer limited intellectual property protections relative to the United States. 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. Furthermore, third parties or employees may infringe or misappropriate our proprietary technologies or other intellectual property rights. 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, and results of operations.

Capital Resources & Stock Ownership Risks

We will need substantial additional capital to maintain, develop and increase our asset base, and the inability to obtain needed capital or financing, on satisfactory terms, or at all, whether due to restrictions in our Credit Agreement or otherwise, could have an adverse effect on our growth and profitability.

Our business plan requires a significant amount of capital expenditures to maintain and grow our production levels over the long term. 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 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 that reduce our sales or increase our costs. 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, 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.

In addition, our existing Credit Agreement contains, and any future financing agreements we may enter into could also contain, operating and financial restrictions and covenants that may limit 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 and 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 or satisfy our other obligations under our Credit Agreement, the lenders could seek to foreclose on our assets.

Even if we are able to obtain financing or access the capital markets, incurring additional debt may significantly increase the risks associated with our existing indebtedness, as discussed elsewhere in these risk factors. 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, which consists of a $1.280 billion Term Loan and a $100 million Revolver that may also be used for swingline loans or letters of credit.

As of December 31, 2022, we had $1.059 billion of outstanding indebtedness under the Term Loan and we were using $21.5 million for outstanding letters of credit, leaving $78.5 million of borrowing availability under the Revolver.

In response to increasing inflation, the U.S. Federal Reserve began to raise interest rates in March 2022. Prevailing high interest rates increase our cost of capital. Additionally, borrowings under certain of our indebtedness are at variable rates of interest and expose us to interest rate volatility. If interest rates increase, our debt service obligations on certain of our variable rate indebtedness will increase even though the amount borrowed remains the same.

In addition to our indebtedness, we also have, and will continue to have, significant pension obligations. The substantial level of these obligations increases the risk that we may be unable to generate cash sufficient to pay amounts owed under these obligations when due. In such a case, we may be forced to reduce or delay business activities, acquisitions, investments and/or capital expenditures; sell assets; restructure or refinance our indebtedness; or seek additional equity capital or bankruptcy protection, and we may not be able to affect any of these remedies when necessary, on satisfactory terms or at all. Our level of indebtedness and pension obligations could also have important consequences to you and significant effects on our business, including:

- increasing our vulnerability to adverse changes in general economic, industry and competitive conditions;
- requiring 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, including dividend payments;
- restricting us from exploiting business opportunities;
- making it more difficult to satisfy our financial obligations, including payments on our indebtedness;
- disadvantaging us when compared to our competitors that have less debt and pension obligations; and
- increasing our borrowing costs or otherwise limiting our ability to borrow additional funds for the execution of our business strategy.

In addition, the amounts owed under the Credit Agreement use LIBOR as a benchmark for establishing the rate at which interest accrues. On March 15, 2022, President Biden signed the Consolidated Appropriation Act of 2022 into law, which includes the Adjustable Interest Rate (LIBOR) Act, containing legislation related to the transition away from LIBOR. This legislation is intended to establish a uniform process for replacing LIBOR in existing contracts and securities that continue after the cessation of LIBOR and do not contain clearly defined or practicable fallback provisions.

On July 19, 2022, the Federal Reserve Board released a proposal that provides default rules for certain contracts that use LIBOR, which would implement the LIBOR Act with replacement rates based on the Secured Overnight Financing Rate (SOFR). We believe the LIBOR Act and the Federal Reserve Board's proposed regulation help provide clarity for the transition of our legacy LIBOR contracts, including investment securities and loans, to alternative reference rates in an orderly manner.

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. 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 continue to 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 in certain circumstances. 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 Agreement.

We also have a post-retirement health and life insurance plan for many of our employees and former employees. The post-retirement benefit plan is unfunded, and retiree health benefits are generally paid as covered expenses are incurred. 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. Although we previously maintained a trust to partially fund health care benefits for future retirees, the trust terminated in 2017 upon depletion of its assets in accordance with trust terms. As a result, our satisfaction of our obligations under our post-retirement benefit plan increases our expenses and reduces our cash available for other uses.

See Note Q - Pension and Post-Retirement Benefits in our Consolidated Financial Statements included in Part II, Item 8. of this Annual Report on Form 10-K for more information about these plans.

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

The stock market has experienced and continues to experience extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of the underlying businesses. In 2022, our stock closed at a high of $20.99 per share and a low of $9.34 per share. 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 inaccurate or unfavorable research or ratings published by industry analysts about our business, or a cessation of coverage of us by industry analysts; quarterly variations in our operating results compared to market expectations; announcements by others in or affecting our industry or our customers; actions by competitors; our acquisition of, investment in or disposition of other businesses; and other global or regional economic, political, legal and regulatory factors that may not be directly related to our performance.

Volatility in the market price or trading volume of our common stock may make it difficult or impossible for you to sell your 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.

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 of Directors may declare out of funds legally available for such payments. Our Board of Directors elected to suspend dividends after paying a dividend in March 2020, and we have yet to resume paying dividends. Applicable Delaware law provides that we may 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 if certain specified conditions are met. 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 of Directors 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 the Credit Agreement or other debt agreements) and any other factors our Board of Directors deems relevant. We are not required to declare future cash dividends on our common stock, and our Board of Directors may determine not to do so at any time.

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 of Directors. 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 our common stock;
- prohibit stockholder action by written consent, which requires all stockholder actions to be taken at a meeting of our stockholders;
- provide that our Board of Directors is expressly authorized to make, alter or repeal our bylaws;
- establish advance notice requirements for nominations of directors or for proposing matters that can be acted upon by stockholders at stockholder meetings; and

- 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 are required to develop and maintain effective disclosure controls and procedures and any failure to maintain the adequacy of our disclosure controls and procedures may adversely affect investor confidence and, as a result, the value of our shares of common stock.

Under Sarbanes-Oxley, we are required to assess the effectiveness of our disclosure controls and procedures on an annual basis. Solely as a result of the changes we had to make to our mining disclosures in our Form 10-K for the fiscal year ended December 31, 2021, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were not effective as of December 31, 2021. To remediate this conclusion, during 2022 we engaged a new qualified person to prepare our mining technical report studies and review the related mining disclosure. Because the omitted disclosures did not affect our financial statements, no additional remediation was deemed necessary. As of result of the remediation, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were effective as of December 31, 2022. If we fail to maintain effective disclosure controls and procedures investor confidence could be negatively affected, which could have a material adverse impact on the market price of our common stock.

Labor & Employment Risks

Our business may suffer if we are unable to attract and retain members of our workforce.

We depend to a large extent on the services of our senior management team and other key personnel. These 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 other personnel. Our operations also rely on skilled laborers using modern techniques and equipment to mine efficiently. We may be unable to train or attract the necessary number of skilled laborers to maintain our operating costs.

With respect to our trucking services, the 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 and could negatively affect our operations and expenses if we are unable to do so. Our success will be dependent on our ability to continue to attract, employ and retain highly skilled personnel at all levels of our operations.

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

As of December 31, 2022, various labor unions represented approximately 28% 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, financial condition, and results of operations.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Our Properties and Logistics Network

Our corporate headquarters is located in Katy, Texas. We also maintain a corporate support center and sales office in Reno, Nevada. Additionally, we operate corporate laboratories located in Berkeley Springs, West Virginia and Reno, Nevada. These locations 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. 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.

We continue to strategically position our supply chain in order to deliver our products 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, 2022, we had 35 transload facilities strategically located near all the major shale basins in the United States. All 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, 2022, we had a leased fleet of 5,777 railcars.

Our acquisition of SandBox extended 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 the Permian Basin, Eagle Ford Shale, Mid-Con, Rocky Mountains and the Marcellus/Utica Shale, 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 mines, production facilities, transload facilities, SandBox operation sites and Corporate offices:

Summary Overview of Mining Operations

Information concerning our material mining properties in this Annual Report on Form 10-K has been prepared in accordance with the requirements of subpart 1300 of Regulation S-K, which first became applicable to us for the fiscal year ended December 31, 2021. As used in this Annual Report on Form 10-K, the terms "mineral resource", "mineral reserve", "proven mineral reserve" and "probable mineral reserve" are defined and used in accordance with subpart 1300 of Regulation S-K. As of December 31, 2022, our individually material mining properties, as determined in accordance with subpart 1300 of Regulation S-K, were the Crane, TX site (the "Crane site"), Lamesa, TX site (the "Lamesa site"), the Ottawa, IL site (the "Ottawa site") and the Lovelock/Colado, NV site (the "Colado site").

The information that follows related to the Crane site, the Lamesa site, the Ottawa site and the Colado site is derived, for the most part from, and in some instances is an extract from, the technical report summaries ("TRSs") related to such properties prepared in compliance with the Item 601(b)(96) and subpart 1300 of Regulation S-K. Portions of the following information are based on assumptions, qualifications and procedures that are not fully described herein. Reference should be made to the full text of the TRSs, filed as exhibits to this Annual Report on 10-K.

As of December 31, 2022, we had 27 operating mines and processing facilities and two additional exploration stage properties, as summarized below. Note that this list includes two processing facilities (Blair, NE and Millen, GA), but excludes mines and processing facilities that have been closed or idled, none of which have any current economic reserves.

Berkeley Springs, West Virginia

We, through U.S. Silica Company, operate surface mines and a silica sand processing plant in Berkeley Springs, Morgan County, West Virginia. The Berkeley Springs site includes a total of 4,435 acres that are owned outright by U.S. Silica. This ownership includes subsurface mineral and water rights. The site has no leased property and pays no royalties.

Our surface mines at the Berkeley Springs facility use hard rock mining methods to produce high-purity sandstone. The plant uses natural gas, 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 processing plant allows 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.

Berkeley Springs operates under 13 different operating permits and complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Blair, Nebraska *[processing plant only]*

EPM operates a perlite processing plant located near the town of Blair, Washington County, Nebraska. The site sits on a 6.6-acre leased parcel that is a portion of a 25.2-acre lot owned by Blair Ag., LLC. The site has a mobile office, expander building, a compressor room and three storage silos.

Our Blair facility uses natural gas, electricity and perlite raw ore from our open-pit Popcorn, Nevada mine that has been initially processed at our Lovelock, Nevada process facility, then shipped by rail to Blair. After unloading, the ore goes through an expander. At temperatures over 1,600-degrees Fahrenheit, perlite expands to almost 15 times its size. The expanded perlite is then sized, packaged or sent to storage silos for bulk shipment to customers. Perlite products are used as a filter media in the manufacturing of bio-fuels, food grade oils, beverages and pharmaceuticals.

The Blair plant operates under one operating permit and complies with other state and federal regulations that do not require a specific permit. The required permit is secured, and the site is operating in full compliance.

Clark, Nevada

EPM operates the Clark, Nevada mine and DE processing plant located 20 miles east of the city of Reno, Nevada. The Clark processing plant is located on approximately 447 acres of private land. The Clark mine consists of approximately 1,123 acres of private land and 292 acres of federal land. EPM maintains two mineral claim leases, with EPM holding 71% ownership. The leases consist of 19 mineral claims, 15 of which are placer claims and four of which are millsite claims.

Our Clark open pit, ramp and bench mine uses mechanical, hard-rock mining methods to extract the DE ore strata. The DE mined at the Clark mine is part of the Miocene-aged Truckee Formation, comprised of up to 200-ft thick, lacustrine DE deposits with interbedded, gravels, sands and volcanic tuffs. The Clark processing plant 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 and animal feed markets.

The Clark mine operates under four permits, while the Clark processing plant must abide by eight separate operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Columbia, South Carolina

We, through U.S. Silica Company, operate a surface mine and silica sand processing plant in Columbia, Lexington County, South Carolina. The processing plant is situated on a 193-acre parcel of owned land. The active mine is located directly north of the plant and is comprised of a 733-acre parcel of leased land. Royalties in the amount of 5% of the total monthly sales revenue are paid to the lessor.

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 processing plant allows 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, and filtration.

The Columbia, South Carolina site actively maintains five regulatory and operating permits. The facility also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Crane, Texas

In accordance with subpart 1300 of Regulation S-K, we have determined that the Crane site is a material mining property. Therefore, a description of the Crane site and its operations can be found below. See "— Crane, TX."

Dubberly, Louisiana

We, through U.S. Silica Company, operate a surface dredge mine and a silica sand processing plant near Dubberly, Louisiana. The land holdings include a total of 356 acres that are owned outright by the Company. The site pays an annual $200 royalty to the former land owner. Another 20 acres of land is leased for $8,500 per year to provide access to the site's National Pollutant Discharge Elimination System water discharge point. The owned and leased tracts include subsurface mineral and water rights.

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 processing plant allows 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.

Dubberly maintains four operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Fernley, Nevada

EPM owns and operates a surface mine and DE processing plant near the town of Fernley, Nevada. The processing plant is located on a 39.9 acre parcel of private land. The Fernley mine property is comprised of 5,668 acres, which mostly consists of federal BLM land (142 active and owned placer mineral claims) and 72.2 acres of private land. Portions of the private land are surface rights only, and related minerals rights are sub-leased from private land owners. There are no royalties associated with the private land holdings at Fernley. BLM land lease payments are around $23,000 annually.

Our Fernley facility surface-mines DE and has a rotary kiln for granular DE products. The processing plant utilizes electricity and recycled oil to manufacture granular products used in absorbent products, soil amendments, fertilizer and pet litter.

The Fernley mine operates under four operating permits. The Fernley processing plant operates under an additional six operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Festus, Missouri

We, through U.S. Silica Company, lease and have mineral rights for silica sand on 635 acres covering a limestone quarry that is owned and operated by Fred Weber, Inc. ("Fred Weber"). The processing plant was constructed on a 40-acre tract within this lease. Fred Weber mines a layer of sandstone in the quarry and delivers it to the processing plant on a price per ton basis. Any and all property ownership, leases and environmental permits related to the mine are the responsibility of Fred Weber.

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. While the Festus facility's production techniques and distribution model enable it to serve all major silica markets, the primary production has been frac sand for oil and gas proppants.

Fred Weber holds and maintains six operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Hazen Mine, Nevada

EPM operates the Hazen, Nevada DE mine that is located three miles southwest of the unincorporated town of Hazen, Churchill County, Nevada. The Hazen mine is located on approximately 1,255 acres of land, comprised of 120 acres of private land and 1,135 acres of federal BLM land. The BLM land is held by four different claim holders. The largest 640-acre parcel has an annual minimum payment of $24,000 and a $1/ton shipped royalty. The second 480-acre parcel has an annual minimum

payment of $7,200 and a $1/ton shipped royalty. The next 13.5-acre parcel has a $1,650 annual payment and a $1/ton shipped royalty. The last 1.7-acre property has a fixed annual payment of $413. Additionally, EPM pays all of the annual mining claim fees at $165 per claim.

Our small open-pit surface mine at Hazen operates as a stand-alone, satellite mine that provides raw DE to several sites. Most of the raw ore is shipped by truck to the Company's nearby DE processing plant at Clark, Nevada. To a lesser extent, raw ore is loaded and shipped by rail to Johns Manville's processing plants in Fruita, Colorado and Grambling, Louisiana. Contracted mining campaigns take place every two to three years and these are designed to build on-site stockpiles to meet shipping requirements. On average, 20,000 bank cubic yards of DE are shipped off site each year.

The Hazen mine operates under five operating permits issued by federal and state agencies. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Hurtsboro, Alabama

We, through U.S. Silica Company, operate a silica sand mine and processing plant near Hurtsboro, Macon County, Alabama. The Hurtsboro processing plant is located on 117 acres of owned land. Mining occurs within 10 miles of the processing plant, on three separate leased land parcels that encompass a total of some 1,100 acres. The mineral leases include subsurface mineral rights, with royalties paid at $0.60 to $0.75 per ton mined.

Our surface mines in Hurtsboro use propane and electricity to produce whole grain silica. The reserves are mined from the Cusseta member of the lower Ripley Formation. The processing plant allows the Hurtsboro facility to meet a wide variety of focused specifications on product composition from customers. As such, the Hurtsboro site services multiple end markets, such as foundry, building products and recreation.

The Hurtsboro site maintains 11 separate mining and environmental permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Jackson/Aberdeen, Mississippi

EP Engineered Clays, our indirect subsidiary, operates a bentonite clay processing plant in the town of Jackson, Hinds County, Mississippi. The Jackson processing facility sits on 70 acres of private land leased from BASF, the former owner of the site. The annual lease rate for the plant is $157,000. EPM also owns a one-acre lot located next to the processing plant as an injection well site. The calcium bentonite raw ore supplied to the Jackson plant is mined at the Aberdeen / Fowlkes Mine, near the town of Aberdeen, Monroe County, Mississippi. The mine property is 648 acres, comprised of 502 acres of owned land and 146 acres of private leased land, split between three landowners. The total annual lease payment for the private property is $12,000.

Our Jackson facility uses natural gas, electricity, water and sulfuric acid to process calcium bentonite from our Fowlkes open-pit mine, located approximately 170 miles from the Jackson plant. 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 Jackson plant operates under five separate operating permits. The Fowlkes Mine operates under two operating permits. Both sites also comply with other state and federal regulations that do not require a specific permit. All required permits are secured, and the sites are operating in full compliance.

Jackson, Tennessee

We, through U.S. Silica Company, operate a silica sand mine and processing plant near Jackson, Tennessee. The Jackson, Tennessee site includes 132 acres of owned land in two separate parcels. The processing plant is located on the smaller 27-acre parcel of owned land. The second parcel of 105 acres hosts a mined-out dredge pond. There are no leases, no royalties and no other associated payments specific to the Jackson, Tennessee land parcels.

Our surface mines in Jackson, Tennessee 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 processing plant allows the Jackson, Tennessee facility to meet a wide variety of focused specifications on product composition from customers. As such, the site services multiple end markets, such as fiberglass, building products, ceramics, fillers and extenders and recreation.

The Jackson, Tennessee site operates under three active permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Lamesa, Texas

In accordance with subpart 1300 of Regulation S-K, we have determined that the Lamesa site is a material mining property. Therefore, a description of the Lamesa site and its operations can be found below. See "— Lamesa, TX."

Lovelock/Colado, Nevada

In accordance with subpart 1300 of Regulation S-K, we have determined that the Colado site, which includes the Lovelock Processing Plant, in Lovelock, Nevada, is a material mining property. Therefore, a description of the Colado site and its operations can be found below. See "— Lovelock/Colado, NV."

Mapleton Depot, Pennsylvania

We, through U.S. Silica Company, operate surface mines and a silica sand processing plant near Mapleton Depot, Huntingdon County, Pennsylvania. The Mapleton Depot operation includes a total of 1,838 acres that are owned outright by U.S. Silica. This ownership includes subsurface mineral and water rights. An additional 345 acres of land is leased for mineral rights and access from three different land owners. The standard lease payment is $0.255 per ore ton mined on 260 acres of the lease land total. The remaining 85 acres have an annual lease amount of $98,000 for mine haulage route access.

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 processing plant allows the Mapleton Depot facility to meet a wide variety of focused specifications on product composition from customers. As such, the Mapleton Depot site services multiple end markets, such as glass, specialty glass, building products, recreation and oil and gas proppants.

Mapleton Depot operates under 21 different operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Mauricetown, New Jersey

We, through U.S. Silica Company, own and operate a silica sand processing plant near the unincorporated community of Mauricetown, Cumberland County, New Jersey. The processing plant is located on the west side of Mauricetown and sits on 488 owned acres of private land. The dredge mining operation, almost six miles northeast near Port Elizabeth, is located on 816 acres of owned land. All property at both sites is owned outright by U.S. Silica. No royalties are paid for the mining of sand on the property.

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 processing plant allows the Mauricetown facility to meet a wide variety of focused specifications on product composition from customers. As such, the Mauricetown site services multiple end markets, such as foundry, filtration, building products and recreation.

Mauricetown operates under 25 separate permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Middleton, Tennessee

EPM owns and operates the Middleton, Tennessee site, comprised of some 1,154 acres located on both sides of the border between Tennessee and Mississippi. The bentonite clay processing plant sits on an owned, 131-acre parcel of land located five miles south of the town of Middleton, Hardeman County, Tennessee. The Tennessee mines consist of 420 acres of owned land and 78 acres of leased land. Mining activities occur in both Tennessee and Mississippi. We own all mineral rights on the leased land, but the land will be transferred back to the owner after cessation of mining. There is no royalty or other fee associated with this lease. The Mississippi mines consist of 525 acres of owned land.

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 per year. The facility uses natural gas, electricity and sulfuric acid to process ore. With on-site milling, screening and multiple packaging capabilities, the Middleton site serves several different industries including agriculture, sports fields and absorbents.

The Middleton mine operates under five separate operating permits. The Middleton processing plant operates under two additional state permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Mill Creek, Oklahoma

We, through U.S. Silica Company, own and operate the Mill Creek mine and processing plant, near the town of Mill Creek, Johnston County, Oklahoma. The Mill Creek operation consists of two silica sand processing plants separated by four miles. The South Plant sits on 369 owned acres and is the home to the ground silica milling, sizing and bagging operations. The North Plant is comprised of 1,501 owned acres and is home to the mine and the whole grain silica sand drying and shipping operations. There are two leased tracts at the North Plant totaling 71 acres; both tracts have been fully mined, but the acreage is still part of the active state mining permit. The purchase agreements for lands at the North Plant included provisions for royalty payments based on tons mined and sold from the individual tracts. Some of this property was purchased over 40 years ago, and the royalty rates are less than the $0.10 per ton.

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 processing plant enables the site to produce multiple whole grain and ground silica products through various methods. 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 North Plant and mine operate under eight separate operating permits. The South Plant must abide by six separate operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and both sites are operating in full compliance.

Millen, Georgia *[processing plant only]*

We, through U.S. Silica Company, operate a silica processing facility located near the town of Millen, Jenkins County, Georgia. The site sits on 819 leased acres, of which the processing plant covers approximately 50 acres.

Our Millen facility has a natural gas kiln that enables the production of specialty industrial products that require high temperature heat treatments. These products are sold to customers that produce finished goods for the building products and residential construction markets. The site can ship bulk or packaged material via truck and the Norfolk Southern railway.

There is only one operating permit of record for the Millen, Georgia Plant. The site also complies with other state and federal regulations that do not require a specific permit. The required permit is secured, and the site is operating in full compliance.

Montpelier, Virginia

We, through U.S. Silica Company, own and operate an aplite mine and processing plant near the unincorporated community of Montpelier, Hanover County, Virginia. The mine and processing plant are located on 824 owned acres, with full mineral rights. No leases or royalties are associated with the property.

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 processing plant allows the Montpelier facility to meet a wide variety of focused specifications on product composition from customers. As such, the Montpelier site services multiple end markets, such as glass, building products and recreation.

The Montpelier site maintains four different operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Ottawa, Illinois

In accordance with subpart 1300 of Regulation S-K, we have determined that the Ottawa site is a material mining property. Therefore, a description of the Ottawa site and its operations can be found below. See “— Ottawa, IL.”

Pacific, Missouri

We, through U.S. Silica Company, own and operate a silica sand mine and production facility near the town of Pacific, St. Louis County, Missouri. The mine and processing plant are located on 524 wholly owned acres, with full sub-surface mineral and water rights. No leases, royalties or other specific payments are associated with the property.

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 processing plant allows the Pacific facility to meet a wide variety of focused specifications on product composition from customers. As such, the Pacific site services multiple end markets, such as glass, foundry, fillers and extenders and oil and gas proppants.

The Pacific site maintains nine different operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Popcorn, Nevada

EPM operates a stand-alone, satellite perlite mine located 18 miles south of the town of Fallon, Churchill County, Nevada. The mine is located on 196 acres of leased federal BLM land, and is comprised of 10 lode mineral claims. The mineral claims are renewed with the BLM on an annual basis at a cost of $165/claim, with a total annual cost of $1,650.

There are no buildings or facilities on this mine site. The only equipment is an owned service front-end loader that is used to muck from blasted ore stockpiles and to load over-the-road haul trucks. The mine operates seasonally (typically for only 30-days per year) in order to build ore stockpiles for shipping. The average annual mine production from the Popcorn mine is around 10,000 stockpile cubic yards.

The raw perlite ore is trucked as needed throughout the year to the Lovelock processing plant, some 80 miles away. At the Lovelock processing plant, the perlite ore is crushed, sized and passed through a flash dryer. At this point, it is either loaded into railcars for shipment to the Blair, Nebraska facility or it is further processed at the Lovelock plant.

The Popcorn mine maintains three different operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Rockwood, Michigan

We, through U.S. Silica Company, own and operate a silica sand production facility within the city of Rockwood, Wayne County, Michigan. The site is comprised of two land parcels, totaling 872 wholly owned acres with full sub-surface mineral and water rights. One land parcel hosts the processing plant; the other land parcel is a drill-proven, undeveloped future mining reserve. No leases, royalties or other specific payments are associated with the Rockwood property.

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 processing plant allows the Rockwood facility to meet a wide variety of focused specifications on product composition from customers. As such, the Rockwood site services multiple end markets, such as glass, building products, oil and gas proppants and chemicals.

The Rockwood facility maintains five operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Sanders, Arizona

EPM operates a calcium bentonite clay mine near the town of Sanders, Apache County, Arizona. There is no clay processing plant at Sanders, just an open pit mine. The mine property consists of some 10,240 acres comprised of private lands leased from Newmont Realty Company. The lease is based on a royalty structure, with an advanced annual royalty of $20,000 and a production royalty of $0.72/ton of dry clay or $1.01/ton of overburden sand (both of which are deducted from the royalty advance). Sand from the site is sold to a third-party, Silica Services. The royalty unit values are annually adjusted based on the Consumer Price Index (“CPI”). No additional fees are associated with the property as Silica Services manages transportation logistics and associated fees with BLM and the Navajo Indian Nation.

Mine operations include two open pits, and a seasonal mechanized bench mining strategy is employed. Overburden waste is mined and removed to access the bentonite clay ore horizon during the wet, winter months. The ore is typically mined and stockpiled in the dry summer periods so that the clay has minimal interaction with water. Mining is completed by a third-party contractor.

Due to the Sanders mine’s location on tribal lands within the Navajo Indian Nation’s Reservation, there are no permits required from any regulatory authority for mining. Regardless, our operation still abides by the requirements captured in the Company’s Corporate Environmental Management Plan.

Sequoya, Nevada *[exploration property]*

The Sequoya, Nevada property is an advanced greenfield DE exploration property in Churchill County, Nevada. It is strategically located along a major highway only seven miles northwest of our Fernley, Nevada Plant and 34 miles southeast from our Lovelock, Nevada processing plant. The site is accessible by exploration and gravel roads that connect back to the I-80 exit at Jessup. EPM owns 42 placer claims that cover 840 acres of public land. The mineral claims are renewed with the BLM on an annual basis at a cost of $165/claim, with a total annual cost of $6,930.

There are no buildings or facilities on site, only a couple of open surface test pits where a bulk sample had been obtained for plant process testing.

The site is currently permitted only for exploration and is in full compliance. No operating permits are required since the site is not developed for operations.

Siskiyou, California *[exploration property]*

The Siskiyou, California site is a greenfield DE exploration property in Siskiyou County, California and it is located approximately 23 miles south of Klamath Falls, Oregon. EPM controls 152 placer claims (146 owned, 6 leased) that cover some 2,240 acres of public land. The owned claims are renewed with the BLM on an annual basis at a cost of $165/claim, with a total annual cost of $24,090. The leased claims are renewed annually at a cost of $7,920.

The property is comprised mostly of undeveloped, high-plains ranch lands with suitable access for exploration drilling provided by pre-existing ranch roads. There are no buildings or facilities on this exploration property.

The site is currently permitted only for exploration and is in full compliance. No operating permits are required since the site is not developed for operations.

Sparta, Wisconsin

We, through U.S. Silica Company, own and operate a silica sand dredge mine and production facility within the town of Sparta, Monroe County, Wisconsin. The site is comprised of 614 wholly owned acres, with full sub-surface mineral and water rights. No leases, royalties or other specific payments are associated with the Sparta site.

Our facility at Sparta uses natural gas and electricity to produce whole grain silica products. The reserve geology is that of high purity alluvial sands, with the primary erosional source being the Wonewoc Formation, known for its round, coarse grains and superior crush strength properties, which makes it an ideal substrate for oil and gas proppants. We mine sand through dredging, where the sand is extracted from the ground with water without the use of any chemicals. The sand is then transported as slurry via pipeline to the processing facility where it is sorted and dried in a no-emissions manner with vibratory screens that use gravity and clean-burning natural gas dryers.

The Sparta site maintains seven operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Vale, Oregon

EPM owns and operates a DE mine and processing plant near the town of Vale, Malheur County, Oregon. The processing plant is on 300 owned acres located seven miles southwest of Vale. The Vale mine is located 50 miles southwest of Vale, near Juntura, Oregon. The mine consists of some 12,640 acres of land that is a combination of private, state and federal lands. There are 1,680 acres of private land, 1,280 acres of Oregon state land, 8,080 acres (186 mineral claims) of BLM land and 1,600 acres of land patented under the Stock Raising Homestead Act ("SRHA") with private surface estate and federal mineral estate (320 acres of which are owned by EPM). Annual lease and royalty payments are made to the Diatomite Products Company ($15,000 minimum plus $10.60/ton sold), the State of Oregon ($10,000 minimum plus $3.16/ton sold) and the federal government of the United States ($165/claim fee). The royalty unit values are adjusted annually based on the CPI.

Our Vale open pit, ramp and bench mine uses mechanical, hard-rock mining methods to extract the DE ore strata. The DE ore strata are part of the Miocene-aged, Juntura Formation. At the processing plant, two kilns can produce calcined and flux-calcined DE 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 Vale site maintains eight operating permits (four plant and four mine). The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Summary of Annual Production

The table below shows annual mined volumes (in thousands) at our mining properties for the fiscal years ended December 31, 2022, 2021 and 2020:

		Tons Mined		
Mine / Location	**Product Type**	**2022**	**2021**	**2020**
Berkeley Springs, WV	Silica Sand	283	301	275
Blair, NE[(1)]	Perlite	—	—	—
Clark, NV	Diatomaceous Earth	54	63	68
Columbia, SC	Silica Sand	377	398	346
Crane, TX	Silica Sand	3,886	3,263	697
Dubberly, LA	Silica Sand	132	138	106
Fernley, NV	Diatomaceous Earth	63	67	46
Festus, MO	Silica Sand	1,468	1,567	1,290
Hazen, NV	Diatomaceous Earth	7	9	11
Hurtsboro, AL	Silica Sand	196	196	125
Jackson/Aberdeen, MS[(2)]	Bentonite Clay	84	84	74
Jackson, TN[(3)]	Silica Sand	—	—	—
Lamesa, TX	Silica Sand	5,871	4,692	3,271
Lovelock/Colado, NV[(4)]	Diatomaceous Earth	175	166	151
Mapleton Depot, PA	Silica Sand	457	308	265
Mauricetown, NJ	Silica Sand	113	166	155
Middleton, TN	Bentonite Clay	190	198	216
Mill Creek, OK	Silica Sand	1,898	1,544	1,235
Millen, GA[(5)]	Silica Sand	—	—	—
Montpelier, VA	Aplite	245	163	196
Ottawa, IL	Silica Sand	3,230	2,967	1,953
Pacific, MO	Silica Sand	951	942	922
Popcorn, NV[(6)]	Perlite	8	—	9
Rockwood, MI[(7)]	Silica Sand	—	—	—
Sanders, AZ	Bentonite Clay	14	14	13
Sequoya, NV[(8)]	Diatomaceous Earth	—	—	—
Siskiyou, CA[(9)]	Diatomaceous Earth	—	—	—
Sparta, WI[(10)]	Silica Sand	1,232	2,025	—
Vale, OR	Diatomaceous Earth	133	117	105

[(1)] Blair, NE is a perlite processing plant. There are no tons mined on site.

[(2)] Mining occurs at the Aberdeen, MS mine. Jackson, MS is the location of the clay processing plant.

[(3)] Jackson, TN purchases raw sand from a third party. There are no tons mined on site.

[(4)] Mining occurs at the Colado, NV mine. Lovelock, NV is the location of the DE processing plant.

[(5)] Millen, GA is a silica sand processing plant. There are no tons mined on site.

[(6)] Popcorn, NV mining is campaigned every two to three years. Raw ore is processed at Blair, NE and/or Lovelock/Colado, NV processing plant.

[(7)] Rockwood, MI purchases raw sand from a third party. There are no tons mined on site.

[(8)] Sequoya, NV is an advanced greenfield exploration property. No mining except a small (~300 tons) bulk sample has been mined from this site.

[(9)] Siskiyou, CA is a greenfield exploration property. To date, no tons have been mined on site.

[(10)] Sparta, WI was idled in 2020.

Summary of Resources and Reserves

In accordance with subpart 1300 of Regulation S-K, we engaged John T. Boyd Company ("JT Boyd") as the qualified person to prepare the TRS for the disclosure of resources and reserves at our four material mining properties: Crane, TX, Lamesa, TX, Ottawa, IL and Lovelock/Colado, NV. The estimates of measured, indicated and inferred resources and proven and probable reserves at our four material mining properties in this Annual Report on Form 10-K have been prepared by JT Boyd and in accordance with the technical definitions established by the SEC under subpart 1300 of Regulation S-K.

Set forth in the tables below are our estimates (in thousands of tons) as of December 31, 2022 of (1) measured, indicated and inferred resources (exclusive of proven and probable reserves), (2) proven and probable reserves and (3) saleable reserves.

The reference point for the resources is in situ or in-place material. The reference point for mineable reserves is recoverable tons after mining extraction losses. The reference point for saleable reserves is finished goods available for sale after process plant losses.

Summary of Resources for the fiscal year ended December 31, 2022[1]				
	Measured Resources	**Indicated Resources**	**Measured + Indicated Resources**	**Inferred Resources**
Silica Sand[2]				
United States				
Berkeley Springs, WA	—	—	—	7,950
Columbia, SC	—	—	—	3,666
Crane, TX	—	2,246	2,246	16,396
Dubberly, LA	—	—	—	1,959
Festus, MO	—	—	—	—
Hurtsboro, AL	—	—	—	—
Jackson, TN[3]	—	—	—	—
Lamesa, TX	622	4,748	5,370	5,002
Mapleton Depot, PA	—	—	—	—
Mauricetown, NJ	—	—	—	4,000
Mill Creek, OK	—	—	—	16,361
Millen, GA[4]	—	—	—	—
Ottawa, IL	—	—	—	88
Pacific, MO	—	—	—	—
Rockwood, MI[5]	—	—	—	—
Sparta, WI	—	—	—	13,500
Total Silica Sand	622	6,994	7,616	68,922
Diatomaceous Earth[6]				
United States				
Clark, NV	—	—	—	1,258
Fernley, NV	—	—	—	4,727
Hazen, NV	—	—	—	—
Lovelock/Colado, NV	—	—	—	689
Sequoya, NV	—	—	—	1,978
Siskiyou, CA	—	—	—	3,656
Vale, OR	—	—	—	19,780
Total Diatomaceous Earth	—	—	—	32,088
Bentonite Clay[7]				
United States				
Jackson/Aberdeen, MS	—	—	—	—

Middleton, TN	—	—	—	11,806
Sanders, AZ	—	—	—	—
Total Bentonite Clay	—	—	—	11,806
Perlite[7]				
United States				
Blair, NE[8]	—	—	—	—
Popcorn, NV	—	—	—	—
Total Perlite	—	—	—	—
Aplite[7]				
United States				
Montpelier, VA	—	—	—	—
Total Aplite	—	—	—	—

[1] Item 1303(b)(ii) of Regulation S-K requires disclosure of resources to be exclusive of reserves. Unless otherwise noted, properties with no resources reported represent a 100% conversion of currently known geologic resources to mineable reserves.

[2] Silica sand resources are based on the 2022 average price of $43 per ton.

[3] Jackson, TN purchases raw sand from a third party. There are no resources on this site.

[4] Millen, GA is a silica sand processing plant that receives ore from other sites. There are no resources on this site.

[5] Rockwood, MI purchases raw sand from a third party. There are no resources on this site.

[6] Diatomaceous earth resources are based on the 2022 average price of $675 per ton.

[7] Resources are based on the 2022 average price of $286 per ton of bentonite clay, perlite and aplite.

[8] Blair, NE is a perlite processing plant. There are no resources on this site.

Summary Reserves for the fiscal year ended December 31, 2022

	Proven Reserves[1]	Probable Reserves[1]	Total Mineable Reserves[1]	Total Saleable Reserves[1]
Silica Sand[2]				
United States				
Berkeley Springs, WV	7,540	—	7,540	6,484
Columbia, SC	6,883	1,755	8,638	7,048
Crane, TX[3]	110,156	37,632	147,788	121,925
Dubberly, LA	3,818	—	3,818	3,207
Festus, MO	11,126	7,411	18,537	13,903
Hurtsboro, AL	493	92	585	410
Jackson, TN[4]	—	—	—	—
Lamesa, TX[5]	93,311	12,800	106,111	79,583
Mapleton Depot, PA	645	2,100	2,745	2,471
Mauricetown, NJ	10,969	—	10,969	9,324
Mill Creek, OK	13,010	—	13,010	11,839
Millen, GA[6]	—	—	—	—
Ottawa, IL[7]	89,742	1,486	91,228	78,913
Pacific, MO	9,485	7,994	17,479	14,857
Rockwood, MI[8]	7,600	—	7,600	4,940
Sparta, WI	17,510	2,740	20,250	17,479
Total Silica Sand	382,288	74,010	456,298	372,383

Diatomaceous Earth[9]				
United States				
Clark, NV	1,711	1,745	3,456	2,419
Fernley, NV	1,085	4,713	5,798	4,679
Hazen, NV	335	84	419	293
Lovelock/Colado, NV[10]	1,671	2,808	4,479	3,655
Sequoyah, NV	111	755	866	707
Siskiyou, CA[11]	—	—	—	—
Vale, OR	16,357	27,287	43,644	38,108
Total Diatomaceous Earth	21,270	37,392	58,662	49,861
Bentonite Clay[12]				
United States				
Jackson/Aberdeen, MS	—	1,063	1,063	737
Middleton, TN	2,513	12,854	15,367	6,608
Sanders, AZ	—	570	570	570
Total Bentonite Clay	2,513	14,487	17,000	7,915
Perlite[12]				
United States				
Blair, NE[13]	—	—	—	
Popcorn, NV	4,323	1,790	6,113	5,502
Total Perlite	4,323	1,790	6,113	5,502
Aplite[12]				
United States			—	
Montpelier, VA	—	12,000	12,000	6,000
Total Aplite	—	12,000	12,000	6,000

[1] Ore reserves are stated as "mineable" reserves (after mining losses) and saleable reserves (after processing plant losses) as finished product available for sale to customers.

[2] Unless otherwise stated, silica sand reserves are based on the 2022 average price of $43 per ton.

[3] Crane, TX economic evaluation based on $23.92/product ton; lower than 2022 ASP of $30.78/ product ton. No price escalation used.

[4] Jackson, TN purchases raw sand from a third party. There are no reserves or tons mined on site.

[5] Lamesa, TX economic evaluation based on $23.90/product ton; lower than 2022 ASP of $31.39/product ton. No price escalation used.

[6] Millen, GA is a silica sand processing plant that receives ore from other U.S. Silica sites. There are no ore reserves or tons mined at this site.

[7] Ottawa, IL economic evaluation based on $42.37/product ton; equal to 2022 ASP. No price escalation used.

[8] Rockwood, MI purchases raw sand ore from a third party. Unmined, proven ore reserves are wholly owned.

[9] Unless otherwise stated, diatomaceous earth reserves are based on the 2022 average price of $675 per ton.

[10] Lovelock/Colado, NV economic evaluation based on $697.27/product ton; equal to 2022 ASP. No price escalation used.

[11] Siskiyou, CA is a greenfield exploration property. As such, there are no mineable reserves to report.

[12] Reserves are based on the 2022 average price of $286 per ton of bentonite clay, perlite and aplite.

[13] Blair, NE is a perlite processing plant. There are no reserves or tons mined at this site.

MATERIAL SITE DESCRIPTIONS

Crane, Texas

The Crane site is a surface proppant sand mining and processing operation located 25 miles west of the City of Odessa in Crane County, Texas. The cities of Lubbock and Dallas, Texas, are located approximately 147 miles northeast and 355 miles east, respectively, of the Crane Operation. Geographically, the Crane Operation’s processing plant is located at approximately 31° 38' 58.34" N latitude and 102° 42' 2.52" W longitude.

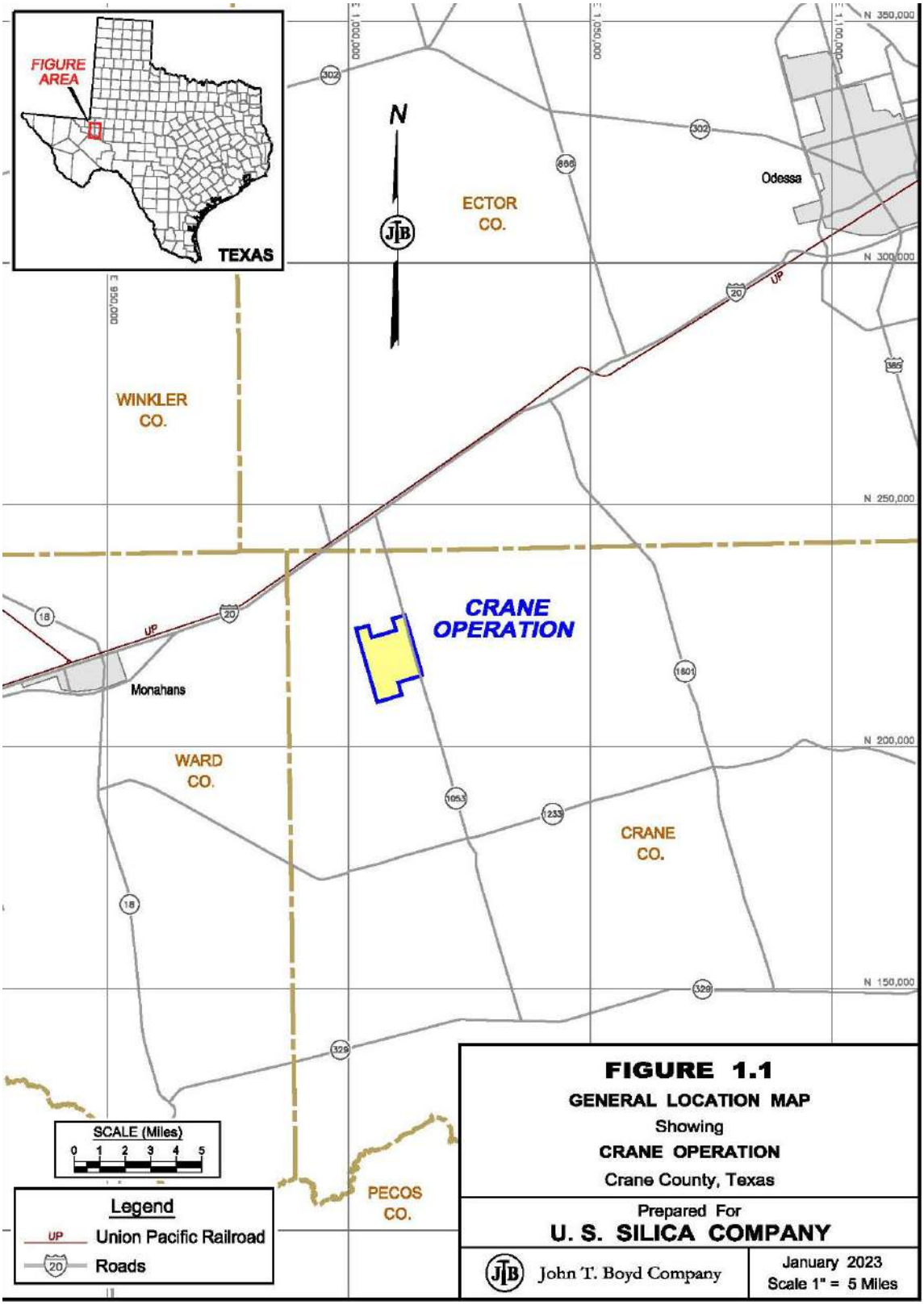


FIGURE AREA
TEXAS
N
JTB
ECTOR CO.
Odessa
WINKLER CO.
CRANE OPERATION
Monahans
WARD CO.
CRANE CO.
PECOS CO.
UP
N 350,000
N 300,000
N 250,000
N 200,000
N 150,000
E 950,000
E 1,000,000
E 1,050,000
E 1,100,000
SCALE (Miles)
0 1 2 3 4 5
Legend
Union Pacific Railroad
Roads
FIGURE 1.1
GENERAL LOCATION MAP
Showing
CRANE OPERATION
Crane County, Texas
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
January 2023
Scale 1" = 5 Miles

The Crane site is comprised of approximately 3,200 acres of surface and mineral rights wholly owned by U.S. Silica. We purchased the Crane site in May 2017 from McKnight Natural Resources and Flying U Properties after completing an initial reconnaissance-level exploration drilling campaign. The purchase agreement included a royalty of $1 per ton of finished sand sold to be paid to the former owners. U.S. Silica is the first landowner to mine proppant sand at this location. Other than sparse agricultural activity and various oil and gas infrastructure, previous landowners have not developed the site.

The Crane site is supported by various utilities and transportation networks needed to allow processing and transportation of finished proppant sands. Electricity is delivered through an above-ground network that terminates at a substation at the processing facility, and from there electricity is distributed via several underground and above-ground powerlines. Initial makeup water for industrial use is obtained through a regional water gathering and transport system for mining and oil and gas operators in west Texas. Potable water is delivered via water jugs and bottles. Natural gas is supplied via several underground pipelines. Tailings from processing are disposed of in old mining pit impoundments. Transportation needs are met through a well-developed road network on both paved and graded dirt roads. No local railheads are present.

We conducted two exploration campaigns on the Crane site. The 26 drill holes completed in and around the property were utilized to define the lateral extent, thickness, particle size distribution, and mineralogy of the target sand deposit at the Crane site. The site is currently in production phase. Contractors are employed to conduct surface mining on the Crane site. The target sand deposit is excavated using conventional truck and excavator methods. The sand does not require drilling or blasting. Excavators and/or front-end loaders are used to load articulated haul trucks with disaggregated sand. The haul trucks deliver raw sand material to stockpiles located near the processing facilities.

Mined material from the stockpile arrives at the Wet Processing Plant by truck, where it is screened and washed to remove vegetation, oversize (> 40-mesh) and fine waste (<200-mesh) material. The remaining material is mixed with water to create a slurry that is passed through a series of desliming cyclones and attrition scrubbers to remove clay and undersized (very fine) particles. The deslimed material is then processed through a series of hydrosizers, hydro-cyclones, and vacuum filters to remove excess water. The remaining “work-in-progress (WIP)” material is stockpiled outside on a drain pad to further reduce moisture before it is recovered and enters the Dry Processing Plant. Within the Dry Processing Plant, the WIP sand is dried, sized and sorted. The 40/70-mesh and 100-mesh dry finished products are stored in silos prior to loading in bulk truck for shipment to customers in the Permian Basin.

The Crane, TX process facility was built in early 2018 with all new and state-of-the-art equipment. This five-year old equipment and facility infrastructure have been responsibly operated and maintained with a rigorous preventive maintenance program which keeps the plant ready to respond to customer demand. The total net book value of the Crane site's real property and fixed assets as of December 31, 2022 was $173.8 million.

Several natural and man-made features have been identified in and around the Crane site which may limit the mineable areas of the property. These features include setbacks from neighboring properties, setbacks from oil production infrastructure and setbacks from existing utility corridors. We have included suitable setbacks in our mining plans to avoid disturbing these areas.

Mining and processing activities on the Crane site are regulated by several federal and state laws. As mandated by these laws and regulations, numerous permits are required for mining, processing, and other incidental activities. All necessary permits are in place or applied for to support immediate operations.

A summary of Crane’s mineral resources and reserves as of December 31, 2022 and 2021 is shown below (in thousands of tons). For more information on our resources and reserves, please refer to Sections 11.0 and 12.0 of the Crane TRS.

Crane, TX - Summary of Resources

	December 31, 2022	December 31, 2021		
Classification	**Amount [1][2][3]**	**Amount [1][2]**	**Amount Change 2022 vs. 2021**	**Percent Change 2022 vs. 2021**
Measured	—	—	—	—
Indicated	2,246	—	2,246	100 %
Total Measured + Indicated Resources	2,246	—	2,246	100 %
Inferred	16,396	27,300	(10,904)	(40)%

[1] Item 1304(b)(2)(d)(2) of regulation S-K requires disclosure of resources to be exclusive of reserves. Unless otherwise noted, line items with no resources represent a 100% conversion of currently known geologic resources to mineable reserves.

[2] Only one commodity (silica sand) is mined, processed and sold at the Crane site. Production of silica sand is driven by market demand. Silica sand production can be modified in response to that demand. As such, the application of minimum mining thicknesses, maximum stripping ratios, or cut-off grades is not generally considered in the estimation of silica sand resources for the Crane site.

[3] Mineral resources for Crane, TX are based on ASP of $30.78/product ton.

Crane, TX - Summary of Reserves

	December 31, 2022	December 31, 2021		
Classification[1]	**Amount[2][3][4]**	**Amount[2][4]**	**Amount Change 2022 vs. 2021**	**Percent Change 2022 vs. 2021**
Proven Reserves				
Mineable	110,156	116,408	(6,252)	(5)%
Saleable[5]	90,879	N/A[5]	N/A[5]	N/A[5]
Probable Reserves				
Mineable	37,632	47,500	(9,868)	(21)%
Saleable[5]	31,046	N/A[5]	N/A[5]	N/A[5]
Total Reserves				
Mineable Total	147,788	163,908	(16,120)	(10)%
Saleable Total[5]	121,925	N/A[5]	N/A[5]	N/A[5]

[1] Ore reserves are stated as "mineable" reserves (after mining losses) and saleable reserves (after processing plant losses) as finished product available for sale to customers. Crane's mine recovery rate is 95% and process recovery rate is 82.5%, resulting in an overall product yield of 78.4%.

[2] Only one commodity (silica sand) is mined, processed and sold at the Crane site. Production of silica sand is driven by market demand. Silica sand production can be modified in response to that demand. As such, the application of minimum mining thicknesses, maximum stripping ratios, or cut-off grades is not generally considered in the estimation of silica sand reserves for the Crane site.

[3] Crane, TX economic evaluation based on $23.92/product ton; lower than 2022 ASP of $30.78/product ton. No price escalation used.

[4] Based on the lateral geologic continuity of Crane's sand dune deposits, Proven ore is defined within 1/4-mile radius of a drill hole. Probable ore extends out to 1/2-mile radius from a drill hole.

[5] On December 31, 2022, we determined to report our reserve estimates as saleable reserves. We have historically reported our reserve estimates as mineable reserves. In an effort to provide investors with a meaningful comparison during this period of transition, we have provided reserve estimates of both the mineable and saleable tons for the fiscal year ended December 31, 2022. As the decision to report saleable reserves was not made until December 31, 2022, saleable tons are not reported for the fiscal year ended December 31, 2021.

The decrease in resources from 2021 to 2022 is primarily attributable to (1) geologic block model changes and (2) changes to the life of mine plan. The decrease in reserves from 2021 to 2022 is primarily attributable to (1) depletion due to

mining of approximately 3,886,000 mineable tons, and (2) revisions to mine plans resulting in a downward adjustment of approximately 12,234,000 mineable tons.

Key assumptions and parameters relating to the mineral reserves at the Crane site are discussed in Sections 11.0 and 12.0, respectively, of the Crane TRS. Only material that can be economically, safely, and legally extracted is contained in these ore reserve estimates. Other key assumptions include the lateral geologic continuity of the mineable dune sand ore strata, ore block model construction criteria, mine design elements (stable pit slope geometries, mining bench height, pit floor limitations, pit dewatering, etc.), and setbacks (from property boundaries, power, natural gas, and water utility lines, oil well infrastructure and ore quality).

Lamesa, Texas

The Lamesa site is a surface proppant sand mining and processing operation located 11 miles northwest of the town of Lamesa in Dawson County, Texas. The cities of Dallas and Lubbock, Texas are located approximately 312 miles east and 56 miles northeast, respectively, of the Lamesa Operation. Geographically, the Lamesa site's processing plant is located at approximately 32° 48' 22.522" N latitude and 102° 7' 33.823" W longitude.

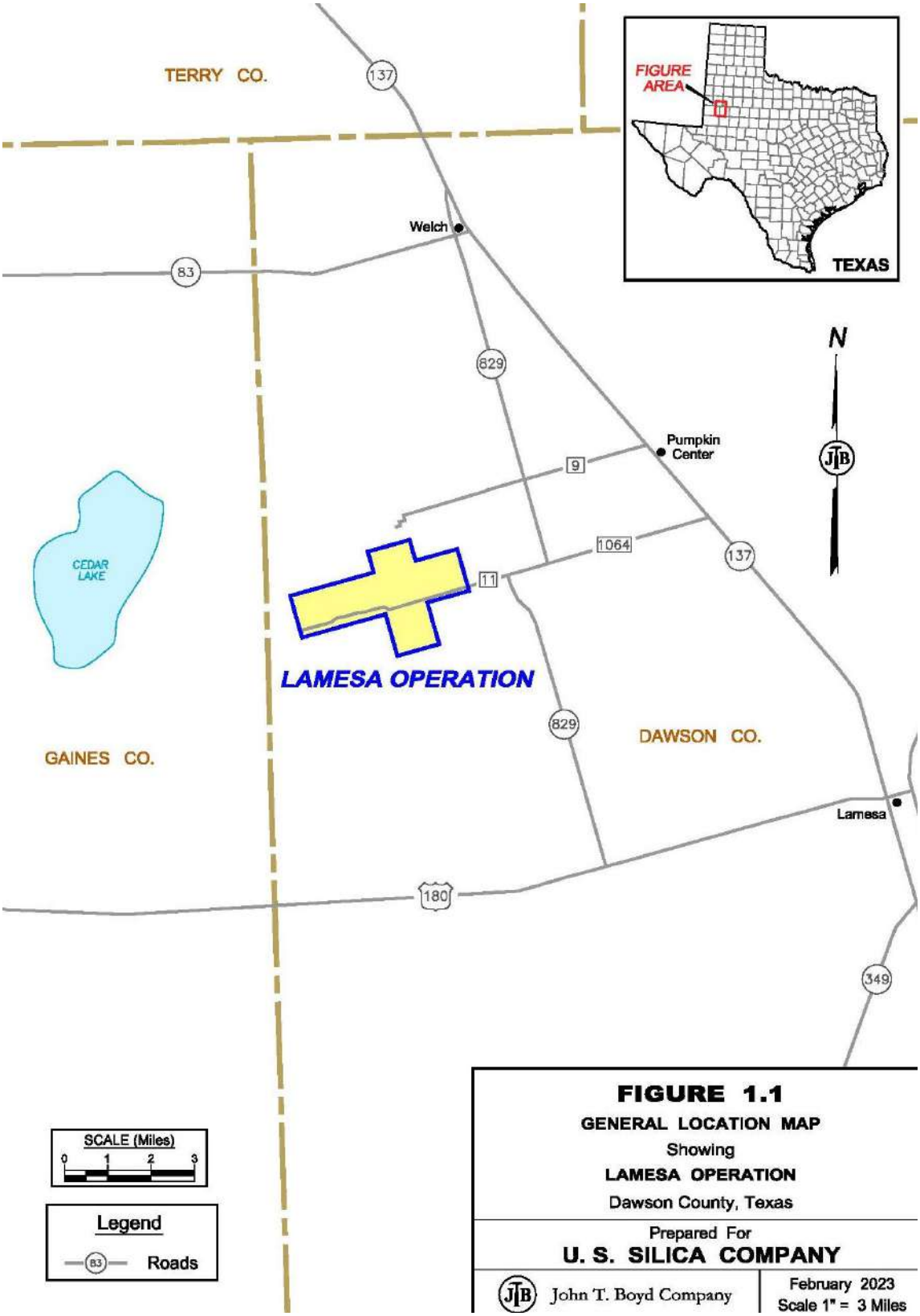


FIGURE 1.1

GENERAL LOCATION MAP

Showing

LAMESA OPERATION

Dawson County, Texas

Prepared For

U. S. SILICA COMPANY

John T. Boyd Company

February 2023

Scale 1" = 3 Miles

The Lamesa site comprises approximately 3,523 acres of surface and minerals rights fully owned by U.S. Silica. We are the first owner to explore for and mine proppant sand from the property. In developing the Lamesa Operation, we have completed three separate geologic exploration campaigns.

The site is accessible by private, state and county roads. The Lamesa site is connected to the local electrical and natural gas distribution systems. Lamesa has four on-site water wells and contracts in place with third parties which cover the life of the mine and provide for adequate access to processing water. The site has offices holding administrative, engineering, and operations staff. Additionally, there are several buildings that house the plant maintenance and support facilities.

Contractors are employed to conduct surface mining on the central and western portions of the Lamesa property. The unconsolidated dune sands sit at the surface, making it very amenable to open pit, mechanized mining methods utilizing heavy mobile mining equipment. At the mine, the unconsolidated sand is extracted directly from the open pit wall / mining face by front-end loader or by excavator and loaded into 40-ton or 60-ton articulated haul trucks. A fleet of haul trucks then delivers the mined sand ore to the processing plant.

At the processing plant, raw sand is sent through a static grizzly deck and vibratory dry scalping screen to remove any coarse debris. The sand and other material that passes the dry scalping screen is conveyed to the wet processing plant, where it is washed, creating a sand slurry. The underflow sand slurry then passes through a series of de-sliming cyclones and attrition scrubber cells that remove any free interstitial clays and grain-coating clays. The de-slimed sand slurry is then de-watered by another series of cyclones and de-water screens as it is conveyed to the drain pad stockpile. Once on the drain pad, gravity helps to naturally drain. This damp sand is then conveyed into one of the dry processing plant’s three rotary dryers. Within the dry processing plant, the sand is dried, sized and sorted. The 40/70-mesh and 100-mesh dry finished products are stored in silos prior to loading into bulk trucks for shipment to customers in the Permian Basin.

We are the first landowner to mine silica at the Lamesa site. Since purchasing the Lamesa property in 2017, we have invested funds to increase the efficiency and expand the capacity of the Lamesa site. All buildings were constructed in 2018. We contract for the loading and hauling portion of the operations at Lamesa. No U.S. Silica equipment is currently dedicated to the mine operations. Similarly, we primarily use leased mobile equipment in the processing plant. We believe that the Lamesa site and its operating equipment are maintained in good working condition. The total net book value of the Lamesa site's real property and fixed assets as of December 31, 2022 was $141.8 million.

Several natural and man-made features have been identified in and around the Lamesa site which may limit the mineable areas of the property. These features include setbacks from neighboring properties, setbacks from oil production infrastructure and setbacks from existing utility corridors. We have included suitable setbacks in our mining plans to avoid disturbing these areas.

Mining and processing activities on the Lamesa site are regulated by several federal and state laws. The Lamesa site is primarily environmentally regulated by the Texas Commission on Environmental Quality (the "TCEQ"). However, the State of Texas does not require a mining permit to extract material. The Lamesa site has secured and is operating in compliance with all required licenses, registrations, and permits.

A summary of Lamesa's mineral resources and reserves as of December 31, 2022 and 2021 is shown below (in thousands of tons). For more information on our resources and reserves, please refer to Sections 11.0 and 12.0 of the Lamesa TRS.

Lamesa, TX - Summary of Resources

	December 31, 2022	December 31, 2021		
Classification	**Amount [1][2][3]**	**Amount [1][2]**	**Amount Change 2022 vs. 2021**	**Percent Change 2022 vs. 2021**
Measured	622	—	622	100 %
Indicated	4,748	—	4,748	100 %
Total Measured + Indicated Resources	5,370	—	5,370	100 %
Inferred	5,002	—	5,002	100 %

[1] Item 1304(b)(2)(d)(2) of regulation S-K requires disclosure of resources to be exclusive of reserves. Unless otherwise noted, line items with no resources represent a 100% conversion of currently known geologic resources to mineable reserves.

[2] Only one commodity (proppant sand) is mined, processed and sold at the Lamesa site. Production of proppant sand is driven by market demand and can be modified in response to that demand. As such, the application of minimum thicknesses, maximum stripping ratios, or cut-off grades is not generally considered in the estimation of silica sand resources for the Lamesa site.

[3] Mineral resources for Lamesa, TX are based on ASP of $31.39/ product ton.

Lamesa, TX - Summary of Reserves

	December 31, 2022	December 31, 2021		
Classification[1]	**Amount[2][3][4]**	**Amount[2][4]**	**Amount Change 2022 vs. 2021**	**Percent Change 2022 vs. 2021**
Proven Reserves				
Mineable	93,311	85,678	7,633	9 %
Saleable[5]	69,983	N/A[5]	N/A[5]	N/A[5]
Probable Reserves				
Mineable	12,800	6,800	6,000	88 %
Saleable[5]	9,600	N/A[5]	N/A[5]	N/A[5]
Total Reserves				
Mineable Total	106,111	92,478	13,633	15 %
Saleable Total[5]	79,583	N/A[5]	N/A[5]	N/A[5]

[1] Ore reserves are stated as "mineable" reserves (after mining losses) and saleable reserves (after processing plant losses) as finished product available for sale to customers. Lamesa's mine recovery rate is 95% and process recovery rate is 75%, resulting in an overall product yield of 71.3%

[2] Only one commodity (proppant sand) is mined, processed and sold at the Lamesa site. Production of proppant sand is driven by market demand and can be modified in response to that demand. As such, the application of minimum thicknesses, maximum stripping ratios, or cut-off grades is not generally considered in the estimation of silica sand reserves for the Lamesa site.

[3] Lamesa, TX economic evaluation based on $23.90/ product ton; lower than 2022 ASP of $31.39/product ton. No price escalation used.

[4] Based on the lateral geologic continuity of Lamesa's sand dune deposits, Proven Ore is defined within 1/4-mile radius of a drill hole. Probable ore extends out to 1/2-mile radius from a drill hole. No P+P ore is considered outside the "dune line" where dunes are absent.

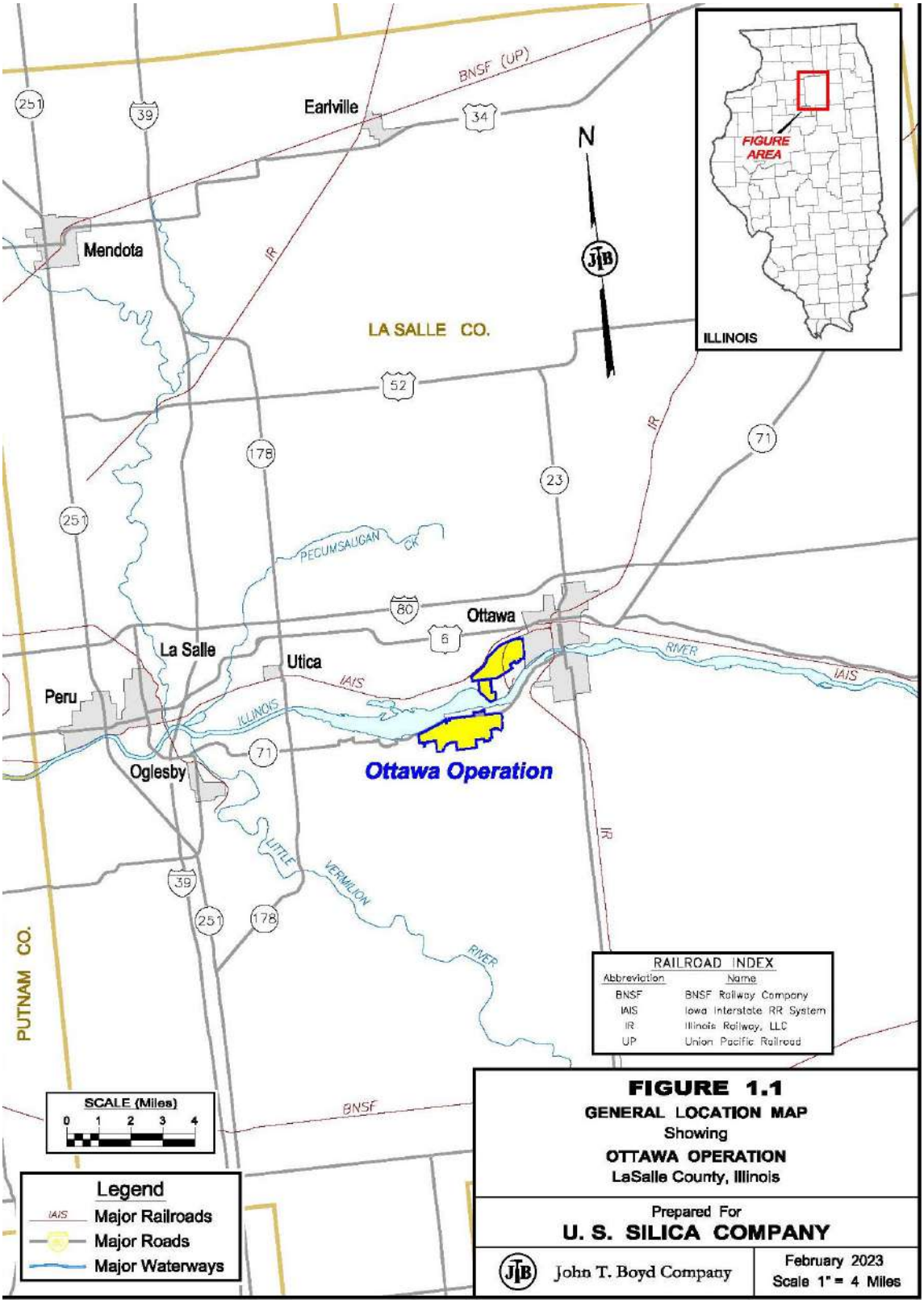
[5] On December 31, 2022, we determined to report our reserve estimates as saleable reserves. We have historically reported our reserve estimates as mineable reserves. In an effort to provide investors with a meaningful comparison during this period of transition, we have provided reserve estimates of both the mineable and saleable tons for the fiscal year ended December 31, 2022. As the decision to report saleable reserves was not made until December 31, 2022, saleable tons are not reported for the fiscal year ended December 31, 2021.

The increase in resources from 2021 to 2022 is primarily attributable to (1) geologic block model changes and (2) changes to the life of mine plan. The increase in reserves from 2021 to 2022 is attributed to (1) depletion due to mining of approximately 5,871,000 mineable tons, and (2) revisions to mine plans resulting in increases of approximately 19,428,000 mineable tons.

Key assumptions and parameters relating to the mineral reserves at the Lamesa site are discussed in Sections 11.0 and 12.0, respectively, of the Lamesa TRS. Only material that can be economically, safely, and legally extracted is contained in these ore reserve estimates. Other key assumptions include the lateral geologic continuity of the mineable dune sand ore strata; ore block model construction criteria; mine design elements (stable pit slope geometries, mining bench height, pit floor limitations, pit dewatering, etc.); and setbacks (from property boundaries, power, natural gas, and water utility lines, oil well infrastructure; and ore quality).

Ottawa, Illinois

U.S. Silica's Ottawa Operation is a surface silica sand mining and processing operation located immediately west of the City of Ottawa in LaSalle County, Illinois. The cities of Chicago and Peoria, Illinois, are located approximately 95 miles east-northeast and 75 miles southwest, respectively, of the Ottawa Operation. Geographically, the Ottawa Operation's processing plant is located at approximately 41° 20' 45.19" N latitude and 88° 52' 33.11" W longitude.


BNSF (UP)
Earlville
Mendota
IR
LA SALLE CO.
N
FIGURE AREA
ILLINOIS
52
178
23
71
251
PECUMSAUGAN CK
80
6
Ottawa
La Salle
Utica
Peru
IAIS
ILLINOIS
RIVER
Ottawa Operation
Oglesby
39
LITTLE VERMILION RIVER
PUTNAM CO.
BNSF
RAILROAD INDEX
Abbreviation | Name
BNSF | BNSF Railway Company
IAIS | Iowa Interstate RR System
IR | Illinois Railway, LLC
UP | Union Pacific Railroad
SCALE (Miles)
0 1 2 3 4
Legend
IAIS Major Railroads
Major Roads
Major Waterways
FIGURE 1.1
GENERAL LOCATION MAP
Showing
OTTAWA OPERATION
LaSalle County, Illinois
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 4 Miles

The Ottawa site includes approximately 2,072 acres of surface and mineral rights that we own outright. The North Ottawa site and former mine site covers 857 acres, the South Ottawa mine includes 1,215 acres. The St. Peter Sandstone has been extensively explored and mined on the Ottawa Operation. The North Ottawa site was mined out by 2010, and exploration on the South Ottawa site began in the year 2000. U.S. Silica provided data for 225 drill holes, wells, field measurements, and test holes in and around the South Ottawa site. These data were utilized to define the lateral extent, thickness, particle size distribution, and mineralogy of the remaining St. Peter Sandstone reserves at the Ottawa Operation.

The site is accessible by city, county and state roads as well as by two railroads. Our Ottawa site has an extensive rail-car loading, storage, and handling facility. Additionally, we have access to a privately-owned barge terminal that leases property from us. The Ottawa site is connected to the local electrical and natural gas distribution systems. Potable water is provided to the plant location by the City of Ottawa's public water system. Additionally, we have a private well at the mine site. The site has offices holding administrative, engineering, and operations staff. In addition, there are several buildings that house the processing facilities plant maintenance and support facilities.

We acquired the Ottawa site 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 site to meet a wide variety of focused specifications on product composition from customers. As such, the Ottawa site 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 silica 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 silica sand capacity. None of Ottawa's mining equipment is more than 15 years old. We believe that the Ottawa facility and its operating equipment are maintained in good working condition. The total net book value of the Ottawa facility's real property and fixed assets as of December 31, 2022 was $73.3 million.

Current mining at the Ottawa Operation takes place on the South Ottawa pit, where the St. Peter Sandstone is excavated using conventional surface mining methods. The first step in the mining process is the removal of the alluvial cover material, or “overburden,” from the sandstone layer. This is completed by a third-party contractor who uses a tracked excavator and articulated haul trucks. Next, blast holes are drilled into the sandstone and charged with a blasting agent. A front-end loader loads the sand into articulated haul trucks that carry the sand to a stockpile located on the pit floor. A bulldozer pushes sand from the stockpile to a high-pressure water cannon, or “monitor,” that uses recycled water from the plant. The water stream breaks up larger chunks of sand and creates a sand-water slurry that flows to a pump. The pump transfers the slurry to the processing plant.

At the processing plant, the sand slurry is fed to a washer that removes some of the ultrafines, which are pumped to tailings. From the washer, the slurry is pumped to hydrosizers that separate the sand into coarse and fine particle size fractions. From this point forward, the two streams are processed in dedicated, parallel circuits. Both streams are wet screened to remove oversized material, which is pumped to an abandoned pit. The screened sand is then thickened and dewatered by vacuum filter belts before being fed to the four fluidized bed dryers. Dried fine sand from the dryers reports to a sizing system where screening units sort the sand by grain size and store it in dedicated bins. A system of blending conveyors then produce sands, which are then loaded into bulk railcars or trucks or bagged for specific end-use markets. Separate streams from the sizing operation feed the fine sand plant and grinding mills.

The fine sand processing plant was built in the 1950’s and consists of a screening system and sixteen product bins. The bagging processing plant is automated and includes a warehouse for packaged product. Truck loading was upgraded in 1998. Whole grain products are shipped primarily to the foundry, glass and hydraulic fracturing industries. The milling processing plant was commissioned in the 1940’s. Whole grain sand is pulverized in dry ball mills using ceramic grinding balls to minimize product contamination. The mill discharge is air-classified, and the product is transported to storage bins for bulk loading or packaging. The oversize grains are rejected by the classifiers and return to the mill feed for re-grinding in a closed loop.

Several natural and man-made features have been identified in and around the Ottawa site which may limit the mineable areas of the property. These features include setbacks from neighboring properties, right of ways, marshes, brooks, wetlands and archaeologically significant sites.

To operate active mining operations on the property, the Illinois Department of Natural Resources, Department of Mines and Minerals required an approved Land Reclamation Plan. Additional restrictions on the use of lands are included in other permits that are required by various Illinois State agencies to operate the mine and plant. The Ottawa site has secured necessary permits and is operating in compliance with all required licenses, registrations, and permits.

A summary of Ottawa's mineral resources and reserves as of December 31, 2022 and 2021 is shown below (in thousands of tons). For more information on our resources and reserves, please refer to Sections 11.0 and 12.0 of the Ottawa TRS.

Ottawa, IL - Summary of Resources

	December 31, 2022	December 31, 2021		
Classification	**Amount [1][2][3]**	**Amount [1][2]**	**Amount Change 2022 vs. 2021**	**Percent Change 2022 vs. 2021**
Measured	—	—	—	— %
Indicated	—	—	—	— %
Total Measured + Indicated Resources	—	—	—	— %
Inferred	88	—	88	100 %

[1] Item 1304(b)(2)(d)(2) of regulation S-K requires disclosure of resources to be exclusive of reserves. Unless otherwise noted, line items with no resources represent a 100% conversion of currently known geologic resources to mineable reserves.

[2] Only one commodity (silica sand) is mined, processed and sold at the Ottawa site. Production of silica sand is driven by market demand. Silica sand production can be modified in response to that demand. As such, the application of minimum mining thicknesses, maximum stripping ratios, or cut-off grades is not generally considered in the estimation of silica sand resources for the Ottawa site.

[3] Mineral resources for Ottawa, IL are based on ASP of $42.37/product ton.

Ottawa, IL - Summary of Mineral Reserves

	December 31, 2022	December 31, 2021		
Classification[1]	**Amount[2][3][4]**	**Amount[2][4]**	**Amount Change 2022 vs. 2021**	**Percent Change 2022 vs. 2021**
Proven Reserves				
Mineable	89,742	66,927	22,815	34 %
Saleable[5]	77,627	N/A[5]	N/A[5]	N/A[5]
Probable Reserves				
Mineable	1,486	33,002	(31,516)	(95)%
Saleable[5]	1,286	N/A[5]	N/A[5]	N/A[5]
Total Reserves				
Mineable Total	91,228	99,929	(8,701)	(9)%
Saleable Total	78,913	N/A[5]	N/A[5]	N/A[5]

[1] Ore reserves are stated as "mineable" reserves (after mining losses) and saleable reserves (after processing plant losses) as finished product available for sale to customers. Ottawa's mine recovery rate is 95% and process recovery rate is 86.5%, resulting in an overall product yield of 82.2%.

[2] Only one commodity (silica sand) is mined, processed and sold at the Ottawa site. Production of silica sand is driven by market demand. Silica sand production can be modified in response to that demand. As such, the application of minimum mining thicknesses, maximum stripping ratios, or cut-off grades is not generally considered in the estimation of silica sand reserves for the Ottawa site.

[3] Ottawa, IL economic evaluation based on $42.37/product ton; equal to 2022 ASP. No price esclation used.

[4] The St. Peter Sandstone occurs as a massive, thick sandstone stratum that is well defined geologically and well understood from historical mining. As such, "reasonable" drill hole spacing in conjunction with mine exposures are used to define Proven Ore. Probable Ore has a more widely spaced drill pattern in the same geologically continuous strata but absent of any mine development exposure.

[5] On December 31, 2022, we determined to report our reserve estimates as saleable reserves. We have historically reported our reserve estimates as mineable reserves. In an effort to provide investors with a meaningful comparison during this period of transition, we have provided reserve estimates of both the mineable and saleable tons for the fiscal year ended December 31, 2022. As the decision to report saleable reserves was not made until December 31, 2022, saleable tons are not reported for the fiscal year ended December 31, 2021.

The increase in resources from 2021 to 2022 is primarily attributable to (1) geologic block model changes and (2) changes to the life of mine plan. The decrease in reserves from 2021 to 2022 is attributed to (1) depletion due to mining of approximately 3,230,000 mineable tons, and (2) revisions to mine plans resulting in deductions of approximately 5,470,000 mineable tons.

Key assumptions and parameters relating to the mineral reserves at the Ottawa site are discussed in Sections 11.0 and 12.0, respectively, of the Ottawa TRS. Only material that can be economically, safely, and legally extracted is contained in these ore reserve estimates. Other key assumptions include the lateral geologic continuity of the ubiquitous St. Peter Sandstone ore strata; ore block model construction criteria; mine design elements (stable pit slope geometries, mining bench height, ground control, pit dewatering, etc.); setbacks (from property boundaries, power, natural gas, and other utility lines); and ore quality).

Lovelock, Nevada - Colado Mine

Located in Pershing County, Nevada, U.S. Silica's Colado site comprises a surface DE mining operation (the "Colado Mine") and a DE processing plant (the "Lovelock Processing Plant") and is approximately 80 miles northeast of the City of Reno. The Lovelock Processing Plant is located seven miles northeast of the City of Lovelock and the Colado Mine is located approximately 19 miles northwest of the plant. Geographically, the southeastern-most access to the Colado Mine is located at approximately 40° 16' 29.66" N latitude and 118° 43' 41.51" W longitude. The Lovelock Processing Plant is located at approximately 40° 14' 45.51" N latitude and 118° 23' 25.35" W longitude.

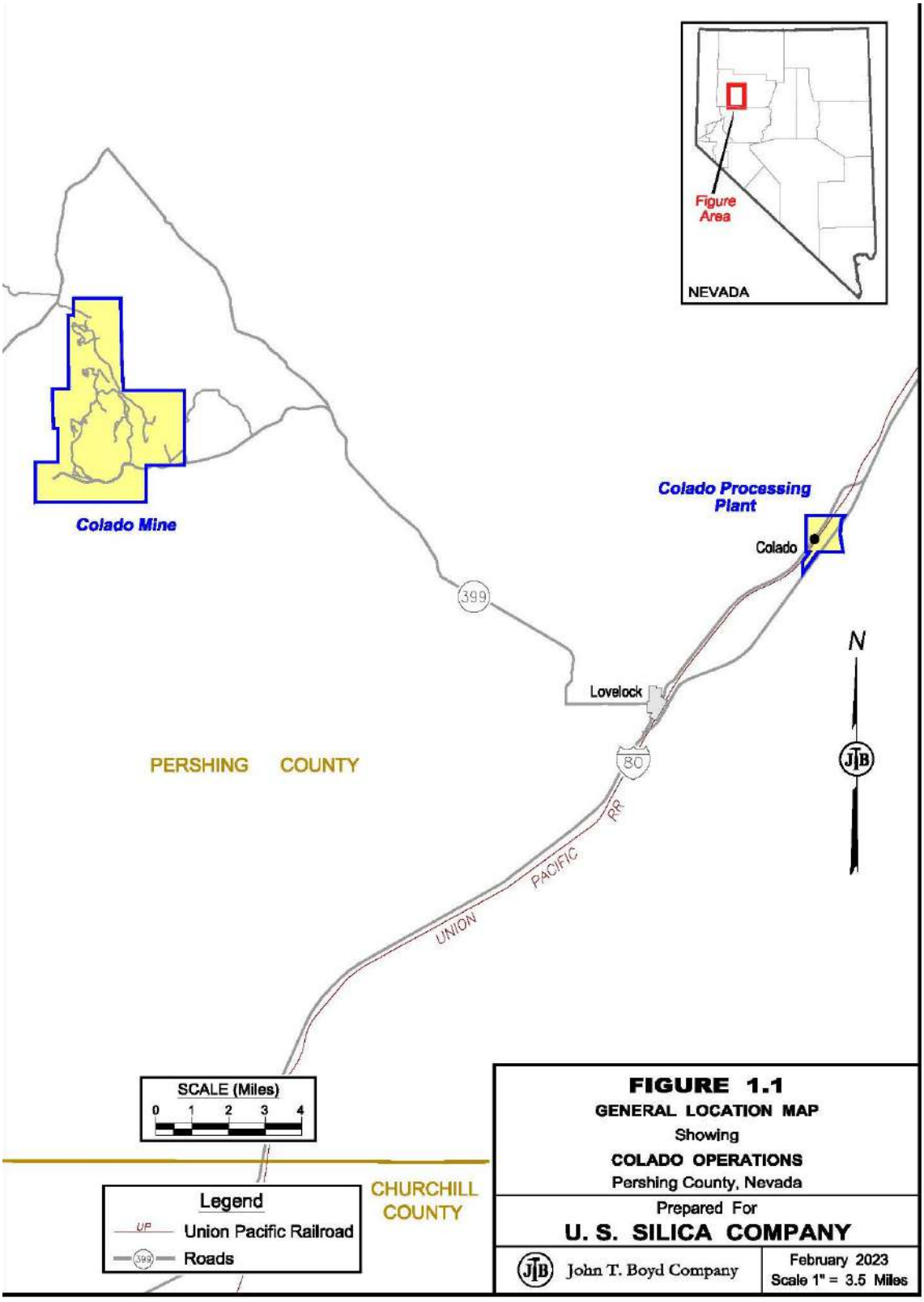


Figure Area
NEVADA
Colado Mine
Colado Processing Plant
Colado
399
Lovelock
N
PERSHING COUNTY
80
UNION PACIFIC RR
SCALE (Miles)
0 1 2 3 4
CHURCHILL COUNTY
Legend
UP Union Pacific Railroad
399 Roads
FIGURE 1.1
GENERAL LOCATION MAP
Showing
COLADO OPERATIONS
Pershing County, Nevada
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3.5 Miles

We hold surface and/or mineral rights to approximately 9,526 acres across the two sites that comprise the Colado Operation. The Colado Mine property comprises approximately 8,993 acres of private and federal lands leased from the Franco-Nevada U.S. Corporation (Franco-Nevada) and the U.S. Department of the Interior's Bureau of Land Management (BLM), respectively. The Lovelock Processing Plant property encompasses approximately 493 acres owned in fee by U.S. Silica and 40 acres leased from the BLM.

The land lease with Franco-Nevada is for 3,842 acres of surface and mineral control at the Colado Mine and is renewed annually. The BLM leases provide U.S. Silica with surface control on federal lands at both the Colado Mine and Lovelock Processing Plant properties. Mineral rights on the BLM-administered lands at the Colado Mine are provided to U.S. Silica by way of 148 active mining claims, of which 132 are active placer claims. Mineral claims are renewed on an annual basis. The Franco-Nevada U.S. Corporation leases are based on a royalty-type structure that considers the tons of product sold during the lease period and how material used for the product tons sold was mined from each lease area. The leases also include a minimum annual amount to ensure a minimum annual payment to the landowners. The royalty unit values are adjusted based on the Consumer Price Index, a statistical index that is calculated and published annually by the U.S. Bureau of Labor Statistics. As for the federal land lease, the Bureau of Land Management publishes a mining claim fees schedule on an annual basis.

The Colado site is remote with few improved roads and installed mine-related infrastructure. The site is accessible by private and state roads. Energy is provided primarily by diesel powered equipment. Water requirements are primarily for dust suppression which is supplied by a municipal water source that is trucked by tanker to the Colado mine. The only onsite buildings are a maintenance shelter used to service the mine equipment and a small portable office. The existing infrastructure is adequate for current production levels and for the ramp-up of operations to full capacity.

The Colado site was initially commissioned in 1959. We acquired the Colado site in connection with the completion of the acquisition of EPM in May 2018. Significant exploration had been undertaken by EPM (and affiliates) prior to our acquisition of the property in 2018. Throughout various exploration campaigns, the subject DE deposits have been identified and delineated through geologic mapping, outcrop sampling, trenching, geophysical surveys, and extensive exploration drilling. Despite Colado's long history, none of the site's mining equipment is more than 50 years old. We believe that the Colado site's facility and its operating equipment are maintained in good working condition. The total net book value of Colado's real property and fixed assets as of December 31, 2022 was $25.1 million. The total net book value for the mine excludes the reserves because during purchase accounting we did not allocate the reserves by mine and they are included at the corporate level.

The DE mining horizons at the Colado Mine are relatively shallow, quite thick, and are moderately dipping. These characteristics favor conventional surface mining techniques. The Colado site is currently in the production phase. Mining occurs on benches, in a stair-like fashion, to remove the overburden waste material and expose the DE beds. The Colado Mine maintains a stockpile of approximately 600,000 cubic yards at the mine site to meet the demands of the processing plant. The raw ore is delivered by truck to the Lovelock Processing Plant.

At the plant, ore is fed into a crusher, where the ore is appropriately sized. The ore is fed into feed silos and then introduced into a flash dryer. There the ore is heated and pneumatically transferred through the wet end of the process. Grit or heavy particles are classified and separated from the process as waste (about 10% of material), while all other material continues through the process. The classified ore is fed to a variable-speed natural gas rotary kiln, where it is processed up to temperatures of 2,000 degrees Fahrenheit. Depending on the final product to be made, soda ash can be added to the kiln, in a process called flux-calcining. The final product from the kiln is then fed to a series of classifiers to further sort the product into different size ranges. Material that is oversized is fed to a hammer mill to be ground, and then to be re-processed; material that is undersized is sent to the fine filler circuit, and everything else is sent to corresponding bins for the last step, packaging and shipping.

No significant encumbrances exist at the mine site. State and federal permits are required to mine the DE and operate the processing plant. Surface disturbance is permitted as needed in accordance with state regulations. Major modifications to the permit are made as needed. We submitted a major modification application during 2021 to address unpermitted disturbance, reclamation of erosion areas, and proposed expansions for continued DE mining operations. We expect final approval of this application during 2023, however, its pending status does not negatively impact current mine operations.

A summary of Colado's DE mineral resources and reserves as of December 31, 2022 and 2021 is shown below (in thousands of tons). For more information on our resources and reserves, please refer to Sections 11.0 and 12.0 of the Colado TRS.

Lovelock/Colado, NV - Summary of Resources

	December 31, 2022	December 31, 2021		
Classification	**Amount [1][2][3]**	**Amount [1][2]**	**Amount Change 2022 vs. 2021**	**Percent Change 2022 vs. 2021**
Measured	—	—	—	— %
Indicated	—	—	—	— %
Total Measured + Indicated Resources	—	—	—	— %
Inferred	689	—	689	100 %

[1] Item 1304(b)(2)(d)(2) of regulation S-K requires disclosure of resources to be exclusive of reserves. Unless otherwise noted, line items with no resources represent a 100% conversion of currently known geologic resources to mineable reserves.

[2] Only one commodity (DE) is mined, processed and sold. The end use can result in multpile products based on customer need. Because targeted blending can be used to meet finished product specification, application of cut-off grades is not generally considered in the estimation of DE resources for the Colado site.

[3] Mineral resources for Lovelock/Colado, NV are based on ASP of $697.27/product ton.

Lovelock, NV - Summary of Mineral Reserves				
	December 31, 2022	December 31, 2021		
Classification[1]	Amount[2][3][4]	Amount[2][4]	Amount Change 2022 vs. 2021	Percent Change 2022 vs. 2021
Proven Reserves				
Mineable	1,671	1,100	571	52 %
Saleable[5]	1,364	N/A[5]	N/A[5]	N/A[5]
Probable Reserves				
Mineable	2,808	3,361	(553)	(16)%
Saleable[5]	2,291	N/A[5]	N/A[5]	N/A[5]
Total Reserves				
Mineable	4,479	4,461	18	— %
Saleable(5)	3,655	N/A[5]	N/A[5]	N/A[5]

[1] Ore reserves are stated as "mineable" reserves (after mining losses) and saleable reserves (after processing plant losses) as finished product available for sale to customers. Lovelock/Colado's mine recovery rate is 76.4% and process recovery rate is 81.6%, resulting in an overall site recovery of 62.3%.

[2] Only one commodity DE is mined, processed and sold at the Lovelock/Colado site. The end use can result in multiple products based on customer need. Because targeted blending can be used to meet finished product specification, application of cut-off grades is not generally considered in the estimation of DE reserves for the Lovelock/Colado site.

[3] Lovelock/Colado, NV economic evaluation based on $697.27/product ton; equal to 2022 ASP. No price escalation used.

(4) The DE ore at Colado occurs as layered, basin-controlled, lacustrine sedimentary deposits interbedded with volcanic ash deposits. As such, tighter drill hole spacings are required to delineate ore reserves. Proven Ore is defined by drill hole spacings of less than 200-ft. and containing at least 5-ore intercepts. Probable Ore is defined by drill hole spacing of less than 400-ft. and containing at least 3-ore intercepts.

(5) On December 31, 2022, we determined to report our reserve estimates as saleable reserves. We have historically reported our reserve estimates as mineable reserves. In an effort to provide investors with a meaningful comparison during this period of transition, we have provided reserve estimates of both the mineable and saleable tons for the fiscal year ended December 31, 2022. As the decision to report saleable reserves was not made until December 31, 2022, saleable tons are not reported for the fiscal year ended December 31, 2021.

The increase in resources from 2021 to 2022 is primarily attributable to (1) geologic block model changes and (2) changes to the life of mine plan. The increase in reserves from 2021 to 2022 is primarily attributable to (1) depletion due to mining of approximately 175,000 mineable tons and (2) revisions to mine plans resulting in net increases of approximately 193,000 mineable tons.

Key assumptions and parameters relating to the mineral reserves at Colado are discussed in Sections 11.0 and 12.0, respectively, of the Colado TRS. Among them are assumptions with respect to geologic continuity of the ore; specific chemical and physical characteristics of the DE deposits; mine design criteria defining safe, efficient and "mineable" geometries (stable pit designs, mining bench height, ground control, economic overburden stripping ratios, haul road design, pit floor design, waste mining and backfill requirements; and ore stockpile management).

Internal Controls Disclosure

The modeling and analysis of our reserves has been developed by our personnel, reviewed by several levels of internal management and, in the case of the four material properties, audited by JT Boyd. This section summarizes the internal control considerations for our development of estimations, including assumptions, used in resource and reserve analysis and modeling.

When determining resources and reserves, as well as the differences between resources and reserves, management developed specific criteria, each of which must be met to qualify as a resource or reserve, respectively. These criteria, such as

demonstration of economic viability, repeatable geologic continuity, and meeting generally accepted quality specifications, are specific and attainable, as applicable. Calculations using site specific criteria for the four material properties were reviewed by JT Boyd. JT Boyd was provided with our exploration data, geologic models, and volumetric estimates and took a three-step approach to validate our resource and reserve estimates at the four material properties: (1) verified the accuracy of geologic model inputs by comparison with drilling logs and laboratory reports, (2) compared the geologic model with compiled drilling data and (3) prepared a stratigraphic grid model of the geologic unit and independently estimated pit shell volumes. All calculations were conducted independently by JT Boyd, then compared to our internal estimates and found to be within acceptable variance. A detailed description of the methodology used to calculate mineral reserves for the four material properties is provided in the TRSs filed as exhibits to this Annual Report.

For all properties, geographical modeling and mine planning efforts serve as a base assumption for resource and reserve estimates at each location. These outputs have been prepared by both our personnel and third-party consultants, and the methodology is compared to industry best practices. Mine planning decisions, such as mining bench height, execution of mining processes and ground control, are determined and agreed upon by our management. Management adjusts forward-looking models by reference to historic mining results, including reviewing performance versus predicted levels of production from the mineral deposit, and if necessary, re-evaluating mining methodologies if production outcomes were not realized as predicted. Ongoing mining and investigation of the mineral deposit, coupled with product quality validation pursuant to industry best practices and customer expectations, provides further empirical evidence as to the homogeneity, continuity and characteristics of the mineral resource. Ongoing quality validation of production also provides a means to monitor for any potential changes in ore-body quality.

Management also assesses risks inherent in mineral resource and reserve estimates, such as the accuracy of geological data that is used to support mine planning, identify hazards and inform operations of the presence of mineable deposits. Also, management is aware of risks associated with potential gaps in assessing the completeness of mineral extraction licenses, entitlements or rights, or changes in laws or regulations that could directly impact the ability to assess mineral resources and reserves or impact production levels. Risks inherent in overestimated reserves can impact financial performance when revealed, such as changes in amortization that are based on life of mine estimates. Quarterly, and as part of our SOX compliance guidelines, a review meeting is held with senior leadership from operations, finance, mine planning, and environmental to review the overall ore reserve changes and any potential impacts to our site asset retirement obligations or site financial metrics.

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 zero, two, and one new silicosis cases filed in 2022, 2021 and 2020, respectively. As of December 31, 2022, there were 42 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 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. 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. For more information regarding silica-related litigation, see Part I, Item 1A. Risk Factors of this Annual Report on Form 10-K and Note P - Commitments and Contingencies to our Consolidated Financial Statements in Part II, Item 8 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 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. 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.

Holders of Record

On February 17, 2023, there were 76,120,988 shares of our common stock outstanding, which were held by approximately 23 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 of this Annual Report on Form 10-K.

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. 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.

The following table presents the total number of shares of our common stock that we purchased during the fourth quarter of 2022, the average price paid per share, the number of shares that we repurchased as part of our share repurchase program, and the approximate dollar value of shares that still could have been repurchased at the end of the applicable fiscal period pursuant to our share repurchase program:

Period	Total Number of Shares Withheld or Forfeited [2]	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, 2022 - October 31, 2022	31,321	$ 12.15	—	$ 126,540,060
November 1, 2022 - November 30, 2022	7,869	$ 13.77	—	$ 126,540,060
December 1, 2022 - December 31, 2022	4,130	$ 12.18	—	$ 126,540,060
Total	43,320	$ 12.45	—	

(1) In May 2018, our Board of Directors authorized and announced the repurchase of up to $200 million of our 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. As of December 31, 2022, we have repurchased a total of 5,036,139 shares of our common stock at an average price of $14.59.

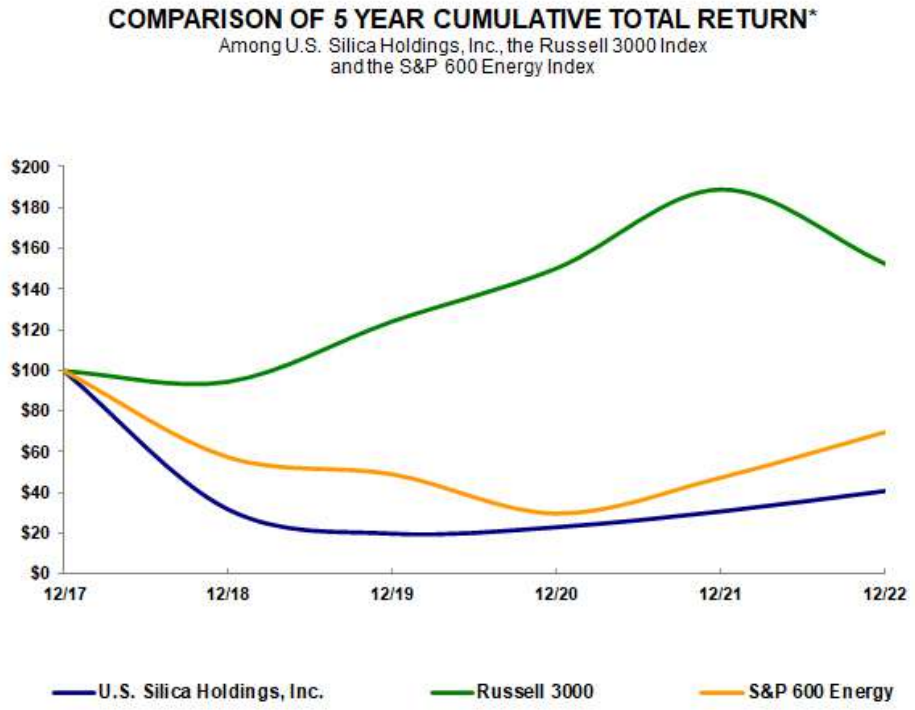
(2) Represents shares withheld by U.S. Silica to pay taxes due upon the vesting of employee restricted stock and restricted stock units for the months ended October 31, November 30 and December 31, 2022, respectively.

We did not repurchase any shares of common stock under our share repurchase program during the three months ended December 31, 2022.

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, 2017 and the reinvestment of all dividends. We elected to include the Standard and Poor's SmallCap 600 Energy Sector index because a number of companies in this index are included in the custom peer group used to determine relative total shareholder return performance share units that we have granted to employees.



*$100 invested on 12/31/17 in stock or index, including reinvestment of dividends.
Fiscal year ending December 31.

Unregistered Sales of Equity Securities

None.

ITEM 6. SELECTED FINANCIAL DATA

[Reserved]

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 the description of the business appearing in Item 1. Business and the Consolidated Financial Statements in Item 8. Financial Statements and Supplementary Data of this Annual Report on Form 10-K.

This discussion contains forward-looking statements, as discussed under "Forward-Looking Statements". 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 of this Annual Report on Form 10-K.

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 global performance materials company and a leading producer of commercial silica used in the oil and gas industry and in a wide range of industrial applications. In addition, through our subsidiary EP Minerals, LLC ("EPM") we are an industry leader in the production of industrial minerals, including diatomaceous earth, clay (calcium bentonite and calcium montmorillonite), and perlite.

During our 123-year history, we have developed core competencies in mining, processing, logistics and materials science that enable us to produce and cost-effectively deliver over 600 diversified product types to customers across our end markets. As of December 31, 2022, we had 27 operating mines and processing facilities and two additional exploration stage properties across the United States. We control 468 million tons of reserves of commercial silica, which can be processed to make 182 million tons of finished products that meet API frac sand specifications, and 82 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 and optimize our asset utilization.

Recent Trends and Outlook

Oil and gas proppants end market trends

Our operations in our Oil & Gas Proppants segment are materially dependent on the levels of activity in natural gas and oil exploration, development and production, which are affected by 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 volatility.

During 2020, the COVID-19 pandemic and related economic repercussions, coupled with an inadequate supply response and exacerbated by the lack of global storage capacity, resulted in a precipitous decline in crude oil prices. Demand for our proppant and logistics services declined as our customers reduced their capital spending budgets and drilling and completion operations in response to lower oil prices. Crude oil prices began to rebound from 2020 levels, with the West Texas Intermediate price of crude oil increasing 55% during 2021 and 7% during 2022. This resulted in strong well completion activity and improved pricing for our Oil & Gas Proppants segment. Strong customer demand and favorable pricing in this segment continued throughout 2022, offset in part by higher transportation and other costs.

The conflict between Russia and Ukraine has increased the disruption, instability and volatility in global markets and industries. As our operations are significantly U.S. based, we have not been, to date, materially impacted by this conflict. We continue to monitor the uncertainty surrounding the extent and duration of this ongoing conflict and the impact that it may have on the global economy and on our business.

Heightened levels of inflation present risk for us in terms of increased labor costs, transportation costs and energy costs that may not be able to be passed on to customers through increased pricing. In addition, rising interest rates will increase our borrowing costs on new and existing debt.

During the three months ended December 31, 2022, frac sand demand, average selling price and tons sold increased compared to the three months ended September 30, 2022, as summarized below. Sales increased by 10% or $23.2 million in our Oil & Gas Proppants segment during the three months ended September 30, 2022 compared to the three months ended June 30, 2022 and increased by 39% or $68.0 million during the three months ended June 30, 2022 compared to the three months ended March 31, 2022. This was primarily due to higher energy prices and a rebound in overall well completion activity.

Amounts in thousands, except per ton data	Three Months Ended				Percentage Change for the Three Months Ended		
Oil & Gas Proppants	**December 31, 2022**	**September 30, 2022**	**June 30, 2022**	**March 31, 2022**	**December 31, 2022 vs. September 30, 2022**	**September 30, 2022 vs. June 30, 2022**	**June 30, 2022 vs. March 31, 2022**
Sales	$ 273,717	$ 267,461	$ 244,246	$ 176,244	2 %	10 %	39 %
Tons Sold	3,568	3,498	3,528	3,060	2 %	(1)%	15 %
Average Selling Price per Ton	$ 76.71	$ 76.46	$ 69.23	$ 57.60	— %	10 %	20 %

If oil and gas drilling and completion activity does not grow, or if frac sand supply remains greater than demand, then we may sell fewer tons, sell 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, and we could incur material asset impairments. If these events occur, we may evaluate actions to reduce costs and improve liquidity.

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-added product offerings in the industrial and specialty products end markets organically as well as through acquisitions, such as White Armor and EPM. Additionally, we have increased our focus on the alternative energy markets and products necessary for the supply chains of solar panels, renewable diesel and wind turbines. Sales of these new higher margin products have increased our Industrial & Specialty Products segment's profitability.

Heightened levels of inflation present risk for us in terms of increased labor costs, transportation costs and energy costs that may not be able to be passed on to customers through increased pricing. In addition, rising interest rates will increase our borrowing costs on new and existing debt. Additionally, we continue to monitor the uncertainty surrounding the extent and duration of the Russia and Ukraine conflict on our business as discussed above.

The COVID-19 pandemic caused severe economic, market and other disruptions worldwide, which began to affect our Industrial & Specialty Products segment in the second quarter of 2020. Even as the COVID-19 pandemic has subsided, we may continue to experience adverse impacts in this segment as a result of any long-term impacts resulting from the pandemic in the relevant markets.

Review of Strategic Alternatives

On June 13, 2022, we announced that we had concluded the review of strategic alternatives for our Industrial & Specialty Products ("ISP") segment which had been initiated in October 2021. We stated that, after extensive review and deliberation, and in consultation with our independent financial and legal advisors, the Board of Directors unanimously determined that retaining ownership of the ISP segment represented the best path forward for U.S Silica and our shareholders.

Our Business Strategy

The key drivers of our strategy include:

- increasing our presence and product offerings 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 Business Strategy and Strengths" in Item 1. Business of this Annual Report on Form 10-K.

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 the price of the product, transportation, surcharges, and 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 40%, 40% and 34% of total sales during the years ended December 31, 2022, 2021 and 2020, respectively. No single customer accounted for more than 10% of our total sales during the years ended December 31, 2022, 2021 and 2020. At December 31, 2022 and 2021, none of our customers' accounts receivable represented 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, particularly in volatile market conditions. When these negotiations occur, 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, 2022, we had 12 minimum purchase supply agreements in the Oil & Gas Proppants segment with initial terms expiring between 2023 and 2034. As of December 31, 2021, we had eight minimum purchase supply agreements in the Oil & Gas Proppants segment with initial terms expiring between 2022 and 2034. Collectively, sales to customers with

minimum purchase supply agreements accounted for 52% and 38% of Oil & Gas Proppants segment sales during the years ended December 31, 2022 and 2021, respectively.

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. Our operating costs can vary significantly based on the volume of product produced and current economic conditions. 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, human resources, information technology, and 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 selling, general, and administrative costs, corporate costs, plant capacity expansion expenses, and facility closure costs.

Segment contribution margin is not a measure of our financial performance under GAAP and should not be considered an alternative measure or superior to measures derived in accordance with GAAP. Our measure of segment contribution margin is not necessarily comparable to other similarly titled captions of other companies due to potential inconsistencies in the methods of calculation. 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 V - 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 or superior 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.

(amounts in thousands)	Year ended December 31,		
	2022	2021	2020
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$ 78,176	$ (33,761)	$ (114,094)
Total interest expense, net of interest income	75,437	69,173	79,148
Provision for taxes	26,159	(2,755)	(60,025)
Total depreciation, depletion and amortization expenses	140,166	161,131	155,568
EBITDA	319,938	193,788	60,597
Non-cash incentive compensation [1]	19,653	19,692	15,827
Post-employment expenses (excluding service costs) [2]	(2,654)	(1,920)	1,729
Merger and acquisition related expenses [3]	6,984	2,961	1,423
Plant capacity expansion expenses [4]	213	928	6,149
Contract termination expenses [5]	6,500	—	—
Goodwill and other asset impairments [6]	—	202	110,688
Business optimization projects [7]	1,209	105	67
Facility closure costs [8]	1,503	1,347	7,093
Gain on valuation change of royalty note payable [9]	—	—	(8,263)
Other adjustments allowable under the Credit Agreement [10]	212	6,372	8,612
Adjusted EBITDA	$ 353,558	$ 223,475	$ 203,922

(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 Q - 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, professional fees, bank fees, severance costs, and other employee related costs. 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.

(5) Reflects contract termination expenses related to strategically exiting a supplier service contract. 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) See Note X - Impairments to our Consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K for additional information. 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.

(7) Reflects costs incurred related to business optimization projects mainly 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 costs incurred mainly related to idled sand facilities and closed corporate offices, including severance costs and remaining contracted costs such as office lease costs, and common area maintenance fees. While these costs are not operational in nature and are not expected to continue for any singular event on an ongoing basis, similar types of expenses may recur in the future.

(9) Gains on valuation change of royalty note payable due to a change in estimate of future tonnages and sales related to the sand shipped from our Tyler, Texas facility. These gains are not operational in nature and are not expected to continue for any singular event on an ongoing basis. See Note K - Debt to our Consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K for additional information.

(10) Reflects miscellaneous adjustments permitted under the Credit Agreement such as recruiting fees and relocation costs. The year ended December 31, 2022 also included costs related to weather events and supplier and logistical issues of $1.1 million, severance restructuring costs of $1.8 million, an adjustment to non-controlling interest of $0.6 million, partially offset by net proceeds of the sale of assets of $1.7 million and $2.9 million related to the gain on extinguishment of debt. The year ended December 31, 2021 also included $3.4 million of transload shortfall and exit fees, $2.1 million related to expenses incurred with severe winter storms during the first quarter, $0.7 million of costs related to a power interruption at a plant location, partially offset by $0.1 million for a measurement period adjustment related to the Arrows Up bargain purchase. The year ended December 31, 2020 also included $1.6 million in transload shortfalls and exit fees, $4.6 million in inventory adjustments, $6.0 million in severance costs, and $11.8 million in legal expense due to the unsuccessful defense of a small number of our patents, offset by $15.2 million related to the gain attributable to the bargain purchase of Arrows Up.

Adjusted EBITDA-Trailing Twelve Months

Our Revolver contains a covenant that we maintain a consolidated total net leverage ratio of no more than 3.75:1.00 that, unless we have the consent of our lenders, 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. This ratio is calculated based on our Adjusted EBITDA for 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 (the "Term Loan") (collectively the "Credit Facility"). 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, 2022, we are in compliance with all covenants under our Credit Facility, and 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. Based on our consolidated leverage ratio of 2.99:1.00 as of December 31, 2022, we have access to the full availability of the Revolver. If our consolidated leverage ratio exceeds 3.75:1.00, we may draw up to $30.0 million without the consent of our lenders. The calculation of the consolidated leverage ratio incorporates the Adjusted EBITDA-trailing twelve months as follows:

(All amounts in thousands)		**December 31, 2022**
Total debt	$	1,053,733
Finance leases		3,260
Total consolidated debt	$	1,056,993
Adjusted EBITDA-trailing twelve months	$	353,558
Pro forma Adjusted EBITDA including impact of acquisitions [(1)]		—
Other adjustments for covenant calculation [(2)]		253
Total Adjusted EBITDA-trailing twelve months for covenant calculation	$	353,811
Consolidated leverage ratio[(3)]		2.99

(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, 2022 and 2021

This section of this Form 10-K generally discusses 2022 and 2021 items and year-to-year comparisons between 2022 and 2021. Discussions of 2020 items and year-to-year comparisons between 2021 and 2020 that are not included in this Form 10-K can be found in "Management's Discussion and Analysis of Financial Condition and Results of Operations" in Part II, Item 7 of our Annual Report on Form 10-K for the fiscal year ended December 31, 2021, which is incorporated by reference herein.

Sales

(In thousands except per ton data)	Year ended December 31,		Percent Change
	2022	2021	2022 vs. 2021
Sales:			
Oil & Gas Proppants	$ 961,667	$ 615,448	56 %
Industrial & Specialty Products	563,480	488,431	15 %
Total sales	$ 1,525,147	$ 1,103,879	38 %
Tons:			
Oil & Gas Proppants	13,654	11,610	18 %
Industrial & Specialty Products	4,362	4,227	3 %
Total Tons	18,016	15,837	14 %
Average Selling Price per Ton:			
Oil & Gas Proppants	$ 70.43	$ 53.01	33 %
Industrial & Specialty Products	129.18	115.55	12 %
Overall Average Selling Price per Ton	$ 84.66	$ 69.70	21 %

Total sales increased 38% for the year ended December 31, 2022 compared to the year ended December 31, 2021, driven by a 14% increase in total tons sold and a 21% increase in overall average selling price.

The increase in total sales was mainly driven by Oil & Gas Proppants sales, which increased 56% for the year ended December 31, 2022 compared to the year ended December 31, 2021. Oil & Gas Proppants average selling price increased 33% and tons sold increased 18%. This overall increase is due to higher energy prices and a rebound in overall well completion activity, offset partially by the recognition of approximately $49.0 million of shortfall fees during the second quarter of 2021 which did not recur in 2022.

The increase in total sales was also partially driven by Industrial & Specialty Products sales, which increased 15% for the year ended December 31, 2022 compared to the year ended December 31, 2021. Industrial & Specialty Products average selling price increased 12% and tons sold increased 3%. The increase is due to overall improved market conditions and pricing increases implemented throughout the year to help offset increased costs as discussed below.

Cost of Sales (excluding depreciation, depletion and amortization)

Cost of sales increased by $275.2 million, or 35%, to $1.1 billion for the year ended December 31, 2022 compared to $795.0 million for the year ended December 31, 2021. These changes result from the main components of cost of sales as discussed below. As a percentage of sales, cost of sales represented 70% for the year ended December 31, 2022 compared to 72% for the same period in 2021.

We incurred $509.8 million and $351.6 million of transportation and related costs for the years ended December 31, 2022 and 2021, respectively. The increase was mainly due to increased volumes, increased carrier costs for SandBox and increased rail car and barge rates. As a percentage of sales, transportation and related costs increased to 33% for the year ended December 31, 2022 compared to 32% for the same period in 2021.

We incurred $171.0 million and $148.0 million of operating labor costs for the years ended December 31, 2022 and 2021, respectively. The $23.0 million increase in labor costs incurred was mainly due to increased headcount to support increased production and merit increases. As a percentage of sales, operating labor costs represented 11% for the year ended December 31, 2022 compared to 13% for the same period in 2021.

We incurred $83.8 million and $56.2 million of electricity and drying fuel (principally natural gas) costs for the years ended December 31, 2022 and 2021, respectively. The $27.6 million increase in electricity and drying fuel costs incurred was mainly due to increased volumes produced and increased natural gas prices. As a percentage of sales, electricity and drying fuel costs represented 5% for both the years ended December 31, 2022 and 2021.

We incurred $93.8 million and $66.0 million of maintenance and repair costs for the years ended December 31, 2022 and 2021, respectively. The increase in maintenance and repair costs incurred was mainly due to an increase in maintenance projects as production increased. As a percentage of sales, maintenance and repair costs represented 6% for both the years ended December 31, 2022 and 2021.

Segment Contribution Margin

Oil & Gas Proppants contribution margin increased by $141.7 million to $301.8 million for the year ended December 31, 2022 compared to $160.1 million for the year ended December 31, 2021, driven by a $346.2 million increase in sales, partially offset by $204.4 million in increased cost of sales. The increase in segment contribution margin was mainly driven by increased production and pricing, overall improved market conditions, and a rebound in well completion activity.

Industrial & Specialty Products contribution margin increased by $1.8 million, or 1%, to $170.3 million for the year ended December 31, 2022 compared to $168.5 million for the year ended December 31, 2021, driven by a $75.0 million increase in revenue, partially offset by $73.3 million in increased cost of sales. The increase in segment contribution margin was due to overall improved market conditions and price increases implemented throughout the year, partially offset by cost increases as discussed above.

Selling, General and Administrative Expenses

Selling, general and administrative expenses increased by $24.2 million, or 20%, to $143.8 million for the year ended December 31, 2022 compared to $119.6 million for the year ended December 31, 2021. The increase was primarily due to fees related to the termination of a supplier contract, increased legal expenses, increases in compensation such as merit and incentive increases, headcount increases due to increased business activity, and expenses related to the strategic review of our ISP segment. In total, our selling, general and administrative expenses represented approximately 9% and 11% of our sales for the years ended December 31, 2022 and 2021, respectively.

Depreciation, Depletion and Amortization

Depreciation, depletion and amortization expense decreased by $20.9 million, or 13%, to $140.2 million for the year ended December 31, 2022 compared to $161.1 million for the year ended December 31, 2021. The decrease was primarily due to certain assets fully depreciating at the end of 2021 and continuing throughout 2022. Depreciation, depletion and amortization expense represented approximately 9% and 15% of our sales for the years ended December 31, 2022 and 2021, respectively.

Goodwill and Other Asset Impairments

During the year ended December 31, 2022, no impairment charges were recorded. During the year ended December 31, 2021, we recorded $0.2 million in asset impairment charges.

Operating Income (Loss)

Operating income was $171.0 million for the year ended December 31, 2022 compared to operating income of $27.9 million for the year ended December 31, 2021. The increase was driven by a 38% increase in total sales, a 13% decrease in depreciation, depletion and amortization expense, partially offset by a 35% increase in cost of sales, and a 20% increase in selling, general and administrative expense.

Interest Expense

Interest expense increased by $6.4 million, or 9%, to $77.6 million for the year ended December 31, 2022 compared to $71.2 million for the year ended December 31, 2021, primarily due to higher interest rates.

Other Income (Expense), net, including interest income

Other income increased by $4.5 million to $10.6 million for the year ended December 31, 2022 compared to $6.1 million in other income for the year ended December 31, 2021. The increase is primarily due to a gain on extinguishment of debt during 2022 and an adjustment in non-service pension costs.

Provision for Income Taxes

We had income tax expense of $26.2 million for the year ended December 31, 2022 compared to income tax benefit of $2.8 million for the year ended December 31, 2021. The effective tax rates were 25% and 7% for the years ended December 31, 2022 and 2021, respectively. See Note S - Income Taxes to our Consolidated Financial Statements in Part II, Item 8. of this Annual Report on Form 10-K for more information.

Net income (loss)

Net income (loss) attributable to U.S. Silica Holdings, Inc., was net income of $78.2 million and net loss of $33.8 million for the years ended December 31, 2022 and 2021, respectively. The year over year changes were due to the factors noted above.

Liquidity and Capital Resources

This section of this Annual Report on Form 10-K generally discusses 2022 and 2021 items and year-to-year comparisons between 2022 and 2021. Discussions of 2020 items and year-to-year comparisons between 2021 and 2020 that are not included in this Form 10-K can be found in "Management's Discussion and Analysis of Financial Condition and Liquidity and Capital Resources" in Part II, Item 7 of our Annual Report on Form 10-K for the fiscal year ended December 31, 2021, which is incorporated by reference herein.

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 pay for 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. 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, 2022, our working capital was $385.3 million and we had $78.5 million of availability under the Revolver. Based on our consolidated leverage ratio of 2.99:1.00 as of December 31, 2022, we have access to the full availability of the Revolver. If our consolidated leverage ratio exceeds 3.75:1.00, we may draw up to $30.0 million without the consent of our lenders.

In connection with the EPM 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 increased our existing senior debt by creating 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. We have made significant progress to prepare for the phasing out of LIBOR and additional transition efforts to prepare for the phasing out of LIBOR are ongoing. We believe both the enacted and proposed regulations help provide clarity for the transition of our legacy LIBOR contracts, including investment securities and loans, to alternative reference rates in an orderly manner.

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. During 2020, our Board of Directors determined that it was not in the best interest of our shareholders to issue a dividend subsequent to the second quarter of the year. We do not have plans to resume issuing dividends.

Net Debt (non-GAAP measure)

Net debt is a non-GAAP measure and is included in this report because we believe net debt is meaningful to investors as we consider net debt and its components to be important indicators of liquidity and financial position. Net debt may not be computed the same as similarly titled measures used by other companies. We define net debt as total debt less cash and cash equivalents. Net debt should not be considered as an alternative or superior to other performance measures derived in accordance with GAAP. The following table provides net debt (in thousands):

	December 31, 2022	December 31, 2021
Total Debt	$ 1,056,993	$ 1,211,420
Less:		
Cash and cash equivalents	280,845	239,425
Net Debt	$ 776,148	$ 971,995

Total Debt:

Total debt was $1.06 billion and $1.21 billion as of December 31, 2022 and 2021, respectively. The decrease was primarily due to the repurchase of $150.0 million of debt and principal payments on the Term Loan.

Cash and Cash Equivalents:

Cash and cash equivalents were $280.8 million and $239.4 million as of December 31, 2022 and 2021, respectively. The increase was primarily due to receipt of $27.4 million capacity reservation fees from customers, an increase in business operations and collections and an increase in days payable outstanding.

Cash Flow Analysis

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

	Year ended December 31,		
	2022	2021	2020
Net cash provided by (used in):			
Operating activities	$ 262,716	$ 169,347	$ (3,403)
Investing activities	(50,953)	(29,856)	(27,564)
Financing activities	(170,343)	(50,986)	(3,853)

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 allowance for credit losses. 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 liabilities.

Net cash provided by operating activities was $262.7 million for the year ended December 31, 2022. This was mainly due to $77.8 million of net income adjusted for non-cash items, including $140.2 million in depreciation, depletion and amortization, $20.9 million in deferred income taxes, $18.4 million in equity-based compensation, $15.8 million in deferred revenue, $1.0 million related to the gain on sales of property, plant and equipment, and $18.4 million in other miscellaneous non-cash items. Also contributing to the change was an $8.1 million increase in accounts receivable, a $31.2 million increase in inventories, a $6.3 million decrease in prepaid expenses and other current assets, a $1.1 million decrease in income taxes, a $67.6 million increase in accounts payable and accrued liabilities, a $22.4 million decrease in operating lease liabilities, and $7.2 million in other operating assets and liabilities.

Net Cash Used in / Provided by Investing Activities

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

Net cash used in investing activities was $51.0 million for the year ended December 31, 2022. This was mainly due to capital expenditures of $53.2 million and capitalized intellectual property costs of $0.4 million, partially offset by proceeds from the sale of property, plant and equipment of $2.6 million. Capital expenditures for the year ended December 31, 2022 were primarily related to facility improvement and maintenance projects, growth projects, equipment lease buyouts and other environmental and health and safety projects.

Subject to our continuing evaluation of market conditions, we anticipate that our capital expenditures in 2023 will be in the range of approximately $50 million to $60 million, which is primarily associated with maintenance, cost improvement capital projects and various growth projects. We expect to fund our capital expenditures through cash on our balance sheet and cash generated from our operations.

Net Cash Used in / Provided by Financing Activities

Financing activities consist primarily of equity issuances, 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 used in financing activities was $170.3 million for the year ended December 31, 2022. This was mainly due to $158.1 million of long-term debt payments, which included $145.1 million in debt repurchases, $7.2 million of short term

debt payments, $3.0 million of tax payments related to shares withheld for vested restricted stock and stock units, $1.4 million principal payments on finance lease obligations, and a $1.5 million distribution to a non-controlling interest, partially offset by proceeds from options exercised of $1.0 million.

Share Repurchase Program

We did not make any repurchases of our common stock under our stock repurchase program in 2022. See Purchase of Equity Securities by the Issuer in Part II, Item 5. 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, 2022, 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]	$ 1,059,062	$ 12,800	$ 1,046,262	$ —	$ —
Estimated interest payments on long-term debt[4]	201,827	98,087	103,740	—	—
Retirement plans	97,087	10,600	20,802	20,065	45,620
Finance lease obligations [5]	3,518	1,249	1,965	304	—
Operating lease obligations[5]	103,456	24,707	34,955	20,093	23,701
Minimum purchase obligations[2]	29,331	10,606	7,181	4,060	7,484
Total Contractual Cash Obligations[3]:	$ 1,494,281	$ 158,049	$ 1,214,905	$ 44,522	$ 76,805

(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, 2022, we accrued $0.3 million in shortfall fees under these service agreements.
(3) The above table excludes discounted asset retirement obligations in the amount of $20.7 million at December 31, 2022, the majority of which have a settlement date beyond 2026, as well as indemnification for surety bonds issued on our behalf discussed in Note P - Commitments and Contingencies 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, 2022.
(5) Includes interest and other operating costs. See Note R - Leases to our Consolidated Financial Statements in Part II, Item 8 of this Annual Report on Form 10-K for additional information on interest costs.

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, 2022, we had $20.7 million accrued for future reclamation costs, as compared to $32.0 million as of December 31, 2021.

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 of this Annual Report on Form 10-K.

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 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. 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 842, 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

From time to time, we may enter into contracts that contain multiple performance obligations, such as work orders containing a combination of product, transportation, equipment rentals, and contract labor services. For these arrangements, 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 received 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.

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 and 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.

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 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 13 - 20 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.

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 are reviewed for impairment annually, or more frequently when indicators of impairment exist.

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 marketplace 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 annually, or more frequently when indicators of impairment exist.

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 annually, or more frequently when indicators of impairment exist.

Income Taxes

Deferred taxes are recognized 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.

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 of this Annual Report on Form 10-K.

Interest Rate Risk

We are exposed to interest rate risk arising from adverse changes in interest rates. As of December 31, 2022, we had $1.06 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 $10.6 million per year.

We have made significant progress to prepare for the phasing out of LIBOR and additional transition efforts to prepare for the phasing out of LIBOR are ongoing.

On March 15, 2022, President Biden signed the Consolidated Appropriation Act of 2022 into law, which includes the Adjustable Interest Rate (LIBOR) Act, containing legislation related to the transition away from LIBOR. This legislation is intended to establish a uniform process for replacing LIBOR in existing contracts and securities that continue after the cessation of LIBOR and do not contain clearly defined or practicable fallback provisions.

On July 19, 2022, the Federal Reserve Board released a proposal that provides default rules for certain contracts that use LIBOR, which would implement the LIBOR Act with replacement rates based on the Secured Overnight Financing Rate (SOFR). We believe the LIBOR Act and the Federal Reserve Board's proposed regulation help provide clarity for the transition of our legacy LIBOR contracts, including investment securities and loans, to alternative reference rates in an orderly manner.

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, 2022 and 2021, the related consolidated statements of operations, comprehensive income, shareholders' equity, and cash flows for each of the three years in the period ended December 31, 2022, 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, 2022 and 2021, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2022, 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, 2022, 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 24, 2023 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 regarding 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.

Critical audit matters

Critical audit matters are matters arising from the current period audit of the financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective, or complex judgements. We determined that there are no critical audit matters.

/s/ GRANT THORNTON LLP

We have served as the Company's auditor since 2004.

Houston, Texas
February 24, 2023

U.S. SILICA HOLDINGS, INC.

CONSOLIDATED BALANCE SHEETS

(in thousands, except share data)

	December 31,	
	2022	**2021**
ASSETS		
Current Assets:		
Cash and cash equivalents	$ 280,845	$ 239,425
Accounts receivable, net	208,631	202,759
Inventories, net	147,626	115,713
Prepaid expenses and other current assets	20,182	18,018
Total current assets	657,284	575,915
Property, plant and mine development, net	1,178,834	1,258,646
Lease right-of-use assets	42,374	42,241
Goodwill	185,649	185,649
Intangible assets, net	140,809	150,054
Other assets	9,630	7,095
Total assets	$ 2,214,580	$ 2,219,600
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current Liabilities:		
Accounts payable and accrued liabilities	$ 216,239	$ 167,670
Current portion of operating lease liabilities	19,773	14,469
Current portion of long-term debt	19,535	18,285
Current portion of deferred revenue	16,275	4,247
Income tax payable	128	1,200
Total current liabilities	271,950	205,871
Long-term debt, net	1,037,458	1,193,135
Deferred revenue	14,477	16,494
Liability for pension and other post-retirement benefits	30,911	32,935
Deferred income taxes, net	64,636	44,774
Operating lease liabilities	64,478	75,130
Other long-term obligations	25,976	37,178
Total liabilities	1,509,886	1,605,517
Commitments and Contingencies (Note P)		
Stockholders' Equity:		
Preferred stock, $0.01 par value, 10,000,000 shares authorized; zero issued and outstanding at December 31, 2022 and 2021	—	—
Common stock, $0.01 par value, 500,000,000 shares authorized; 85,631,109 issued and 75,738,512 outstanding at December 31, 2022; 84,746,194 issued and 75,033,352 outstanding at December 31, 2021	854	845
Additional paid-in capital	1,234,834	1,218,575
Retained deficit	(351,084)	(429,260)
Treasury stock, at cost, 9,892,597 and 9,712,842 shares at December 31, 2022 and 2021, respectively	(186,196)	(186,294)
Accumulated other comprehensive income (loss)	(1,723)	349
Total U.S. Silica Holdings, Inc. stockholders' equity	696,685	604,215
Non-controlling interest	8,009	9,868
Total stockholders' equity	704,694	614,083
Total liabilities and stockholders' equity	$ 2,214,580	$ 2,219,600

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

U.S. SILICA HOLDINGS, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS

(in thousands, except per share amounts)

	Year Ended December 31,		
	2022	**2021**	**2020**
Sales:			
Product	$ 1,139,773	$ 896,203	$ 732,187
Service	385,374	207,676	113,698
Total sales	1,525,147	1,103,879	845,885
Cost of sales (excluding depreciation, depletion and amortization):			
Product	801,789	633,857	486,982
Service	268,400	161,126	88,088
Total cost of sales (excluding depreciation, depletion and amortization)	1,070,189	794,983	575,070
Operating expenses:			
Selling, general and administrative	143,838	119,628	124,171
Depreciation, depletion and amortization	140,166	161,131	155,568
Goodwill and other asset impairments	—	202	110,688
Total operating expenses	284,004	280,961	390,427
Operating income (loss)	170,954	27,935	(119,612)
Other (expense) income:			
Interest expense	(77,598)	(71,157)	(79,885)
Other income, net, including interest income	10,643	6,146	24,350
Total other expense	(66,955)	(65,011)	(55,535)
Income (loss) before income taxes	103,999	(37,076)	(175,147)
Income tax (expense) benefit	(26,159)	2,755	60,025
Net income (loss)	$ 77,840	$ (34,321)	$ (115,122)
Less: Net loss attributable to non-controlling interest	(336)	(560)	(1,028)
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$ 78,176	$ (33,761)	$ (114,094)
Earnings (loss) per share attributable to U.S. Silica Holdings, Inc.:			
Basic	$ 1.04	$ (0.45)	$ (1.55)
Diluted	$ 1.01	$ (0.45)	$ (1.55)
Weighted average shares outstanding:			
Basic	75,512	74,350	73,634
Diluted	77,670	74,350	73,634
Dividends declared per share	$ —	$ —	$ 0.02

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,		
	2022	**2021**	**2020**
Net income (loss)	$ 77,840	$ (34,321)	$ (115,122)
Other comprehensive (loss) income:			
Unrealized (loss) gain on derivatives (net of tax of $(746), $0, and $973 for 2022, 2021, and 2020, respectively)	(2,342)	—	3,053
Foreign currency translation adjustment (net of tax of $(269), $(309), and $444 for 2022, 2021 and 2020, respectively)	(845)	(1,000)	1,391
Pension and other post-retirement benefits liability adjustments (net of tax of $355, $3,131, and $2,207 for 2022, 2021 and 2020, respectively)	1,115	9,828	6,931
Comprehensive income (loss)	$ 75,768	$ (25,493)	$ (103,747)
Less: Comprehensive loss attributable to non-controlling interest	(336)	(560)	(1,028)
Comprehensive income (loss) attributable to U.S. Silica Holdings, Inc.	$ 76,104	$ (24,933)	$ (102,719)

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 Deficit	Accumulated Other Comprehensive (Loss) Income	Total U.S. Silica Holdings Inc., Stockholders' Equity	Non-controlling Interest	Total Stockholders' Equity
Balance at January 1, 2020	$ 823	$ (180,912)	$ 1,185,116	$ (279,956)	$ (19,854)	$ 705,217	$ 11,363	$ 716,580
Net loss	—	—	—	(114,094)	—	(114,094)	(1,028)	(115,122)
Unrealized gain on derivatives	—	—	—	—	3,053	3,053	—	3,053
Foreign currency translation adjustment	—	—	—	—	1,391	1,391	—	1,391
Pension and post-retirement liability	—	—	—	—	6,931	6,931	—	6,931
Cash dividend declared ($0.02 per share)	—	—	—	(1,446)	—	(1,446)	—	(1,446)
Contributions from non-controlling interest	—	—	—	—	—	—	1,196	1,196
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	14,911	—	—	14,911	—	14,911
Shares withheld for tax payments related to vested restricted stock and stock units	4	(703)	(4)	—	—	(703)	—	(703)
Balance at December 31, 2020	827	(181,615)	1,200,023	(395,496)	(8,479)	615,260	11,531	626,791
Net loss	—	—	—	(33,761)	—	(33,761)	(560)	(34,321)
Foreign currency translation adjustment	—	—	—	—	(1,000)	(1,000)	—	(1,000)
Pension and post-retirement liability	—	—	—	—	9,828	9,828	—	9,828
Cash dividends	—	—	—	(3)	—	(3)	—	(3)
Distributions to non-controlling interest	—	—	—	—	—	—	(1,103)	(1,103)
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	18,809	—	—	18,809	—	18,809
Proceeds from options exercised	—	344	(239)	—	—	105	—	105
Shares withheld for tax payments related to vested restricted stock and stock units	18	(5,023)	(18)	—	—	(5,023)	—	(5,023)
Balance at December 31, 2021	845	(186,294)	1,218,575	(429,260)	349	604,215	9,868	614,083
Net income (loss)	—	—	—	78,176	—	78,176	(336)	77,840
Unrealized loss on derivatives	—	—	—	—	(2,342)	(2,342)	—	(2,342)
Foreign currency translation adjustment	—	—	—	—	(845)	(845)	—	(845)
Pension and post-retirement liability	—	—	—	—	1,115	1,115	—	1,115

Cash dividends	—	—	—	—	—	—	—	—
Distributions to non-controlling interest	—	—	—	—	—	—	(1,523)	(1,523)
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	18,364	—	—	18,364	—	18,364
Proceeds from options exercised	—	3,051	(2,096)	—	—	955	—	955
Shares withheld for tax payments related to vested restricted stock and stock units	9	(2,953)	(9)	—	—	(2,953)	—	(2,953)
Balance at December 31, 2022	$ 854	$ (186,196)	$ 1,234,834	$ (351,084)	$ (1,723)	$ 696,685	$ 8,009	$ 704,694

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,		
	2022	**2021**	**2020**
Operating activities:			
Net income (loss)	$ 77,840	$ (34,321)	$ (115,122)
Adjustments to reconcile net income (loss) to net cash provided by (used in) operating activities:			
Depreciation, depletion and amortization	140,166	161,131	155,568
Goodwill and other asset impairments	—	202	110,688
Debt issuance amortization	4,815	5,059	5,131
Original issue discount amortization	974	1,026	1,036
Gain on valuation change of royalty note payable	—	—	(8,263)
Deferred income taxes	20,940	(7,493)	(61,805)
Deferred revenue	(15,801)	(18,158)	(23,569)
Gain on disposal of property, plant and equipment	(1,005)	(131)	(2,597)
Equity-based compensation	18,364	18,809	14,911
Allowance for credit losses, net of recoveries	617	(455)	1,510
Gain on remeasurement of leases	—	—	(24,056)
Other	11,959	28,632	23,146
Changes in operating assets and liabilities, net of effects of acquisitions:			
Accounts receivable	(8,075)	5,026	48,441
Inventories	(31,209)	(11,029)	15,245
Prepaid expenses and other current assets	6,277	12,371	980
Income taxes	(1,072)	1,828	(153)
Accounts payable and accrued liabilities	67,576	48,709	(86,734)
Operating lease liabilities	(22,410)	(24,451)	(62,140)
Liability for pension and other post-retirement benefits	(2,134)	(15,341)	(11,941)
Other noncurrent assets and liabilities	(5,106)	(2,067)	16,321
Net cash provided by (used in) operating activities	262,716	169,347	(3,403)
Investing activities:			
Capital expenditures	(53,168)	(30,307)	(34,461)
Capitalized intellectual property costs	(394)	(210)	(456)
Proceeds from sale of property, plant and equipment	2,609	661	7,353
Net cash used in investing activities	(50,953)	(29,856)	(27,564)
Financing activities:			
Dividends paid	(164)	(26)	(6,185)
Proceeds from options exercised	955	105	—
Tax payments related to shares withheld for vested restricted stock and stock units	(2,953)	(5,023)	(703)
(Payments on) proceeds from draw down on the Revolver	—	(25,000)	25,000
Payments on short-term debt	(7,237)	(6,398)	(7,131)
Payments on long-term debt	(158,064)	(12,800)	(15,985)
Distributions to (contributions from) non-controlling interest	(1,523)	(1,103)	1,196
Principal payments on finance lease obligations	(1,357)	(741)	(45)
Net cash used in financing activities	(170,343)	(50,986)	(3,853)
Net increase (decrease) in cash and cash equivalents	41,420	88,505	(34,820)
Cash and cash equivalents, beginning of period	239,425	150,920	185,740
Cash and cash equivalents, end of period	$ 280,845	$ 239,425	$ 150,920

Supplemental cash flow information:			
Cash paid (received) during the period for:			
Interest	$ 71,235	$ 64,650	$ 73,695
Taxes, net of refunds	$ (14,809)	$ (12,994)	$ (39,908)
Non-cash Items:			
Net assets assumed in business acquisition	$ —	$ 68	$ 8,241
Accrued capital expenditures	$ 6,175	$ 1,196	$ 26,136

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

NOTE A—ORGANIZATION

U.S. Silica Holdings, Inc. (“Holdings,” and together with its subsidiaries “we,” “us” or the “Company”) is a global performance materials company and a leading producer of commercial silica used in the oil and gas industry and in a wide range of industrial applications. In addition, through our subsidiary EP Minerals, LLC ("EPM") we are an industry leader in the production of industrial minerals, including diatomaceous earth, clay (calcium bentonite and calcium montmorillonite) and perlite. During our 123-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 V - Segment Reporting for more information on our reportable segments.

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.

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.

Reclassifications

Certain reclassifications of prior period presentations have been made to conform to the current period presentation.

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 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 credit losses; 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. 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, building and construction products, filler and extenders, filtration, glass, absorbents, sports and recreation, foundry 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 allowance for credit losses. 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 credit losses. See Note F - Accounts Receivable and Note T - 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, which 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, if sufficient information exists to reasonably estimate the fair value of the liability. These obligations include environmental remediation liabilities when incurred, which is generally upon acquisition, construction or development and/or through the normal operation of the asset. These obligations also 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.

See Note L - 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 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 13 - 20 years. Intangible assets that are amortized are reviewed for impairment annually, or more frequently when indicators of impairment exist.

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.

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 are reviewed for impairment annually, or more frequently when indicators of impairment exist.

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 marketplace 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 annually, or more frequently when indicators of impairment exist.

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 annually, or more frequently when indicators of impairment exist.

See Note I - Goodwill and Intangible Assets.

Leases

We lease railroad cars, office space, mining property, mining/processing equipment, and transportation and other equipment. Operating leases are included in lease right-of-use ("ROU") assets, current portion of operating lease liabilities, and operating lease liabilities in our consolidated balance sheets. Finance leases are included in lease right-of-use assets, current portion of long-term debt, and long-term debt in our consolidated balance sheets. Leases with an initial term of 12 months or less are not recorded on the balance sheet. ROU assets represent our right to use an underlying asset for the lease term and lease liabilities represent our obligation to make lease payments arising from the lease. ROU assets and liabilities are recognized at the commencement date of the lease based on the present value of lease payments over the lease term. As most of our leases do not provide an implicit rate, we use our incremental borrowing rate based on the information available at the commencement date in determining the present value of lease payments. The ROU assets also include any lease payments made at or before the commencement date of the lease and excludes lease incentives. Our lease terms may include options to extend or terminate the lease when it is reasonably certain that we will exercise that option. Lease expense for lease payments is recognized on a straight-line basis over the lease term. We have lease agreements with lease and non-lease components, the latter of which are generally accounted for separately. See Note R - Leases.

We periodically evaluate whether current events or circumstances indicate that the carrying value of our ROU assets exceeds fair value. If circumstances indicate an impairment exists, we estimate fair value primarily utilizing internally developed cash flow models and quoted market prices, discounted at an appropriate weighted average cost of capital. 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.

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 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 product at prices or at volumes below the requirements in our existing supply agreements. 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 842, 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

From time to time, we may enter into contracts that contain multiple performance obligations, such as work orders containing a combination of product, transportation, equipment rentals, and contract labor services. For these arrangements, 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 received 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 T - 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 and 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

We defer 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 $4.8 million for the year ended December 31, 2022, and $5.1 million and $5.1 million for the years ended December 31, 2021 and 2020. 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 tables, 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 Q - 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. 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, 2022 and 2021, our self-insurance reserves totaled $5.6 million and $5.8 million, respectively, of which $1.8 million and $2.1 million, respectively, were 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. Advertising costs have not been a significant component of expense for the years ended December 31, 2022, 2021, or 2020.

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 our 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 our 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. We also grant certain employees performance share units, the vesting of which is based on adjusted free cash flow ("ACF") targets. The number of ACF measured units that will vest will be based on ACF achievement versus target. The ACF targets are set annually and are approved by the Board of Directors. The related compensation expense is recognized on a straight-line basis over the vesting period.

See Note O - Equity-based Compensation.

Income Taxes

Deferred taxes are recognized 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.

See Note S - Income Taxes.

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.

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

We account 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

None.

New Accounting Pronouncements Not Yet Adopted

In March 2020, the FASB issued ASU 2020-04, Reference Rate Reform (Topic 848): Facilitation of the Effects of Reference Rate Reform on Financial Reporting followed by ASU 2021-01, Reference Rate Reform (Topic 848): Scope, issued in January 2021, to provide clarifying guidance regarding the scope of Topic 848. ASU 2020-04 was issued to provide optional guidance for a limited period of time to ease the potential burden in accounting for (or recognizing the effects of) reference rate reform on financial reporting. Generally, the guidance is to be applied as of any date from the beginning of an interim period that includes or is subsequent to March 12, 2020, or prospectively from a date within an interim period that includes or is subsequent to March 12, 2020, up to the date that the financial statements are available to be issued. ASU 2020-04 and ASU 2021-01 are effective for all entities through December 31, 2022. In April 2022, the FASB proposed to extend the effective date through December 31, 2024 and affirmed this decision in December 2022. As of December 31, 2022, we have not elected to use the optional guidance and continue to evaluate the options provided by ASU 2020-04 and ASU 2021-01. See Note K - Debt for discussion of the use of the adjusted LIBOR rate in connection with borrowings under our senior secured revolving credit facility.

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:

In thousands, except per share amounts	Year ended December 31,		
	2022	2021	2020
Numerator:			
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$ 78,176	$ (33,761)	$ (114,094)
Denominator:			
Weighted average shares outstanding	75,512	74,350	73,634
Diluted effect of stock awards	2,158	—	—
Weighted average shares outstanding assuming dilution	77,670	74,350	73,634
Earnings (loss) per share attributable to U.S. Silica Holdings, Inc.:			
Basic earnings (loss) per share	$ 1.04	$ (0.45)	$ (1.55)
Diluted earnings (loss) per share	$ 1.01	$ (0.45)	$ (1.55)

Potentially dilutive shares are excluded from the calculation of diluted weighted average shares outstanding and diluted earnings per share if we are 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. Such potentially dilutive shares and stock awards (in thousands) excluded from the calculation of diluted earnings (loss) per common share were as follows:

	Year ended December 31,		
	2022	2021	2020
Potentially dilutive shares excluded	—	1,714	238
Stock options excluded	509	667	826
Restricted stock and performance share units awards excluded	36	66	3,435

NOTE D—ACCUMULATED OTHER COMPREHENSIVE INCOME (LOSS)

Accumulated Other Comprehensive Income (Loss)

Accumulated other comprehensive income (loss) consists of fair value adjustments associated with cash flow hedges, accumulated adjustments for net experience gains or 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 income (loss) by component (in thousands):

	For the Year Ended December 31, 2022			
	Unrealized loss on cash flow hedges	Foreign currency translation adjustments	Pension and other post-retirement benefits liability	Total
Beginning Balance	$ —	$ (417)	$ 766	$ 349
Other comprehensive (loss) income before reclassifications	(2,342)	(845)	1,172	(2,015)
Amounts reclassed from accumulated other comprehensive loss	—	—	(57)	(57)
Ending Balance	$ (2,342)	$ (1,262)	$ 1,881	$ (1,723)

Any amounts reclassified from accumulated other comprehensive income (loss) 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

During the first quarter of 2020, we settled multiple intellectual property and contractual lawsuits involving our SandBox Logistics unit and Arrows Up, LLC. As part of the settlement, SandBox Logistics took control of Arrows Up's existing business, including all equipment and sand logistics contracts, while also receiving a cash payment.

We accounted for the acquisition of Arrows Up, LLC under the acquisition method of accounting in accordance with ASC 805, Business Combinations. Estimates of fair value included in the Consolidated Financial Statements represented our best estimates and valuations. In accordance with the acquisition method of accounting, the fair values were subject to adjustment until we completed our analysis, which was during the first quarter of 2021. This business combination resulted in a bargain purchase pursuant to ASC 805-30-25 because no consideration was paid for the fair value of assets acquired and liabilities assumed. The fair value of assets acquired, which included cash, accounts receivable, inventories, lease right-of-use assets, and property plant, and equipment, was $20.1 million. The fair value of liabilities assumed, which included lease liabilities and other long-term liabilities, was $2.5 million. A gain on bargain purchase of $17.6 million was recorded in "Other income, net, including interest income" in the Consolidated Statement of Operations.

During the first quarter of 2021, we recorded a $0.1 million increase to accounts receivable, which was our final adjustment to the purchase price. The total adjustments during the measurement period of $2.4 million were recorded as a net decrease to the initial gain on bargain purchase and recorded in "Other (expense) income, net, including interest income" in the Consolidated Statement of Operations.

NOTE F—ACCOUNTS RECEIVABLE

Accounts receivable (in thousands) consisted of the following:

	December 31, 2022	December 31, 2021
Trade receivables	$ 209,683	$ 182,992
Less: Allowance for credit losses	(5,691)	(5,248)
Net trade receivables	203,992	177,744
Other receivables[(1)]	4,639	25,015
Total accounts receivable	$ 208,631	$ 202,759

[(1)]At December 31, 2022 and 2021, other receivables included zero and $21.5 million of refunds related to NOL carryback claims filed for various tax years in accordance with certain provisions of the CARES Act.

We classify our trade receivables into the following portfolio segments: Oil & Gas Proppants and Industrial & Specialty Products, which also aligns with our reporting segments. We estimate the allowance for credit losses based on historical collection trends, the age of outstanding receivables, risks attributable to specific customers, such as credit history, bankruptcy or other going concern issues, and current economic and industry conditions. If events or circumstances indicate that specific receivable balances may be impaired, further consideration is given to the collectability of those balances and the allowance is adjusted accordingly. Past due balances are written off when we have exhausted our internal and external collection efforts and have been unsuccessful in collecting the amount due.

The following table reflects the change of the allowance for credit losses (in thousands) disaggregated by portfolio segments:

	Oil & Gas Proppants	Industrial & Specialty Products	Total
Beginning balance, December 31, 2021	$ 4,625	$ 623	$ 5,248
Allowance for credit losses	(469)	1,086	617
Write-offs	(128)	(46)	(174)
Ending balance, December 31, 2022	$ 4,028	$ 1,663	$ 5,691

Our ten largest customers accounted for approximately 40%, 40% and 34% of total sales during the years ended December 31, 2022, 2021 and 2020, respectively. No single customer accounted for more than 10% of our total sales during the years ended December 31, 2022, 2021 and 2020. At December 31, 2022 and 2021, none of our customers' accounts receivable represented 10% or more of our total trade accounts receivable.

NOTE G—INVENTORIES

Inventories (in thousands) consisted of the following:

	December 31, 2022	December 31, 2021
Supplies	$ 54,805	$ 45,605
Raw materials and work in process	47,042	36,529
Finished goods	45,779	33,579
Total inventories	$ 147,626	$ 115,713

NOTE H—PROPERTY, PLANT AND MINE DEVELOPMENT

Property, plant and mine development (in thousands) consisted of the following:

	December 31, 2022	December 31, 2021
Mining property and mine development	$ 789,601	$ 789,122
Asset retirement cost	8,869	22,283
Land	53,128	55,541
Land improvements	76,456	76,248
Buildings	73,151	72,207
Machinery and equipment	1,217,933	1,189,548
Furniture and fixtures	3,922	3,932
Construction-in-progress	55,696	35,060
	2,278,756	2,243,941
Accumulated depletion, depreciation, amortization and impairment charges	(1,099,922)	(985,295)
Total property, plant and mine development, net	$ 1,178,834	$ 1,258,646

Depreciation, depletion, and amortization expense related to property, plant and mine development for the years ended December 31, 2022 and 2021 was $128.4 million and $149.6 million, respectively.

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
Balance at December 31, 2020	$ —	$ 185,649	$ 185,649
Impairment losses	—	—	—
Balance at December 31, 2021	—	185,649	185,649
Impairment losses	—	—	—
Balance at December 31, 2022	$ —	$ 185,649	$ 185,649

Goodwill and trade names are evaluated for impairment annually as of October 31, or more frequently when indicators of impairment exist. 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. There were no triggering events identified, therefore, no impairment charges were recorded related to goodwill or trade names for the years ended December 31, 2022 and 2021.

The changes in the carrying amount of intangible assets (in thousands) consisted of the following:

	December 31, 2022				December 31, 2021			
	Gross Carrying Amount	Accumulated Amortization	Impairments	Net	Gross Carrying Amount	Accumulated Amortization	Impairments	Net
Technology and intellectual property	$ 71,651	$ (29,990)	$ —	$ 41,661	$ 71,209	$ (25,069)	$ (38)	$ 46,102
Customer relationships	66,999	(32,791)	—	34,208	66,999	(27,987)	—	39,012
Total definite-lived intangible assets:	$ 138,650	$ (62,781)	$ —	$ 75,869	$ 138,208	$ (53,056)	$ (38)	$ 85,114
Trade names	64,240	—	—	64,240	64,240	—	—	64,240
Other	700	—	—	700	700	—	—	700
Total intangible assets:	$ 203,590	$ (62,781)	$ —	$ 140,809	$ 203,148	$ (53,056)	$ (38)	$ 150,054

Estimated useful life of technology and intellectual property is 15 years. Estimated useful life of customer relationships is a range of 13 - 20 years.

Amortization expense was $9.7 million, $9.7 million and $10.3 million for the years ended December 31, 2022, 2021, and 2020, respectively.

At December 31, 2022, the estimated amortization expense related to definite-lived intangible assets (in thousands) for the five succeeding years is as follows:

2023	$ 9,696
2024	$ 9,698
2025	$ 9,696
2026	$ 9,696
2027	$ 9,696

NOTE J—ACCOUNTS PAYABLE AND ACCRUED LIABILITIES

Accounts payable and accrued liabilities (in thousands) consisted of the following:

	December 31,	
	2022	2021
Trade payables	$ 182,555	$ 134,494
Accrued salaries and wages	10,911	11,347
Accrued vacation liability	3,093	2,847
Current portion of liability for pension and post-retirement benefits	1,118	1,227
Accrued healthcare liability	1,492	1,619
Accrued property taxes and sales taxes	4,287	4,625
Current portion of derivative liability	2,312	—
Other accrued liabilities	10,471	11,511
Accounts payable and accrued liabilities	$ 216,239	$ 167,670

Other accrued liabilities consist of employer related expenses, royalties payable, accrued interest payable, and other items.

NOTE K—DEBT

Debt (in thousands) consisted of the following:

	December 31, 2022	December 31, 2021
Senior secured credit facility:		
Revolver expiring May 1, 2023 (8.44% at December 31, 2022 and 4.13% at December 31, 2021)	$ —	$ —
Term Loan facility—final maturity May 1, 2025 (8.44% at December 31, 2022 and 5.00% December 31, 2021)	1,059,062	1,222,000
Less: Unamortized original issue discount	(2,035)	(3,350)
Less: Unamortized debt issuance cost	(8,922)	(15,200)
Insurance financing notes payable	5,628	4,424
Finance leases	3,260	3,546
Total debt	1,056,993	1,211,420
Less: current portion	(19,535)	(18,285)
Total long-term portion of debt	$ 1,037,458	$ 1,193,135

Senior Secured Credit Facility

On May 1, 2018, we entered into a Third Amended and Restated Credit Agreement (the "Credit Agreement"), which 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 (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. 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 on 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 Agreement contains covenants that, among other things, limit 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, 2022 and 2021, we were in compliance with all covenants in accordance with our senior secured Credit Facility.

Term Loan

At December 31, 2022, contractual maturities of our senior secured Credit Facility (in thousands) are as follows:

2023	$ 12,800
2024	12,800
2025	1,033,462
2026	—
2027	—
Thereafter	—
Total	$ 1,059,062

Revolving Line-of-Credit

We have a $100.0 million Revolver with zero drawn and $21.5 million allocated for letters of credit as of December 31, 2022, leaving $78.5 million available under the Revolver.

Based on our consolidated leverage ratio of 2.99:1.00 as of December 31, 2022, we have access to the full availability of the Revolver. If our consolidated leverage ratio exceeds 3.75:1.00, we may draw up to $30.0 million without the consent of our lenders.

Debt Repurchases

During the three months ended September 30, 2022, we repurchased outstanding debt under the Term Loan in the amount of $100 million discounted at a rate of 97%. A proportionate share of debt issuance and original discount costs were written off in conjunction with this repurchase which resulted in additional expense of approximately $1.2 million. As a result, we recorded a gain on extinguishment of debt in the amount of $1.7 million. The gain on extinguishment was recorded in Other income, net, including interest income in the Consolidated Statements of Operations.

During the three months ended December 31, 2022, we repurchased outstanding debt under the Term Loan in the amount of $50 million discounted at a rate of 96.25%. A proportionate share of debt issuance and original discount costs were written off in conjunction with this repurchase which resulted in additional expense of approximately $0.6 million. As a result, we recorded a gain on extinguishment of debt in the amount of $1.2 million. The gain on extinguishment was recorded in Other income, net, including interest income in the Consolidated Statements of Operations.

Note Payable Secured by Royalty Interest

In conjunction with the acquisition of New Birmingham, Inc. in August 2016, we assumed a note payable secured by a royalty interest. During the fourth quarter of 2020, we executed an amendment to the note payable which settled the outstanding balance in its entirety in exchange for a one-time payment of $2.55 million. Future royalties may be owed under this amended agreement if we resume production at our Tyler facility, however, we have no plans to resume production. Therefore, no amounts have been accrued. The settlement of the note payable resulted in a gain of $8.3 million which was recorded in Other income, net, including interest income in the Consolidated Statements of Operations.

Insurance Financing Notes Payable

During the third quarter of 2022, we renewed our insurance policies and financed the payments through notes payable with a stated interest rate of 6.0%. These payments will be made in installments throughout a nine-month period and, as such, were classified as current debt. As of December 31, 2022, the notes payable had a balance of $5.6 million.

NOTE L—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. Liabilities related to our asset retirement obligations are recorded in other long-term liabilities on our balance sheets. Changes in the asset retirement obligations (in thousands) are as follows:

	December 31, 2022	December 31, 2021
Beginning balance	$ 32,049	$ 24,717
Accretion	1,498	1,450
Additions and revisions of estimates	(12,753)	5,882
Payments	(62)	—
Ending balance	$ 20,732	$ 32,049

The decrease in liability is primarily attributable to revisions of estimates of reclamation costs, mainly related to change in interest rates.

NOTE M—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, 2022 and 2021, approximate their reported carrying values, therefore we have classified our cash equivalents as Level 1 of the fair value hierarchy.

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, therefore we have classified our long-term debt as Level 1 of the fair value hierarchy.

Derivative Instruments

The estimated fair value of our derivative instruments is recorded at each reporting period and is determined based on inputs that are readily available in public markets or can be derived from information available in publicly quoted markets. Therefore, we have classified these swap agreements as Level 2 of the fair value hierarchy.

NOTE N—DERIVATIVE INSTRUMENTS

Cash Flow Hedges of Natural Gas Price Risk

Natural gas is the primary fuel source used for drying in the commercial silica production process. In the past, the price of natural gas has been volatile, and we believe this volatility may continue. In order to manage our exposure to natural gas price increases, we have entered into natural gas swaps. All of these swap agreements commenced in December 2022. The derivative instruments are recorded on the balance sheet within other current or long-term assets or liabilities based on maturity dates at their fair values. As of December 31, 2022, the fair value of our natural gas swaps was a liability of $3.1 million, of which $2.3 million is classified within accounts payable and accrued liabilities on our balance sheet and $0.8 million is classified within other long-term obligations on our balance sheet.

We have designated the natural gas 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 M - Fair Value Accounting for more information regarding the estimated fair values of our derivative instruments.

	December 31, 2022				December 31, 2021			
	Maturity Date	Contract/Notional Amount (MMBtu)	Carrying Amount	Fair Value	Maturity Date	Contract/Notional Amount	Carrying Amount	Fair Value
Natural Gas - W. Texas (WAHA) - Inside FERC	2023	1,200,000	$ (1,887)	$ (1,887)	N/A	—	$ —	$ —
Natural Gas - W. Texas (WAHA) - Inside FERC	2024	870,000	$ (656)	$ (656)	N/A	—	$ —	$ —
Natural Gas - Henry Hub - NYMEX	2023	300,000	$ (425)	$ (425)	N/A	—	$ —	$ —
Natural Gas - Henry Hub - NYMEX	2024	120,000	$ (85)	$ (85)	N/A	—	$ —	$ —
Natural Gas - Henry Hub - NYMEX	2025	90,000	$ (35)	$ (35)	N/A	—	$ —	$ —

During the year ended December 31, 2022, we had no ineffectiveness for the natural gas swap derivatives.

The following table summarizes the effect of derivative instruments (in thousands) on our income statements and our consolidated statements of comprehensive income:

	Year ended December 31,		
	2022	2021	2020
Deferred losses from derivatives in OCI, beginning of period	$ —	$ —	$ (3,053)
(Loss) gain recognized in OCI from derivative instruments	(2,342)	—	3,053
Deferred losses from derivatives in OCI, end of period	$ (2,342)	$ —	$ —

NOTE O—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, amended and restated effective February 1, 2020, amended and restated effective May 13, 2021 and amended and restated effective May 12, 2022. 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, 2022, we had 2,649,220 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:

	Number of Shares	Weighted Average Exercise Price	Aggregate Intrinsic Value	Weighted Average Remaining Contractual Term in Years
Outstanding at December 31, 2021	666,718	$ 30.84	$ —	2.4 years
Granted	—	$ —	$ —	
Exercised	(90,000)	$ 10.61	$ 613	
Forfeited	—	$ —	$ —	
Expired	(68,195)	$ 17.46	$ —	
Outstanding at December 31, 2022	508,523	$ 36.22	$ —	2.0 years
Exercisable at December 31, 2022	508,523	$ 36.22	$ —	2.0 years

There were no grants of stock options during the years ended December 31, 2022, 2021 and 2020.

The following table summarizes stock option exercise activity:

	As of December 31,		
	2022	2021	2020
Options exercised (in actual shares)	90,000	10,164	—
Intrinsic value of options exercised (in thousands)	$ 613	$ 44	$ —
Cash received from options exercised (in thousands)	$ 955	$ 105	$ —
Tax benefit realized from options exercised (in thousands)	$ 148	$ 11	$ —

As of December 31, 2022, 2021 and 2020, there was no 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:

	Number of Shares	Grant Date Weighted Average Fair Value
Unvested, December 31, 2021	1,144,310	$ 8.37
Granted	728,357	$ 10.74
Vested	(401,555)	$ 8.97
Forfeited	(32,726)	$ 9.82
Unvested, December 31, 2022	1,438,386	$ 9.37

We granted 728,357, 881,261 and 1,590,170 restricted stock and restricted stock unit awards during the years ended December 31, 2022, 2021 and 2020, respectively. The fair value of the awards was based on the market price of our stock at date of grant.

We recognized $6.8 million, $7.3 million and $8.1 million of equity-based compensation expense related to restricted stock awards during the years ended December 31, 2022, 2021 and 2020, respectively. As of December 31, 2022, there was $8.2 million of unrecognized compensation expense related to these restricted stock awards, which is expected to be recognized over a weighted-average period of 1.8 years.

We also granted cash awards during the year ended December 31, 2020. These awards will vest over a period of three years and will be settled in cash. As such, these awards have been classified as liability instruments. We recognized $0.9 million, $0.9 million and $0.6 million of expense related to these awards for the years ended December 31, 2022, 2021 and 2020. The liability for these awards is included in accounts payable and other accrued liabilities on our balance sheets. These awards will be remeasured at fair value each reporting period with resulting changes reflected in our income statements. Estimated unrecognized expense related to these awards is $0.1 million over a period of 0.1 years.

Performance Share Unit Awards

The following table summarizes the status of, and changes in, our performance share unit awards:

	Number of Shares		Grant Date Weighted Average Fair Value
Unvested, December 31, 2021	1,914,589	$	9.77
Granted	920,681	$	11.79
Vested	(497,401)	$	14.56
Forfeited/Cancelled	(45,118)	$	11.30
Unvested, December 31, 2022	2,292,751	$	9.51

We granted 920,681, 886,091 and 1,020,161 of performance share unit awards during the years ended December 31, 2022, 2021 and 2020, respectively. A portion of these awards was measured against total shareholder return ("TSR"), and a portion was measured against adjusted free cash flow ("ACF") targets. The grant date weighted average fair value of these awards was estimated to be $11.79, $12.04 and $6.57 for the years ended December 31, 2022, 2021 and 2020, respectively. The number of TSR measured units that will vest will depend on the percentage ranking of our TSR compared to the TSR for each of the companies in the peer group over the three year period from January 1, 2022 through December 31, 2024 for the 2022 grant, January 1, 2021 through December 31, 2023 for the 2021 grant, and January 1, 2020 through December 31, 2022 for the 2020 grant. The number of ACF measured units that will vest will be based on ACF achievement versus target. The ACF targets are set annually and are approved by the Board of Directors. The related compensation expense is recognized on a straight-line basis over the vesting period.

The grant date fair value for the TSR 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 $11.5 million, $11.5 million and $6.8 million of compensation expense related to performance share unit awards during the years ended December 31, 2022, 2021 and 2020, respectively. As of December 31, 2022, there was $8.7 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 years.

We also granted cash awards during the year ended December 31, 2020. These awards will vest over a period of three years and will be settled in cash. As such, these awards have been classified as liability instruments. We recognized $1.1 million, $0.7 million and $0.9 million of expense related to these awards for the years ended December 31, 2022, 2021 and 2020, respectively. The liability for these awards is included in accounts payable and other accrued liabilities on our balance sheets. These awards will be remeasured at fair value each reporting period with resulting changes reflected in our income statements. Estimated unrecognized expense related to these awards is $0.1 million over a period of 0.1 years.

NOTE P—COMMITMENTS AND CONTINGENCIES

Future Minimum Annual Commitments (in thousands):

Year ending December 31,	Minimum Purchase Commitments
2023	$ 10,606
2024	4,295
2025	2,886
2026	2,180
2027	1,880
Thereafter	7,484
Total future purchase commitments	$ 29,331

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 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 years ended December 31, 2022, 2021 and 2020, zero, two and one claims, respectively, were brought against U.S. Silica. As of December 31, 2022, there were 42 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, 2022 and 2021, other non-current assets included zero for insurance for third-party products liability claims, and other long-term obligations included $0.8 million and $0.9 million, respectively, for third-party products liability claims.

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, 2022, there were $42.6 million in bonds outstanding. The majority of these bonds, $38.6 million, relate to reclamation requirements issued by various government authorities. Reclamation bonds remain outstanding until the mining area is reclaimed and the authority issues a formal release. The remaining bonds relate to licenses, permits, and tax collections.

NOTE Q— PENSION AND POST-RETIREMENT BENEFITS

We maintain a single-employer noncontributory defined benefit pension plan covering certain employees. The plan is frozen to all new employees. The plan provides 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 plan consistent with a goal of appropriate minimization of the unfunded projected benefit obligations. The pension plan uses a benefit level per year of service for covered hourly employees and a final average pay method for covered salaried employees. The plan uses 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. In general, retiree health benefits are paid as covered expenses are incurred.

Net pension benefit cost (in thousands) consisted of the following:

	Year Ended December 31,		
	2022	2021	2020
Service cost	$ 2,516	$ 2,855	$ 2,253
Interest cost	3,120	2,619	4,037
Expected return on plan assets	(5,887)	(5,688)	(6,019)
Net amortization and deferral	2,249	3,212	3,127
Net pension benefit costs	$ 1,998	$ 2,998	$ 3,398

Net post-retirement benefit cost (in thousands) consisted of the following:

	Year Ended December 31,		
	2022	2021	2020
Service cost	$ 18	$ 24	$ 70
Interest cost	180	141	584
Unrecognized net (gain)/loss	(2,360)	(2,204)	—
Net post-retirement benefit costs	$ (2,162)	$ (2,039)	$ 654

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 were as follows:

	Pension Benefits		Post-retirement Benefits	
	2022	2021	2022	2021
Benefit obligation at January 1,	$ 144,251	$ 157,198	$ 9,391	$ 11,318
Service cost	2,516	2,855	18	24
Interest cost	3,120	2,619	180	141
Actuarial (gain) loss	(28,494)	(6,637)	(1,566)	(3,193)
Benefits paid	(9,486)	(9,551)	(504)	(680)
Other	340	(2,233)	58	1,781
Benefit obligation at December 31,	$ 112,247	$ 144,251	$ 7,577	$ 9,391
Fair value of plan assets at January 1,	$ 120,911	$ 120,563	$ —	$ —
Actual return on plan assets	(22,507)	7,099	—	—
Employer contributions	—	2,800	446	579
Benefits paid	(9,486)	(9,551)	(504)	(680)
Other	1	—	58	101
Fair value of plan assets at December 31,	$ 88,919	$ 120,911	$ —	$ —
Plan assets less than benefit obligations at December 31 recognized as liability for pension and other post-retirement benefits	$ (23,328)	$ (23,340)	$ (7,577)	$ (9,391)

The accumulated benefit obligation for the defined benefit pension plans, which excludes the assumption of future salary increases, totaled $112.2 million and $144.3 million at December 31, 2022 and 2021, respectively. We record components other than service costs in Other income, net, including interest income in the Consolidated Statements of Operations.

We also sponsor unfunded, nonqualified pension plans. The projected benefit obligation, accumulated benefit obligation and fair value of plan assets for these plans were $1.2 million, $1.2 million and zero, respectively, at December 31, 2022 and $1.5 million, $1.5 million and zero, respectively, at December 31, 2021.

Future estimated annual benefit payments (in thousands) for pension and post-retirement benefit obligations were as follows:

	Benefits		
		Post-retirement	
	Pension	Before Medicare Subsidy	After Medicare Subsidy
2023	$ 9,489	$ 996	$ 996
2024	9,466	942	942
2025	9,323	844	844
2026	9,250	791	791
2027	9,072	729	729
2028-2032	42,390	2,715	2,715

Our best estimate of expected contributions to the pension and post-retirement medical benefit plans for the 2023 fiscal year are zero and $1.0 million, respectively.

The total amounts in accumulated other comprehensive income (loss) related to net actuarial loss for the pension and post-retirement plans were $6.5 million and $10.2 million as of December 31, 2022 and 2021, respectively. The total amounts in accumulated other comprehensive income (loss) related to prior service cost for the pension and post-retirement plans, were gains of $5.4 million and $7.8 million as of December 31, 2022 and 2021, respectively.

The actuarial gains in 2022 and 2021 were primarily driven by the change in discount rates on the U.S. qualified plan and postretirement medical plans. The impact of the discount rate change was partially offset by the actual return on plan assets exceeding the expected return on plan assets.

The following weighted-average assumptions were used to determine our obligations under the plans:

	Pension Benefits		Post-retirement Benefits	
	2022	2021	2022	2021
Discount rate	5.2 %	2.8 %	5.1 %	2.6 %
Long-term rate of compensation increase	N/A	N/A	N/A	N/A
Long-term rate of return on plan assets	6.0 %	5.8%	N/A	N/A
Health care cost trend rate:				
Pre-65 initial rate/ultimate rate	N/A	N/A	6.8%/4.5%	6.2%/4.5%
Pre-65 ultimate year	N/A	N/A	2031	2028
Post-65 initial rate/ultimate rate	N/A	N/A	N/A/N/A	N/A/N/A
Post-65 ultimate year	N/A	N/A	N/A	N/A

The weighted average discount rates used to determine the projected pension and post-retirement obligations were updated to reflect the expected long-term rates of return with maturities comparable to payments for the plan obligations utilizing Aon Hewitt's AA Above Medium Curve.

Mortality tables used for pension benefits and post-retirement benefits plans were the following:

	Pension and Post-retirement Benefits	
	2022	2021
Healthy Lives	Pri-2012 base mortality tables with generational mortality improvements using Scale MP-2021	Pri-2012 base mortality tables with generational mortality improvements using Scale MP-2021
Disabled Lives	Pri-2012 base mortality tables with generational mortality improvements using Scale MP-2021	Pri-2012 base mortality tables with generational mortality improvements using Scale MP-2021

The major investment categories and their relative percentage of the fair value of total plan assets as invested were as follows:

	Pension Benefits		Post-retirement Benefits[(1)]	
	2022	2021	2022	2021
Equity securities	54.3 %	51.6 %	— %	— %
Debt securities	44.2 %	46.1 %	— %	— %
Cash	1.5 %	2.3 %	— %	— %

[(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, 2022, by asset category, were as follows:

	Level 1	Level 2	Level 3	Total
Cash and cash equivalents	$ —	$ 1,362	$ —	$ 1,362
Mutual funds:				
Diversified emerging markets	4,221	—	—	4,221
Foreign large blend	16,740	—	—	16,740
Large-cap blend	15,464	—	—	15,464
Mid-cap blend	7,720	—	—	7,720
Real Assets	4,144	—	—	4,144
Fixed income securities:				
Corporate notes and bonds	27,892	—	—	27,892
U.S. Treasuries	5,223	—	—	5,223
Mortgage-backed securities	—	3,000	—	3,000
Asset-backed securities	—	3,153	—	3,153
Net asset	$ 81,404	$ 7,515	$ —	$ 88,919

The fair values of the pension plan assets (in thousands) at December 31, 2021, by asset category, were as follows:

	Level 1	Level 2	Level 3	Total
Cash and cash equivalents	$ —	$ 2,743	$ —	$ 2,743
Mutual funds:				
Diversified emerging markets	6,375	—	—	6,375
Foreign large blend	21,719	—	—	21,719
Large-cap blend	22,907	—	—	22,907
Mid-cap blend	11,411	—	—	11,411
Real estate	—	—	—	—
Fixed income securities:				
Corporate notes and bonds	35,365	—	—	35,365
U.S. Treasuries	6,915	—	—	6,915
Mortgage-backed securities	—	2,242	—	2,242
Asset-backed securities	—	1,739	—	1,739
Real Assets	—	9,495	—	9,495
Net asset	$ 104,692	$ 16,219	$ —	$ 120,911

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
		2022	2021		2022	2021	2020		
LIUNA	52-6074345/001	Green	Green	No	$ 395	$ 378	$ 361	No	6/7/2025
IUOE	36-6052390/001	Green	Green	No	376	328	256	No	8/1/2027
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, 2022, 2021 and 2020. 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. For all other eligible employees, we make a contribution of up to 6% of eligible earnings. Contributions were $6.9 million, $5.9 million and $4.4 million for the years ended December 31, 2022, 2021 and 2020, respectively.

NOTE R— LEASES

We lease railroad cars, office space, mining property, mining/processing equipment, and transportation and other equipment. The majority of our leases have remaining lease terms of approximately one year to 20 years. Our lease terms may include options to extend or terminate the lease when it is reasonably certain that we will exercise that option. We have lease agreements with lease and non-lease components, the latter of which are generally accounted for separately.

Supplemental balance sheet information related to leases (in thousands except for term and rate information) was as follows:

Leases	Classification	December 31, 2022	December 31, 2021
Assets			
Operating	Lease right-of-use assets	$ 39,088	$ 38,793
Finance	Lease right-of-use assets	3,286	3,448
Total leased assets		$ 42,374	$ 42,241
Liabilities			
Current			
Operating	Current portion of operating lease liabilities	$ 19,773	$ 14,469
Finance	Current portion of long-term debt	1,107	1,061
Non-Current			
Operating	Operating lease liabilities	64,478	75,130
Finance	Long-term debt, net	2,153	2,485
Total lease liabilities		$ 87,511	$ 93,145

Operating lease liabilities are based on the net present value of the remaining lease payments over the remaining lease term. As most of our leases do not provide an implicit rate, in determining the lease liability and the present value of lease payments, we used our incremental borrowing rate based on the information available at the lease commencement date. The weighted average remaining lease term and discount rate related to leases were as follows:

Lease Term and Discount Rate	December 31, 2022	December 31, 2021
Weighted average remaining lease term:		
Operating leases	6.4 years	6.9 years
Finance leases	4.4 years	3.6 years
Weighted average discount rate:		
Operating leases	5.7 %	5.7 %
Finance leases	5.1 %	5.1 %

The components of lease expense included in our Consolidated Statements of Operations were as follows:

Lease Costs	Classification	Year Ended December 31, 2022	Year Ended December 31, 2021
Operating lease costs [1]	Cost of Sales	$ 38,576	$ 33,185
Operating lease costs [2]	Selling, general, and administrative	1,641	1,880
Total [3]		$ 40,217	$ 35,065

[1] Included short-term operating lease costs of $23.5 million and $17.9 million for the years ended December 31, 2022 and 2021, respectively.
[2] Included short-term operating lease costs of $0.5 million and $0.4 million for the years ended December 31, 2022 and 2021, respectively.
[3] Does not include expense of $1.5 million and $0.8 million for the years ended December 31, 2022 and 2021 for finance leases.

Supplemental cash flow information related to leases was as follows:

	Year Ended December 31, 2022	Year Ended December 31, 2021
Cash paid for amounts included in the measurement of lease liabilities:		
Operating cash flows for operating leases	$ 22,410	$ 24,451
Financing cash flows for finance leases	$ 1,576	$ 759
Right-of-use assets obtained in exchange for new lease liabilities:		
Operating leases	$ 14,744	$ 17,350
Finance leases	$ 2,536	$ 3,815

Maturities of lease liabilities as of December 31, 2022:

Maturities of lease liabilities	**Operating leases**	**Finance leases**
2023	$ 24,707	$ 1,249
2024	20,230	1,123
2025	14,725	842
2026	11,812	271
2027	8,281	33
Thereafter	23,701	—
Total lease payments	$ 103,456	$ 3,518
Less: Interest	16,715	258
Less: Other operating expenses	2,490	—
Total	$ 84,251	$ 3,260

NOTE S— INCOME TAXES

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.

On March 27, 2020, the Coronavirus Aid, Relief, and Economic Security Act ("CARES" Act) was enacted and signed into law in response to the COVID-19 pandemic. The CARES Act, among other things, permitted NOL carryovers and carrybacks to offset 100% of taxable income for taxable years beginning after 2017 and before 2021. In addition, the CARES Act allowed NOLs generated after 2017 and before 2021 to be carried back to each of the five preceding taxable years to generate a refund of previously paid income taxes. As a result, during 2020, we carried the NOL generated in 2019 back to offset the taxable income in the 2014 tax year generating a refund of $36.6 million. This refund was received during the second quarter of 2020. We also amended our 2018 tax return to generate an NOL by electing bonus depreciation. We then carried the NOL generated in 2018 back to offset the taxable income in prior years generating a refund of $26.3 million, of which $4.9 million was received during the fourth quarter of 2020 and $21.1 million was received during the first quarter of 2022. At December 31, 2022, the remaining $0.3 million of this refund was included in our deferred tax asset balance. The deferred tax assets related to the NOLs generated in 2018 and 2019 were recorded at the statutory income tax rate for 2018 and 2019, which was 21% for both years. As a result of the carry back of these NOLs to prior years, the NOLs will be utilized at the statutory income tax rate for pre-2018, which was 35%. This increase in the tax rate at which the 2018 and 2019 NOLs will be utilized results in a deferred tax benefit. Accordingly, for the year ended December 31, 2020, we recorded a deferred tax benefit of $22.3 million. Pursuant to ASC 740, this was recorded as a discrete component of the tax benefit.

Income (loss) before income taxes (in thousands) consisted of the following:

	Year ended December 31,		
	2022	**2021**	**2020**
United States	$ 87,686	$ (48,328)	$ (183,656)
Foreign	16,313	11,252	8,509
Total	$ 103,999	$ (37,076)	$ (175,147)

Income tax (expense) benefit (in thousands) consisted of the following:

	Year ended December 31,		
	2022	2021	2020
Current:			
Federal	$ (1,650)	$ —	$ —
State	(3,078)	(3,353)	(307)
Foreign	(491)	(1,385)	(1,473)
	(5,219)	(4,738)	(1,780)
Deferred:			
Federal	(17,881)	7,589	57,214
State	(3,059)	(96)	4,591
Foreign	—	—	—
	(20,940)	7,493	61,805
Income tax (expense) benefit	$ (26,159)	$ 2,755	$ 60,025

Income tax (expense) benefit (in thousands) differed from the amount that would be provided by applying the U.S. federal statutory rate due to the following:

	Year ended December 31,		
	2022	2021	2020
Income tax (expense) benefit computed at U.S. federal statutory rate	$ (21,838)	$ 7,786	$ 36,781
Decrease (increase) resulting from:			
Statutory depletion	2,963	2,012	1,230
Prior year tax return reconciliation	(1,564)	(2,490)	(2,084)
State income taxes, net of federal benefit	(4,003)	445	5,013
Impact of international operations	(830)	(380)	(795)
Unrecognized tax benefits	(89)	(1,302)	—
Adjustment to deferred taxes from the CARES Act	—	—	22,318
Equity compensation	(195)	(627)	(1,477)
Executive compensation	(300)	(2,092)	(579)
Other, net	(303)	(597)	(382)
Income tax (expense) benefit	$ (26,159)	$ 2,755	$ 60,025

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 carryforwards.

The tax effects of the types of temporary differences and carry forwards that gave rise to deferred tax assets and liabilities (in thousands) consisted of the following:

	December 31,	
	2022	2021
Gross deferred tax assets:		
Net operating loss carry forward and state tax credits	$ 54,638	$ 77,327
Pension and post-retirement benefit costs	6,789	7,318
Property, plant and equipment	5,935	8,619
Accrued expenses	18,232	14,930
Inventories	—	1,200
Federal tax credits	1,047	4,188
Stock-based compensation expense	6,374	4,359
Interest expense limitation	19,826	16,921
Intangibles	6,366	7,876
Lease obligation liability	11,393	13,297
Other	5,886	4,399
Total deferred tax assets	136,486	160,434
Gross deferred tax liabilities:		
Land and mineral property basis difference	(124,669)	(121,211)
Fixed assets and depreciation	(74,714)	(83,708)
Inventories	(1,170)	—
Other	(569)	(289)
Total deferred tax liabilities	(201,122)	(205,208)
Net deferred tax liabilities	$ (64,636)	$ (44,774)

We have federal net operating loss carry forwards of approximately $215.8 million at December 31, 2022. A portion of those losses are subject to an annual limitation under Internal Revenue Code Section 382, but are expected to be fully realized. NOL deductions generated in tax years after December 31, 2017 can offset 100% of taxable income for periods prior to 2021 but only 80% of taxable income after 2020. The CARES Act also prohibits NOL carrybacks on NOLs generated after December 31, 2020 but allows indefinite carryforwards. As of December 31, 2022, we have general business credits of approximately $1.0 million, which will expire beginning in 2033. These credits are expected to be fully realized.

The following table is a reconciliation of our unrecognized tax benefits (in thousands):

	Year ended December 31,		
	2022	2021	2020
Balance as of January 1	$ 856	$ —	$ —
Additions for tax positions of prior years	—	856	—
Balance as of December 31	$ 856	$ 856	$ —

If the unrecognized tax benefits of $0.9 million are realized, this would negatively impact the effective tax rate. As of December 31, 2022, 2021 and 2020, we had approximately $0.5 million, $0.4 million, and zero, respectively, of interest and penalties related to uncertain tax positions. During 2022, 2021 and 2020, we accrued and recognized estimated interest and penalties related to uncertain tax positions of approximately $0.1 million, $0.4 million and zero, respectively. We include potential interest and penalties related to uncertain tax positions in the income tax (expense)/benefit line item in our Consolidated Statements of Operations. We do not expect a significant change to the unrecognized tax benefits during the next twelve months. Tax returns filed with the IRS for the years 2019 through 2021 along with tax returns filed with numerous state entities remain subject to examination.

NOTE T— 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 reflects our sales disaggregated by major source (in thousands):

	Year Ended December 31, 2022			Year Ended December 31, 2021		
Category	Oil & Gas Proppants	Industrial & Specialty Products	Total Sales	Oil & Gas Proppants	Industrial & Specialty Products	Total Sales
Product	$ 576,293	$ 563,480	$ 1,139,773	$ 407,772	$ 488,431	$ 896,203
Service	385,374	—	385,374	207,676	—	207,676
Total Sales	$ 961,667	$ 563,480	$ 1,525,147	$ 615,448	$ 488,431	$ 1,103,879

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 (in thousands):

	Unbilled Receivables	
	December 31, 2022	December 31, 2021
Beginning Balance	$ 1,957	$ 47,982
Reclassifications to billed receivables	(4,457)	(105,305)
Revenues recognized in excess of period billings	2,500	59,280
Ending Balance	$ —	$ 1,957

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.

	Deferred Revenue	
	December 31, 2022	December 31, 2021
Beginning Balance	$ 20,741	$ 33,692
Revenues recognized from balances held at the beginning of the period	(3,905)	(13,172)
Revenues deferred from period collections on unfulfilled performance obligations	27,398	5,207
Revenues recognized from period collections	(13,482)	(4,986)
Ending Balance	$ 30,752	$ 20,741

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. However, the changes in the deferred revenue balance are partially attributable to revenue recognized as variable consideration from shortfall fees assessed to multiple customers according to contract terms as of December 31, 2022 and 2021. For the years ended December 31, 2022 and 2021, we recognized revenue as variable consideration from shortfall fees according to contract terms in the amounts of $1.1 million and $49.7 million, respectively. We believe these amounts are the best estimates of revenue to recognize as of year end.

During the second quarter of 2021, we entered into an agreement to settle a customer dispute regarding fees related to minimum purchase commitments from 2014-2020. As a result of this settlement, we recognized approximately $49.0 million in revenue as of June 30, 2021. These amounts were received in full during the second and third quarters of 2021.

Foreign Operations

The following table includes information related to our foreign operations (in thousands):

	For the years ended		
	December 31, 2022	December 31, 2021	December 31, 2020
Total Sales	$ 112,753	$ 96,317	$ 86,179
Pre-tax income	$ 16,313	$ 11,252	$ 8,509
Net income	$ 12,887	$ 8,889	$ 6,722

Foreign operations constituted approximately $33.4 million and $30.7 million of consolidated assets as of December 31, 2022 and 2021, respectively.

NOTE U— RELATED PARTY TRANSACTIONS

There were no related party transactions during the years ended December 31, 2022, 2021 or 2020.

NOTE V— 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 600 product types and materials used in a variety of markets including building and construction products, fillers and extenders, filtration, glassmaking, absorbents, foundry, and sports and recreation.

An operating segment’s performance is primarily evaluated based on segment contribution margin, which excludes selling, general, and administrative costs, corporate costs, plant capacity expansion expenses, and facility closure costs. 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:

	Year Ended December 31,		
	2022	2021	2020
Sales:			
Oil & Gas Proppants	$ 961,667	$ 615,448	$ 414,897
Industrial & Specialty Products	563,480	488,431	430,988
Total sales	1,525,147	1,103,879	845,885
Segment contribution margin:			
Oil & Gas Proppants	301,837	160,052	142,041
Industrial & Specialty Products	170,280	168,499	159,176
Total segment contribution margin	472,117	328,551	301,217
Operating activities excluded from segment cost of sales	(17,159)	(19,655)	(30,402)
Selling, general and administrative	(143,838)	(119,628)	(124,171)
Depreciation, depletion and amortization	(140,166)	(161,131)	(155,568)
Goodwill and other asset impairments	—	(202)	(110,688)
Interest expense	(77,598)	(71,157)	(79,885)
Other income, net, including interest income	10,643	6,146	24,350
Income tax (expense) benefit	(26,159)	2,755	60,025
Net income (loss)	$ 77,840	$ (34,321)	$ (115,122)
Less: Net loss attributable to non-controlling interest	(336)	(560)	(1,028)
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$ 78,176	$ (33,761)	$ (114,094)

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 both December 31, 2022 and 2021, goodwill of $185.6 million has been allocated to these segments with zero assigned to Oil & Gas Proppants and $185.6 million to Industrial & Specialty Products.

NOTE W— PARENT COMPANY FINANCIALS

U.S. SILICA HOLDINGS, INC.
(PARENT COMPANY ONLY)
CONDENSED BALANCE SHEETS

	December 31,	
	2022	2021
	(in thousands)	
ASSETS		
Current Assets:		
Cash and cash equivalents	$ 48,398	$ 46,996
Other receivables	275	—
Due from affiliates	160,315	165,632
Total current assets	208,988	212,628
Investment in subsidiaries	495,776	401,691
Total assets	$ 704,764	$ 614,319
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current Liabilities:		
Accounts payable and accrued liabilities	$ 50	$ 50
Dividends payable	20	186
Total current liabilities	70	236
Total liabilities	70	236
Stockholders' Equity:		
Preferred stock	—	—
Common stock	854	845
Additional paid-in capital	1,234,834	1,218,575
Retained deficit	(351,084)	(429,260)
Treasury stock, at cost	(186,196)	(186,294)
Accumulated other comprehensive (loss) income	(1,723)	349
Total U.S. Silica Holdings, Inc. stockholders' equity	696,685	604,215
Non-controlling interest	8,009	9,868
Total stockholders' equity	704,694	614,083
Total liabilities and stockholders' equity	$ 704,764	$ 614,319

U.S. SILICA HOLDINGS, INC.

(PARENT COMPANY ONLY)

CONDENSED STATEMENTS OF OPERATIONS AND COMPREHENSIVE INCOME (LOSS)

	Year ended December 31,		
	2022	2021	2020
	(in thousands)		
Sales	$ —	$ —	$ —
Cost of sales	—	—	—
Operating expenses			
Selling, general and administrative	253	252	253
Total operating expenses	253	252	253
Operating loss	(253)	(252)	(253)
Other income (expense)			
Interest income	565	5	210
Total other income	565	5	210
Income (loss) before income taxes and equity in net earnings of subsidiaries	312	(247)	(43)
Income tax expense	—	—	—
Income (loss) before equity in net earnings of subsidiaries	312	(247)	(43)
Equity in earnings of subsidiaries, net of tax	77,528	(34,074)	(115,079)
Net income (loss)	$ 77,840	$ (34,321)	$ (115,122)
Less: Net loss attributable to non-controlling interest	(336)	(560)	(1,028)
Net income (loss) attributable to U.S. Silica Holdings, Inc.	$ 78,176	$ (33,761)	$ (114,094)
Net income (loss)	$ 77,840	$ (34,321)	$ (115,122)
Other comprehensive (loss) income			
Unrealized (loss) gain on derivatives (net of tax of $(746), $0, and $973 for 2022, 2021, and 2020, respectively)	(2,342)	—	3,053
Foreign currency translation adjustment (net of tax of $(269), $(309), and $444 for 2022, 2021 and 2020, respectively)	(845)	(1,000)	1,391
Pension and other post-retirement benefits liability adjustment (net of tax of $355, $3,131, and $2,207 for 2022, 2021 and 2020, respectively)	1,115	9,828	6,931
Comprehensive income (loss)	$ 75,768	$ (25,493)	$ (103,747)
Less: Comprehensive loss attributable to non-controlling interest	(336)	(560)	(1,028)
Comprehensive income (loss) attributable to U.S. Silica Holdings, Inc.	$ 76,104	$ (24,933)	$ (102,719)

U.S. SILICA HOLDINGS, INC.

(PARENT COMPANY ONLY)

CONDENSED STATEMENTS OF STOCKHOLDERS' EQUITY

(amounts in thousands)	Par Value	Treasury Stock	Additional Paid-In Capital	Retained Deficit - Present	Accumulated Other Comprehensive (Loss) Income	Total U.S. Silica, Inc. Stockholders' Equity	Non-controlling Interest	Total Stockholders' Equity
Balance at January 1, 2020	$ 823	$ (180,912)	$ 1,185,116	$ (279,956)	$ (19,854)	$ 705,217	$ 11,363	$ 716,580
Net loss	—	—	—	(114,094)	—	(114,094)	(1,028)	(115,122)
Unrealized gain on derivatives	—	—	—	—	3,053	3,053	—	3,053
Foreign currency translation adjustment	—	—	—	—	1,391	1,391	—	1,391
Pension and post-retirement liability	—	—	—	—	6,931	6,931	—	6,931
Cash dividend declared ($0.02 per share)	—	—	—	(1,446)	—	(1,446)	—	(1,446)
Contributions from non-controlling interest	—	—	—	—	—	—	1,196	1,196
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	14,911	—	—	14,911	—	14,911
Shares withheld for employee taxes related to vested restricted stock and stock units	4	(703)	(4)	—	—	(703)	—	(703)
Balance at December 31, 2020	$ 827	$ (181,615)	$ 1,200,023	$ (395,496)	$ (8,479)	$ 615,260	$ 11,531	$ 626,791
Net loss	—	—	—	(33,761)	—	(33,761)	(560)	(34,321)
Foreign currency translation adjustment	—	—	—	—	(1,000)	(1,000)	—	(1,000)
Pension and post-retirement liability	—	—	—	—	9,828	9,828	—	9,828
Cash dividends	—	—	—	(3)	—	(3)	—	(3)
Distributions to non-controlling interest	—	—	—	—	—	—	(1,103)	(1,103)
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	18,809	—	—	18,809	—	18,809
Proceeds from options exercised	—	344	(239)	—	—	105	—	105
Shares withheld for employee taxes related to vested restricted stock and stock units	18	(5,023)	(18)	—	—	(5,023)	—	(5,023)
Balance at December 31, 2021	$ 845	$ (186,294)	$ 1,218,575	$ (429,260)	$ 349	$ 604,215	$ 9,868	$ 614,083
Net income (loss)	—	—	—	78,176	—	78,176	(336)	77,840
Unrealized loss on derivatives	—	—	—	—	(2,342)	(2,342)	—	(2,342)
Foreign currency translation adjustment	—	—	—	—	(845)	(845)	—	(845)
Pension and post-retirement liability	—	—	—	—	1,115	1,115	—	1,115
Cash dividends	—	—	—	—	—	—	—	—
Distributions to non-controlling interest	—	—	—	—	—	—	(1,523)	(1,523)
Common stock-based compensation plans activity:								
Equity-based compensation	—	—	18,364	—	—	18,364	—	18,364
Proceeds from options exercised	—	3,051	(2,096)	—	—	955	—	955
Shares withheld for employee taxes related to vested restricted stock and stock units	9	(2,953)	(9)	—	—	(2,953)	—	(2,953)
Balance at December 31, 2022	$ 854	$ (186,196)	$ 1,234,834	$ (351,084)	$ (1,723)	$ 696,685	$ 8,009	$ 704,694

U.S. SILICA HOLDINGS, INC.

(PARENT COMPANY ONLY)

CONDENSED STATEMENTS OF CASH FLOWS

	Year ended December 31,		
	2022	**2021**	**2020**
		(in thousands)	
Operating activities:			
Net income (loss)	$ 77,840	$ (34,321)	$ (115,122)
Adjustments to reconcile net income (loss) to net cash provided by (used in) operating activities:			
Undistributed (income) loss from equity method investment, net	(77,528)	34,074	115,079
Changes in assets and liabilities, net of effects of acquisitions:			
Other receivables	(275)	—	—
Accounts payable and accrued liabilities	—	(236)	155
Net cash provided by (used in) operating activities	37	(483)	112
Investing activities:			
Investment in subsidiary	—	—	—
Net cash used in investing activities	—	—	—
Financing activities:			
Dividends paid	(164)	(26)	(6,185)
Proceeds from options exercised	955	105	—
Tax payments related to shares withheld for vested restricted stock and stock units	(2,953)	(5,023)	(703)
(Distributions to) contributions from non-controlling interest	(1,523)	(1,103)	1,196
Net financing activities with subsidiaries	5,050	6,675	582
Net cash provided by (used in) financing activities	1,365	628	(5,110)
Net increase (decrease) in cash and cash equivalents	1,402	145	(4,998)
Cash and cash equivalents, beginning of period	46,996	46,851	51,849
Cash and cash equivalents, end of period	$ 48,398	$ 46,996	$ 46,851
Supplemental cash flow information:			
Cash received during the period for:			
Interest	$ (565)	$ (17)	$ (210)

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 our consolidated net assets. The ability of our operating subsidiaries to pay dividends may be restricted due to the terms of our Credit Facility, as discussed in Note K - Debt to these financial statements.

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, our 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 our 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 X— IMPAIRMENTS

We recorded impairment charges (in thousands) for the following assets:

Description	December 31, 2022	December 31, 2021	December 31, 2020
Inventories, net	$ —	$ —	$ 6,837
Property, plant and mine development, net	—	164	11,822
Operating lease right-of-use assets	—	—	3,406
Goodwill	—	—	86,100
Intangible assets, net	—	38	2,523
Total	$ —	$ 202	$ 110,688

2020 Impairments

During 2020, there was an unprecedented drop in global demand combined with the breakdown of the Organization of the Petroleum Exporting Countries and other oil producing nations ("OPEC+") agreement to restrict oil production that led to one of the largest annual crude oil inventory builds in history. This led to a sharp reduction in global crude oil prices. Containment measures and other economic, travel, and business disruptions caused by COVID-19 also affected refinery activity and future demand for crude oil, and consequently, the services and products of our Oil & Gas Proppants segment. As a result of these triggering events, we completed impairment assessments for our assets, including plant, property and mine development, right-of-use assets, inventories, and other intangible assets.

Inventories, net

We recorded impairment charges primarily related to unused inventory at plants we idled. These charges related to the Oil & Gas Proppants segment and are recorded in "Goodwill and other asset impairments" in the Consolidated Statements of Operations.

Property, plant and mine development

We estimated the future undiscounted net cash flows of certain asset groupings 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. In the cases where the undiscounted cash flows are less than the carrying value of the assets, we recognized an impairment loss equal to the amount by which the carrying value exceeds the fair value of the assets. Impairment charges were recorded related primarily to our Kosse, Texas facility, which was idled. These charges related to the Oil & Gas Proppants segment and are recorded in "Goodwill and other asset impairments" in the Consolidated Statements of Operations.

Operating lease right-of-use assets

We determined the fair value of the railcars primarily utilizing internally developed cash flow models and quoted market prices, discounted at an appropriate weighted average cost of capital. As a result, we recognized impairment charges primarily related to various equipment leases and an office building lease. These charges related mainly to the Oil & Gas Proppants segment and are recorded in "Goodwill and other asset impairments" in the Consolidated Statements of Operations.

Goodwill

We performed a quantitative analysis and determined that the goodwill of our Oil & Gas Proppants reporting unit was impaired. We recognized goodwill impairment charges during the first quarter of 2020. These impairment charges were recorded in the "Goodwill and other asset impairments" caption of our Consolidated Statements of Operations. The fair value of our reporting units was determined using the discounted cash flow method.

Intangible assets, net

We recorded impairments of $1.1 million for trade names and $1.4 million for patents and intellectual property as of December 31, 2020, which was recorded in the Industrial & Specialty Products segment as a result of the discontinuance of a minor product line. These charges were recorded in the "Goodwill and other asset impairments" caption of our Consolidated Statements of Operations.

NOTE Y-SUBSEQUENT EVENTS

We evaluated subsequent events through the date the consolidated financial statements were available for issuance and did not identify any events requiring disclosure.

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, 2022. 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. Solely as a result of the changes we had to make to our mining disclosures in our Form 10-K for the fiscal year ended December 31, 2021, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were not effective as of December 31, 2021. To remediate this conclusion, during 2022 we engaged a new qualified person to prepare our mining technical report studies and review the related mining disclosures. Because the omitted disclosures did not affect our financial statements, no additional remediation was deemed necessary. Based on the evaluation of our disclosure controls and procedures as of December 31, 2022, 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. Based upon the evaluation under this framework, management concluded that our internal control over financial reporting was effective as of December 31, 2022.

Our independent registered public accounting firm has audited the effectiveness of our internal control over financial reporting as of December 31, 2022, 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, 2022 that materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

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, 2022, 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, 2022, 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, 2022, and our report dated February 24, 2023 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.

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.

GRANT THORNTON LLP

Houston, Texas
February 24, 2023

ITEM 9B. OTHER INFORMATION

Not applicable.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

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 2023 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 the instruction 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 2023 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 2023 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 2023 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 2023" in the 2023 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 24, 2023, are included as part of Item 8. Financial Statements and Supplementary Data.

	Page
Report of Independent Registered Public Accounting Firm	79
Consolidated Balance Sheets as of December 31, 2022 and 2021	80
Consolidated Statements of Operations for the Years Ended December 31, 2022, 2021 and 2020	81
Consolidated Statements of Comprehensive Income for the Years Ended December 31, 2022, 2021 and 2020	82
Consolidated Statements of Stockholders' Equity for the Years Ended December 31, 2022, 2021 and 2020	83
Consolidated Statements of Cash Flows for the Years Ended December 31, 2022, 2021 and 2020	85
Notes to the Consolidated Financial Statements	87

Financial Statement Schedules

Schedule I - Condensed Financial Information of Parent (U.S. Silica Holdings, Inc.) at December 31, 2022 and 2021 and for the years ended December 31, 2022, 2021 and 2020 is included in Note W - 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 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
4.2	Description of the Registrant's Securities Registered Pursuant to Section 12 of the Exchange Act	10-K	001-35416	4.2	February 25, 2020
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	10.1	March 22, 2012
10.2+	Form of Nonqualified Stock Option Agreement.	S-1/A	333-175636	10.17	August 29, 2011

10.3+	Form of Indemnification Agreement.	S-1/A	333-175636	10.20	December 29, 2011
10.4+	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
10.5+	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
10.6+	Omnibus Amendment dated February 18, 2016 to Award Agreements.	8-K	001-35416	10.3	February 23, 2016
10.7+	Form of Nonqualified Stock Option Agreement.	10-K	001-35416	10.2	February 25, 2015
10.8+	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
10.9+	Omnibus Amendment dated November 3, 2016 to Award Agreements.	10-K	001-35416	10.22	February 23, 2017
10.10+	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
10.11	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
10.12	Consent and Amendment Agreement, dated as of August 23, 2019, among U.S. Silica Company and BNP Paribas, as administrative agent and the lenders named therein, amending that certain Third Amended and Restated Credit Agreement, dated as of May 1, 2018.	10-Q	001-35416	10.1	October 30, 2019
10.13+	Form of Performance Share Unit Agreement (Adjusted Cash Flow) Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan	10-Q	001-35416	10.1	May 1, 2019
10.14+	Form of Performance Share Unit Agreement (Relative TSR) Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan	10-Q	001-35416	10.2	May 1, 2019
10.15+	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	May 1, 2019
10.16+	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	10.1	May 1, 2020
10.17+	U.S. Silica Holdings, Inc. Amended and Restated Change in Control Severance Plan, as amended and restated April 29, 2020.	10-Q	001-35416	10.2	May 1, 2020
10.18+	Form of Performance Share Unit Agreement (Relative TSR) Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan	10-Q	001-35416	10.1	April 30, 2021
10.19+	Letter Agreement, effective September 21, 2021, by and between Sandra Rogers and U.S. Silica Holdings, Inc.	10-K	001-35416	10.19	February 25, 2022

10.20+	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	10.1	April 29, 2022
10.21+	Form of Performance Share Unit Agreement (Relative TSR) Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan	10-Q	001-35416	10.2	April 29, 2022
10.22+	Form of Performance Share Unit Agreement (Adjusted Cash Flow) Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan	10-Q	001-35416	10.3	April 29 2022
10.23+	Fourth Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan, as amended and restated May 12, 2022	8-K	001-35416	10.1	May 13, 2022
21.1*	List of subsidiaries of U.S. Silica Holdings, Inc.				
23.1*	Consent of Independent Registered Public Accounting Firm.				
23.2*	Consent of Third Party Qualified Person				
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.				
96.1*	Technical Report Summary, Ottawa Site, LaSalle County, Illinois				
96.2*	Technical Report Summary, Colado Site, Pershing County, Nevada				
96.3*	Technical Report Summary, Lamesa Site, Lamesa, Dawson County, Texas				
96.4*	Technical Report Summary, Crane Site, Crane County, Texas				
101*	101.INS XBRL Instance - the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document				
	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				
104*	Cover Page from the Company's Annual Report on Form 10-K for the year ended December 31, 2020 formatted Inline XBRL (and contained in Exhibit 101)				

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 24th day of February, 2023.

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	Chief Executive Officer and Director (Principal Executive Officer)	February 24, 2023
/S/ DONALD A. MERRIL Donald A. Merril	Executive Vice President, Chief Financial Officer (Principal Financial and Accounting Officer)	February 24, 2023
/S/ CHARLES SHAVER Charles Shaver	Chairman of the Board	February 24, 2023
/S/ PETER BERNARD Peter Bernard	Director	February 24, 2023
/s/ DIANE DUREN Diane Duren	Director	February 24, 2023
/S/ WILLIAM J. KACAL William J. Kacal	Director	February 24, 2023
/s/ SANDRA ROGERS Sandra Rogers	Director	February 24, 2023

Exhibit 21.1

Name	Jurisdiction of Formation
Hourglass Acquisition I, LLC	Delaware
Preferred Rocks USS Inc.	Delaware
Hourglass Holdings, LLC	Delaware
USS Holdings, Inc.	Delaware
U.S. Silica Company	Delaware
Pennsylvania Glass Sand Corporation	Delaware
The Fulton Land and Timber Company	Pennsylvania
Ottawa Silica Company	Delaware
Ottawa Silica Company, Ltd.	Quebec, Canada
Coated Sand Solutions, LLC	Delaware
Cadre Services Inc.	Delaware
Cadre Material Products, LLC	Texas
Fairchild Silica, LLC	Delaware
Utica Silica, LLC	Delaware
Tyler Silica Company	Delaware
New Birmingham Resources, LLC	Texas
NBR Sand, LLC	Texas
NBR Maritime I, LLC	Texas
NBR Maritime II, LLC	Texas
Sandbox Enterprises, LLC	Texas
Oren Technologies, LLC	Texas
Sandbox Leasing, LLC	Texas
Sandbox Logistics, LLC	Texas
Sandbox Transportation, LLC	Texas
Mississippi Sand, LLC	Missouri
Arcadia Sand, LLC	Delaware
Boss Energy Resources, LLC	Delaware
Seagraves Development, LLC	Delaware
EP Minerals Holdings, Inc.	Delaware
EP Acquisition, LLC	Delaware
EP Management Corporation	Delaware
EP Minerals, LLC	Delaware
EP Engineered Clays Corporation	Delaware
EP Minerals International S.A.S.	France
EP Minerals Europe Verwaltungs und Beteiligungs GmbH	Germany
EP Minerals Europe GmbH & Co. KG	Germany
EP Mexican Parent, Inc.	Delaware
EP Minerals de Mexico S. de R.L. de C.V.	Mexico
Celatom de Mexico S. de R.L. de C.V.	Mexico
Kermit Pipeline, LLC (50% ownership)	Texas
Spruce Acquisition, LLC	Delaware

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We have issued our reports dated February 24, 2023, with respect to the consolidated financial statements and internal control over financial reporting included in the Annual Report of U.S. Silica Holdings, Inc. on Form 10-K for the year ended December 31, 2022. We hereby consent to the incorporation by reference of said reports in the Registration Statements of U.S. Silica Holdings, Inc. on Form S-3ASR (333-258323) and Forms S-8 (333-179480, 333-204062, 333-238198, 333-256389 and 333-265119).

/s/ Grant Thornton LLP

Houston, Texas
February 24, 2023

John T. Boyd Company
Mining and Geological Consultants

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4000 Town Center Boulevard, Suite 300
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www.jtboyd.com

February 24, 2023
File: 3076.017

Subject: **CONSENT OF THIRD-PARTY QUALIFIED PERSON**

Ladies and Gentlemen:

The John T. Boyd Company ("BOYD") in connection with the filing of the U.S. Silica Holdings, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2022 and any amendments or supplements and/or exhibits thereto (collectively, the "Form 10-K"), consent to:

- the filing and use of the technical report summary titled "Technical Report Summary, Silica Sand Resources and Reserves, Ottawa Operation, LaSalle County, Illinois" (the "Ottawa Technical Report"), with an effective date of December 31, 2022, as an exhibit to and referenced in the Form 10-K;
- the filing and use of the technical report summary titled "Technical Report Summary, Proppant Sand Resources and Reserves, Lamesa Operation, Dawson County, Texas" (the "Lamesa Technical Report"), with an effective date of December 31, 2022, as an exhibit to and referenced in the Form 10-K;
- the filing and use of the technical report summary titled "Technical Report Summary, Proppant Sand Resources and Reserves, Crane Operation, Crane County, Texas" (the "Crane Technical Report"), with an effective date of December 31, 2022, as an exhibit to and referenced in the Form 10-K;
- the filing and use of the technical report summary titled "Technical Report Summary, Diatomaceous Earth Resources and Reserves, Colado Operation, Pershing County, Nevada" (the "Colado Technical Report" and together with the Ottawa Technical Report, Lamesa Technical Report, and Crane Technical Report, the "Technical Reports"), with an effective date of December 31, 2022, as an exhibit to and referenced in the Form 10-K;

- the use of and references to our name, including our status as an expert or “qualified person” (as defined in Subpart 1300 of Regulation S-K promulgated by the Securities and Exchange Commission), in connection with the Form 10-K and any such Technical Report; and
- the information derived, summarized, quoted or referenced from any of the Technical Reports, or portions thereof, that was prepared by BOYD, that BOYD supervised the preparation of and/or that was reviewed and approved by BOYD, that is included or incorporated by reference in the Form 10-K.

BOYD is responsible for authoring, and this consent pertains to, the Technical Reports. BOYD certifies that it has read the Form 10-K and that it fairly and accurately represents the information in the sections of the Technical Reports for which BOYD is responsible.

BOYD also consents to the incorporation by reference in U.S. Silica Holdings, Inc.’s registration statements on Form S-8 (Nos. 333-265119, 333-256389, 333-238198, 333-204062, 333-179480) and Form S-3ASR (No.333-258323) of the above items as included in the Form 10-K.

Respectfully submitted,

JOHN T. BOYD COMPANY
By: /s/ John T. Boyd

John T. Boyd II
President and CEO

Exhibit 31.1

CERTIFICATION

I, Bryan A. Shinn, certify that:

1. I have reviewed this Annual Report on Form 10-K of U.S. Silica Holdings, Inc. (the "Company") for the year ended December 31, 2022;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

    c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

    a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: February 24, 2023

/s/ BRYAN A. SHINN

Name: Bryan A. Shinn
Title: Chief Executive Officer

Exhibit 31.2

CERTIFICATION

I, Donald A. Merril, certify that:

1. I have reviewed this annual report on Form 10-K of U.S. Silica Holdings, Inc. (the "Company") for the year ended December 31, 2022;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

    c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

    a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: February 24, 2023

/s/ DONALD A. MERRIL

Name: Donald A. Merril
Title: Chief Financial Officer

Exhibit 32.1

SECTION 1350 CERTIFICATION

I, Bryan A. Shinn, Chief Executive Officer, U.S. Silica Holdings, Inc. (the "Company"), hereby certify, on the date hereof, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to the best of my knowledge:

i. The Annual Report on Form 10-K of the Company for the year ended December 31, 2022 (the "Report") fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended; and

ii. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: February 24, 2023

/s/ BRYAN A. SHINN

Name: Bryan A. Shinn
Title: Chief Executive Officer

A signed copy of this original statement required by Section 906 has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff on request.

Exhibit 32.2

SECTION 1350 CERTIFICATION

I, Donald A. Merril, Chief Financial Officer, U.S. Silica Holdings, Inc. (the "Company"), hereby certify, on the date hereof, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to the best of my knowledge:

i. The Annual Report on Form 10-K of the Company for the year ended December 31, 2022 (the "Report") fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended; and

ii. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: February 24, 2023

/s/ DONALD A. MERRIL

Name: Donald A. Merril
Title: Chief Financial Officer

A signed copy of this original statement required by Section 906 has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff on request.

Exhibit 95.1

Mine Safety Disclosure

The following disclosures are provided pursuant to the Dodd-Frank Wall Street Reform and Consumer Protection Act (the "Act") and Item 104 of Regulation S-K, which requires certain disclosures by companies required to file periodic reports under the Securities Exchange Act of 1934, as amended, that operate mines regulated under the Federal Mine Safety and Health Act of 1977 (the "Mine Act").

Mine Safety Information. Whenever the Federal Mine Safety and Health Administration ("MSHA") believes a violation of the Mine Act, any health or safety standard or any regulation has occurred, it may issue a citation which describes the alleged violation and fixes a time within which the U.S. mining operator must abate the alleged violation. In some situations, such as when MSHA believes that conditions pose a hazard to miners, MSHA may issue an order removing miners from the area of the mine affected by the condition until the alleged hazards are corrected. When MSHA issues a citation or order, it generally proposes a civil penalty, or fine, as a result of the alleged violation, that the operator is ordered to pay. Citations and orders can be contested and appealed, and as part of that process, are often reduced in severity and amount, and are sometimes dismissed. The number of citations, orders and proposed assessments vary depending on the size and type (underground or surface) of the mine as well as by the MSHA District's approach to enforcement. Due to timing and other factors, the data below may not agree with the mine data retrieval system maintained by the MSHA at www.MSHA.gov

The following table details the citations and orders issued and civil penalties assessed to us by MSHA during the quarter ended December 31, 2022:

(*whole dollars*)

Mine or Operating Name/MSHA Identification Number	Section 104 S&S Citations	Section 104(b) Orders	Section 104(d) Citations and Orders	Section 110(b)(2) Violations	Section 107(a) Orders	Total Dollar Value of MSHA Assessments Proposed (1)	Total Number of Mining Related Fatalities	Received Notice of Pattern of Violations Under Section 104(e) (yes/no)	Received Notice of Potential to Have Pattern Under Section 104(e) (yes/no)	Legal Actions Pending as of Last Day of Period	Legal Actions Initiated During Period	Legal Actions Resolved During Period
Berkley Springs, WV / 4602805	0	0	0	0	0	$0.00	0	No	No	0	0	0
Celatom Mine, OR / 3503237	0	0	0	0	0	$0.00	0	No	No	0	0	0
Celatom Plant, OR / 3503236	0	0	0	0	0	$532.00	0	No	No	0	0	0
Cheto Mine, AZ / 0200103	0	0	0	0	0	$0.00	0	No	No	0	0	0
Clark, NV / 2600677	0	0	0	0	0	$0.00	0	No	No	0	0	0
Columbia, SC / 3800138	0	0	0	0	0	$716.00	0	No	No	0	0	0
Crane, TX / 4105331	0	0	0	0	0	$0.00	0	No	No	0	0	0
Dubberly, LA / 1600489	0	0	0	0	0	$0.00	0	No	No	0	0	0
Fernley, NV / 2601950	0	0	0	0	0	$0.00	0	No	No	0	0	0
Festus, MO / 2302377	0	0	0	0	0	$266.00	0	No	No	0	0	0
Fowlkes Mine, MS / 2200460	0	0	0	0	0	$0.00	0	No	No	0	0	0
Hazen Mine, NV/ 2600679	0	0	0	0	0	$0.00	0	No	No	0	0	0
Hurtsboro, AL / 100617	0	0	0	0	0	$0.00*	0	No	No	0	0	0

Jackson, MS / 2200415	0	0	0	0	0	$0.00*	0	No	No	0	0	0
Jackson, TN / 4002937	0	0	0	0	0	$0.00	0	No	No	0	0	0
Kosse, TX / 4100262	0	0	0	0	0	$0.00	0	No	No	0	0	0
Lamesa, TX / 4105363	0	0	0	0	0	$0.00	0	No	No	0	0	0
Lovelock (Colado Plant) / 2600680	0	0	0	0	0	$0.00	0	No	No	27	0	0
Lovelock, NV (Colado Mine) / 2600672	0	0	0	0	0	$0.00	0	No	No	0	0	0
Mapleton, PA / 3603122	1	0	0	0	0	$0.00*	0	No	No	0	0	0
Mauricetown, NJ / 2800526	0	0	0	0	0	$133.00	0	No	No	0	0	0
Middletown, TN / 4002968	0	0	0	0	0	$0.00	0	No	No	0	0	0
Mill Creek Mine, OK / 3400836	0	0	0	0	0	$0.00	0	No	No	0	0	0
Mill Creek Plant, OK / 3400377	0	0	0	0	0	$0.00	0	No	No	0	0	0
Millen, GA / 0901232	0	0	0	0	0	$0.00	0	No	No	0	0	0
Montpelier, VA / 4402829	0	0	0	0	0	$0.00	0	No	No	0	0	0
Ottawa, IL / 1101013	0	0	0	0	0	$0.00	0	No	No	0	0	0
Pacific, MO / 2300544	0	0	0	0	0	$0.00	0	No	No	0	0	0
Popcorn Mine, NV / 2602236	0	0	0	0	0	$0.00	0	No	No	0	0	0
Port Elizabeth, NJ / 2800510	0	0	0	0	0	$0.00	0	No	No	0	0	0
Rockwood, MI / 2000608	0	0	0	0	0	$0.00*	0	No	No	0	0	0
Sparta, WI / 4703644	0	0	0	0	0	$0.00	0	No	No	0	0	0
Tyler, TX /4104182	0	0	0	0	0	$0.00	0	No	No	0	0	0
Utica, IL / 1103268	0	0	0	0	0	$0.00	0	No	No	0	0	0

(1) Amounts included are the total dollar value of proposed assessments received from MSHA from October 1, 2022 through December 31, 2022, regardless of whether the assessment has been challenged or appealed. Citations and orders can be contested and appealed, and as part of that process, are sometimes reduced in severity and amount, and sometimes dismissed. The number of citations, orders, and proposed assessments vary by the MSHA District's approach to enforcement and vary depending on the size and type of the operation

* As of December 31, 2022, MSHA had not yet proposed an assessment for 3 non-S&S citations at the Hurtsboro Plant, AL.
* As of December 31, 2022, MSHA had not yet proposed an assessment for 3 non-S&S citations at the Jackson Plant, MS.
* As of December 31, 2022, MSHA had not yet proposed an assessment for 4 non-S&S citations and one S&S citation at the Mapleton Plant, PA.
* As of December 31, 2022, MSHA had not yet proposed an assessment for 4 non-S&S citations and one S&S citation at the Rockwood Plant, MI.

TECHNICAL REPORT SUMMARY
SILICA SAND RESOURCES AND RESERVES
OTTAWA OPERATION

LaSalle County, Illinois

Prepared For

U.S. SILICA COMPANY

Katy, Texas

By

John T. Boyd Company

Mining and Geological Consultants

Pittsburgh, Pennsylvania

Report No. 3076.019

FEBRUARY 2023

JOHN T. BOYD COMPANY

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February 16, 2023

JOHN T. BOYD COMPANY

Mining and Geological Consultants

File: 3076.019

U.S. Silica Company
24275 Katy Freeway, Suite 600
Katy, TX 77494-7271

Attention: Mr. Terry Lackey
Mining Director

Subject: Technical Report Summary
Silica Sand Resources and Reserves
Ottawa Operation
LaSalle County, Illinois

Ladies and Gentlemen:

The John T. Boyd Company (BOYD) was retained by U.S. Silica Company (U.S. Silica) to complete an independent technical assessment of the silica sand resource and reserve estimates for the Ottawa Operation as of December 31, 2022.

This technical report summary: (1) summarizes material technical and geoscientific information for the subject mining property, (2) provides the conclusions of our technical assessment, and (3) provides a statement of silica sand resources and reserves for the Ottawa Operation.

Respectfully submitted,

JOHN T. BOYD COMPANY
By:

John T. Boyd II
President and CEO

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LETTER OF TRANSMITTAL

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GLOSSARY OF ABBREVIATIONS AND DEFINITIONS

000	:	Thousand(s)
$	:	US dollar(s)
%	:	Percent or percentage
AMSL	:	Above mean sea level
API	:	American Petroleum Institute
ARO	:	Asset Retirement Obligations
ASP	:	Average Selling Price
ASTM	:	ASTM International (formerly American Society for Testing and Materials)
BNSF	:	BNSF Railway Company
BOYD	:	John T. Boyd Company
CapEx	:	Capital expenditures
Constant Dollar	:	A monetary measure that is not influenced by inflation and used to compare time periods. Sometimes referred to as “real dollars”.
CSX	:	CSX Transportation
DCF	:	Discounted Cash Flow
Discount Rate	:	A rate of return used to discount future cash flows based on the return investors expect to receive from their investment.
EBIT	:	Earnings before interest and taxes
EBITDA	:	Earnings before interest, taxes, depreciation, and amortization
Frac Sand	:	*See “Proppant Sand”*
ft	:	Foot/feet
HDPE	:	High-density polyethylene
IDNR	:	Illinois Department of Natural Resources

Indicated Silica Sand Resource	:	That part of a silica sand resource for which quantity and quality are estimated based on adequate geological evidence and sampling. The level of geological certainty associated with an indicated silica sand resource is sufficient to allow a qualified person to apply modifying factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Because an indicated silica sand resource has a lower level of confidence than the level of confidence of a measured silica sand resource, an indicated silica sand resource may only be converted to a probable silica sand reserve.
IEMA	:	Illinois Emergency Management Agency
ILEPA	:	Illinois Environmental Protection Agency
Inferred Silica Sand Resource	:	That part of a silica sand resource for which quantity and quality are estimated based on limited geological evidence and sampling. The level of geological uncertainty associated with an inferred silica sand resource is too high to apply relevant technical and economic factors likely to influence the prospects of economic extraction in a manner useful for evaluation of economic viability. Because an inferred silica sand resource has the lowest level of geological confidence of all silica sand resources, which prevents the application of the modifying factors in a manner useful for evaluation of economic viability, an inferred silica sand resource may not be considered when assessing the economic viability of a mining project, and may not be converted to a silica sand reserve.
IRR	:	Internal rate-of-return
ISO		International Organization for Standardization
ISP	:	Industrial and Specialty Products
lb	:	Pound
LOM	:	Life-of-Mine
Measured Silica Sand Resource	:	That part of a silica sand resource for which quantity and quality are estimated based on conclusive geological evidence and sampling. The level of geological certainty associated with a measured silica sand resource is sufficient to allow a qualified person to apply modifying factors, as defined herein, in sufficient detail to support detailed mine planning and final evaluation of the economic viability of the deposit. Because a measured silica sand resource has a higher level of confidence than the level of confidence of either an indicated silica sand resource or an inferred silica sand resource, a measured silica sand resource may be converted to a proven silica sand reserve or to a probable silica sand reserve
Mesh	:	A measurement of particle size often used in determining the size distribution of granular material.
Mineral Reserve	:	*See “Silica Sand Reserve”*

Mineral Resource	:	*See "Silica Sand Resource"*
Modifying Factors		The factors that a qualified person must apply to indicated and measured silica sand resources and then evaluate to establish the economic viability of silica sand reserves. A qualified person must apply and evaluate modifying factors to convert measured and indicated silica sand resources to proven and probable silica sand reserves. These factors include but are not restricted to: mining; processing; infrastructure; economic; marketing; legal; environmental compliance; plans, negotiations, or agreements with local individuals or groups; and governmental factors. The number, type and specific characteristics of the modifying factors applied will necessarily be a function of and depend upon the mineral, mine, property, or project.
MSHA	:	Mine Safety and Health Administration. A division of the U.S. Department of Labor
NPV	:	Net Present Value
O&G	:	Oil and Gas
Probable Silica Sand Reserve	:	The economically mineable part of an indicated and, in some cases, a measured silica sand resource.
Production Stage Property	:	A property with material extraction of silica sand reserves.
Proppant Sand	:	Proppant (frac) sand is a naturally occurring, high silica content quartz sand, with grains that are generally well rounded and exhibit high compressive strength characteristics relative to other proppant sand. It is utilized as a prop or "proppant" in unconventional shale frac well completions.
Proven Silica Sand Reserve	:	The economically mineable part of a measured silica sand resource which can only result from conversion of a measured silica sand resource.
PSI	:	Pounds per square inch
QP	:	Qualified Person

Qualified Person : An individual who is:

1. A mineral industry professional with at least five years of relevant experience in the type of mineralization and type of deposit under consideration and in the specific type of activity that person is undertaking on behalf of the registrant; and

2. An eligible member or licensee in good standing of a recognized professional organization at the time the technical report is prepared. For an organization to be a recognized professional organization, it must:

    a. Be either:
        i. An organization recognized within the mining industry as a reputable professional association; or
        ii. A board authorized by U.S. federal, state, or foreign statute to regulate professionals in the mining, geoscience, or related field;
    b. Admit eligible members primarily based on their academic qualifications and experience;
    c. Establish and require compliance with professional standards of competence and ethics;
    d. Require or encourage continuing professional development;
    e. Have and apply disciplinary powers, including the power to suspend or expel a member regardless of where the member practices or resides; and
    f. Provide a public list of members in good standing.

ROM : Run-of-Mine. The processing feed material, including silica sand and any inseparable waste, excavated from the mine.

SEC : U.S. Securities and Exchange Commission

Silica Sand Reserve : Silica sand reserve is an estimate of tonnage and grade or quality of indicated and measured silica sand resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated silica sand resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted.

Silica Sand Resources	:	Silica sand resource is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. A silica sand resource is a reasonable estimate of mineralization, taking into account relevant factors such as cut-off grade, likely mining dimensions, location or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable. It is not merely an inventory of all mineralization drilled or sampled.
S-K 1300	:	Subpart 1300 and Item 601(b)(96) of the U.S. Securities and Exchange Commission's Regulation S-K
SPCC	:	Spill Prevention, Controls and Countermeasure
Ton	:	Short Ton. A unit of weight equal to 2,000 pounds
U.S. Silica	:	U.S. Silica Company, its parent company (U.S. Silica Holdings, Inc.) and its consolidated subsidiaries as a combined entity.

1.0 EXECUTIVE SUMMARY

1.1 Introduction

U.S. Silica's Ottawa Operation is an active surface silica sand mining and processing operation that has been in existence for over 100 years.

BOYD prepared this technical report summary for U.S. Silica in support of their disclosure of silica sand reserves for the Ottawa Operation in accordance with Subpart 1300 and Item 601(b)(96) of the SEC's Regulation S-K (S-K 1300). The purpose of this report is threefold: (1) to summarize material technical and geoscientific information for the subject mining property, (2) to provide the conclusions of our technical assessment, and (3) to provide a statement of silica sand resources and/or reserves for the Ottawa Operation.

Information used in our assessment was obtained from: (1) files provided by U.S. Silica, (2) discussions with U.S. Silica personnel, (3) records on file with regulatory agencies, (4) public sources, and (5) nonconfidential information in BOYD's possession.

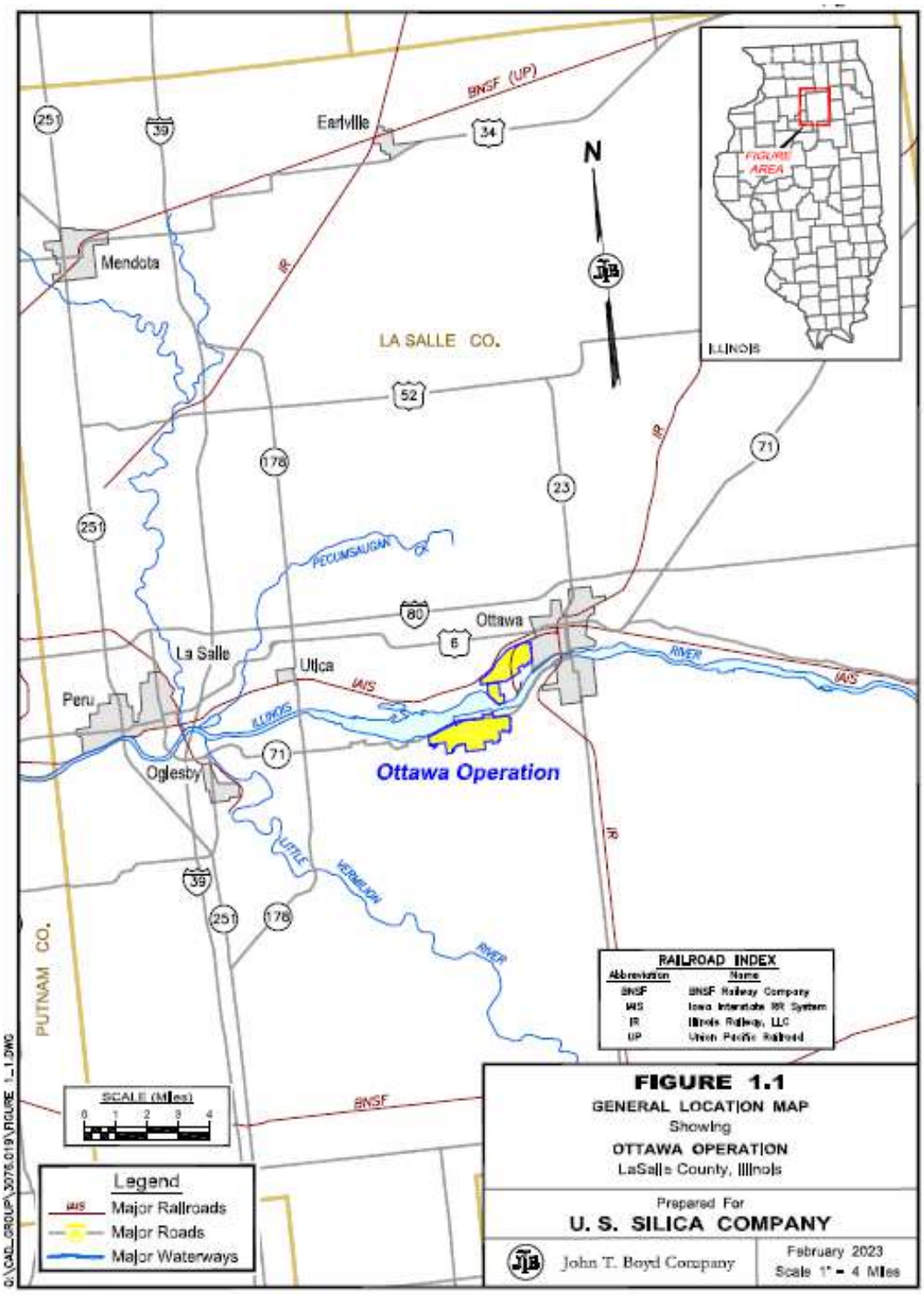
Unless otherwise noted, the effective date of the information, including estimates of silica sand reserves, is December 31, 2022.

Weights and measurements are expressed in the US customary measurement system throughout this report.

1.2 Property Description

U.S. Silica's Ottawa Operation is a surface silica sand mining and processing operation located immediately west of the City of Ottawa in LaSalle County, Illinois. The cities of Chicago and Peoria, Illinois, are located approximately 95 miles east-northeast and 75 miles southwest, respectively, of the Ottawa Operation. The general location of the Ottawa Operation is provided in Figure 1.1, following this page.

The property is bisected by the Illinois River into the North Ottawa and South Ottawa sites. The mine offices, maintenance facilities, processing plant, loadout facilities, and former mining pits are located on the North Ottawa site, while the active (South Ottawa Pit) and future mining areas (West Ottawa and Mississippi Sand Pit) are located on the South Ottawa site. A slurry line driven under the Illinois River connects the two sites, and


BNSF (UP)
Earlville
34
251
39
Mendota
IR
LA SALLE CO.
52
178
23
71
PECUMSAUGAN CK
80
Ottawa
6
La Salle
Utica
IAIS
Peru
ILLINOIS
RIVER
Oglesby
Ottawa Operation
LITTLE VERMILION RIVER
PUTNAM CO.
BNSF
N
FIGURE AREA
ILLINOIS
RAILROAD INDEX
Abbreviation | Name
BNSF | BNSF Railway Company
IAIS | Iowa Interstate RR System
IR | Illinois Railway, LLC
UP | Union Pacific Railroad
SCALE (Miles)
0 1 2 3 4
Legend
Major Railroads
Major Roads
Major Waterways
FIGURE 1.1
GENERAL LOCATION MAP
Showing
OTTAWA OPERATION
LaSalle County, Illinois
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 4 Miles
O:\CAD_GROUP\3076.019\FIGURE 1_1.DWG

is used to transport Run-of-Mine (ROM) sand material from South Ottawa to the processing plant.

The Ottawa Operation has mined silica sand exclusively from the St. Peter Sandstone Formation for over 100 years. Within the boundaries of the Ottawa Operation, U.S. Silica wholly owns both surface and mineral rights on all ±2,072 acres. BOYD is not aware of any encumbrances, litigation, or orders which would hinder continued development of the property.

1.3 Geology

The Ottawa Operation's target silica bearing formation is the St. Peter Sandstone, which is a massive formation in areal extent and thickness. Aerially, it extends from Minnesota to Arkansas and from Illinois into Nebraska and South Dakota. On a regional basis, the St. Peter Sandstone ranges in thickness from a few feet to over 1,200 ft, with a general thickness of 100 ft to 200 ft. In northern Illinois, the thickness can be over 300 ft thick.

At the Ottawa Operation, the St. Peter Sandstone is flat lying with no evidence of faulting, and has been eroded to an average thickness of approximately 90 ft. The formation is a white to buff colored, fine- to medium-grained ortho-quartzite. It contains rounded, clear polished sand quartz grains with minor secondary silica and clay cement.

Grain size distribution and iron-staining drives the mine planning. Iron tends to be concentrated near the surface and is visible in orange staining. Iron also increases at the bottom sandstone contact, occurring mostly as pyrite. The deposit is coarser in its top half. Where the upper part of the formation is eroded, multiple mining faces must operate to ensure adequate sand is available to meet product specifications.

In the defined resource areas, the St. Peter Sandstone is overlain by a thin layer of overburden material consisting of clay, sandy gravel, peat, and limestone cap rock.

1.4 Exploration

The St. Peter Sandstone has been extensively explored and mined on the Ottawa Operation. The North Ottawa site was mined out by 2010, and exploration on the South Ottawa site began in the year 2000. U.S. Silica provided data for 225 drill holes, wells, field measurements, and test holes in and around the South Ottawa site. These data were utilized to define the lateral extent, thickness, particle size distribution, and mineralogy of the remaining St. Peter Sandstone reserves at the Ottawa Operation.

BOYD's audit indicates that in general: (1) U.S. Silica has performed extensive drilling and sampling work on the subject property, (2) the work completed has been done by competent personnel, and (3) the amount of data available combined with extensive knowledge and historic production of the St. Peter Sandstone, are sufficient to confirm the thickness, lateral extents, and quality characteristics of the South Ottawa silica sand reserves.

1.5 Silica Sand Resources and Reserves

As shown in Table 1.1, below, U.S. Silica owns approximately 88,000 in place tons of inferred silica sand resources, exclusive of silica sand reserves, at the Ottawa Operation, as of December 31, 2022.

Table 1.1: Ottawa Operation Silica Sand Resources[1]
(as of December 31, 2022)

Classification	In-Place Tons (000)
Inferred	88

Notes:
1. Silica sand resources are reported *in addition to* silica sand reserves.

While these "additional" silica sand resources have not been included in the Ottawa Operation's life-of-mine (LOM) plan, they are considered to have prospects for eventual economic extraction by virtue of their similarity—in terms of demonstrated extraction methods and expected finished product qualities—to those converted to silica sand reserves.

U.S. Silica's estimated surface mineable silica sand reserves for the Ottawa Operation total 78.9 million saleable product tons remaining as of December 31, 2022. The silica sand reserves are fully owned by U.S. Silica and are summarized in Table 1.2, below.

Table 1.2: Ottawa Operation Silica Sand Reserves (as of December 31, 2022)

	Tons (000)	
Classification	Mineable	Saleable
Proven	89,742	77,627
Probable	1,486	1,286
Total	91,228	78,913

The Ottawa Operation has a well-established history of mining, processing, and selling silica sand products into various markets. BOYD has concluded that sufficient studies have been undertaken to enable the silica sand resources to be converted to silica sand reserves based on proposed operating methods and forecasted costs and revenues.

1.6 Operations

1.6.1 Mining

Current mining at the Ottawa Operation takes place on the South Ottawa site, where the St. Peter Sandstone is excavated using conventional surface mining methods. The thin overlying layer of unconsolidated overburden is scraped off and stockpiled in order to expose the St. Peter Sandstone Formation. The mineable sandstone interval is then drilled and blasted in benches ranging from 40 to 75 ft high. An excavator or front-end loader is then used to load the shot and blasted sandstone into articulated haul trucks. The haul trucks deliver raw sand material to a monitor station, where the material is further broken down via high-pressure water jets, that also create a sand slurry. The sand slurry is then pumped through lines that run under the Illinois River to the processing facilities which are located on the North Ottawa site, where processing of the ROM silica sand begins.

Over the past seven years, the operation has mined over 24 million tons of raw sand. During late 2019 and 2020, production fell to match decreased customer demand due to the COVID-19 pandemic from approximately 4 million tons per year to under 2.5 million tons. U.S. Silica's Life-of-Mine (LOM) plan forecasts mining 91.2 million tons of ROM silica sand at a nominal rate of 3.8 million tons per year for the remaining life of the operation.

BOYD reviewed the LOM plans for U.S. Silica's Ottawa Operation to determine whether the plans: (1) utilize generally accepted engineering practices, and (2) align with historical and industry norms. Based on our assessment, it is BOYD's opinion that the forecasted production levels for the Ottawa Operation are reasonable, logical, and consistent with typical sandstone surface mining practices in the St. Peter Sandstone and historical results achieved by U.S. Silica.

1.6.2 Processing

The Ottawa Operation's wet and dry processing plants, along with grinding mills, are located on the north shore of the Illinois River, on the Ottawa North site. The processing facilities also include an ASTM circuit, which is used to produce ASTM 20/30 and ASTM C109 compliant sand for cement and abrasion testing. The Ottawa Operation is the world's only supplier of fully ASTM-compliant sands.

Pumped ROM slurry material from the South Ottawa site arrives at the processing plant, where it is washed to remove fine waste (clay and silt) material, sorted and sized, then dried. At this point, the silica sand is divided into two streams depending on finished product requirements—whole grain sand is sorted and sized again prior to packaging, while ground silica products are milled to produce fine silica powders.

Over its history, the processing plant has been upgraded and expanded several times as needed to meet specific market demands. The plants currently run 24 hours a day, 365 days a year, with a nominal capacity of 3.29 million tons of finished sand per year. Based on our review, it is BOYD's opinion that the processing methods and existing equipment at the plant will be sufficient for the forecasted production levels over the life of the operation.

1.6.3 Other Infrastructure

The Ottawa Operation is supported by various utilities and transportation networks needed to allow processing and transportation of finished silica sands.

Electricity to the North Ottawa site is delivered through an above-ground network that terminates at a substation on the west end of the processing facility, and from there electricity is distributed via several underground and above-ground powerlines.

Initial makeup water is obtained through a series of wells drilled on the South Ottawa site, and recovered and recycled for reuse whenever possible. Potable water is delivered through the City of Ottawa's public water system.

Natural gas is supplied via several underground pipelines.

Tailings from processing consist generally of clays, silts, and very fine sands, which are typically disposed of in old mining pit impoundments. The tailings ponds are currently located east of the processing plant, and are designed to accommodate rejects produced during the next five to ten years of production. At that time, it is expected that mining in the South Ottawa site will have advanced to the West Ottawa Pit, and the mined out South Ottawa Pit will be used for tailings.

Infrastructure to transport finished sand product include three different systems currently in-place at the Ottawa Operation: (1) the Illinois Railway, a former BNSF short line, transports rail cars to and from a CSX interchange located in the City of Ottawa; access from there is then available to several Class 1 railroads – BNSF, Union Pacific, and Norfolk Southern; (2) numerous local, county, and state roadways and highways that are within four miles of the processing facilities; and (3) U.S. Silica also maintains access to several third-party owned barge terminals, which are located on the north shore of the Illinois River, and are all situated on land owned by U.S. Silica.

1.7 Financial Analysis

1.7.1 Market Analysis

The Ottawa Operation is U.S. Silica's largest "blended" operation, supplying various grades of silica sand to both the Oil and Gas (O&G) and the Industrial and Specialty Products (ISP) markets. Their finished silica sand products are used in variety of industrial applications by a large customer base.

U.S. Silica's product sales were materially impacted by the COVID-19 pandemic, with sales dropping precipitously in 2019 due to decreased customer demand. However, their sales volumes and revenues have recovered substantially, and continued growth is expected over the long-term.

1.7.2 Capital and Operating Cost Estimates

The Ottawa Operation's financial performance over the last years is summarized as follows:

- Average realization (selling price) for finished silica sand products increased from $36.91 per ton sold in 2020 to $42.37 per ton sold in 2022.
- Total cash cost of sales also increased from $29.48 per ton sold in 2020 to $32.85 per ton sold in 2022.

- EBITDA margin increased slightly from 20.1% in 2020 to 22.5% in 2022.
- Capital expenditures totaled almost $9.5 million over the last three years, averaging $1.27 per ton sold.

Forward-looking production and unit cost estimates are based on actual past performance and subject to U.S. Silica's customary internal budget review and approvals process. In BOYD's opinion, operating volumes are well-defined and understood, as are mining and processing productivities.

The Ottawa Operation and related facilities are fully developed and should require no near-term major capital investment to maintain full commercial production. Historically, the timing and amount of capital expenditures has been largely discretionary and within U.S. Silica's control. Their budgetary allocations for sustaining and discretionary capital expenditures over the next three years totals $8.3 million. Thereafter, capital expenditures are expected to rise 3% year-over-year from 2025's $2.2 million. BOYD considers the near-term detailed capital expenditure schedule as presented by U.S. Silica to be reasonable and representative of the capital necessary to operate the Ottawa Operation.

Operating cost estimates were developed based on recent actual costs and considering specific operational activity levels and cost drivers. In the near-term, U.S. Silica expects their unit operating costs to stay relatively level (on an uninflated basis). As such, the projected total cash cost of sales over the life of the mine is $32.85 per ton sold. As the operation is in a steady state, BOYD considers the future operating cost estimates to be reasonable and appropriate.

1.7.3 Economic Analysis

An economic analysis of the Ottawa Operation was prepared in-house by U.S. Silica as part of their annual budgeting process. The financial model forecasts future free cash flow from silica sand production and sales over the life cycle of the Ottawa Operation using the annual forecasts of production, sales revenues, and operating and capital costs.

Table 1.3, below, provides a summary of the estimated financial results for remaining life of the Ottawa Operation.

Table 1.3: Financial Results

	Units	Remaining Life of Min Total
Remaining Life	years	25
Production:		
ROM Production	000 tons	91,228
Product Sales	000 tons	78,913
Total Revenues	$ millions	3,343.5
Total Cash Costs of Sales	$ millions	2,592.3
Capital Expenditures	$ millions	78.0
Pre-Tax:		
Cash Flow	$ millions	672.3
$NPV_{12.5}$	$ millions	221.3
After-tax:		
Cash Flow	$ millions	499.2
$NPV_{12.5}$	$ millions	164.9

Table 1.4 summarizes the results of the pre-tax and after-tax discounted cash flows (DCF) and net present value (NPV) analyses for the Ottawa Operation.

Table 1.4: DCF-NPV Analysis

	NPV ($ millions)		
	10%	12.5%	15%
Pre-Tax	262.0	221.3	190.7
After-Tax	195.0	164.9	142.1

The NPV estimate was made for purposes of confirming the economic viability of the reported silica sand reserves and not for purposes of valuing the U.S. Silica, Ottawa Operation, or its assets. Internal rate-of-return (IRR) and project payback were not calculated, as there was no initial investment considered in the financial analysis.

BOYD reviewed the financial model and its inputs in detail, and opined that the model provides a reasonable and accurate reflection of the Ottawa Operation's expected economic performance based on the assumptions and information available at the time of our review.

1.8 Permitting Requirements

Numerous permits are required by federal and state law for mining, processing, and related activities at the Ottawa Operation, which U.S. Silica reports are in place or pending approval. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of current regulations.

U.S. Silica reports having an extensive environmental management and compliance process designed to follow or to exceed industry standards.

Mine safety is regulated by the U.S. Department of Labor's Mine Safety and Health Administration (MSHA). MSHA inspects the facilities a minimum of twice yearly. U.S. Silica's safety record compares favorably with its regional peers.

BOYD is not aware of any regulatory violation or compliance issue which would materially impact the silica sand reserve estimate.

1.9 Conclusions

It is BOYD's overall conclusion that U.S. Silica's estimates of silica sand reserves, as reported herein: (1) were prepared in conformance with accepted industry standards and practices, and (2) are reasonably and appropriately supported by technical evaluations, which consider all relevant modifying factors.

Given the lengthy operating history and status of evolution, residual uncertainty (future risk) for this operation is considered minor under the current and foreseeable operating environment.

It is BOYD's opinion that extraction of the silica sands reported herein is technically, legally, and economically achievable after the consideration of potentially material modifying factors. The ability of U.S. Silica, or any mine operator, to recover all of the reported silica sand reserves is dependent on numerous factors that are beyond the control of, and cannot be anticipated by, BOYD. These factors include mining and geologic conditions, the capabilities of management and employees, the securing of required approvals and permits in a timely manner, future silica sand prices, etc. Unforeseen changes in regulations could also impact performance.

2.0 INTRODUCTION

2.1 Registrant

U.S. Silica is a US-based mining company headquartered in Katy, Texas. The company's common stock is listed on the New York Stock Exchange (NYSE:SLCA). U.S. Silica is actively engaged in the production and marketing of commercial silica sand and performance materials (diatomaceous earth, calcium bentonite clay, calcium montmorillonite clay, and perlite products). Their whole grain silica products are used as frac (proppant) sand for oil and natural gas recovery, and in the manufacture of glass, foundry, and building products. U.S. Silica's performance materials are used in: (1) filtration for foods and beverages, pharmaceuticals, and swimming pools; (2) as additives in paint and coatings, plastics and rubber, and agriculture products; and (3) for bleaching, catalysis and adsorption in edible oil processing, aromatics purification, and industrial and chemical applications. Additional information regarding U.S. Silica can be found on their website: www.ussilica.com.

2.2 Terms of Reference and Purpose

U.S. Silica retained BOYD to complete an independent technical assessment of their internally-prepared silica sand resource and reserve estimates and supporting information for the Ottawa Operation.

BOYD prepared this technical report summary for U.S. Silica in support of their disclosure of silica sand reserves for the Ottawa Operation in accordance with S-K 1300. The purpose of this report is threefold: (1) to summarize material technical and geoscientific information for the subject mining property, (2) to provide the conclusions of our technical assessment, and (3) to provide a statement of silica sand resources and/or reserves for the Ottawa Operation.

BOYD's findings are based on our detailed examination of the supporting geologic and other scientific, technical, and economic information provided by U.S. Silica, as well as our assessment of the methodology and practices applied by U.S. Silica in formulating the estimates of silica sand resources and reserves disclosed in this report. We did not independently estimate silica sand resources or reserves from first principles.

We used standard engineering and geoscience methods, or a combination of methods, that we considered to be appropriate and necessary to establish the conclusions set forth herein. As in all aspects of mining property evaluation, there are uncertainties

inherent in the interpretation of engineering and geoscience data; therefore, our conclusions necessarily represent only informed professional judgment.

The ability of U.S. Silica, or any mine operator, to recover all of the estimated silica sand reserves presented in this report is dependent on numerous factors that are beyond the control of, and cannot be anticipated by, BOYD. These factors include mining and geologic conditions, the capabilities of management and employees, the securing of required approvals and permits in a timely manner, future sand prices, etc. Unforeseen changes in regulations could also impact performance. Opinions presented in this report apply to the site conditions and features as they existed at the time of BOYD's investigations and those reasonably foreseeable.

This report is intended for use by U.S. Silica, subject to the terms and conditions of its professional services agreement with BOYD. We also consent to U.S. Silica filing this report as a technical report summary with the SEC pursuant to S-K 1300. Except for the purposes legislated under US securities law, any other uses of or reliance on this report by any third party is at that party's sole risk.

2.3 Expert Qualifications

BOYD is an independent consulting firm specializing in mining-related engineering and financial consulting services. Since 1943, BOYD has completed over 4,000 projects in the United States and more than 60 other countries. Our full-time staff comprises mining experts in: civil, environmental, geotechnical, and mining engineering; geology; mineral economics; and market analysis. Our extensive experience in silica sand resource and reserve estimation combined with our knowledge of the subject property, provides BOYD an informed basis on which to opine on the reasonableness of the estimates provided by U.S. Silica. An overview of BOYD can be found on our website at www.jtboyd.com.

The individuals primarily responsible for completing this technical assessment and the preparation of this report are by virtue of their education, experience, and professional association considered qualified persons (QPs) as defined in S-K 1300.

Neither BOYD nor its staff employed in the preparation of this report have any beneficial interest in U.S. Silica, and are not insiders, associates, or affiliates of U.S. Silica. The results of our assessment were not dependent upon any prior agreements concerning the conclusions to be reached, nor were there any undisclosed understandings concerning any future business dealings between U.S. Silica and BOYD. This report was prepared in return for fees based upon agreed commercial rates, and the payment for

our services was not contingent upon our opinions regarding the project or approval of our work by U.S. Silica and its representatives.

2.4 Principal Sources of Information

Information used in this assignment was obtained from: (1) files provided by U.S. Silica, (2) discussions with U.S. Silica personnel, (3) records on file with regulatory agencies, (4) public sources, and (5) nonconfidential information in BOYD's possession.

The following information was provided by U.S. Silica:

- Year-end reserve statements and reports for 2021 and 2022.
- Exploration records (e.g., drilling logs and lab sheets).
- Geologic databases of lithology and sand quality.
- Computerized geologic models.
- Mapping data, with:
  - Land ownership boundaries.
  - Infrastructure locations.
  - Easement and right-of-way boundaries.
  - Surveyed topography (surface elevation).
- Mine plans, production schedules, and supporting data.
- Overview of processing operations and detailed flow sheets.
- Copies of mining and operating permits.
- Historical information, including:
  - Production reports.
  - Financial statements.
  - Product sales and pricing.

Information from sources external to BOYD and/or U.S. Silica are referenced accordingly.

The data and work papers used in the preparation of this report are on file in our offices.

2.5 Personal Inspections

A site visit and inspection of the Ottawa Operation was completed on October 18, 2022,
by BOYD's QPs responsible for the preparation of this report. The site visit included: (1) observation of the active mining operations, (2) a tour of the mine site's surface infrastructure, and (3) a tour of the process plant and truck loadouts. BOYD's representatives were accompanied by senior U.S. Silica engineering and management personnel who openly and cooperatively answered questions regarding, but not limited

to: site history; deposit geology; mining and processing operations; near- and long-range mining plans; and silica sand marketing.

2.6 Report Version

The silica sand resources and reserves presented in this Technical Report Summary are effective as of December 31, 2022. The effective (i.e., “as of”) date of the report is December 31, 2022.

This is the third Technical Report Summary filed by U.S. Silica for the Ottawa Operation and supersedes the following previously filed reports:

Westward Environmental; February 2022; Technical Report Summary Ottawa Site, Lasalle County, Illinois.

Westward Environmental; September 2022; Technical Report Summary Ottawa Site, Lasalle County, Illinois.

The user of this document should ensure that this is the most recent disclosure of silica sand resources and reserves for the Ottawa Operation as it is no longer valid if more recent estimates have been issued.

2.7 Units of Measure

The US customary measurement system has been used throughout this report. Tons are short tons of 2,000 pounds-mass. Unless otherwise stated, currency is expressed in US Dollars ($). Historic prices and costs are presented in nominal (unadjusted) dollars. Future dollars values are expressed on a constant (unescalated) basis.

3.0 PROPERTY DESCRIPTION

3.1 Location

U.S. Silica's Ottawa Operation is a surface silica sand mining and processing operation located immediately west of the City of Ottawa in LaSalle County, Illinois. The cities of Chicago and Peoria, Illinois, are located approximately 95 miles east-northeast and 75 miles southwest, respectively, of the Ottawa Operation.

The property is bisected by the Illinois River into the North Ottawa and South Ottawa sites. The mine offices, maintenance facilities, processing plant, loadout facilities, and former mining pits are located on the North Ottawa site, while the active and future mining areas are located on the South Ottawa site. The South Ottawa site includes three defined pits: South Ottawa, where current mining is taking place, and the West Ottawa Pit and the Mississippi Sand Pit (future mining areas). A slurry line driven under the Illinois River connects the two sites, and feeds ROM sand material from South Ottawa to the processing plant.

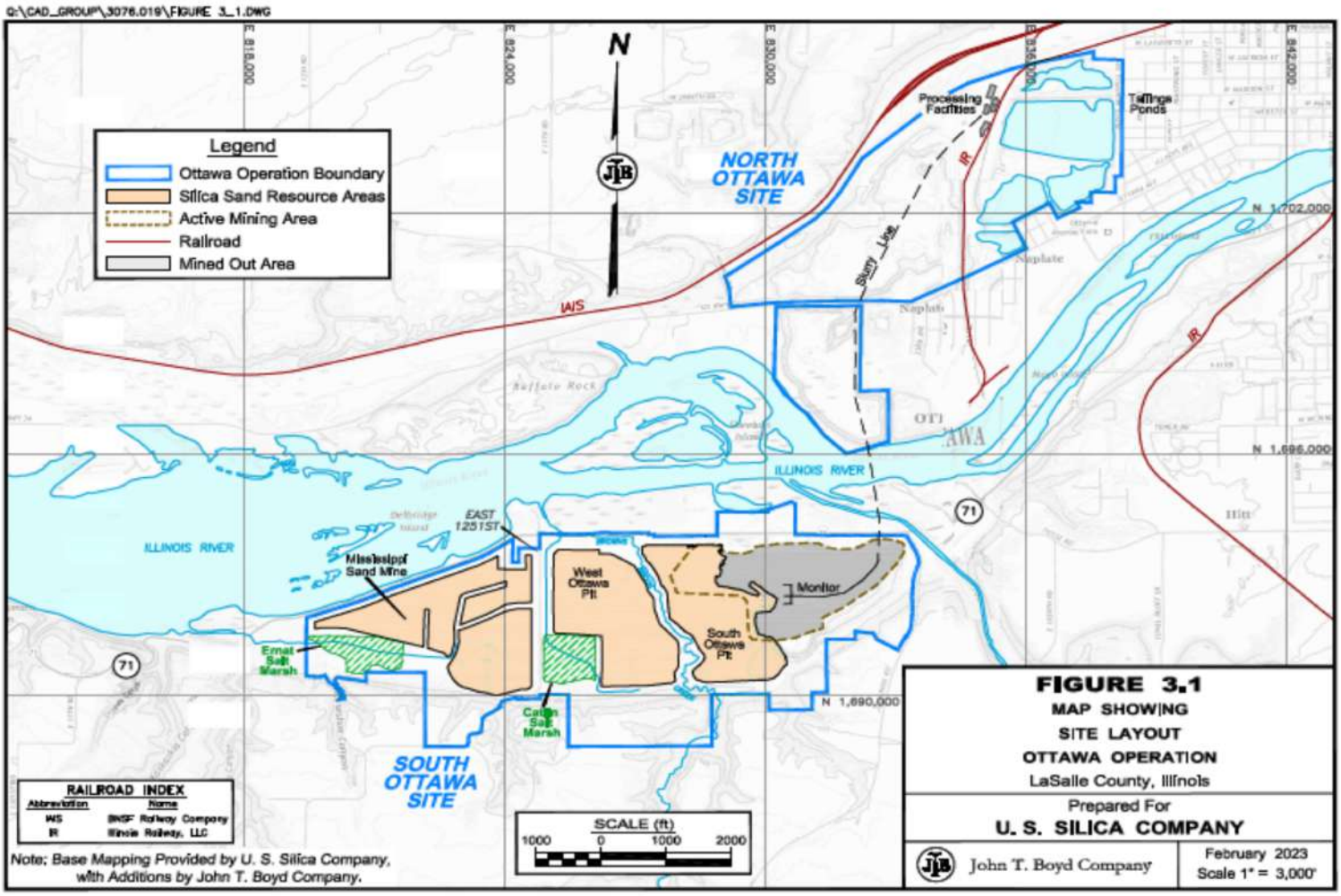
Geographically, the Ottawa Operation's processing plant is located at approximately 41° 20' 45.19" N latitude and 88° 52' 33.11" W longitude. Figures 1.1 (page 1-2) and 3.1, on the following page, illustrate the location and general layout of the Ottawa Operation.

3.2 Property Rights

U.S. Silica and its predecessors purchased the parcels of land—both surface and mineral rights—that currently comprise the Ottawa Operation at various times in its history to underpin their long-term operational goals. Currently, the Ottawa Operation comprises 68 parcels totaling approximately 2,072 acres of surface and minerals rights fully owned by U.S. Silica, as shown in Table 3.1.

Table 3.1: Property Ownership

Site	Township	Parcels	Acres
North Ottawa	Ottawa	42	857
South Ottawa	South Ottawa	26	1,215
Total		68	2,072


G:\CAD_GROUP\3076.019\FIGURE 3_1.DWG
Legend
Ottawa Operation Boundary
Silica Sand Resource Areas
Active Mining Area
Railroad
Mined Out Area
N
NORTH OTTAWA SITE
SOUTH OTTAWA SITE
Processing Facilities
Tailings Ponds
Slurry Line
IAIS
IR
ILLINOIS RIVER
EAST 1251ST
Mississippi Sand Mine
West Ottawa Pit
South Ottawa Pit
Monitor
Ernst Salt Marsh
Cedar Salt Marsh
Naplate
Buffalo Rock
E 818,000
E 824,000
E 830,000
E 836,000
E 842,000
N 1,702,000
N 1,696,000
N 1,690,000
71
RAILROAD INDEX
Abbreviation
Name
INS
BNSF Railway Company
IR
Illinois Railway, LLC
SCALE (ft)
1000
0
1000
2000
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 3.1
MAP SHOWING
SITE LAYOUT
OTTAWA OPERATION
LaSalle County, Illinois
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3,000'

3.3 Encumbrances

3.3.1 Fees and Royalties

To maintain ownership of the Ottawa Operation properties, U.S. Silica must pay property taxes to the local government in LaSalle County. To BOYD's knowledge there are no liens against the properties.

It is BOYD's understanding that there are no royalties, overriding or limited royalties, working interests, production payments, net profit interests, or other mineral interests in the Ottawa Operation properties.

3.3.2 Permitting Requirements

Mining and processing activities on the Ottawa Operation properties are regulated by several federal and state laws. As mandated by these laws and regulations, numerous permits are required for mining, processing, and other incidental activities. U.S. Silica reports that necessary permits are in place or applied for to support immediate operations. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of the current regulations. Permitting and permitting conditions are discussed further in Chapter 17 of this report.

In BOYD's opinion, U.S. Silica has demonstrated their ability and cooperation to align their operating plans with any permitting requirements that may be encountered during the normal course of business.

BOYD is not aware of any current material violations or fines imposed by regulators on the Ottawa Operation.

3.3.3 Mining Restrictions

Several natural and man-made features have been identified in and around the South Ottawa site which may limit the mineable areas of the property. As of this report, these features include:

- Setbacks from neighboring properties.
- Illinois Route 71 right-of-way.
- East 1251st Road (Catlin Park Road) right-of-way.
- Catlin Salt Marsh.
- Ernat Salt Marsh.
- Brown's Brook.
- Jurisdictional wetlands and tributaries.
- Archeologically significant sites.

U.S. Silica has included suitable setbacks in their mining plans to avoid disturbing these sensitive areas. As such, these areas have been excluded from the estimates of silica sand resources and reserves presented herein.

3.3.4 Other Significant Factors or Risks

To the extent known to BOYD, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the Ottawa Operation property that are not discussed in this report. However, the reported silica sand resources and reserves may be materially impacted by: U.S. Silica's failure to comply with permit conditions and rules; delays in obtaining required government or other regulatory approvals or permits; U.S. Silica's inability to obtain such required approvals or permits; or unforeseen changes in governmental regulations.

4.0 PHYSIOGRAPHY, ACCESSIBILITY, AND INFRASTRUCTURE

4.1 Topography, Elevation, and Vegetation

The Ottawa Operation lies within the Bloomington Ridged Plain division of the Till Plains Section physiographic province of Illinois. This region is generally characterized by low, broad, gently sloping ridges formed by glacial moraines, intertwined with wide regions of relatively flat grasslands.

Surface elevations in and around the property range from approximately 460 ft above mean sea-level (AMSL) near the Illinois River, to over 610 ft AMSL on the southern-most extents of the South Ottawa site where it abuts the Illinois River bluff.

Various streams and waterways are present in the immediate area, which drain into the Illinois River. The Ottawa South site contains several wetlands and almost all areas north of the bluff are located within the flood plain of the Illinois River.

Land cover in the immediate area consists predominantly of a mixture of forest, crop/pastureland, and medium density rural areas outside of the city of Ottawa—which is characterized as a medium-to-high density urban area.

4.2 Accessibility

General access to the Ottawa Operation is via a well-developed network of primary and secondary roads serviced by state and local governments. These roads provide direct access to the mine site and processing facilities and are generally open year-round.

A dedicated rail spur connects the Ottawa Operation to BNSF and CXS Class 1 rail lines located to the north and east of the property. Union Pacific and Norfolk Southern rail lines can be accessed utilizing truck transloading, if necessary.

Due to the operation’s location along the Illinois River, U.S. Silica also leases property to a privately-owned barge terminal, which may also be utilized for transporting finished goods.

4.3 Climate

Climate in and around the Ottawa Operation is characteristic for the midwestern US, with four seasons ranging from very cold and snowy winters to hot and humid summers, with generally milder falls and springs. The average daily high temperatures typically reach above freezing all 12 months of the year, while the low temperatures typically drop below freezing during 7 months of the year. Winter temperatures typically range from 18 degrees Fahrenheit (° F) to 36° F, while summer temperatures usually range from 60° F to 84° F. Average annual precipitation for the area is approximately 37 inches of rain and 21 inches of snow.

In general, the operating season for the Ottawa Operation is year-round. Adverse weather conditions seldom limit mining, processing, and loading operations; however, extreme weather conditions may temporarily impact operations. Periodic flooding is possible during heavy rainfall.

4.4 Infrastructure Availability and Sources

The Ottawa Operation lies within a well-developed region of north-central Illinois and has been operating for over 100 years in a region of mixed industrial and suburban development. The City of Ottawa has a population of almost 19,000 and over 500,000 people live in LaSalle County and the surrounding counites, according to 2021 US Census data.

Finished silica sand products from the Ottawa Operation are mainly transported to customer by rail and supported by U.S. Silica's extensive on-site rail-car loading, storage, and handling facility. Access to a well-maintained network of roads and a barge terminal provide alternative transportation options.
Several regional airports are located within an hour's drive from the Ottawa Operation, and the Chicago O'Hare and Midway international airports are less than two hours away by car.

Reliable sources of electrical power, water, supplies, and materials are readily available. Electrical power is provided to the operation by regional utility companies. Water is supplied by public water services, surface impoundments, or water wells. The Ottawa Operation has an abundance of recycled slurry water and processing water available.

5.0 HISTORY

5.1 Reserve Acquisition

The *United States Silica Sand Company*, a separate entity from U.S. Silica, established the first large-scale silica sand mining operation near the town of Ottawa, on the southern side of the Illinois River in 1894. This company mined the St. Peter Sandstone using a combination of blasting and hydraulic mining, in very much the same manner that the formation is mined today.

Edmund B. Thornton, a competitor to the United States Silica Sand Company, began a local silica sand mining operation on the present day North Ottawa site in 1900 under the name Ottawa Silica Company. By the 1920's, the Ottawa Silica Company had taken over most of the silica sand production in the area, eventually resulting in the Thornton family buying out the United States Silica Sand Company in 1928. The Thornton family continued to own and operate the Ottawa Silica Company until 1986, when the company was sold to Rio Tinto Zinc, a large mining conglomerate based in London.

Rio Tinto Zinc merged the newly acquired Ottawa Silica Company with their Berkely Springs, West Virgina-based Pennsylvania Glass Sand Company in January 1987, forming what is now U.S. Silica.

5.2 Exploration and Development

The Ottawa Silica Company was formed over 100 years ago to meet the demands of a small and local market segment. As industry and mass production grew and evolved, the operation did as well, and it began selling silica sand into additional markets, such as glass making, foundry casting, abrasives, building materials, and other segments over the years.

The grinding plant was built in the 1940's to produce ground silica products. This plant utilizes dry ball mills to reduce silica sand grains into fine-ground silica powders for use in various specialty markets for composite glasses, adhesives, fillers, sealants, ceramics, and epoxies.

A significant example of changing markets affecting the Ottawa Operation occurred in the late 1990's and early 2000's, as the use of silica sand in hydraulic fracturing of shales for oil and gas production began to increase drastically. Seeing demands for silica sand shift in their market base and noting what looked to be a growing segment at the

time, U.S. Silica shifted their production strategies to accommodate this market segment. In 2008, development of the Marcellus Shale, and the subsequent additional demand for proppant sands resulted in various expansions being undertaken by U.S. Silica. In order to be able to meet growing demand for proppant sands, the Ottawa Operation expanded its production capacity by 500 thousand tons per year in 2009. Demand for proppant sands continued to increase, and U.S. Silica again expanded the Ottawa operations in 2011 by another 900 thousand tons per year, reaching the present-day production capacity of 3.3 million product tons per year.

Exploration on the South Ottawa site began in 2000 as U.S. Silica began developing strategies in anticipation of having to move production to the south side of the Illinois River. There is no record of any exploration being performed prior to 2000 on the South Ottawa site. Exploration data for the mined-out areas in the North Ottawa site were not reviewed for this report.

The North Ottawa Pit was depleted of mineable sand by 2010, at which time mining operations were moved to the South Ottawa Pit. A slurry line was driven from the eastern portion of the South Ottawa Pit area, under the Illinois River, and to the existing processing plant which is located on the North Ottawa site. Operations continue in the original South Ottawa Pit today.

Again, considering future mine planning needs, U.S. Silica initiated a reserve expansion project in the spring of 2016, with the objective of extending the life of the Ottawa Operation. To this end, U.S. Silica acquired a 314-acre parcel, known as the Mississippi Sand Mine, located adjacent to the western border of the South Ottawa site.

U.S. Silica notes they have continually renovated and updated their facilities in order to improve operational efficiency and better respond to changing market demands. These continuous process improvements have resulted in the operation’s ability to produce multiple types of products using various processing methods (washing, hydraulic sizing, grinding, screening, and blending).

6.0 GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

6.1 Regional Geology

The Ottawa Operation mines and processes material from the St. Peter Sandstone, which is a massive formation in areal extent and thickness. The formation is found principally in the area drained by the Mississippi River and its tributaries, spanning north to south from Minnesota to Arkansas and east to west from Illinois into Nebraska and South Dakota. On a regional basis, the St. Peter Sandstone ranges in thickness from a few feet to over 1,200 ft, with a general thickness of 100 ft to 200 ft. Depths of the sandstone range from a few feet to greater than 10,000 ft.

The St. Peter Sandstone is Middle Ordovician in age (around 460 million years old) and was deposited in an advancing marine shoreline dominated by eolian dune and beach processes. Since the deposition, the formation has experienced several episodes of subsidence and uplift.

Except where it has been removed by erosion, the St. Peter Sandstone covers most of the Illinois Basin at depths varying from a few feet to almost 7,000 ft. The formation outcrops in four principal areas of northern Illinois: (1) the Ottawa-Utica-Millington area, where it outcrops along the Illinois and Fox rivers; (2) the Oregon-Dixon area; (3) the Brookville-Harper area; and (4) the Calhoun County area. In northern Illinois, the thickness of the formation can reach over 300 ft; however, it generally occurs as a 100 ft to 200 ft thick bed. Variations in the thickness of the St. Peter Sandstone are due to post depositional erosion and its highly irregular lower boundary.

The St. Peter Sandstone is a super-mature quartz arenite (≈99% quartz) that consists primarily of well-sorted, fine- to medium-sized, well-rounded quartz grains that are friable or weakly cemented and generally free from clay, carbonates, and heavy minerals. On a regional basis, the formation exhibits grain size that generally ranges from coarser in the upper section to finer in the lower section. As a rule, the lower portion of the formation is fine-grained with iron, alumina, and carbonate contamination increasing with depth.

The St. Peter Formation is an important aquifer as well as a source of high purity silica sand.

6.2 Local Geology

6.2.1 Stratigraphy

Ordovician and Pennsylvanian sedimentary strata comprise the uppermost stratigraphic units underlying the soils in and around the Ottawa Operation. These units primarily include bedrock of, in ascending stratigraphic order, the Prairie du Chien, Ancell, Platteville, and Galena groups of the Ordovician series, and the Pennsylvanian Carbondale Formation. The stratigraphic relationship between these groups is presented in Figure 6.1 as follows.

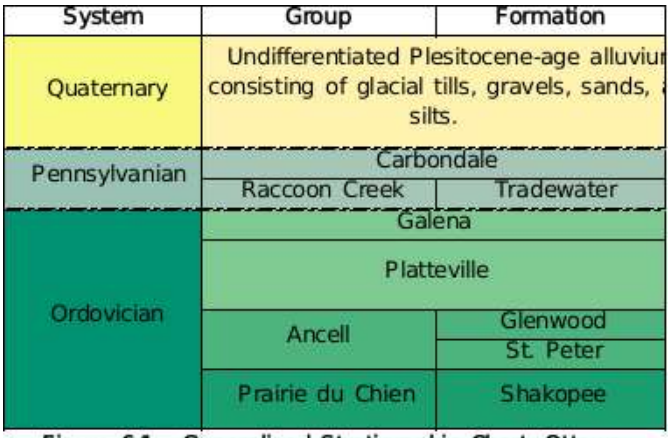


Figure 6.1: Generalized Stratigraphic Chart, Ottawa, Illinois

The following text discusses the strata encountered near Ottawa in ascending depositional order.

Shakopee

The Shakopee Dolomite of the Prairie du Chien Group is composed of argillaceous to pure, very fine-grained dolomite with some thin beds of medium-grained, cross-bedded sandstone, medium-grained dolomite, green to light gray shale, and buff siltstone.

St. Peter

The St. Peter Sandstone unconformably overlies the Shakopee Dolomite formation, and is composed of three members. The lower unit, the Kress Member, consists of chert conglomerate with beds of red and green shale and medium- to coarse-grained sandstone. The remainder of the St. Peter Sandstone is composed of well-rounded, well-sorted, medium- to coarse-grained sandstone of the Tonti and Starved Rock Members,

in depositional order. Locally, the upper part of the St. Peter Sandstone can be poorly consolidated, becoming more consolidated with depth.

Glenwood

The Glenwood Formation is a highly varied unit of poorly sorted sandstone, impure dolomite, and green shale overlying the St. Peter Sandstone. The sandstones have a distinctive bimodal, or “pudding stone,” texture, with medium grains of well-rounded quartz sand, like those of the St. Peter Sandstone, but contained in a matrix of very fine sand and coarse silt. The Glenwood sandstones also contain a variety of heavy minerals, including abundant garnet. This unit is generally not present in the immediate vicinity of the Ottawa Operation but can be found south of the property.

Platteville and Galena

The Platteville and Galena Formations are often combined due to consisting mainly of carbonate sequences of limestone and dolomite. These formations are present south of the Ottawa Operation, but not in the immediate vicinity.

Tradewater and Carbondale

These Pennsylvanian strata are predominantly clastic and contain subordinate amounts of coal and limestone. While this formation is not found at the Ottawa Operation, it comprises the primary near-surface bedrock strata south of the bluffs that border the Illinois River Valley.

Undifferentiated Quaternary Alluvium

Surface geology consists of what is mapped as the Quaternary Age Cahokia Alluvium, an unconsolidated interval of poorly sorted silts, clays, and sand and gravels. Thickness of this unit varies greatly in the region but is very thin within the Illinois River Valley.

6.2.2 Structural Geology

The St. Peter Sandstone at Ottawa lies very near the surface (thereby creating favorable mining conditions) primarily for two reasons. Firstly, one of the most prominent structural features in the Illinois Basin, the La Salle Anticlinorium, has uplifted the sandstone formation from its original depositional position. Secondly, glacial floodwaters of the Late Wisconsin Episode carved the upper reaches of the Illinois River Valley, removing most of strata overlying the St. Peter Sandstone, leaving the sandstone near the land surface as a bedrock bench that is easily identifiable.

On the south bank of the Illinois River, the St. Peter Sandstone forms bluffs and outcrops in the valleys incident to the bluffs from Ottawa to Little Rock, Illinois. In this area, the

overlying formations are principally Pennsylvanian beds, though locally, as at the edge of the bluff in Starved Rock State Park and near Little Rock, the sandstone is bare or is covered with a thin mantle of soil or glacial till.

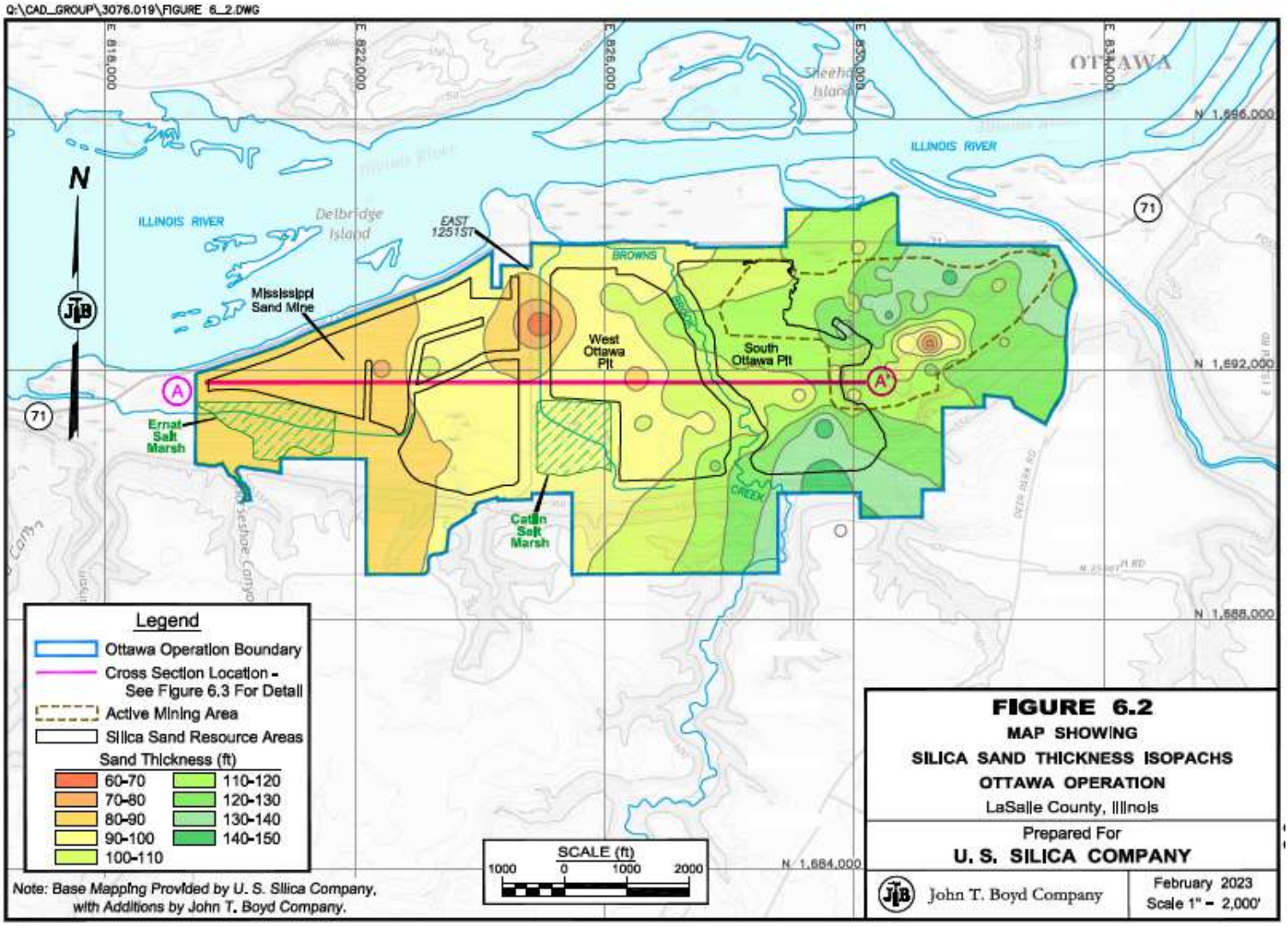
6.3 Property Geology

The St. Peter Sandstone is the only strata of economic interest at the Ottawa Operation, and is very uniform in depositional nature and continuity throughout much of the surrounding region. BOYD considers the subject silica sand deposit to be of low geologic complexity. Furthermore, the geology of the St. Peter Sandstone is well understood after a lengthy history of commercial operations at Ottawa.

Within the defined resource boundaries, the St. Peter Sandstone exhibits: (1) low depth of cover, (2) lateral continuity, (3) a minimum thickness of 70 ft, (4) gentle dipping, and (5) minimal faulting. Figure 6.2, following this page, provides a map of the St. Peter Sandstone thickness. A cross-section through the deposit is provided in Figure 6.3.

The two members of the St. Peter Sandstone—the coarser-grained upper Starved Rock and finer-grained lower Tonti members—are easily identifiable and separable during mining and can be blended as required to meet product specifications. Deleterious materials such as iron (which manifests as orange staining) are easily removed during mining and processing. The sandstone unit is covered by a thin layer of overburden that is generally less than 20 ft thick.

The Ottawa Operation’s sands are generally characterized by a high silica content, high roundness and sphericity, white coloration, and lack of deleterious material. The sandstone is very weakly cemented, allowing it to be mined hydraulically without the need for crushing, which retains the well-rounded grain shape. Because of the monocrystalline structure, these sands have superior grain strength when compared to other silica sands and are suitable for pressure applications generally up to the 9,000-pounds per square inch (psi) range. These characteristics are responsible for the market popularity of the Ottawa Operation’s silica sand products.


Q:\CAD_GROUP\3076.019\FIGURE 6_2.DWG
E 818,000
E 822,000
E 826,000
E 830,000
E 834,000
N 1,696,000
N 1,692,000
N 1,688,000
N 1,684,000
OTTAWA
ILLINOIS RIVER
ILLINOIS RIVER
Delbridge Island
EAST 1251ST
BROWNS
Mississippi Sand Mine
West Ottawa Plt
South Ottawa Plt
Ernat Salt Marsh
Catlin Salt Marsh
A
A'
71
71
N
Legend
Ottawa Operation Boundary
Cross Section Location - See Figure 6.3 For Detail
Active Mining Area
Silica Sand Resource Areas
Sand Thickness (ft)
60-70
70-80
80-90
90-100
100-110
110-120
120-130
130-140
140-150
SCALE (ft)
1000
0
1000
2000
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 6.2
MAP SHOWING
SILICA SAND THICKNESS ISOPACHS
OTTAWA OPERATION
LaSalle County, Illinois
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 2,000'

Q:\CAD_GROUP\3076.019\FIGURE 6_3.DWG

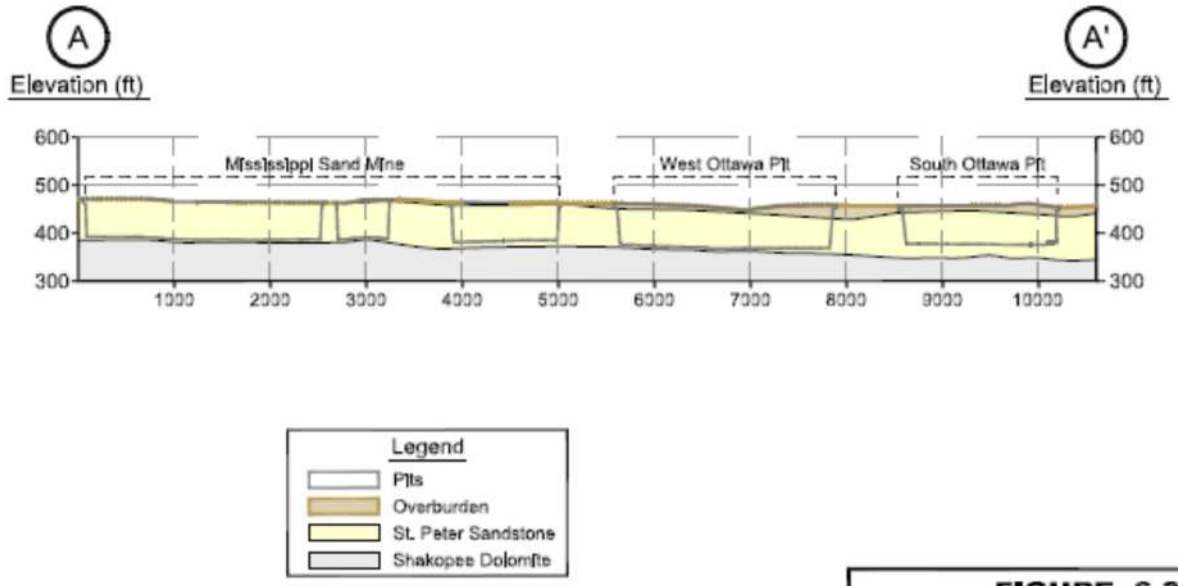


FIGURE 6.3
CROSS SECTION A - A'
OTTAWA OPERATION
LaSalle County, Illinois

Prepared For
U. S. SILICA COMPANY

John T. Boyd Company

February 2023
Scales As Shown

Horizontal 1" = 1,000'
Vertical 1" = 200'
Vertical Exaggeration 5X

Note : See Figure 6.2 For Cross Section Location.

7.0 EXPLORATION DATA

7.1 Background

The Ottawa Operation has an extensive history, over 100 years, of mining and producing of finished silica sand from the St. Peter Sandstone. The Ottawa North site was depleted of silica sand reserves by 2010, by which time operations had commenced at the Ottawa South site. All of the silica sand reserves reported herein are contained within the planned mining areas of the Ottawa South site.

BOYD was provided source records (drilling logs, testing results, and core photographs) and a database compiling the results 225 drill holes, wells, field measurements, and test holes located in and around the South Ottawa site. Records indicate that these exploration data were collected between 2000 and 2014.

An overview of U.S. Silica's exploration and sampling standardized procedures was also provided, which summarizes methodologies and techniques utilized during the various exploration programs completed at the Ottawa Operation.

7.2 Exploration Procedures

7.2.1 Drilling

Drill holes on the Ottawa South site were completed using various drilling procedures based on specific goals and data needs at various stages of planning and developing the Ottawa Mine. Drilling methods utilized to delineate the sub-surface geology include diamond core drilling, rotosonic drilling, and rotary auger drilling techniques. The various exploration campaigns completed, in addition to outcrop mapping, site surveys, and review of United States Geological Survey and Illinois State Geological Survey mapping, serve as the basis for evaluating the extents and geologic continuity of the St. Peter Sandstone underlying the Ottawa South site.

BOYD's review of the reported methodologies and procedures indicate the exploration data obtained and utilized by U.S. Silica for the South Ottawa site were carefully and professionally collected, prepared, and documented, conforming with general industry standards, and are appropriate for use of evaluating and estimating silica sand resources and reserves.

7.2.2 Sand Quality Sampling

The Ottawa Operation's sand quality sampling procedures followed standard industry practices, based on the information provided and discussions held with U.S. Silica personnel. With a preference to utilize diamond core drilling methodologies, the general procedures for sampling during any of the exploration programs, are as follows:

- Recovered drill cores are placed into core boxes and labeled with drill hole name, down hole footage, and recorded thicknesses for each recovered core.
- Cores are geologically logged and photographed, with characteristics of the overall stratigraphy recorded while being boxed. This allowed U.S. Silica to alter pre-determined drilling depths as the program progressed, in order to ensure the entire target strata were sampled and collected.
- Boxed core samples were transported by U.S. Silica to one of their two internal laboratories—located in Berkeley Springs, WV and Katy, TX—where they were checked in and split into 5-ft sample intervals for preparation and testing.
- Details on the expansion property exploration sampling techniques were not provided by Mississippi Sands to U.S. Silica. However, available archival core samples were examined by U.S. Silica personnel, and the 5-ft sample intervals examined seemed to be representative of the local geology. These samples were originally tested at a third-party (Bowser-Morner, Inc.) laboratory in Dayton, Ohio. U.S. Silica obtained samples of the available archival drilling cores and transported and performed their own testing at one of their internal laboratories prior to finalizing the acquisition of the Mississippi Sands property.

U.S. Silica maintained control of exploration core samples throughout the entirety of each drilling campaign, from the point of logging and boxing of recovered cores in the field, to transportation and delivery of core samples to their internal laboratories, through performing preparation and analyses on each of the samples.

Available testing results were reviewed by BOYD during our assessment, and our review of the field and sampling procedures noted above showed that the general description and sampling work were conducted to appropriate standards. Based on the stated standards, both in the field and in the laboratory, BOYD considers the sample preparation and analytical procedures were adequate for the purposes of evaluating and estimating silica sand resources and reserves at the Ottawa Operation.

7.2.3 Sand Testing

Samples obtained from the exploration campaigns completed at the Ottawa Operation were taken to one of the company's in-house laboratories, where they were prepared and analyzed for particle size distribution analyses. Samples were split and prepared

following standardized company procedures—U.S. Silica's ISO 9001 Quality System of Corporate Analytical Procedures—to ensure analytical consistency throughout each of the various exploration campaigns. These procedures are designed to closely match the operational capabilities of the Ottawa Operation's processing plant.

Preparation of each sample consisted of initially splitting the recovered core in half using a chisel and hammer. One half of the core is placed back into the core boxes which are then stored for archival purposes, while the other half of the core is further prepared and processed for lab testing purposes.

Analysis samples were then crushed, quartered, and mixed to create a uniform and representative mixture of the core interval, and are then divided into 1,000-to-5,000-gram samples, depending on the type and amount of testing to be performed. The desired sample size is then run through various crushing techniques to disaggregate the sand grains and fine materials as much as possible before beginning the washing and scrubbing procedures.

An approximately 1,500-gram sample is then obtained and washed before being run through a scalping procedure to remove coarse (+16-mesh size for proppant sand product testing; +30-mesh size for industrial product testing) particles. This process primarily removes the oversize "coarse waste" size fraction, leaving behind the material that would typically be washed in the wet processing plant. The remaining material is weighed and labeled as a "washed sample".

The washed sample is further prepared by simulating the wet processing plant conditions, which consist of placing a sample into scrubbers for three minutes, rinsing and decanting, and then drying to arrive at a "scrubbed sample", which represents material that the wet processing plant would prepare before being run through a drying plant.

The scrubbed samples are then dried and analyzed following API/ISO standards for particle size distribution analysis and then API RP 19C/ISO-13503-2 standard testing for proppant materials used in fracturing and gravel-packing operations.

7.2.4 Other Exploration Methods

There were not any other methods of exploration (such as airborne or ground geophysical surveys) reported for the Ottawa Operation.

7.3 Exploration Results

7.3.1 Summary of Exploration

A total of 225 drill holes were completed in and around the South Ottawa area. The distribution of these drill holes is shown on Figure 7.1, on the next page.

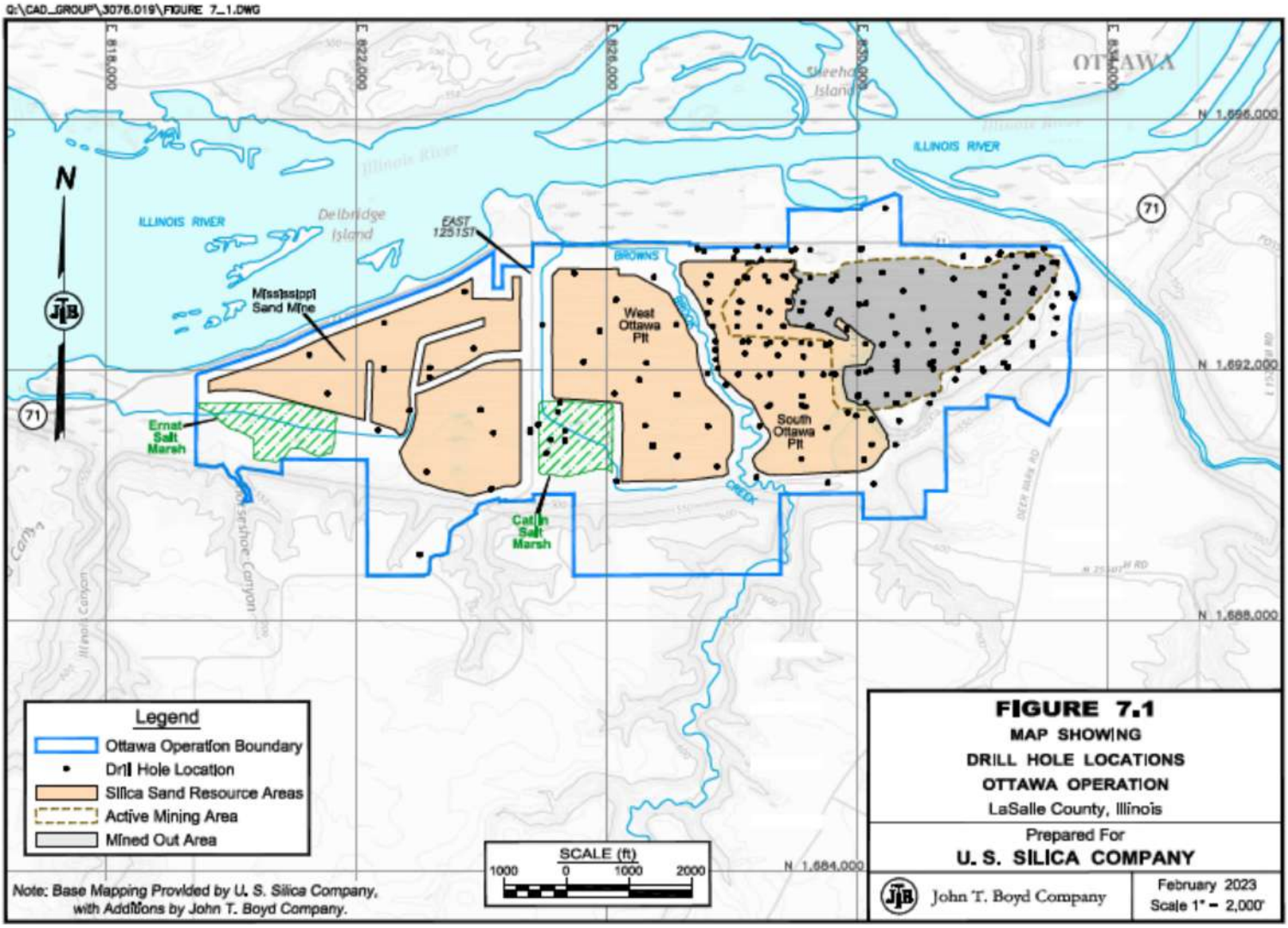
As mentioned, the 225 drill holes include a variety of drill holes, wells, field measurements, and test holes. BOYD's review determined that 102 holes penetrated the full depth of the St. Peters Sandstone and were supported by suitable lithologic and sand quality records. Lithologic data from many of the shorter holes (i.e., those which did not penetrate the entire thickness of the sandstone strata), we used to estimate the thickness of the overburden material over the South Ottawa site.

General descriptive statistics for the St. Peter Sandstone, and overburden material are provided in Table 7.1, below.

Table 7.1: Descriptive Statistics, Stratigraphic Interval Thickness

	Interval Thickness (feet)	
	Overburden	St. Peter Sandstone
Count	195	102
Mean	11.5	113.5
Minimum	1.0	64.0
Maximum	33.0	156.0
Standard Deviation	6.89	18.98
Coefficient of Variance	0.60	0.17

These data confirm the generally uniform nature of the deposit underlying the South Ottawa site and support the interpretation of the sandstone's thickness illustrated in Figure 6.2 (page 6-5).


Q:\CAD_GROUP\3076.019\FIGURE 7_1.DWG
E 818,000
E 822,000
E 826,000
E 830,000
E 834,000
N 1,696,000
N 1,692,000
N 1,688,000
N 1,684,000
OTTAWA
ILLINOIS RIVER
Deibridge Island
EAST 1251ST
BROWNS
Mississippi Sand Mine
West Ottawa Pit
South Ottawa Pit
Ernat Salt Marsh
Catlin Salt Marsh
71
N
Legend
Ottawa Operation Boundary
Drill Hole Location
Silica Sand Resource Areas
Active Mining Area
Mined Out Area
SCALE (ft)
1000 0 1000 2000
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 7.1
MAP SHOWING
DRILL HOLE LOCATIONS
OTTAWA OPERATION
LaSalle County, Illinois
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 2,000'

7.3.2 Silica Sand Quality

The Ottawa Operation produces a wide variety of proppant sand and specialty silica sands products for numerous customers. While not all of the finished products must adhere to a published set of specifications, U.S. Silica utilizes samples obtained during exploration to ascertain the suitability of the mineable sandstone for producing the various materials it supplies to customers.

Particle size distribution and iron content are noted as the primary drivers of mine planning at the Ottawa Operation. Particle size distribution within the sandstone, necessitates the concurrent mining of multiple areas of the mine to ensure supply of appropriately sized material to the processing plant. Similarly, as iron content increases near the top and bottom of the sandstone, this material must be discarded or blended with higher quality sand before processing.

U.S. Silica performs testing at their laboratories for API/ISO specifications; however, no data were made available for our review. Historically, API RP 19C/ISO 13503-2 proppant sand characteristics were strictly used to determine the suitability of a sand product for use during fracking stages of oil and gas well development. Over time, these specifications have become merely guidelines and the suitability of a proppant sand product is now determined by the end user. Indeed, many end users test the products that they purchase to determine if they meet their own internal specifications. BOYD notes that U.S. Silica has demonstrated commercial success in producing and marketing their finished silica sand products; as such, it is BOYD's opinion that sand quality data provided are representative and suitable for the estimation of silica sand resources and reserves.

7.3.3 Grain Size Distribution

Grain size distribution was analyzed according to API RP 19C/ISO 13503-2, Section 6.
A table of weighted average grain size distribution of the in-situ sand deposit, based on laboratory testing results, is shown in Table 7.2, below.

Table 7.2: Weighted Average Particle Size Distribution

Approximate In-Place Product Distribution					
% Retained By Mesh Size				% Product	
>40	40/70	70/140	<140	40/70	70/140
22.0	54.0	21.0	3.0	72.0	28.0

The preceding table highlights the relative fineness of the sand found within the Ottawa South Property, indicating a majority of the sand particles are concentrated between the “passing 40-mesh” and “retained 140-mesh” size fraction. Accordingly, the predominant marketable proppant sand product consists of the 40/140-mesh sand.

7.3.4 Grain Shape (Sphericity and Roundness)

Grain shape is defined under ISO 13503-2/API RP19C, Section 7. Under this standard, recommended sphericity and roundness values for proppants are 0.6 or greater. As part of the grain shape analysis, the presence of grain clusters (weakly cemented grain aggregates) and their approximate proportion in the sample are reported.

While individual sample testing results for the Ottawa Operation’s deposit were not available for review at the time of this report, it is important to note that the St. Peter Sandstone is well studied and widely known to consistently exhibit the general characteristics of being a fine-to-medium grained, well-rounded, and well-sorted sandstone comprised primarily of weakly cemented and extraordinarily pure quartz grains that contain little-to-no deleterious materials within the sandstone matrix.

U.S. Silica has also produced and sold sand into various oil and gas basins, where ultimately the sand has been shown to meet customer specifications.

7.3.5 Crush Resistance

Crush resistance is a key test that determines the amount of pressure a sand grain can withstand under laboratory conditions for a two-minute duration. It is analyzed according to ISO 13503-2/API RP19C, Section 11. Under this standard, the highest stress level (psi) in which the proppant produces no more than 10% crushed fine material is rounded down to the nearest 1,000 psi and reported as the “K-value” of the material.

The Ottawa Operation’s silica sand products are noted for exhibiting high crush strengths.

7.3.6 Mineralogical Analyses

Mineralogical analyses were performed via x-ray fluorescence to determine the concentrations of various minerals present within the sandstone matrix. Testing determined that the minerals present in the sandstone matrix will generally be removed during processing of the mined silica sand. Mineralogical testing was conducted on a composited interval of the entire mineable interval from a given drill hole.

7.4 Data Verification

For purposes of this report, BOYD did not verify historic drill hole data by conducting independent drilling. It is customary in preparing similar mining resource and reserve estimates to accept basic drilling and sample quality data as provided by the client subject to the reported results being judged representative and reasonable.

BOYD's efforts to judge the appropriateness and reasonability of the source exploration data included reviewing representative samples of provided drilling logs, sampling procedures, sand quality testing results, and discussing aspects of developing the operation with U.S. Silica personnel during our site visit. Reviewed drilling records were compared with their corresponding database records for transcription errors; of which none were found. Lithologic and sand quality data points were compared via visual and statistical inspection with geologic mapping and cross-sections.

7.5 Adequacy of Exploration and Sampling

BOYD's review indicates that in general, U.S. Silica has performed an acceptable level of drilling and sampling work at the Ottawa Operation. The work completed has been done by competent personnel in a manner consistent with industry practices. The amount of data available, combined with extensive knowledge of the St. Peter Sandstone, are sufficient to confirm deposit uniformity and continuity throughout the South Ottawa area. Similarly, BOYD's review of testing data provided by U.S. Silica suggests that the analyses completed are generally appropriate to determine silica sand characteristics and determine the subsequent quality of finished silica sand products. As such, it is BOYD's opinion that the exploration and sampling data are suitable for use in the estimation of silica sand resources and reserves for the Ottawa Operation.

8.0 SAMPLE PREPARATION, ANALYSIS, AND SECURITY

The reader is referred to Sections 7.2 and 7.3 of this report for details regarding sample preparation, analysis, and security.

9.0 DATA VERIFICATION

BOYD, by way of the data verification processes described in various sections of this report, has used only that data, which were deemed by the QPs to have been generated with proper industry standard procedures, were accurately transcribed from the original source and were suitable to be used for the purpose of preparing estimates of silica sand resources and reserves.

BOYD's subject-specific data verification efforts and our conclusions arising therefrom are discussed in the following sections of this report:

Topic	Report Section(s)
Exploration Data	Section 7.4
Sample Preparation, Analysis, and Security	Section 7.4
Silica Sand Resource Estimates	Section 11.2
Operating Plans	Chapters 13 and 1
Capital and Operating Costs	Chapter 18
Economic Analysis Inputs	Chapter 19

Based on our review, it is BOYD's overall conclusion that the information made available to us at the time of this report is representative and reliable for use in estimating the silica sand resources and reserves of the Ottawa Operation.

BOYD is not aware of any other limitations on nor failure to conduct appropriate data verification.

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10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

Please refer to Chapter 7 for information regarding mineralogical and grain size distribution testing.

11.0 SILICA SAND RESOURCE ESTIMATE

11.1 Applicable Standards and Definitions

Unless noted, silica sand resource estimates disclosed herein are done so in accordance with the standards and definitions provided by S-K 1300. It should be noted that BOYD considers the terms “mineral” and “silica sand” to be generally interchangeable within the relevant sections of S-K 1300.

Estimates of mineral resources are always subject to a degree of uncertainty. The level of confidence that can be applied to a particular estimate is a function of, among other things: the amount, quality, and completeness of exploration data; the geological complexity of the deposit; and economic, legal, social, and environmental factors associated with mining the resource. By assignment, BOYD used the definitions provided in S-K 1300 to describe the varying degree of certainty associated with the estimates reported herein.

The definition of mineral resource provided by S-K 1300 is:

> *Mineral resource is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. A mineral resource is a reasonable estimate of mineralization, taking into account relevant factors such as cut-off grade, likely mining dimensions, location or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable. It is not merely an inventory of all mineralization drilled or sampled.*

Estimates of mineral resources are subdivided to reflect different levels of geological confidence into measured (highest geologic assurance), indicated, and inferred (lowest geologic assurance). Please refer to the Glossary of Abbreviations and Definitions for the meanings ascribed to these terms.

11.2 Silica Sand Resources

11.2.1 Methodology

Based on provided information, U.S. Silica's geologic modeling and silica sand resource estimation techniques generally consist of following:

1. The top and bottom elevations of the quartzose (high-quality) St. Peter Sandstone interval is interpreted from drill hole records and sand particle size analyses. Strata above the interpreted sandstone interval are considered overburden (waste). Strata below the sandstone unit—generally, the Kress cherty shale or Shakopee Dolomite—are also considered waste.
2. Interpreted drill hole records are compiled and validated. Strata thicknesses are aggregated, and sand particle size analyses of the sandstone unit are composited for each data point. The compiled drill hole data are imported into GEOVIA Surpac™ geologic modeling and mine planning software.
3. A geologic block model of the deposit is developed using industry standard stratigraphic modeling methods. The geologic model delineates overburden, and the top and bottom of the mineable sandstone horizon.
4. Contiguous regions of mineable sandstone are outlined (applying criteria discussed below in Section 11.2.2), and LOM pit shells are created
5. Estimates of in-place overburden waste and mineable sandstone volumes are derived from the LOM pit shells and recent topographic (surface elevation) surveys.
6. An in-place sandstone dry density of 135 pounds per cubic foot is used to convert the in-place sand volumes to in-place sand tons.

11.2.2 Estimation Criteria

Development of the silica sand resource estimate for the Ottawa Operation assumes mining and processing methods and equipment which have been utilized successfully at the site for decades.

The target mining horizon, the St. Peter Sandstone, underlies the entirety of U.S. Silica's property at the Ottawa Operation, and is manifested as a continuous, flat-lying sedimentary rock unit with consistent depth and thickness. While the sandstone exhibits vertical variations in quality, all of the unit is mined and sold under various product specifications. The high-quality sandstone is easily distinguished from the surrounding lower-quality or non-sandstone rock units, aiding in the interpretation of the mineable horizon. Additionally, the Ottawa Operation has a lengthy commercial history of producing numerous products with various size and quality specifications, allowing nearly all of the identified mineable sandstone interval to be utilized. Based on the uniformity of the sand deposit being mined, cut-off grades, strip ratio, and other typical mining factors do not define economic mineabilty. Production of silica sand is driven by

market demand. Silica sand production can be modified in response to that demand. As such, the application of minimum mining thicknesses, maximum stripping ratios (the ratio of waste to sandstone excavated), or cut-off grades is not generally considered in the estimation of silica sand resources for the Ottawa Operation.

The limits of the silica sand resources are constrained to those portions of the interpreted sandstone deposit that:

- Are reasonably defined by available drilling and sampling data.
- Contain products that meet generally accepted specifications.
- Honor any legal mining constraints (e.g., property boundaries, environmental setbacks, utility and infrastructure setbacks, etc.).
- Adhere to physical mining constraints.
- Contain products that can be sold at a profit (i.e., be economic).

U.S. Silica applied the following offsets to define the silica sand resource boundaries for the Ottawa Operation:

- 25-ft buffer around wetlands and streams.
- 200-ft offsets from neighboring property boundaries.
- 160-ft right-of-ways around roadways.

The following mine design criteria are used to develop the pits shells which constrain the estimated silica sand resources:

- Slopes of 33% in topsoil, clay, gravel, or unconsolidated overburden materials.
- Slopes of 70° in sandstone.
- A minimum of a 10-ft wide safety bench is left at the alluvium/rock and rock/sand contacts.
- A minimum of a 25-ft wide safety bench is left at approximately 425 feet AMSL.
- The bottom of mineable resources is by pit design at a variable elevation to allow proper drainage, and is limited to 5 ft above the underlying shale/dolomite or a minimum elevation of 378 ft AMSL, whichever is higher.

Silica sand resources for the Ottawa Operation are assessed for reasonable prospects for eventual economic extraction by reporting only that material which has been subsequently converted to silica sand reserves after the application of all material modifying factors.

BOYD has reviewed the criteria employed by U.S. Silica in developing their estimates of silica sand resources. The parameters are supported by historical results and align with those employed at similar operations. As such, it is BOYD's opinion that the stated criteria are reasonable and appropriate for the estimation of silica sand resources at the Ottawa Operation.

11.2.3 Classification

Geologic assuredness is established by the availability of both structural (thickness and elevation) and particle size distribution for the St. Peter Sandstone. Classification is generally based on the concentration or spacing of exploration data, geological understanding, continuity of mineralization relative to the style of mineralization, and uncertainty with the exploration data. Table 11.1 provides the general criteria employed in the classification of the silica sand resources.

Table 11.1: Silcia Sand Resource Classification Criteria

Classification (Geologic Confidence)	Data Point Spacing (feet)		
Measured	0	–	1,500
Indicated	1,500	–	3,000
Inferred	3,000	–	6,000

Extrapolation or projection of resources in any category beyond any data point does not exceed half the point spacing distance.

BOYD reviewed the classification criteria employed by U.S. Silica with regards to data density, data quality, geological continuity and/or complexity, and estimation quality. The St. Peter Sandstone is well-known and of low geologic complexity. We believe these criteria appropriately reflect their implied levels of geologic assurance with respect to the estimation of silica sand resources.

Mineable sand resources on the property are well-defined throughout all areas of the mine plan. Observed drill hole spacing averages approximately 500 ft through a majority of the active mining area, with future mining areas exhibiting a general drill hole spacing averaging approximately 750 ft to 1,250 ft.

11.2.4 Silica Sand Resource Estimate

Resource estimates of in-place silica sand at the Ottawa Operation as of December 31, 2022, as reported by U.S. Silica are shown in Table 11.2 below.

Table 11.2: Ottawa Operation Silica Sand Resources
(as of December 31, 2022)

	In-Place Tons (000)		
Classification	Planned[1]	Additional[2]	Total
Measured	94,466	-	94,466
Indicated	1,564	-	1,564
Total Measured + Indicated	96,030	-	96,030
Inferred	-	88	88

Notes:
1. "Planned" resources are those included in the approved LOM plan.
2. "Additional" resources are those reported in addition to silica sand reserves.

As shown, U.S. Silica controls approximately 93 million in-place tons of measured and indicated silica sand resources, *inclusive* of silica sand reserves. In addition, they control approximately 88,000 in-place tons of inferred silica sand resources. Silica sand resources are not silica sand reserves and do not have demonstrated economic viability.

The silica sand resources shown under the “Planned” column of Table 11.2 include only those in-place tons which are included in U.S. Silica’s LOM plan for the Ottawa Operation and therefore considered for conversion to silica sand reserves. The silica sand resources shown under the “Additional” column of Table 11.2 have not been included in the LOM plan and are considered *exclusive* of (i.e., “in addition to”) the reported silica sand reserves. These “Additional” silica sand resources are considered to have prospects for eventual economic extraction by virtue of their similarity, in terms of demonstrated extraction methods and expected finished product qualities, to those converted to silica sand reserves. However, further studies are required to convert the “Additional” silica sand resources to silica sand reserves.

11.2.5 Validation

BOYD was provided with U.S. Silica’s exploration data, geologic models, and volumetric estimates. We have reviewed this information, on a representative basis, by:

- Verifying the accuracy of geologic model inputs by comparison with drilling logs and laboratory reports.
- Comparing the geologic model with compiled drilling data.

- Preparing a stratigraphic grid model of the sandstone unit and independently estimating pit shell volumes.

It is BOYD's opinion that the geologic model is representative of the informing data and that the data are of sufficient quality to support the silica sand resource estimate provided herein. Furthermore, it is our opinion that the estimation methods and criteria employed are both appropriate and reasonable for the deposit type and proposed extraction methods.

BOYD is not aware of any technical, legal, economic, or other relevant factors that could materially affect the silica sand resource estimate. The accuracy of silica sand resource estimate is, in part, a function of the quality and quantity of available data and of engineering and geological interpretation and judgment. Given the data available at the time this report was prepared, the estimates presented herein are considered reasonable. However, they should be accepted with the understanding that additional data and analysis available after the date of the estimate may result in a change to the current estimate. These revisions may be material. There is no guarantee that all or any part of the estimated resources will be recoverable.

12.0 SILICA SAND RESERVE ESTIMATE

12.1 Applicable Standards and Definitions

Unless noted, silica sand reserve estimates disclosed herein are done so in accordance with the standards and definitions provided by S-K 1300. It should be noted that BOYD considers the terms “mineral” and “silica sand” to be generally interchangeable within the relevant sections of S-K 1300.

Estimates of mineral reserves are always subject to a degree of uncertainty. The level of confidence that can be applied to a particular estimate is a function of, among other things: the amount, quality, and completeness of exploration data; the geological complexity of the deposit; and economic, legal, social, and environmental factors associated with mining the reserve. By assignment, BOYD used the definitions provided in S-K 1300 to describe the varying degree of certainty associated with the estimates reported herein.

The definition of mineral reserve provided by S-K 1300 is:

> *Mineral reserve is an estimate of tonnage and grade or quality of indicated and measured mineral resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated mineral resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted.*

Estimates of mineral reserves are subdivided to reflect geologic confidence, and potential uncertainties in the modifying factors, into proven (highest assurance) and probable. Please refer to the Glossary of Abbreviations and Definitions for the meanings ascribed to these terms.

Figure 12.1, below, illustrates the relationship between mineral resources and mineral reserves.

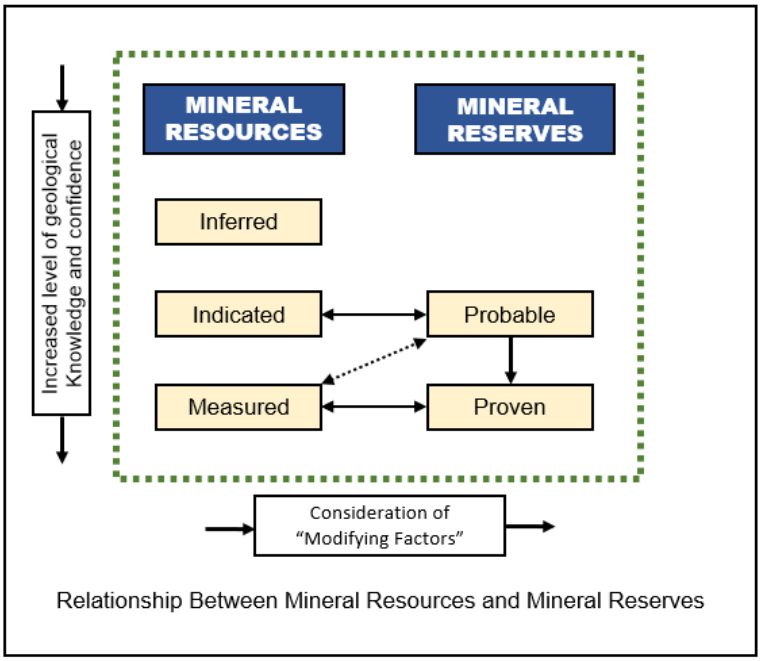


Figure 12.1: Relationship Between Mineral Resources and Mineral Reserves

By industry convention, silica sand reserves are presented on two bases: mineable and saleable. Mineable reserves represent the ROM tonnage available for excavation and processing. Saleable reserves represent the tonnage of finished silica sand available for sale after processing the mineable reserves.

12.2 Silica Sand Reserves

12.2.1 Methodology

Estimates of silica sand reserves for the Ottawa Operation are derived contemporaneously with estimates of silica sand resources. The Ottawa Operation utilizes commercially proven mining and processing methods to extract and process silica sand from the subject property. The operation's production plans are revised periodically to assure that the conversion of in-place sand to saleable product are: (1) in reasonable conformity with present and recent historical operational performance, and (2) reflective of expected mining and processing operations.

To derive estimates of mineable tons and saleable product tons (i.e., proven and probable silica sand reserves), the following modifying factors were applied to the in-place measured and indicated silica sand resources underlying the respective mine plan areas:

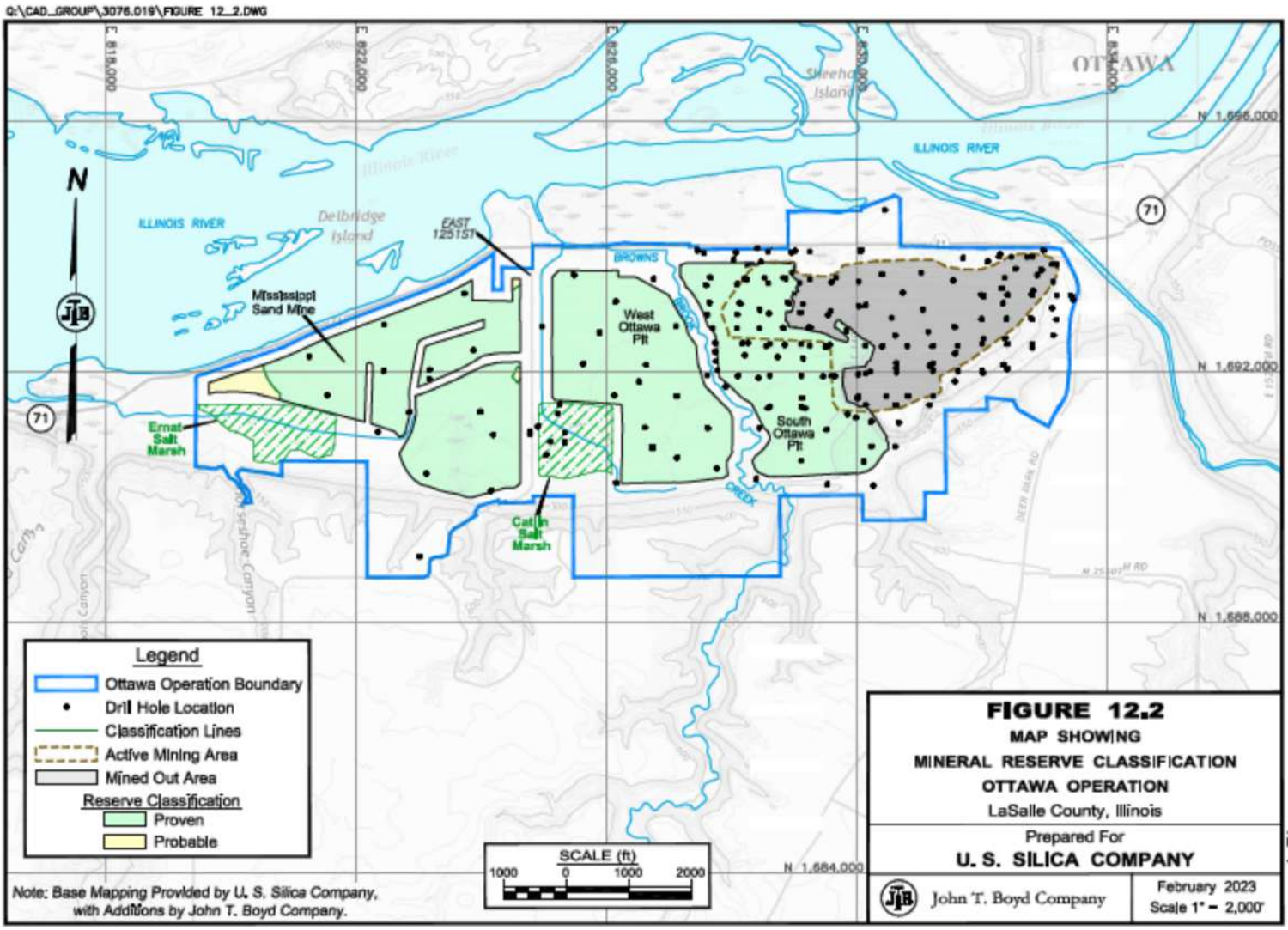
- A 95% mining recovery factor, which assumes that 5% of the mineable (in-place) silica sand resource will not be recovered for various reasons. Applying this recovery factor to the in-place resource results in the estimated ROM sand tonnage (i.e., the mineable silica sand reserves) that will be delivered to the wet process plant.
- An overall 86.5% processing yield. This factor accounts for removal of out-sized (i.e., larger than 20-mesh and smaller than 140-mesh) sand and losses in the wet and dry processing plants due to minor inefficiencies.

The overall product yield (after mining and processing losses) for the Ottawa Operation is estimated at approximately 82.2%. That is, for every 100 tons of in-place silica sand, approximately 82 tons will be recovered and sold as product. Mining recovery and processing yield factors are derived from historical operating results.

Economic availability of the silica sand reserves is established by the financial analysis presented in Chapter 19. A long-range average selling price of $42.37 per product ton has been used to estimate silica sand reserves for the Ottawa Operation.

12.2.2 Classification

Proven and probable silica sand reserves are derived from measured and indicated silica sand resources, respectively, in accordance with S-K 1300. BOYD is satisfied that the stated silica sand reserve classification reflects the outcome of technical and economic studies. Figure 12.2, following this page, illustrates the classification of the silica sand reserves at the Ottawa Operation.


Q:\CAD_GROUP\3076.019\FIGURE 12_2.DWG
E 818,000
E 822,000
E 826,000
E 830,000
E 834,000
N 1,696,000
N 1,692,000
N 1,688,000
N 1,684,000
OTTAWA
Sheehan Island
ILLINOIS RIVER
Illinois River
Delbridge Island
EAST 1251ST
BROWNS
Mississippi Sand Mine
West Ottawa Pit
South Ottawa Pit
Ernat Salt Marsh
Catlin Salt Marsh
71
N
Legend
Ottawa Operation Boundary
Drill Hole Location
Classification Lines
Active Mining Area
Mined Out Area
Reserve Classification
Proven
Probable
SCALE (ft)
1000 0 1000 2000
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 12.2
MAP SHOWING
MINERAL RESERVE CLASSIFICATION
OTTAWA OPERATION
LaSalle County, Illinois
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 2,000'

12.2.3 Silica Sand Reserve Estimate

U.S. Silica's estimated surface mineable silica sand reserves for the Ottawa Operation total 78.9 million saleable product tons, as of December 31, 2022. The silica sand reserves reported in Table 12.1, below, are based on the approved LOM plan which, in BOYD's opinion, is technically achievable and economically viable after the consideration of all material modifying factors.

Table 12.1: Ottawa Operation Silica S
Reserves (as of December 31, 202

	Tons (000)	
Classification	Mineable	Saleable
Proven	89,742	77,627
Probable	1,486	1,286
Total	91,228	78,913

All of the reported silica sand reserves wholly owned by U.S. Silica.

The silica sand reserves of the Ottawa Operation are well-explored and defined. It is our conclusion that over 98% of the stated reserves can be classified in the proven reliability category (the highest level of assurance) with the remainder classified as probable. Given the geologic uniformity and history of mining the St. Peter Formation on the Ottawa Operation properties, it is reasonable to assume that the small portion of probable reserves will be converted to proven reserves upon completion of additional exploration and testing.

The Ottawa Operation has a well-established history of mining, processing, and selling silica sand products into various markets. BOYD has assessed that sufficient studies have been undertaken to enable the silica sand resources to be converted to silica sand reserves based on current and proposed operating methods and practices. Changes in the factors and assumptions employed in these studies may materially affect the silica sand reserve estimate.

The extent to which the silica sand reserves may be affected by any known geological, operational, environmental, permitting, legal, title, variation, socio-economic, marketing,

political, or other relevant issues has been reviewed as warranted. It is the opinion of BOYD that U.S. Silica has appropriately mitigated, or has the operational acumen to mitigate, the risks associated with these factors. BOYD is not aware of any additional risks that could materially affect the development of the silica sand reserves.

Based on our independent review, we have a high degree of confidence that the estimates shown in this report accurately represent the available silica sand reserves controlled by U.S. Silica, as of December 31, 2022.

12.2.4 Reconciliation with Previous Estimates

When comparing U.S. Silica's silica sand reserve estimates as of December 31, 2022, with the estimates presented[1] for December 31, 2021, we note a net decrease of approximately 8.7 million mineable tons resulting from: (1) depletion due to mining of approximately 3.2 million mineable tons, and (2) revisions to mine plans resulting in deductions of approximately 5.5 million mineable tons. BOYD does not consider these deductions, either individually or combined, to represent material changes to the silica sand reserves of the Ottawa Operation.

[1] U.S. Silica did not present reserves on a Saleable Tons basis for the 2021 financial year.

13.0 MINING METHODS

13.1 Mining Operations

Surface silica sand mining has been conducted at the Ottawa Operation for over 100 years. Recent and current mining operations are located in the South Ottawa Pit, on the south bank of the Illinois River.

In and around the Ottawa Operation, the St. Peter Sandstone generally exhibits a shallow depth, flat altitude, and consistent thickness. These characteristics favor conventional surface mining techniques. Since the target sandstone formation does not extend below the water table, the quarry is ‘dry-mined’ using truck and shovel mining methods. Mining occurs in a stair-like fashion to recover sand from the top of the formation (in elevation) down to the lowest practical elevation (generally 5 ft from the bottom of the St. Peter Sandstone).

The thin overburden, including topsoil, cap rock and vegetation, is cleared and transported to several mined-out areas in pit where it is stockpiled for future reclamation needs. The material is poorly consolidated and thus drilling and blasting is typically not needed for this stage of the mining operations. Overburden removal is performed, as required (usually one year in advance of sand mining), by third party contractors and does not appear to hinder sand mining to any appreciable degree.

Once the overburden has been stripped, the poorly cemented sandstone is drilled and blasted in a series of benches between 40 to 75 ft high. Drilling and blasting are performed by local third-party contractors several times a year depending on production requirements.

An excavator or front-end loader is used to load the shot sandstone into articulated haul trucks for transport to a “monitor station” where the material is further broken down

using high-pressure water to create a sand/water slurry. Figure 13.1, below, shows the loading operations in the South Ottawa Pit.

Figure 13.1: Loading Operations at the Ottawa Operation

The slurry is transported under the Illinois River to the processing plant via a series of pumps and high-density polyethylene (HDPE) pipes. A bulldozer is used to push any stockpiled rock in this area towards the monitor. Large stockpiling capacity at the monitor station can help alleviate ROM sand supply fluctuations caused by minor disruptions in mining activities.

After the slurry material is transported to the processing plant, the water is recycled and returned to the mine site for reuse. The pipes are positioned under the roadways to the north of the pit and under the Illinois River through lines which were drilled by directional boring methods. Booster pump stations along the slurry line allows the sand to stay in suspension. This method of mining and transportation has proven to be very effective since operations commenced in the South Ottawa Pit.

The mine generally operates year-round.

13.2 Mine Equipment and Staffing

13.2.1 Mine Equipment

The primary mobile equipment involved in sand excavation includes:

- One Volvo 480EC Excavator.
- Four John Deere 460E class articulated trucks.
- One John Deere 444 Loader
- One Caterpillar D8 Dozer.
- One John Deere 1050 Dozer.
- Two Volvo 350F Loaders.
- A water truck and other ancillary equipment.

The mobile equipment fleet is comprised of both leased and owned equipment. Regular maintenance of mobile equipment is performed by U.S. Silica personnel at the Ottawa facility. Major rebuilds or repairs are performed offsite at third-party repair facilities.

If maintained in good condition, the mobile equipment fleet should be capable of achieving production levels required by the LOM plan.

13.2.2 Staffing

The Ottawa Operation is staffed by 145 hourly and salaried personnel. A breakdown of employees by classification is provided in Table 13.1.

Table 13.1: Employees by Classification

Classification	Employees
Mine Operations	36
Plant Operations	59
Maintenance	24
Salaried	26
Total	145

Hourly employees are represented by the United Steelworkers of America.

Most employees live in and around the City of Ottawa. Except for a drop in employment in 2020 (attributed to poor market conditions during the COVID pandemic), staffing levels across the operational sites have largely remained consistent. The workforce can be expanded or reduced based on market and seasonal demands.

13.3 Engineering and Planning

The primary mine planning consideration is the safe, economical, and regular supply of raw high-quality sand feed to the processing plant. In commercial mining terms, the quantities of overburden removed, and sand mined each year at the Ottawa Operation are considered modest. The sandstone deposit affords easy access with its shallow depth and large areal extent. As such, mining plans for the Ottawa mine are relatively simple and very flexible, able to be modified based on demand in a relatively short time frame.

Geotechnically, the St. Peter Sandstone is relatively competent and the mining depths so shallow such that slumping, or collapsing, has not been a detriment to the mining process. The pit design parameters discussed in Section 11.2.2 have been used with success at the operation for decades.

Excessive inflow of groundwater into the pit is not expected. As such, dewatering before or during mining activities should be manageable with drainage ditches and sumps. Flood waters from the adjacent Illinois River are a manageable risk. Onsite water ponds can be used to hold any excessive ground or storm water.

13.4 Mining Sequence and Production

Mining of the St. Peter Sandstone at the Ottawa Operation commenced shortly after the founding of the Ottawa Silica Company in 1900 and has continued, without lengthy disruptions, to the present day. Over the past seven years, the operation has mined over 24 million tons of raw sand. During late 2019 and 2020, production was reduced from approximately 4 million tons per year to under 2.5 million tons in response to decreased

customer demand due to the COVID-19 pandemic. Production rebounded in 2021 and 2022, and is forecasted to rise in the LOM plan as illustrated in Figure 13.2, below.

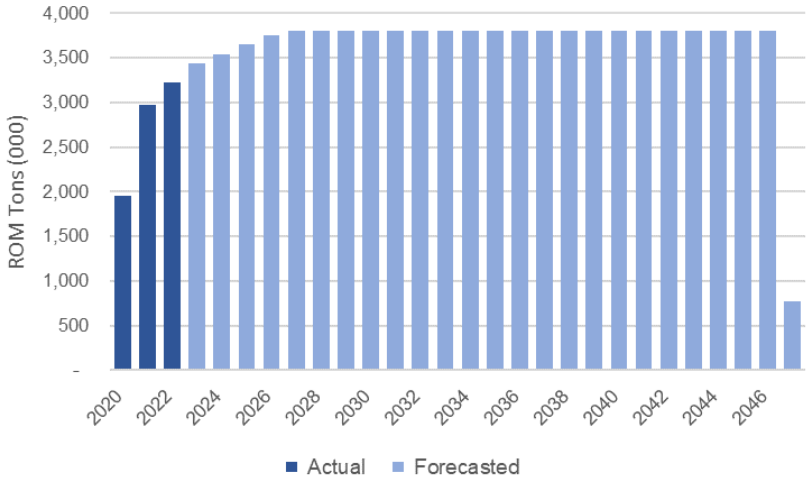
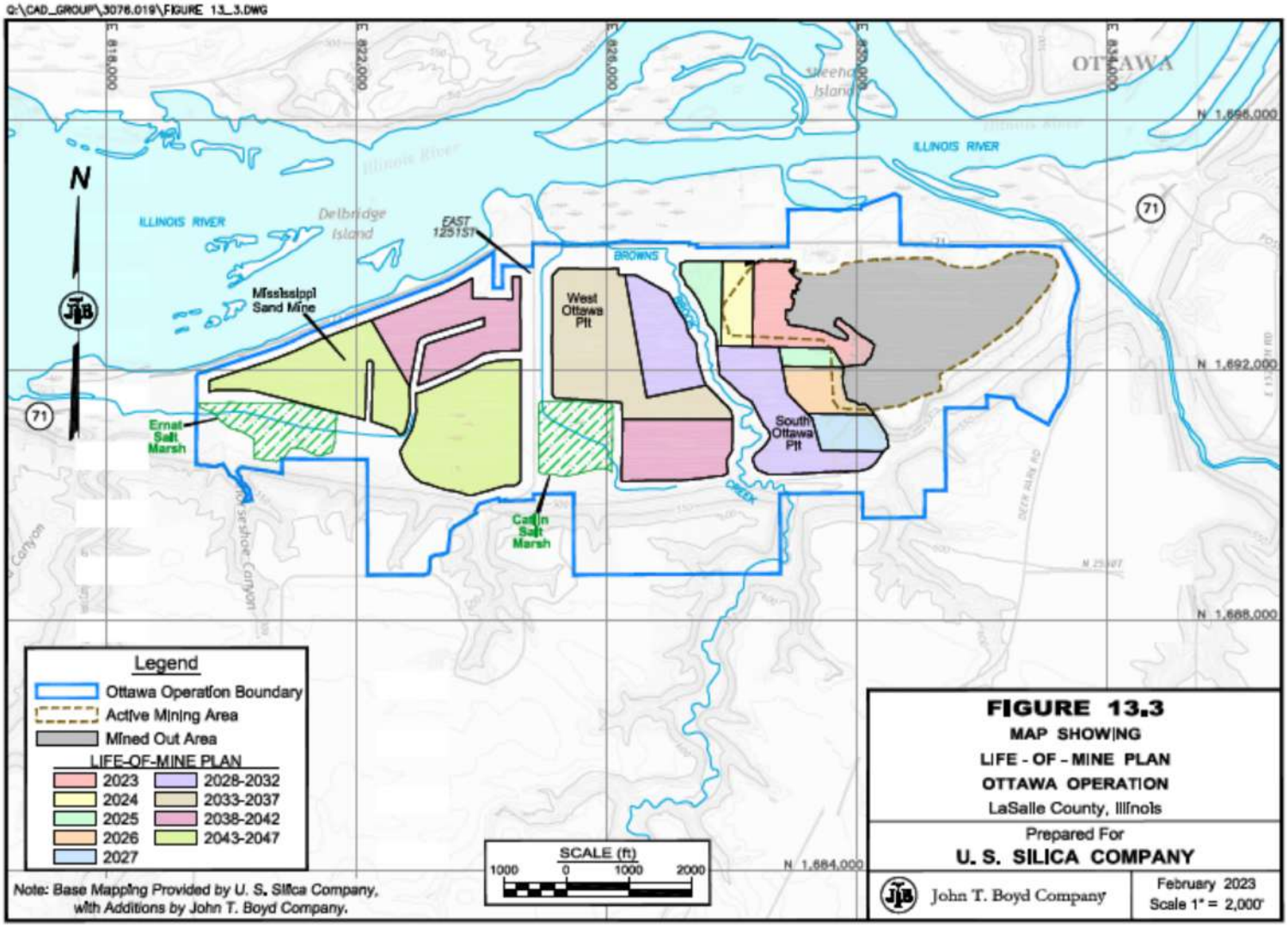


Figure 13.2: Recent Historical and LOM Forecasted Mining Production

The proposed mining sequence is illustrated in Figure 13.3, on the following page. As shown, the proposed mining sequence anticipates that the remaining northern half of the South Ottawa Pit will be mined out over the next three years (by 2025). Production will then shift to the southern half of the South Ottawa Pit and commence in a general north to south, then east to west direction until 2031. At which point, mining on the West Ottawa Pit located on the other side of Browns Brook will commence in an east to west, then north to south direction until sometime prior to 2042. Mining on the Mississippi Sand Mine, located west of the county road bisecting the property, will begin on or before 2042 in an east to west direction and mining will conclude on the south-east corner of the track sometime in 2047. Reclamation will occur concurrently with production as exhausted mining areas are returned to agreed-upon final design.

BOYD reviewed the LOM plans for U.S. Silica's Ottawa Operation to determine whether the plans: (1) utilize generally accepted engineering practices, and (2) align with historical and industry norms. Based on our assessment, it is BOYD's opinion that the forecasted production levels for the Ottawa Operation are reasonable, logical, and consistent with typical sandstone surface mining practices in the St. Peter Sandstone and historical results achieved by U.S. Silica.


Q:\CAD_GROUP\3076.019\FIGURE 13_3.DWG
E 818,000
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N 1,696,000
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N 1,688,000
N 1,684,000
OTTAWA
ILLINOIS RIVER
Illinois River
Deibridge Island
EAST 1251ST
BROWNS
CREEK
Mississippi Sand Mine
West Ottawa Pit
South Ottawa Pit
Ernst Salt Marsh
Caslin Salt Marsh
71
N
Legend
Ottawa Operation Boundary
Active Mining Area
Mined Out Area
LIFE-OF-MINE PLAN
2023
2024
2025
2026
2027
2028-2032
2033-2037
2038-2042
2043-2047
SCALE (ft)
1000 0 1000 2000
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 13.3
MAP SHOWING
LIFE - OF - MINE PLAN
OTTAWA OPERATION
LaSalle County, Illinois
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 2,000'

14.0 PROCESSING OPERATIONS

14.1 Overview

The Ottawa Operation's processing plant is located on the north shore of the Illinois River. U.S. Silica purchased the plant in 1987, when it acquired the Ottawa Operation. The plant has been upgraded and expanded several times since its initial construction.

The production of finished silica sand begins when the plant receives a slurry of raw sand and water from the mine. From this slurry, multiple products are generated through various wet and dry processing methods. Figure 14.1, on the next page, presents a simplified process flow from the mine to the product distribution.

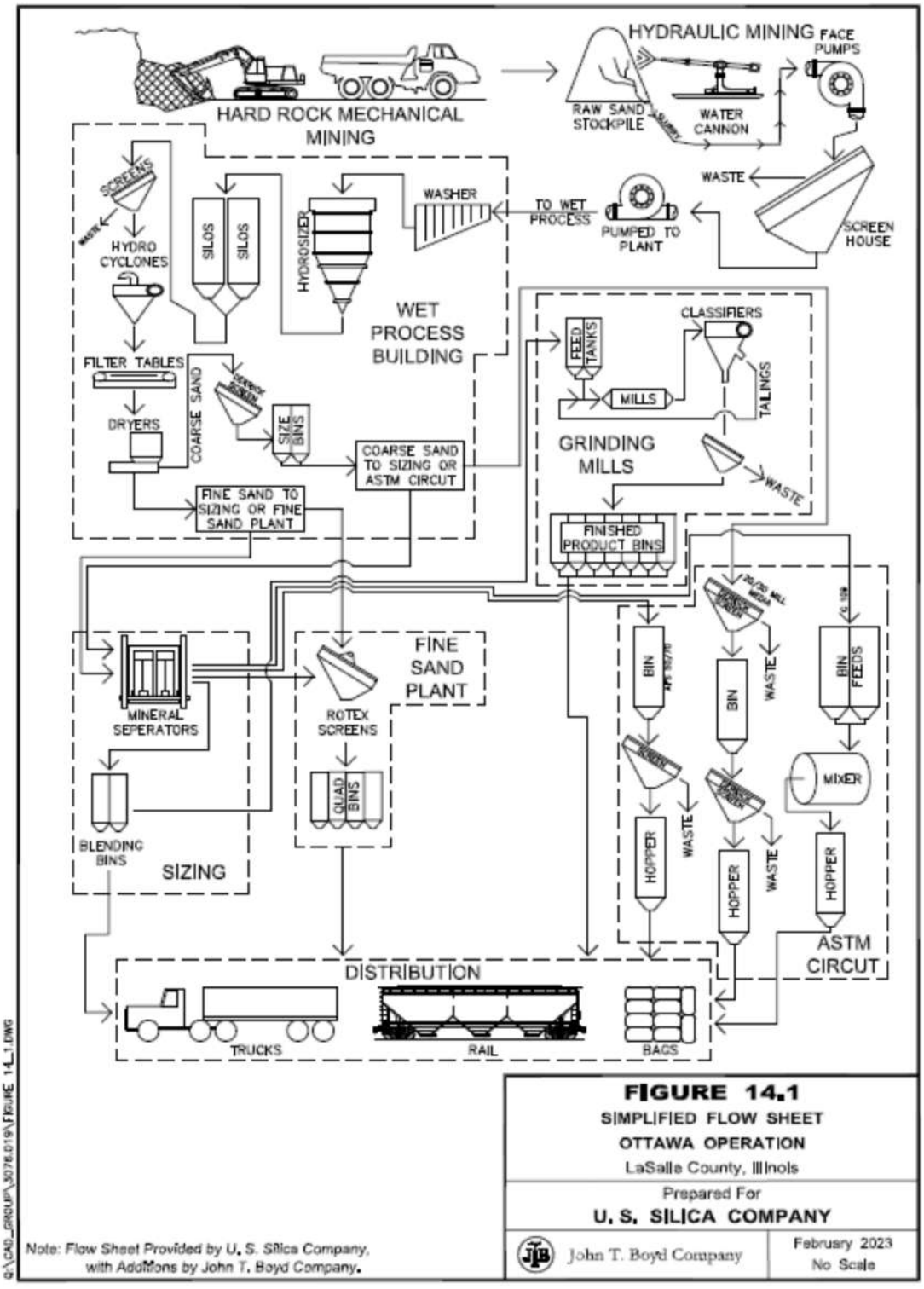
Currently the plant runs 24 hours a day, 365 days a year and has a nominal capacity of 3.29 million tons of finished sand per year. Plant capacity is limited by the ability to separate fine silica sand and by permit restrictions tied to drying capacity.

BOYD is unaware of any reported interruptions, outages, shortages, or failures related to processing operations which have materially affected the Ottawa Operation. Given the operation is well-established, we believe the risk of such events materially affecting the estimates of silica sand reserves presented herein is low.

14.1.1 Wet Processing Plant

The Wet Processing Plant was originally built in 1975 and underwent expansions in 2009 and 2011. The Wet Processing Plant does not produce any finished goods, but instead supplies feed-materials to other processing operations.

The plant receives its raw sand feed through the slurry pumping system from the mine. The slurry from the mine is passed through a material washer to remove the very fine size fractions (mostly clays) which are too small to include in salable products. These very fine particles, or tailings, are separated from the plant feed and are sent to settling ponds where the water is recovered for future use. From here the plant feed passes through a bank of hydrosizers, hydro-cyclones, and vacuum filters to remove excess water. This water is also reclaimed for future use.



Note: Flow Sheet Provided by U. S. Silica Company, with Additions by John T. Boyd Company.

FIGURE 14.1

SIMPLIFIED FLOW SHEET

OTTAWA OPERATION

LaSalle County, Illinois

Prepared For

U. S. SILICA COMPANY

John T. Boyd Company

February 2023

No Scale

Q:\CAD_GROUP\3076.019\FIGURE 14_1.DWG

By this point, the sand has been separated into coarse and fine particle size fractions which are processed in dedicated, parallel coarse and fine circuits based on the sizes of their intended final use. The wet silica sand streams are then dried in four fluidized bed dryers where the dried silica sand is processed as whole grain silica in the Sizing and Fine Sand Plant or sent to the Grinding Mill for production of ground silica products. One dryer is dedicated to the coarse-sand stream and three to the fine-sand stream.

14.1.2 Sizing and Fine Sand Plant

The Fine Sand Plant was built in the 1950's and is used to produce whole grain silica sand products. Whole grain products are shipped primarily to the foundry, glass, and hydraulic fracturing industries.

Drying of whole grain silica begins by processing portions of the coarse-sand stream and the fine-sand streams from the Wet Processing Plant. This material is then sorted into various size fractions, then prepped for shipment by either a bulk carrier (rail or truck) or is loaded into bags in the bagging plant and warehoused for specific end-use markets.

14.1.3 Grinding Mills

The Grinding Plant was built in the 1940's and utilizes dry ball mills to reduce whole-grain silica sand into ground-silica products for sale to the specialty and composite glass, fused silica, adhesives, and countertop markets. It is also used as a filler and extender for a range of applications including paints and coatings, sealants, ceramics, and epoxy. The products produced as ground silica carry the trademark Sil-Co-Sil™.

The grinding mills process material produced from the coarse-sand stream of Wet Processing Plant or from the Fine Sand Plant. Dried whole grain sand is pulverized in ball mills using ceramic grinding media. The mill discharge is classified into size fractions using air classifiers. The finished products are then moved into storage bins for bulk loading or packaging. The oversize grains are rejected by the classifiers and return to the mill feed for re-grinding in a closed circuit.

14.1.4 ASTM Circuit

The ASTM Circuit produces U.S. Silica's ASTM products. The Ottawa Operation has the distinct advantage of supplying the well-known, highly respected original "Ottawa Silica" that is used for cement and abrasion testing under ASTM 20/30 and ASTM C109. The Ottawa Operation remains the only supplier of fully ASTM-compliant sands in the world.

The ASTM Circuit takes material from the Sizing and Fine Sand Plant and passes it through several screening and blending operations to produce silica sand meeting the rigid specifications required of ASTM products.

14.2 Production

The Ottawa Operation's LOM plan forecasts increased production from the processing plant until the nominal production capacity is reached. Recent annual production results and forecasted production over the expected life of the operation is provided in Figure 14.2, below.

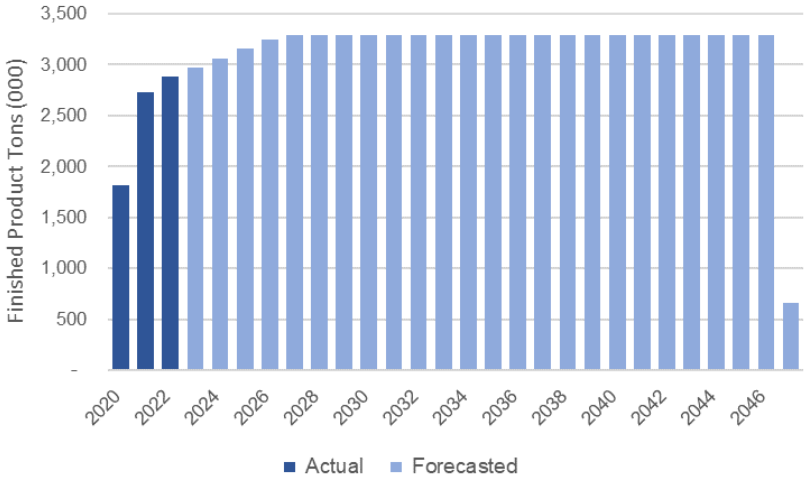


Figure 14.2: Recent Historical and LOM Forecasted Processing Plant Production

14.3 Conclusion

Based on our review, it is BOYD's opinion that the processing methods and existing equipment at the plant will be sufficient for the forecasted production of finished silica sand products.

15.0 MINE INFRASTRUCTURE

15.1 Overview

The infrastructure required for the ongoing operations is generally in place at the Ottawa Operation. Figure 3.1 (page 3-2) illustrates the general layout of the infrastructure at the Ottawa Operation.

The surface facilities currently located at the operation are well constructed and have the necessary capacity/capabilities to support the Ottawa Operation's near-term operating plans. Operational preference may lead to the upgrading of some existing facilities if the operation expands in the future.

BOYD is unaware of any reported interruptions, outages, shortages, or failures related to infrastructure requirements which have materially affected the Ottawa Operation. Given the operation is well-established, we believe the risk of such events materially affecting the estimates of silica sand reserves presented herein is low.

15.2 Transportation

The Ottawa Operation is serviced by a network of roads maintained by the local municipality, county, and state. These roads are either paved or well-maintained graded roadways. Road access is available year-round.

The Illinois Railway is a former BNSF short line that handles rail car transfer for the processing plant. Empty rail cars are delivered by the railway's owner, OmniTrax, and loaded ones are moved to the CSX interchange located in the City of Ottawa, where they can transfer to the mainline. Access to several other Class 1 railroads—BNSF, Union Pacific, and Norfolk Southern—is also available. The BNSF has a connection with the Illinois Railway at Oswego, IL and Streator, IL. The Union Pacific and Norfolk Southern can be accessed via truck transloading. U.S. Silica leases all its rail cars. Switching and other yard operations are performed by plant personnel with the company's Trackmobile Railcar Movers.

U.S. Silica also has access to several third-party owned barge terminals which are located on the north shore of the Illinois River. The land upon which these terminals are located is owned by U.S. Silica.

15.3 Utilities

Electric power for the processing plant is supplied by Ameren Illinois. It is delivered by an above-ground network of utility poles running parallel with the CSX rail corridor and terminates at a substation located on the west end of the processing facility, directly south of the Dry Product Plant. Power is then distributed to the facility by several underground powerlines and above ground poles. The South Ottawa Pit is supplied with electricity by the Cornbelt Energy Corp.

Natural gas used by the processing plant is currently supplied by NiCor. The gas is delivered by several underground pipes running parallel to the CSX rail line.

Water is used for both personnel consumption and for the mining/processing of the silica sand. Potable water is delivered to the processing plant by the City of Ottawa's public water system. A private well on site at the South Ottawa Pit is used for sanitary needs of the employees there. Water for mining and processing operations is provided by a series of wells drilled at the South Ottawa Pit site. In addition, U.S. Silica has a recycling system where water is recovered from processing and tailings disposal and pumped back to the mine site for reuse. The water for industrial uses is transported by a series of pumps and HDPE pipelines, either as a water/sand slurry mix, or recycled water.

15.4 Tailings Disposal

The mining and processing of silica sand at the Ottawa Operation creates a substantial amount of waste tailings. These tailings are typically a mixture of clay, very fine sand, and other non-silica minerals. Tailings is typically disposed of in ponds (former mining pits) where the solid materials settle to the bottom and water is recovered for reuse.

These tailings ponds are currently located directly to the east of the processing plant in the old mining pits. The existing tailing ponds are designed to accommodate rejects generated during the next 5 to 10 years of production. Once mining has progressed to the West Ottawa Pit, it is anticipated that the former South Ottawa Pit will be back filled with tailings.

15.5 Other Structures

Several other buildings are located on the property, including:

- Office buildings that host operations, safety, financial, and administrative staff.
- Several support buildings for housing machinery and maintenance activities.
- A warehouse for material storage and product bagging
- Several product loadouts.
- Various pump structures and outbuildings.

16.0 MARKET STUDIES

16.1 Product Specifications

The Ottawa Operation is U.S. Silica's largest "blended" operation, supplying various grades of silica sand to both the O&G and the ISP markets. Their finished silica sand products are used in variety of industrial applications by a large customer base. Products sold by the operation include:

- 40/70-mesh and 100-mesh silica sand for oil and gas proppants used in hydraulic fracturing ("fracking"). The availability of rail and barge transportation allows the Ottawa Operation to serve distant markets, including the Bakken, Permian, and Marcellus basins.
- Fine-grain silica sand, called "F-Grade", used in foundry casting.
- 200-mesh sized fine silica sand used as a cement additive for injecting into wells to bond steel casings to the rock.
- Bright, white very fine white silica powder called "Sil-Co-Sil" used for countertops, ceramics, fiberglass, and specialty glass.
- ASTM 20/30 and ASTM C109 compliant sand, called "Ottawa Silica", that is used for cement and abrasion testing. The Ottawa Operation remains the world's only supplier of "Ottawa Silica".

The Ottawa Operation's long history, high quality sand, and robust transportation network allows it to transport product to both industrial and oil and gas markets that would otherwise be uneconomical for similar deposits to enter.

16.2 Historical Sales

Recent historical sales data provided by U.S. Silica for the Ottawa Operation is summarized in Table 16.1, below.

Table 16.1: Historical Sales Data

	Units	2020	2021	2022
Product Sales	000 tons	1,820	2,726	2,888
Average Selling Price	$/ton sold	36.91	34.47	42.37

O&G demand, as well as whole silica demand generally, dropped in 2020 as compared to 2019 due to the COVID-19 pandemic. However, recovery began in the fourth quarter of 2020 and continued throughout 2021 and 2022. In 2020, the average selling price (ASP) was $36.91 per sold ton. In 2021, the ASP dropped to $34.47 per sold ton; however, the ASP rose to $42.37 per sold ton in 2022.

According to sales information provided by U.S. Silica for the Ottawa Operation:

- Sales of whole grain silica sand to the O&G segment account for approximately 60% of total sales. The ISP segment accounts for nearly all of the remaining sales.
- Contract sales account for roughly 45% of total product sales.
- The top-five customer by sales revenue account for approximately 15% of total sales.

BOYD is not aware of any material contracts for the sale of silica sand from the Ottawa Operation.

16.3 Market Outlook

Historically, the Ottawa Operation had been founded in 1900 as a supplier to the ISP markets—more specifically, the glass and foundry industry which was in a state of expansion. As the market grew, the Ottawa Operation has also worked on diversifying to other areas, such as ceramics, cement, and fiberglass.

In the last 20 years, the O&G industry in the United States has exploded in size in response to new technologies for horizontal drilling and the fracking of tight hydrocarbon deposits. The proppants used to help free the oil and gas require a very fine silica sand to prop open the cracks. The sand from the Ottawa Operation was found to be an excellent sand for this purpose due to its high compressive strength and individual grain shapes. As demand for proppant sand grew, the Ottawa Operation underwent several expansions to meet the needs of the O&G market.

Starting in the late 2010’s, to lower costs, oil and gas companies started to look for more locally sourced silica sand. Transportation costs were attractive enough to spur the opening of many new silica sand mines (for example, U.S. Silica’s Crane and Lamesa operations were opened in the Permian Basin in Texas for this reason). In 2020, due to COVID-19 and the collapse of oil and gas prices, sales into the silica sand segment from the Ottawa Operation was significantly reduced. The industrial sand market was affected

as well, but not as greatly. Since late 2020, the oil and gas industry has become a dominant customer once again for the Ottawa Operation. During this same period U.S. Silica has seen an increase in demand from its industrial customers

Having survived the challenging environment of 2019 and 2020, the Ottawa Operation should continue to prove viable into the future notwithstanding a sustained and significant energy price collapse. Their low-cost mining scheme, advantaged transport to select basins, and high-quality product help to create an advantage compared with other silica sand producers.

U.S. Silica expects sustained growth for the Ottawa Operation in both the O&G and ISP segments. Although local sources of proppant sand have been developed and taken some demand away, it is expected that the Ottawa Operation's higher quality products will see increased, although uneven, demand in the O&G industry. The Ottawa Operation's long history and excellent sand quality should continue to drive growth in the ISP segment, especially with growth in demand for consumer goods.

17.0 PERMITTING AND COMPLIANCE

17.1 Permitting

Numerous permits are required by federal, state, and municipal law for mining, processing, and related activities at the Ottawa Operation. U.S. Silica reports that necessary permits to support current and near-term operations are in place or pending approval. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of current regulations.

A description of the salient permitting requirements for the Ottawa Operation follows.

The Illinois Department of Natural Resources (IDNR) requires a Surface Mining Permit for all operations that affect over 10 acres per year by mining or remove more than 10 ft of overburden (soil on top of the rock or mineral being extracted). A Surface Mining Permit application requires the operator to submit an operating plan that illustrates how the land will be affected by mining operations, as well as a reclamation plan that describes how the mined land will be restored for future use. The mine reclamation plan must be submitted for review to the LaSalle County Board. If the County Board requests, a public hearing will be scheduled by the IDNR to receive comments on the proposed reclamation plan. The Ottawa Operation has current IDNR permits (Nos. 1862-12, 1743-15, 1776-17, and 1825-19). In support of these permits, a surety bond was issued to IDNR in the amount of $344,000 for approximately 80 acres of surface mining reclamation.

U.S. Silica maintains a Spill Prevention, Controls and Countermeasure (SPCC) Plan at the Ottawa Operation to address requirements of the federal Oil Pollution Prevention Regulations (40 CFR Part 112). The SPCC Plan establishes oil spill preparedness, prevention, planning, response, and notification procedures per the federal regulations and addresses state-specific oil spill reporting notification and response requirements as administered by the Illinois Emergency Management Agency (IEMA).

Construction of the slurry pipeline, which transports raw sand from the mine to the processing plant under the Illinois River, was authorized by the US Army Corps of Engineers and IDNR as a Nationwide Permit 12 (CEMVR-OD-P-2006-53). In May of 2017, U.S. Silica received approval from IDNR to replace the existing sand slurry

pipeline within their easement under Statewide Permit No. 8 which authorizes the construction of underground pipeline and utility crossings.

IDNR authorized a Mine Refuse Disposal Permit 1947-SP for the slurry refuse disposal area within an approximately 43-acre inactive pit (“A Pit”) located at the North Ottawa site. The permit includes a description of proposed reclamation activities following disposal activities.

U.S. Silica is permitted to discharge stormwater from the Mississippi Sands Mine under National Pollutant Discharge Elimination System General Permit No. ILG840203. No mining has been conducted by U.S. Silica at the Mississippi Sands Mine as of the date of this report.

Individual Permit No. IL0001325, as approved by the Illinois Environmental Protection Agency (ILEPA), authorizes discharge of wastewater from the North and South Ottawa sites. Sampling and reporting requirements include three grab samples monthly reported using the Discharge Monitoring Report system, quarterly visual monitoring, semi-annual monitoring and reporting of metals, arsenic, cyanide and total phenols, and an annual inspection report.

Air emissions resulting from the processing plant at Ottawa are authorized under the ILEPA Clean Air Act Permit Program Permit #95060046. Provisions of the permit include maintenance and calibration of monitoring devices and monthly opacity visible emissions observations.

The Ottawa Operation is classified under RCRA Subtitle C as a Very Small Quantity Generator of Hazardous Waste (EPA ID #ILD155166952), generating less than or equal to 100 kilograms per month of non-acute hazardous waste. Waste classifications handled at the site include D001 Ignitable Waste, D002 Corrosive Waste, and D009 Mercury. U.S. Silica personnel maintain an Illinois Radioactive Material License (#IL-01709-01) through the IEMA.

U.S. Silica maintains a LaSalle County Floodplain Development Permit #2014-12 for construction of an earthen berm within a regulated Special Flood Hazard Area of the Illinois River watershed basin.

17.2 Compliance

U.S. Silica reports having an extensive environmental management and compliance process designed to follow or to exceed industry standards.

In their 2021 corporate sustainability report, U.S. Silica reports:

- Increasing the use of renewable energy sources.
- Improving the quality of local water by utilizing best-in-class tailings management techniques.
- Recycling or reusing tailings waste for land reclamation.
- Partnering with neighbors and local chapters of the North American Bluebird Society to provide safe nesting boxes, food, and other habitat management measures to support the bluebird populations in and around the Ottawa Operation.

Mine safety is regulated by MSHA. MSHA inspects the facilities a minimum of twice yearly. U.S. Silica's safety record compares favorably with its regional peers.

Based on our review of information provided by U.S. Silica and available public information, it is BOYD's opinion that the Ottawa Operation's record of compliance with applicable mining, water quality, and environmental regulations is generally typical for that of the industry. BOYD is not aware of any regulatory violation or compliance issue which would materially impact the silica sand reserve estimate.

17.3 Post-Mining Land Use and Reclamation

Disturbed areas at the Ottawa Operation must be reclaimed in accordance with approved reclamation and abandonment plans. These plans are a condition of U.S. Silica's operating permits and licenses and generally require:

- Landscaping of berms and areas affected by berms.
- Regrading and landscaping of unconsolidated overburden piles and pit highwalls.
- Regrading and landscaping of disused roads.
- Natural flooding of the excavated pits for the creation of lakes.
- Removal of all equipment and product stockpiles.
- All hazardous wastes must be disposed of.

Mine site reclamation costs are funded from U.S. Silica's Asset Retirement Obligations (ARO) account. Funding of the ARO account is included in the Ottawa Operation's operating costs discussed in Chapter 18 and included in the economic analysis

presented in Chapter 19. ARO costs estimates are reviewed annually and current estimated at approximately $5.5 million for the Ottawa Operation. As a matter of good mining practice, U.S. Silica seeks to conduct progressive reclamation throughout the operation's mining life to minimize risk and costs at closure.

17.4 Community Engagement

The Ottawa Operation has been a fixture in the Ottawa, Illinois community for over a century. U.S. Silica is one of the major employers and economic contributors in the area. BOYD is unaware of any plans, negotiations, agreements with local individuals or groups or commitments to ensure local procurement and hiring.

U.S. Silica's corporate sustainability report outlines the components of its core community engagement initiatives. It's stated priorities include increasing charitable contributions to organization that support the local community and actively seeking opportunities for volunteering and community engagement.

18.0 CAPITAL AND OPERATING COSTS

18.1 Historical Financial Performance

Table 18.1 summarizes the past three years of financial data for the Ottawa Operation. We remind the reader that the COVID-19 pandemic caused severe economic, market, and other disruptions which began to affect U.S. Silica's silica sand operations in the second quarter of 2020.

Table 18.1: Historical Financials

	Units	2020	2021	2022
Production:				
ROM Production	000 tons	1,953	2,967	3,230
Process Yield	%	93.2	91.9	89.4
Product Sales	000 tons	1,820	2,726	2,888
Gross Revenues	$ 000	67,191	93,961	122,377
Average Selling Price	$/ton sold	36.91	34.47	42.37
Total Cash Costs of Sales	$ 000	53,662	76,614	94,895
Average Cash Cost of Sales	$/ton sold	29.48	28.11	32.85
Capital Expenditures	$ 000	2,182	1,517	5,770

Gross revenues include income from product sales and shipping.

Total cash costs of sales include operating costs (i.e., mining, ongoing reclamation, processing, product loadout, and other related costs) in addition to selling, general, and administrative expenses.

Capital expenditures include maintenance (sustaining) expenses and discretionary spending on continuous improvement projects to drive and maintain cost efficiencies.

Based on the financial data presented above:

- Average realization increased from $36.91 per ton sold in 2020 to $42.37 per ton sold in 2022.
- Total cash cost of sales also increased from $29.48 per ton sold in 2020 to $32.85 per ton sold in 2022.
- EBITDA margin increased slightly from 20.1% in 2020 to 22.5% in 2022.
- Capital expenditures totaled almost $9.5 million over the three years, averaging $1.27 per ton sold.

18.2 Estimated Costs

The production and unit cost estimates provided by U.S. Silica are based on actual past performance and their customary internal budget review and approvals process. Operating volumes are well-defined and understood, as are mining and processing productivities. As such, it is BOYD's opinion that the production and financial projections are reasonable and are likely to be within ± 20% accuracy level.

This section contains forward-looking information related to capital and operating cost estimates for the Ottawa Operation.

There are inherent known and unknown risks and uncertainties associated with all mining operations. These risks, uncertainties, and other factors are not quantifiable, but include or are not limited to, adverse general economic conditions, operating hazards, inherent uncertainties in interpreting engineering and geologic data, fluctuations in commodity prices and prices for operational services, government regulation and political risks, as well as other risks commonly associated with the mining industry.

18.2.1 Projected Capital Expenditures

The Ottawa Operation and related facilities are fully developed and should not require any near-term major capital investment to maintain full commercial production. Historically, the timing and amount of capital expenditures has been largely discretionary and within U.S. Silica's control. Their budgetary allocations for sustaining and discretionary capital expenditures over the next three years is provided in Table 18.2, below.

Table 18.2: Projected Capital Costs

Year	CapEx ($ 000)
2023	4,000
2024	2,135
2025	2,213
Total	8,348

BOYD considers the near-term detailed capital expenditure schedule as presented by U.S. Silica to be reasonable and representative of the capital necessary to operate the Ottawa Operation.

After 2025, capital expenditures are projected to increase 3% per year from 2025's level until the end of operation's life. As the Ottawa Operation is in a steady state of production, the projected capital expenditures are considered reasonable and expected.

18.2.2 Projected Operating Costs

Operating cost estimates were developed based on recent actual costs and considering specific operational activity levels and cost drivers. The estimates consider current and expected labor headcount and salaries, major consumables and unit prices, power costs, and equipment and maintenance costs. The total operating cost estimate includes all site costs related to mining, processing, and general and administrative activities.

In the near-term, U.S. Silica expects their unit operating costs to stay relatively consistent (on an uninflated basis). As such, the projected total cash cost of sales over the life of the mine is $32.85 per ton sold. As the operation is in a steady state, BOYD considers the future operating cost estimates to be reasonable and appropriate.

19.0 ECONOMIC ANALYSIS

19.1 Approach

The economic analysis presented in this chapter was made for the purposes of confirming the commercial viability of the Ottawa Operation's reported silica sand reserves and not for the purposes of valuing U.S. Silica, the Ottawa Operation, or its assets. The economic analysis contains forward-looking information related to the projected operating and financial performance of the Ottawa Operation and therefore involves inherent known and unknown risks and uncertainties, some of which may be outside of U.S. Silica's control. U.S. Silica, as with all mining companies, actively evaluates, changes, and modifies business and operating plans in response to various factors that may affect operational and/or financial results. Actual results, production levels, operating expenses, sales realizations, and all other modifying factors could vary significantly from the assumptions and estimates provided in this analysis. Risk is subjective, as such, BOYD recommends that each reader should evaluate the project based on their own investment criteria.

The financial model used for the purposes of the economic analysis has been prepared in-house by U.S. Silica as part of their annual budgeting process. The model forecasts future free cash flow from silica sand production and sales over the life cycle of the Ottawa Operation using the annual forecasts of production, sales revenues, and operating and capital costs discussed earlier in this report. A DCF analysis, in which future free cash flows are discounted to present value, is used to derive a NPV for the silica sand reserves. Use of DCF-NPV analysis is a standard method within the mining industry to assess the economic value of a project after allowing for the cost of capital invested.

The financial evaluation of the Ottawa Operation has been undertaken on a simplified after-tax basis and does not reflect U.S. Silica's corporate tax structure. NPV is calculated using an after-tax discount rate of 12.5% ($NPV_{12.5}$). Cash flows were assumed to occur in the middle of each year and are discounted to mid-year 2022. Cost estimates and other inputs to the cash flow model for the project have been prepared using constant 2022 money terms, i.e., without provision for inflation. Internal rate of return and project payback were not calculated, as there was no initial investment (sunk costs) considered in the financial model provided herein.

A suite of sensitivities was calculated to evaluate the effect of the main drivers of economic performance, including variations in sales prices, operating costs, and capital costs.

BOYD has reviewed the financial model and its inputs in detail. It is our opinion that the financial model provides a reasonable and accurate reflection of the Ottawa Operation's expected economic performance based on the assumptions and information available at the time of our review.

19.2 Assumptions and Limitations

Cash flow projections for the Ottawa Operation have been generated from the annual forecasts of production, sales revenues, and operating and capital costs discussed earlier in this report. A summary of the key assumptions and limitations is provided below:

- Sales volumes of finished silica sand are expected to increase 3% per annum (limited by processing plant capacity of 3.29 million product tons per year) while maintaining a consistent product mix.
- ROM production requirements are based an expected processing yield of 86.5% (the historic average) and are also projected to increase 3% per annum until plant capacity is reached. Forecasted ROM production is at or below the capacity of the existing mining equipment and related infrastructure.
- Forecasted revenues are based on sales of various grades of finished silica sand with a weighted-average sales price of $42.37 per ton.
- Capital and operating costs are discussed in Chapter 18. Capital expenditures are derived from budgetary allocations for the first three years of the forecast and escalated thereafter at 3% per annum. Unit operating costs are expected to remain relatively constant over the life of the operation at $32.85 per sold ton.
- Taxes are based on:
  - Federal Business Income Tax rate of 21%.
  - Illinois Corporate Income and Replacement Tax rate of 9.5%.
- Buildup of net working capital is equal to 25% of positive cash (operating) margins.
- Depreciation and amortization expenses are estimated as the average of the proceeding three years.
- No asset recovery/salvage values were included in the valuation.

19.3 Financial Model Results

Estimated LOM pre-tax and after-tax cash flows for silica sand production from the Ottawa Operation are presented in Table 19.1, on the following page.

Table 19.1

ANNUAL PRODUCTION AND CASH FLOW FORECAST
OTTAWA OPERATION
Prepared For
U.S. SILICA COMPANY
By
John T. Boyd Company
Mining and Geological Consultants
February 2023

Description	Units	2023	2024	2025	2026	2027	2028 to 2032	2033 to 2042	2043 to 2047	Total
Production:										
ROM Production	000 tons	3,439	3,543	3,649	3,758	3,803	19,017	38,035	15,984	91,228
Product Sales	000 tons	2,975	3,064	3,156	3,251	3,290	16,450	32,900	13,826	78,913
Total Revenues	$ 000	126,052	129,834	133,729	137,741	139,397	696,987	1,393,973	585,797	3,343,511
Average Selling Price	$/ton sold	42.37	42.37	42.37	42.37	42.37	42.37	42.37	42.37	42.37
Total Cash Costs of Sales	$ 000	97,730	100,662	103,682	106,792	108,077	540,383	1,080,765	454,176	2,592,266
Average Cash Cost of Sales	$/ton sold	32.85	32.85	32.85	32.85	32.85	32.85	32.85	32.85	32.85
EBITDA	$ 000	28,322	29,172	30,047	30,949	31,321	156,604	313,208	131,621	751,244
Depreciation & Amortization	$ 000	8,096	7,406	7,001	7,501	7,303	36,573	73,182	36,592	183,653
EBIT	$ 000	20,227	21,766	23,046	23,448	24,018	120,031	240,026	95,029	567,591
Taxes	$ 000	6,169	6,639	7,029	7,152	7,326	36,610	73,208	28,984	173,115
Operating Income	$ 000	14,058	15,127	16,017	16,296	16,693	83,422	166,818	66,045	394,476
Capital Expenditures	$ 000	4,000	2,135	2,213	2,279	2,348	12,839	32,138	20,002	77,954
Net Working Capital Contribution	$ 000	210	212	219	225	93	-	-	-	960
Net Income	$ 000	9,847	12,780	13,585	13,791	14,252	70,583	134,680	46,043	315,562
Pre-tax Cash Flow	$ 000	24,112	26,825	27,615	28,444	28,880	143,765	281,070	111,619	672,330
Discounted at 12.5%	$ 000	22,733	22,481	20,572	18,835	16,998	60,295	50,989	8,400	221,303
After-tax Cash Flow	$ 000	17,943	20,186	20,586	21,292	21,554	107,156	207,862	82,635	499,215
Discounted at 12.5%	$ 000	16,917	16,917	15,335	14,099	12,687	44,950	37,751	6,203	164,859

Table 19.2, below, provides a summary of the estimated remaining life of mine financial results for the Ottawa Operation.

Table 19.2: Financial Results

	Units	Remaining Life of Mine Total
Remaining Life	years	25
Production:		
ROM Production	000 tons	91,228
Product Sales	000 tons	78,913
Total Revenues	$ millions	3,343.5
Total Cash Costs of Sales	$ millions	2,592.3
Capital Expenditures	$ millions	78.0
Pre-Tax:		
Cash Flow	$ millions	672.3
$NPV_{12.5}$	$ millions	221.3
After-tax:		
Cash Flow	$ millions	499.2
$NPV_{12.5}$	$ millions	164.9

DCF-NPV on a pre-tax and after-tax basis, using discount rates of 10%, 12.5% (the base case), and 15%, were calculated utilizing the projected cash flows. Table 19.3 summarizes the results of the pre-tax and after-tax DCF-NPV analyses:

Table 19.3: DCF-NPV Analysis

	NPV ($ millions)		
	10%	12.5%	15%
Pre-Tax	262.0	221.3	190.7
After-Tax	195.0	164.9	142.1

As shown, the pre-tax DCF-NPV ranges from approximately $190.7 million to $262 million. The after-tax DCF-NPV ranges from approximately $142.1 million to $195 million.

The economic analysis confirms that the Ottawa Operation generates positive pre- and after-tax financial results and a real $NPV_{12.5}$ of $164.9 million. As such, it is BOYD's

opinion that the Ottawa Operation's silica sand reserves have demonstrated economic viability.

19.4 Sensitivity Analysis

Table 19.4, below, shows the sensitivity of the project after-tax for a cash flow discounted at 12.5% ($NPV_{12.5}$) to a variation over a range of 20% above and below the base case in: (1) average selling prices and (2) operating costs.

Table 19.4: After-Tax $NPV_{12.5}$ Sensitivity Analysis ($ millions)

Cash Costs of Sales	Revenues									
		-20%	-15%	-10%	-5%	0%	5%	10%	15%	20%
	-20%	131.2	168.5	204.7	241.0	277.2	313.4	349.6	385.8	422.0
	-15%	101.9	139.6	176.7	212.9	249.1	285.3	321.5	357.7	394.0
	-10%	72.7	110.4	148.1	184.8	221.0	257.2	293.5	329.7	365.9
	-5%	43.5	81.2	118.9	156.6	192.9	229.2	265.4	301.6	337.8
	0%	14.3	52.0	89.7	127.4	**164.9**	201.1	237.3	273.5	309.7
	5%	-	22.8	60.4	98.1	135.8	173.0	209.2	245.4	281.6
	10%	-	-	31.2	68.9	106.6	144.3	181.1	217.4	253.6
	15%	-	-	3.3	39.7	77.4	115.1	152.8	189.3	225.5
	20%	-	-	-	10.5	48.2	85.8	123.5	161.2	197.4

As might be expected, the project is most sensitive to changes in product pricing and operating costs. The Ottawa Operation generates negative value only if costs are increased substantially *and* selling prices are reduced dramatically.

The project is less sensitive to capital costs. There is little to no impact varying the capital costs from 70% to 130% of the base case.

This analysis demonstrates the project value to be relatively robust, with positive NPVs reported across the range of values assessed.

20.0 ADJACENT PROPERTIES

There is no information used in this report that has been sourced from adjacent properties. There are no other active silica sand mines in the immediate vicinity of the Ottawa Operation.

21.0 OTHER RELEVANT DATA AND INFORMATION

BOYD is not aware of any additional information which would materially impact the silica sand reserve estimates reported herein.

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22.0 INTERPRETATION AND CONCLUSIONS

22.1 Audit Findings

BOYD's independent technical assessment was conducted in accordance with S-K 1300 and concludes:

- Sufficient data have been obtained through site exploration and sampling programs and mining operations to support the geological interpretations of the sandstone deposit underlying the controlled property of the Ottawa Operation. The data are of sufficient quantity and reliability to reasonably support the silica sand resource and reserve estimates presented in this report.
- BOYD is of the opinion that our data verification efforts: (1) adequately support confirm the reasonableness of geologic interpretations, resource estimation criteria, and economic assumptions, (2) and therefore support the use of the data in silica sand resource/reserve estimation.
- The 78.9 million saleable product tons of silica sand reserves (as of December 31, 2022) identified on the property are reasonably and appropriately supported by technical studies, which consider expected geologic conditions, planned mining and processing operations, forecasted product revenues, and operating and capital cost estimates. As such, BOYD is of the opinion that there are reasonable expectations that the stated silica sand reserves for the Ottawa Operations are technically, economically, and legally extractable as of December 31, 2022.
- In addition to the reported reserves, U.S. Silica controls approximately 88,000 in-place tons of inferred silica sand resources at the Ottawa Operation. It is BOYD's opinion that the stated silica sand resources have been reported using economic and mining assumptions to support the reasonable potential for eventual economic extraction.
- There is no other relevant information material to the Ottawa Operation that is necessary to make this technical report summary not misleading.

22.2 Significant Risks and Uncertainties

As a mining operation with a lengthy operating history, the purpose of U.S. Silica's periodic mine planning exercises is to: (1) collect and analyze sufficient data to reduce or to eliminate risk in the technical components of the project, and to, (2) refine economic projections based on current data. There is a high degree of certainty for this project under the current and foreseeable operating environment. A general assessment of risk is presented in the relevant sections of this report.

23.0 RECOMMENDATIONS

Based on the scope of our assignment, BOYD has no recommendations regarding the Ottawa Operation. It is our understanding that U.S. Silica continuously reviews and improves operating practices as a matter of course.

24.0 REFERENCES

A list of supporting information is provided in Section 2.4. Additional references are cited as footnotes in the report as required.

25.0 RELIANCE ON INFORMATION PROVIDED BY REGISTRANT

In the preparation of this report, BOYD has relied, exclusively and without independent verification, upon information furnished by U.S. Silica as presented in Table 25.1, below.

Table 25.1: Information Relied Upon from Registrant

Subject Matter	Information	Report Chapter(s)
Environmental	Permits, bond, and reclamation liability	3, 17
	Sustainability initiatives	17
	Surface tailings management	15
	Mine closure requirements and plans	17
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BOYD exercised due care in reviewing the information provided by U.S. Silica within the scope of our expertise and experience (which is in technical and financial mining issues) and concluded the data are reasonable and appropriate considering the status of the subject properties and the purpose for which this report was prepared. We have no reason to believe that any material facts have been withheld or misstated, or that further analysis may reveal additional material information. However, the accuracy of the results and conclusions of this report are reliant on the accuracy of the information provided by U.S. Silica.

TECHNICAL REPORT SUMMARY
DIATOMACEOUS EARTH RESOURCES AND RESERVES
COLADO OPERATION

Pershing County, Nevada

Prepared For

U.S. SILICA COMPANY

Katy, Texas

By

John T. Boyd Company

Mining and Geological Consultants

Pittsburgh, Pennsylvania

Report No. 3076.017

FEBRUARY 2023

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File: 3076.017

U.S. Silica Company
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Attention: Mr. Terry Lackey
Mining Director

Subject: Technical Report Summary
Diatomaceous Earth Resources and Reserves
Colado Operation
Pershing County, Nevada

Ladies and Gentlemen:

The John T. Boyd Company (BOYD) was retained by U.S. Silica Company (U.S. Silica) to complete an independent technical assessment of the diatomaceous earth (DE) resource and reserve estimates for the Colado Operation as of December 31, 2022.

This technical report summary: (1) summarizes material technical and geoscientific information for the subject mining property, (2) provides the conclusions of our technical assessment, and (3) provides a statement of DE resources and reserves for the Colado Operation.

Respectfully submitted,

JOHN T. BOYD COMPANY
By:

John T. Boyd II
President and CEO

q:\eng_wp\3076.017 u.s. silica - colado\wp\cover letter.docx

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LETTER OF TRANSMITTAL

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GLOSSARY OF ABBREVIATIONS AND DEFINITIONS

000	:	Thousand(s)
$	:	US dollar(s)
%	:	Percent or percentage
AMSL	:	Above mean sea level
ARO	:	Asset Retirement Obligation(s)
ASP	:	Average Selling Price
ASTM	:	ASTM International (formerly American Society for Testing and Materials)
BLM	:	Bureau of Land Management. A division of the U.S. Department of the Interior.
BOYD	:	John T. Boyd Company
CAGR	:	Compound Annual Growth Rate
CapEx	:	Capital Expenditures
Constant Dollar	:	A monetary measure that is not influenced by inflation and used to compare time periods. Sometimes referred to as “real dollars”.
DCF	:	Discounted Cash Flow
DE	:	Diatomaceous Earth
Diatomaceous Earth	:	Diatomaceous earth, commonly known as diatomite, is a naturally occurring sedimentary rock that is a result of the accumulation of skeletal remains of diatoms, which are microscopic single-celled aquatic algae.
Diatomaceous Earth Reserve	:	Diatomaceous earth reserve is an estimate of tonnage and grade or quality of indicated and measured diatomaceous earth resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated diatomaceous earth resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted.

GLOSSARY OF ABBREVIATIONS AND DEFINITIONS - Continued

Diatomaceous Earth Resource	:	Diatomaceous earth resource is a concentration or occurrence of diatomaceous earth material of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. A diatomaceous earth resource is a reasonable estimate of mineralization, taking into account relevant factors such as cut-off grade, likely mining dimensions, location or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable. It is not merely an inventory of all mineralization drilled or sampled.
Discount Rate	:	A rate of return used to discount future cash flows based on the return investors expect to receive from their investment.
EBIT	:	Earnings before interest and taxes
EBITDA	:	Earnings before interest, taxes, depreciation, and amortization
EP Minerals	:	EP Minerals, LLC., a wholly owned subsidiary of U.S. Silica.
ft	:	Foot/feet
Indicated Diatomaceous Earth Resource	:	That part of a diatomaceous earth resource for which quantity and quality are estimated based on adequate geological evidence and sampling. The level of geological certainty associated with an indicated diatomaceous earth resource is sufficient to allow a qualified person to apply modifying factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Because an indicated diatomaceous earth resource has a lower level of confidence than the level of confidence of a measured diatomaceous earth resource, an indicated diatomaceous earth resource may only be converted to a probable diatomaceous earth reserve.
Inferred Diatomaceous Earth Resource	:	That part of a diatomaceous earth resource for which quantity and quality are estimated based on limited geological evidence and sampling. The level of geological uncertainty associated with an inferred diatomaceous earth resource is too high to apply relevant technical and economic factors likely to influence the prospects of economic extraction in a manner useful for evaluation of economic viability. Because an inferred diatomaceous earth resource has the lowest level of geological confidence of all diatomaceous earth resources, which prevents the application of the modifying factors in a manner useful for evaluation of economic viability, an inferred diatomaceous earth resource may not be considered when assessing the economic viability of a mining project, and may not be converted to a diatomaceous earth reserve.
IRR	:	Internal rate-of-return
ISO		International Organization for Standardization

lb	:	Pound
LOM	:	Life-of-Mine
Measured Diatomaceous Earth Resource	:	That part of a diatomaceous earth resource for which quantity and quality are estimated based on conclusive geological evidence and sampling. The level of geological certainty associated with a measured diatomaceous earth resource is sufficient to allow a qualified person to apply modifying factors, as defined herein, in sufficient detail to support detailed mine planning and final evaluation of the economic viability of the deposit. Because a measured diatomaceous earth resource has a higher level of confidence than the level of confidence of either an indicated diatomaceous earth resource or an inferred diatomaceous earth resource, a measured diatomaceous earth resource may be converted to a proven diatomaceous earth reserve or to a probable diatomaceous earth reserve
Mesh	:	A measurement of particle size often used in determining the size distribution of granular material.
Mineral Reserve	:	*See "Diatomaceous Earth Reserve"*
Mineral Resource	:	*See "Diatomaceous Earth Resource"*
Modifying Factors		The factors that a qualified person must apply to indicated and measured diatomaceous earth resources and then evaluate to establish the economic viability of diatomaceous earth reserves. A qualified person must apply and evaluate modifying factors to convert measured and indicated diatomaceous earth resources to proven and probable diatomaceous earth reserves. These factors include but are not restricted to: mining; processing; infrastructure; economic; marketing; legal; environmental compliance; plans, negotiations, or agreements with local individuals or groups; and governmental factors. The number, type and specific characteristics of the modifying factors applied will necessarily be a function of and depend upon the mineral, mine, property, or project.
MSHA	:	Mine Safety and Health Administration. A division of the U.S. Department of Labor.
NDEP	:	Nevada Division of Environmental Protection
NPV	:	Net Present Value

Probable Diatomaceous Earth Reserve	:	The economically mineable part of an indicated and, in some cases, a measured diatomaceous earth resource.
Production Stage Property	:	A property with material extraction of diatomaceous earth reserves.
Proven Diatomaceous Earth Reserve	:	The economically mineable part of a measured diatomaceous earth resource which can only result from conversion of a measured diatomaceous earth resource.
PSI	:	Pounds per square inch
QP	:	Qualified Person
Qualified Person	:	An individual who is: 1. A mineral industry professional with at least five years of relevant experience in the type of mineralization and type of deposit under consideration and in the specific type of activity that person is undertaking on behalf of the registrant; and 2. An eligible member or licensee in good standing of a recognized professional organization at the time the technical report is prepared. For an organization to be a recognized professional organization, it must: a. Be either: i. An organization recognized within the mining industry as a reputable professional association; or ii. A board authorized by U.S. federal, state, or foreign statute to regulate professionals in the mining, geoscience, or related field; b. Admit eligible members primarily based on their academic qualifications and experience; c. Establish and require compliance with professional standards of competence and ethics; d. Require or encourage continuing professional development; e. Have and apply disciplinary powers, including the power to suspend or expel a member regardless of where the member practices or resides; and f. Provide a public list of members in good standing.
ROM	:	Run-of-Mine. The processing feed material, including diatomaceous earth and any inseparable waste, excavated from the mine.
SEC	:	U.S. Securities and Exchange Commission

S-K 1300	:	Subpart 1300 and Item 601(b)(96) of the U.S. Securities and Exchange Commission's Regulation S-K
SPCC	:	Spill Prevention, Controls and Countermeasure
Ton	:	Short Ton. A unit of weight equal to 2,000 pounds
UP	:	Union Pacific
USGS	:	U.S. Geological Survey
U.S. Silica	:	U.S. Silica Company, its parent company (U.S. Silica Holdings, Inc.) and its consolidated subsidiaries as a combined entity.

1.0 EXECUTIVE SUMMARY

1.1 Introduction

U.S. Silica's Colado Operation is an active surface DE mining and processing operation that has been in existence for over 65 years.

BOYD prepared this technical report summary for U.S. Silica in support of their disclosure of DE resources and reserves for the Colado Operation in accordance with Subpart 1300 and Item 601(b)(96) of the SEC's Regulation S-K (S-K 1300). The purpose of this report is threefold: (1) to summarize material technical and geoscientific information for the subject mining property, (2) to provide the conclusions of our technical assessment, and (3) to provide a statement of DE resources and/or reserves for the Colado Operation.

Information used in our assessment was obtained from: (1) files provided by U.S. Silica, (2) discussions with U.S. Silica personnel, (3) records on file with regulatory agencies, (4) public sources, and (5) nonconfidential information in BOYD's possession.

Unless otherwise noted, the effective date of the information, including estimates of DE resources and reserves, is December 31, 2022.

Weights and measurements are expressed in the US customary measurement system throughout this report.

1.2 Property Description

Located in Pershing County, Nevada, U.S. Silica's Colado Operation comprises a surface mining operation (the "Colado Mine") and a processing plant (the "Colado Processing Plant"). The mine and plant are in Pershing County, Nevada, approximately 80 miles northeast of the City of Reno. The general location of the Colado Operation is provided in Figure 1.1, following this page.

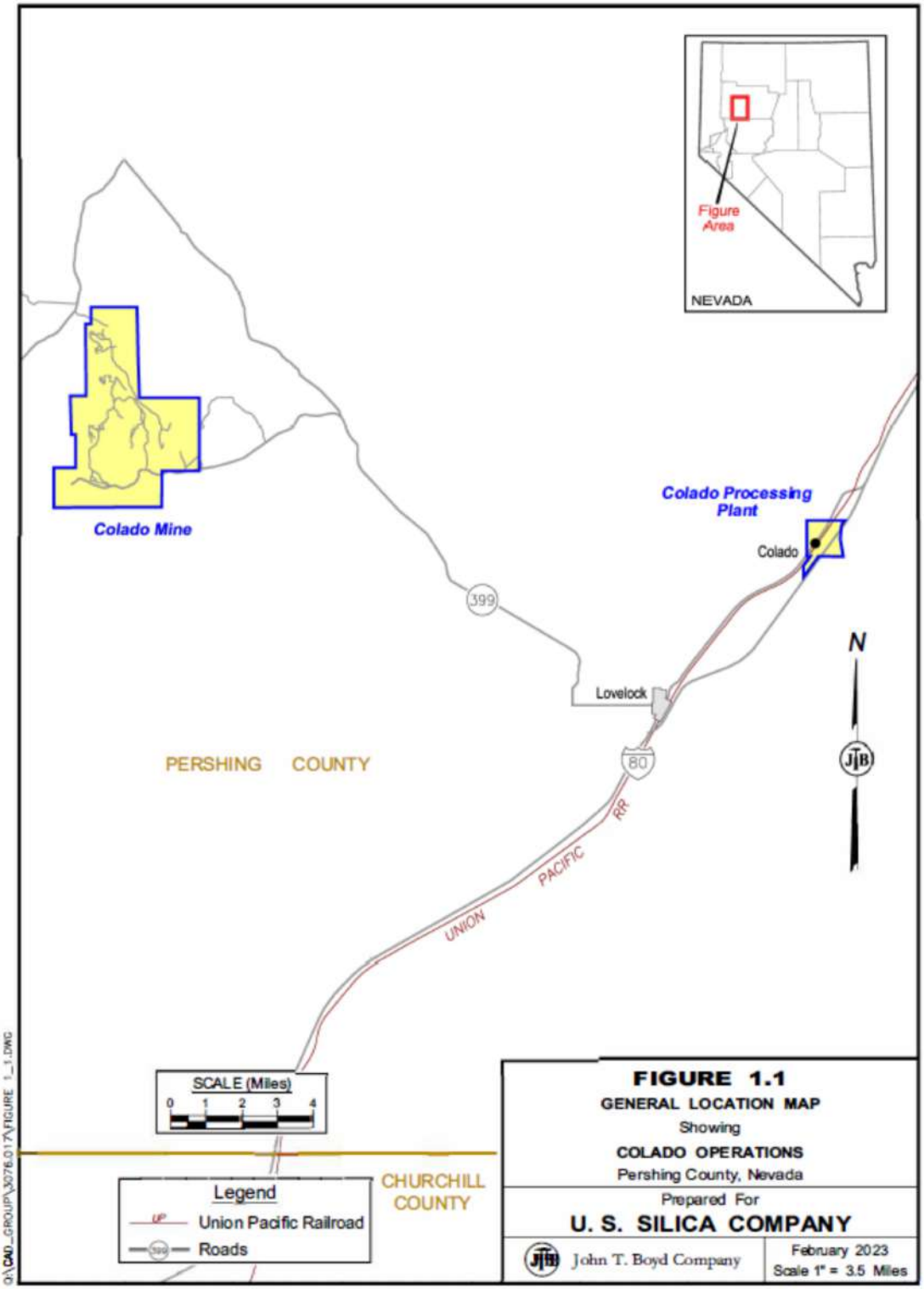
Figure Area
NEVADA
Colado Mine
Colado Processing Plant
Colado
399
Lovelock
80
N
PERSHING COUNTY
UNION PACIFIC RR
SCALE (Miles)
0 1 2 3 4
CHURCHILL COUNTY
Legend
Union Pacific Railroad
Roads
FIGURE 1.1
GENERAL LOCATION MAP
Showing
COLADO OPERATIONS
Pershing County, Nevada
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3.5 Miles
Q:\CAD_GROUP\3076.017\FIGURE 1-1.DWG

U.S. Silica holds surface and/or mineral rights to approximately 9,526 acres across the two sites that comprise the Colado Operation. The Colado Mine property comprises ±8,993 acres of private and federal lands leased from the Franco-Nevada U.S. Corporation (Franco-Nevada) and the U.S. Department of the Interior's Bureau of Land Management (BLM), respectively. The Colado Processing Plant property encompasses ±533 acres owned in fee by U.S. Silica or leased from the BLM. BOYD is not aware of any encumbrances, litigation, or orders which would hinder continued development of the property.

1.3 Geology

Exploration and mining activities have identified several near-surface DE deposits on the Colado Mine property. DE, commonly known as diatomite, is a naturally occurring sedimentary rock that is a result of the accumulation of skeletal remains of diatoms, which are microscopic single-celled aquatic algae. Diatom skeletons are composed primarily of amorphous silica (non-crystalline SiO_2). The cylindrical shape and high pore volume of these diatom skeletons provide high mechanical strength, natural filtration, and absorption capabilities.

The mineable DE on the Colado property is typically observed as consisting of between one to four beds (varies by pit) separated by friable tuffaceous (compacted volcanic ash) units. The DE beds are generally white or light pink in color and tend to be very clean, while the interbedded tuffaceous units are generally gray in color. The contrast in bed coloring makes visual selection during mining relatively easy.

Welded and lithic tuffs directly overly the DE beds, with Miocene to Pliocene (Tertiary) age basalt flows forming a weathering-resistant capping unit, which has helped preserve the underlying strata from being eroded.

Structure within the immediate area is considered to be relatively simple when compared to other uplifted blocks, as low dip angles (generally less than 10 degrees) are noted in most of the DE beds being mined.

Several high-angle displacement faults are present at the Colado Mine, however throughout the typical course of mining (overburden removal and benching into deeper DE beds), these areas are well exposed, allowing modified mining operations when required.

1.4 Exploration

The Colado Mine has been extensively explored and mined since the late 1950s. Throughout various exploration campaigns, the subject DE deposits have been identified and delineated through geologic mapping, outcrop sampling, trenching, geophysical surveys, and extensive exploration drilling. BOYD was provided source records (drilling logs, testing results, and core photographs), summary reports, and/or databases compiling the results 1,153 drill holes located in and around the Colado Mine property. These data were utilized to delineate the lateral extent, thickness, and quality of the remaining DE resources and reserves at the Colado Operation.

BOYD's audit indicates that in general: (1) U.S. Silica has performed extensive drilling and sampling work on the subject property, (2) the work completed has been done by competent personnel, and (3) the amount of data available combined with extensive knowledge of and historic production from subject DE beds are sufficient to confirm the thickness, lateral extents, and quality characteristics of the Colado Operation's DE resources and reserves.

1.5 Diatomaceous Earth Resources and Reserves

As shown in Table 1.1, below, U.S. Silica owns approximately 689,000 in place tons of inferred DE resources, *exclusive* of DE reserves, at the Colado Operation, as of December 31, 2022.

Table 1.1: Colado Operation Diatomaceou Earth Resources[1] (as of December 31, 2022)

Classification	In-Place Tons (000)
Inferred	689

Notes:
1. Diatomaceous earth resources are reported *in addition* to diatomaceous earth reserves.

While these "additional" DE resources have not been included in the Colado Operation's life-of-mine (LOM) plan, they are considered to have prospects for eventual economic extraction by virtue of their similarity—in terms of demonstrated extraction methods and expected finished product qualities—to those converted to DE reserves.

U.S. Silica's estimated surface mineable DE reserves for the Colado Operation total 3.7 million saleable product tons remaining as of December 31, 2022. The DE reserves are fully controlled by U.S. Silica and are summarized in Table 1.2, below.

Table 1.2: Colado Operation Diatomaceo Earth Reserves (as of December 31, 2022)

	Tons (000)	
Classification	Mineable	Saleable
Proven	1,671	1,364
Probable	2,808	2,291
Total	4,479	3,655

The Colado Operation has a well-established history of mining, processing, and selling DE products into various markets. BOYD has concluded that sufficient studies have been undertaken to enable the DE resources to be converted to DE reserves based on proposed operating methods and forecasted costs and revenues.

1.6 Operations

1.6.1 Mining

The DE mining horizons at the Colado Mine are relatively shallow, quite thick, and are moderately dipping. These characteristics favor conventional surface mining techniques using excavators and trucks. Mining occurs on benches, in a stair-like fashion, to remove the overburden waste material and expose the DE beds.

Excavation of the DE beds occurs from late spring until early fall, a period of roughly 200 days, before wet winter weather impedes moisture control in the ROM stockpiles. During the winter months, the removal of overburden and other support activities continues as access to the site is typically available year-round. The Colado Mine maintains a stockpile of approximately 600,000 cubic yards at the mine site to meet the demands of the processing plant. U.S. Silica's LOM Plan requires mining 141,000 to 196,000 ROM tons annually, well within the capacity of the current mining fleet.

BOYD reviewed the LOM plans for U.S. Silica's Colado Operation to determine whether the plans: (1) utilize generally accepted engineering practices, and (2) align with historical and industry norms. Based on our assessment, it is BOYD's opinion that the forecasted production levels for the Colado Operation are reasonable, logical, and

consistent with typical surface mining practices and historical results achieved by U.S. Silica.

1.6.2 Processing

The production of finished DE products begins when the plant receives raw DE from the mine by truck. From this raw feed material, numerous products are generated through various processing methods, including kiln drying, milling, and sizing.

Since its construction in the late 1950s, the Colado Processing Plant has been upgraded and expanded several times as needed to meet specific market demands. The plants currently run 24 hours a day, nearly 300 days a year, with a nominal capacity of 162,000 tons of finished DE products per year.

Based on our review, it is BOYD's opinion that the processing methods and existing equipment at the plant will be sufficient for the forecasted production levels over the life of the operation.

1.6.3 Other Infrastructure

The Colado Mine is remote with little installed mine-related infrastructure. The mine site is accessible by private and state roads. Energy for the mine site is provided primarily by diesel powered equipment. Fuel and water is trucked to the site by local suppliers and stored in tanks.

The Colado Processing Plant has been operating in its present location for over 60 years and is supplied with reliable and sufficient power and natural gas from regional utility companies. Water for the Colado plant comes from municipal sources. Waste disposal and handling capacity and capability is sufficient for projected production levels. Transportation of supplies and finished products is facilitated by interstate highways and railroad access.

1.7 Financial Analysis

1.7.1 Market Analysis

The Colado Operation produces a wide range of finished DE products, which generally fall into one of the following categories:

- Food grade products (filter-aids) sold into the filtration markets are used extensively to filter out contaminants from fruit juices, wine, beer, sugar, bio-diesel fuel, high fructose corn syrup, and water.
- Fine-filler products are used as additives in paints, rubber, paper, and plastics.

- Aggregate products, which are used primarily as industrial absorbents, catalysts, and carriers for pesticides.

Based on estimates provided by the U.S. Geological Survey (USGS), the Colado Operation accounted for approximately 10% of the total production of finished DE products in the U.S. during 2022.

The market for DE is driven by the increasing demand for natural and eco-friendly products, the growing awareness of the benefits of DE in agriculture and sanitation, and the increasing use of DE in the construction, paint, and coatings industries. Based on the USGS's estimates, the compound annual growth rate (CAGR) for domestic DE production between 2018 and 2022 is 3.5%, while the post-COVID (2019–2022) CAGR is 12.7%.

Strong growth in demand and prices for finished DE products from the Colado Operation is expected. BOYD believes it is reasonable to assume that pricing will sustain over the remaining life of the Colado Operation.

1.7.2 Capital and Operating Cost Estimates

The Colado Operation's financial performance over the last years is summarized as follows:

- Average realization (selling price) for finished DE products increased from $491.94 per ton sold in 2020 to $697.27 per ton sold in 2022.
- Total cash cost of sales also increased from $328.86 per ton sold in 2020 to $545.48 per ton sold in 2022.
- EBITDA margin decreased from 33.2% in 2020 to 21.8% in 2022.
- Capital expenditures totaled almost $12.5 million over the last three years, averaging $35.97 per ton sold.

Forward-looking production and unit cost estimates are based on actual past performance and subject to U.S. Silica's customary internal budget review and approvals process. In BOYD's opinion, operating volumes are well-defined and understood, as are mining and processing productivities.

The Colado Operation and related facilities are fully developed and should require no near-term major capital investment to maintain full commercial production. Historically, the timing and amount of capital expenditures has been largely discretionary and within U.S. Silica's control. Their budgetary allocations for sustaining and discretionary capital

expenditures over the next three years totals $17.3 million. Thereafter, capital expenditures are expected to rise 3% year-over-year from 2025's $5.9 million. BOYD considers the near-term detailed capital expenditure schedule as presented by U.S. Silica to be reasonable and representative of the capital necessary to operate the Colado Operation.

Operating cost estimates were developed based on recent actual costs and considering specific operational activity levels and cost drivers. In the near-term, U.S. Silica expects their unit operating costs to stay relatively level (on an uninflated basis). As such, the projected total cash cost of sales over the life of the mine is $545.48 per ton sold. As the operation is in a steady state, BOYD considers the future operating cost estimates to be reasonable and appropriate.

1.7.3 Economic Analysis

An economic analysis of the Colado Operation was prepared in-house by U.S. Silica as part of their annual budgeting process. The financial model forecasts future free cash flow from DE production and sales over the life cycle of the Colado Operation using the annual forecasts of production, sales revenues, and operating and capital costs.

Table 1.3, below, provides a summary of the estimated financial results for remaining life of the Colado Operation.

Table 1.3: Financial Results

	Units	Remaining Life of Mine Total
Remaining Life	years	25
Production:		
ROM Production	000 tons	4,479
Product Sales	000 tons	3,655
Total Revenues	$ millions	2,548.4
Total Cash Costs of Sales	$ millions	1,993.7
Capital Expenditures	$ millions	202.1
Pre-Tax:		
Cash Flow	$ millions	350.8
$NPV_{12.5}$	$ millions	109.8
After-tax:		
Cash Flow	$ millions	253.0
$NPV_{12.5}$	$ millions	81.6

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Table 1.4 summarizes the results of the pre-tax and after-tax discounted cash flows (DCF) and net present value (NPV) analyses for the Colado Operation.

Table 1.4: DCF-NPV Analysis

	NPV ($ millions)		
	10%	12.5%	15%
Pre-Tax	131.2	109.8	93.8
After-Tax	97.0	81.6	70.0

The NPV estimate was made for purposes of confirming the economic viability of the reported DE reserves and not for purposes of valuing the U.S. Silica, Colado Operation, or its assets. Internal rate-of-return (IRR) and project payback were not calculated, as there was no initial investment considered in the financial analysis presented herein.

BOYD reviewed the financial model and its inputs in detail, and opined that the model provides a reasonable and accurate reflection of the Colado Operation's expected economic performance based on the assumptions and information available at the time of our review.

1.8 Permitting and Compliance

Numerous permits are required by federal and state law for mining, processing, and related activities at the Colado Operation, which U.S. Silica reports are in place or pending approval. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of current regulations.

U.S. Silica reports having an extensive environmental management and compliance process designed to follow or to exceed industry standards.

Mine safety is regulated by the U.S. Department of Labor's Mine Safety and Health Administration (MSHA). MSHA inspects the facilities a minimum of twice yearly. U.S. Silica's safety record compares favorably with its regional peers.

BOYD is not aware of any regulatory violation or compliance issue which would materially impact the DE reserve estimate.

1.9 Conclusions

It is BOYD's overall conclusion that U.S. Silica's estimates of DE reserves, as reported herein: (1) were prepared in conformance with accepted industry standards and practices, and (2) are reasonably and appropriately supported by technical evaluations, which consider all relevant modifying factors.

Given the lengthy operating history and status of evolution, residual uncertainty (future risk) for this operation is considered minor under the current and foreseeable operating environment.

It is BOYD's opinion that extraction of the DE reported herein is technically, legally, and economically achievable after the consideration of potentially material modifying factors. The ability of U.S. Silica, or any mine operator, to recover all of the reported DE reserves is dependent on numerous factors that are beyond the control of, and cannot be anticipated by, BOYD. These factors include mining and geologic conditions, the capabilities of management and employees, the securing of required approvals and permits in a timely manner, future product prices, etc. Unforeseen changes in regulations could also impact performance.

2.0 INTRODUCTION

2.1 Registrant

U.S. Silica is a US-based mining company headquartered in Katy, Texas. The company's common stock is listed on the New York Stock Exchange (NYSE:SLCA). U.S. Silica is actively engaged in the production and marketing of commercial DE and performance materials (DE, calcium bentonite clay, calcium montmorillonite clay, and perlite products). Their whole grain silica products are used as frac (proppant) sand for oil and natural gas recovery, and in the manufacture of glass, foundry, and building products. U.S. Silica's performance materials are used in: (1) filtration for foods and beverages, pharmaceuticals, and swimming pools; (2) as additives in paint and coatings, plastics and rubber, and agriculture products; and (3) for bleaching, catalysis and adsorption in edible oil processing, aromatics purification, and industrial and chemical applications. Additional information regarding U.S. Silica can be found on their website: www.ussilica.com.

2.2 Terms of Reference and Purpose

U.S. Silica retained BOYD to complete an independent technical assessment of their internally-prepared DE resource and reserve estimates and supporting information for the Colado Operation.

BOYD prepared this technical report summary for U.S. Silica in support of their disclosure of DE reserves for the Colado Operation in accordance with S-K 1300. The purpose of this report is threefold: (1) to summarize material technical and geoscientific information for the subject mining property, (2) to provide the conclusions of our technical assessment, and (3) to provide a statement of DE resources and/or reserves for the Colado Operation.

BOYD's findings are based on our detailed examination of the supporting geologic and other scientific, technical, and economic information provided by U.S. Silica, as well as our assessment of the methodology and practices applied by U.S. Silica in formulating the estimates of DE resources and reserves disclosed in this report. We did not independently estimate DE resources or reserves from first principles.

We used standard engineering and geoscience methods, or a combination of methods, that we considered to be appropriate and necessary to establish the conclusions set forth herein. As in all aspects of mining property evaluation, there are uncertainties

inherent in the interpretation of engineering and geoscience data; therefore, our conclusions necessarily represent only informed professional judgment.

The ability of U.S. Silica, or any mine operator, to recover all of the estimated DE reserves presented in this report is dependent on numerous factors that are beyond the control of, and cannot be anticipated by, BOYD. These factors include mining and geologic conditions, the capabilities of management and employees, the securing of required approvals and permits in a timely manner, future DE product prices, etc. Unforeseen changes in regulations could also impact performance. Opinions presented in this report apply to the site conditions and features as they existed at the time of BOYD's investigations and those reasonably foreseeable.

This report is intended for use by U.S. Silica, subject to the terms and conditions of its professional services agreement with BOYD. We also consent to U.S. Silica filing this report as a technical report summary with the SEC pursuant to S-K 1300. Except for the purposes legislated under US securities law, any other uses of or reliance on this report by any third party is at that party's sole risk.

2.3 Expert Qualifications

BOYD is an independent consulting firm specializing in mining-related engineering and financial consulting services. Since 1943, BOYD has completed over 4,000 projects in the United States and more than 60 other countries. Our full-time staff comprises mining experts in: civil, environmental, geotechnical, and mining engineering; geology; mineral economics; and market analysis. Our extensive experience in DE resource and reserve estimation combined with our knowledge of the subject property, provides BOYD an informed basis on which to opine on the reasonableness of the estimates provided by U.S. Silica. An overview of BOYD can be found on our website at www.jtboyd.com.

The individuals primarily responsible for completing this technical assessment and the preparation of this report are by virtue of their education, experience, and professional association considered qualified persons (QPs) as defined in S-K 1300.

Neither BOYD nor its staff employed in the preparation of this report have any beneficial interest in U.S. Silica, and are not insiders, associates, or affiliates of U.S. Silica. The results of our assessment were not dependent upon any prior agreements concerning the conclusions to be reached, nor were there any undisclosed understandings concerning any future business dealings between U.S. Silica and BOYD. This report was prepared in return for fees based upon agreed commercial rates, and the payment for

our services was not contingent upon our opinions regarding the project or approval of our work by U.S. Silica and its representatives.

2.4 Principal Sources of Information

Information used in this assignment was obtained from: (1) files provided by U.S. Silica, (2) discussions with U.S. Silica personnel, (3) records on file with regulatory agencies, (4) public sources, and (5) nonconfidential information in BOYD's possession.

The following information was provided by U.S. Silica:

- Year-end reserve statements and reports for 2021 and 2022.
- Exploration records (e.g., drilling logs and lab sheets).
- Geologic databases of lithology and sample results.
- Computerized geologic models.
- Mapping data, with:
  - Land ownership boundaries.
  - Infrastructure locations.
  - Easement and right-of-way boundaries.
  - Surveyed topography (surface elevation).
- Mine plans, production schedules, and supporting data.
- Overview of processing operations and detailed flow sheets.
- Copies of mining and operating permits.
- Historical information, including:
  - Production reports.
  - Financial statements.
  - Product sales and pricing.

Information from sources external to BOYD and/or U.S. Silica are referenced accordingly.

The data and work papers used in the preparation of this report are on file in our offices.

2.5 Personal Inspections

A site visit and inspection of the Colado Operation was completed on October 12, 2022, by BOYD's QPs responsible for the preparation of this report. The site visit included: (1) observation of the active mining operations, (2) a tour of the mine site's surface infrastructure, and (3) a tour of the process plant and truck loadouts. BOYD's representatives were accompanied by senior U.S. Silica engineering and management personnel who openly and cooperatively answered questions regarding, but not limited

to: site history; deposit geology; mining and processing operations; near- and long-range mining plans; and DE marketing.

2.6 Report Version

The DE resources and reserves presented in this Technical Report Summary are effective as of December 31, 2022. The effective (i.e., “as of”) date of the report is December 31, 2022.

This is the third Technical Report Summary filed by U.S. Silica for the Colado Operation and supersedes the following previously filed reports:

Westward Environmental; February 2022; Technical Report Summary Colado Site, Lovelock, Pershing County, Nevada.

Westward Environmental; September 2022; Technical Report Summary Colado Site, Lovelock, Pershing County, Nevada.

The user of this document should ensure that this is the most recent disclosure of DE resources and reserves for the Colado Operation as it is no longer valid if more recent estimates have been issued.

2.7 Units of Measure

The US customary measurement system has been used throughout this report. Tons are short tons of 2,000 pounds-mass. Unless otherwise stated, currency is expressed in US Dollars ($). Historic prices and costs are presented in nominal (unadjusted) dollars. Future dollars values are expressed on a constant (unescalated) basis.

3.0 PROPERTY DESCRIPTION

3.1 Location

Located in Pershing County, Nevada, U.S. Silica's Colado Operation comprises a surface DE mining operation and a DE processing plant. The Colado Mine and Colado Processing Plant are located in Pershing County, Nevada, approximately 80 miles northeast of the City of Reno. Figure 1.1 (page 1-2) shows the general location of the Colado Operation.

The Colado Processing Plant is located seven miles northeast of the City of Lovelock, sandwiched between Business Highway 95 (Upper Valley Road) and Interstate 80 (I-80). The Colado Mine is located approximately 19 miles northwest of the plant via the paved Seven Troughs Rd. (CR 399).

Geographically, the southeastern-most access to the Colado Mine is located at approximately 40° 16' 29.66" N latitude and 118° 43' 41.51" W longitude. The Colado Processing Plant is located at approximately 40° 14' 45.51" N latitude and 118° 23' 25.35" W longitude.

3.2 Property Rights

U.S. Silica holds surface and/or mineral rights to approximately 9,526 acres across the two sites that comprise the Colado Operation. The Colado Mine property comprises ±8,993 acres of private and federal lands leased from the Franco-Nevada and the BLM, respectively. The Colado Processing Plant property comprises ±533 acres owned in fee by U.S. Silica or leased from the BLM. Surface and mineral control associated with the Colado Operation is summarized in Table 3.1, below.

Table 3.1: Property Control Summary

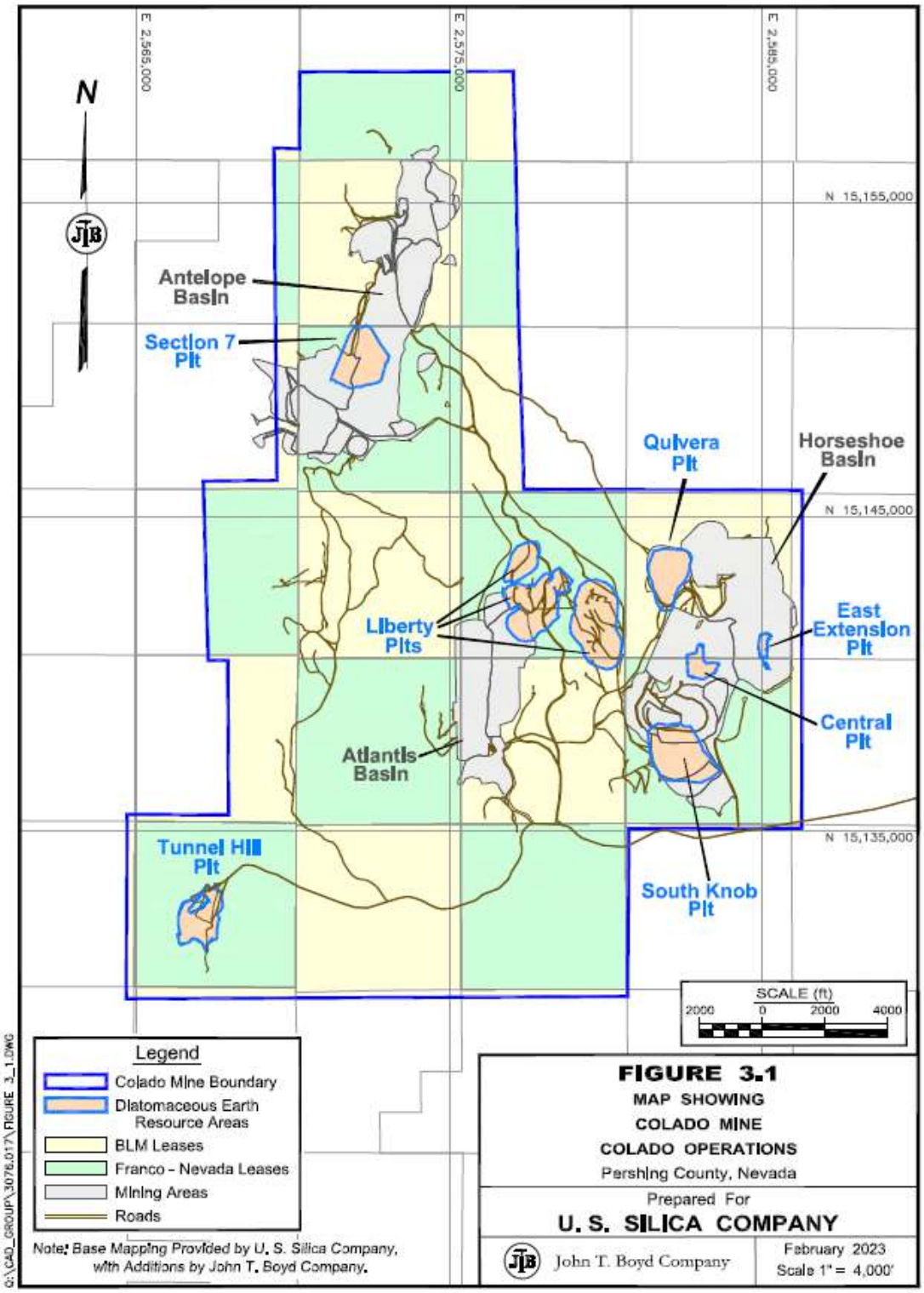
			Acres	
Site	Control Type	Landowner	Surface	Mineral
Colado Mine	Lease	Franco-Nevada	3,842	3,842
	Lease/Claims	BLM	5,151	3,174
	Subtotal		8,993	7,016
Colado Plant	Fee	U.S. Silica	493	-
	Lease	BLM	40	-
	Subtotal		533	-
Total			9,526	7,016

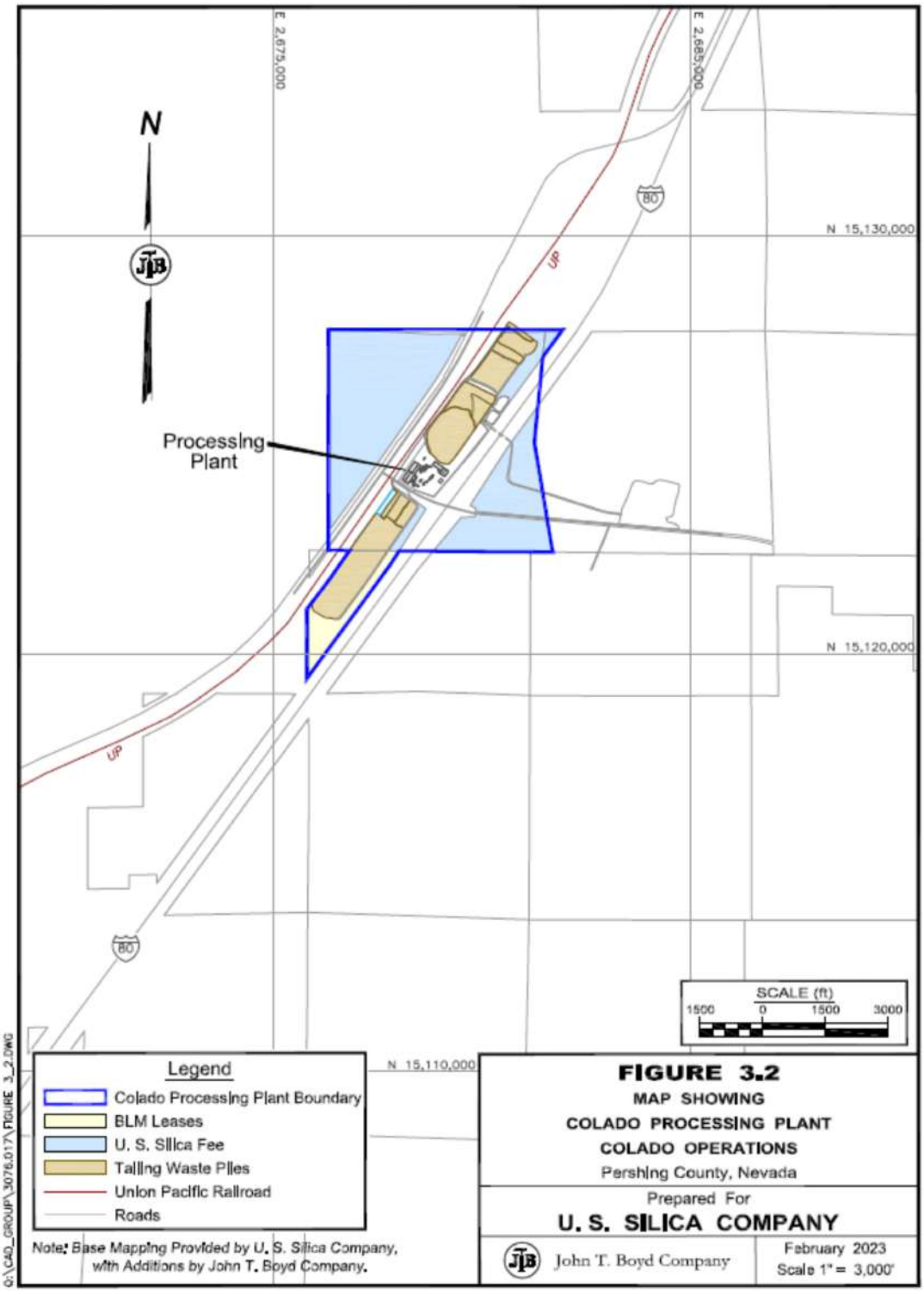
Figures 3.1 and 3.2, on the following pages, illustrate the general layout (including property ownership) of the Colado Mine and Colado Processing Plant, respectively.

The Franco-Nevada lease provides U.S. Silica with approximately 3,842 acres of surface and mineral control at the Colado Mine. The lease dates back to 1966 and has been amended several times. The current lease amendment expires in December 2034 and is expected to be renewed at that time. The Franco-Nevada lease requires annual royalty payments.

The BLM leases provide U.S. Silica with surface control on federal lands at both the Colado Mine and Colado Processing Plant properties. Mineral rights on the BLM-administered lands at the Colado Mine are provided to U.S. Silica by way of 148 active mineral claims, of which 132 are placer claims. Mineral claims are renewed on an annual basis and require nominal maintenance fees.

As shown is Table 3.1, U.S. Silica owns in fee approximately 493 acres upon which the Colado Processing Plant is situated.


N
E 2,565,000
E 2,575,000
E 2,585,000
N 15,155,000
N 15,145,000
N 15,135,000
Antelope Basin
Section 7 Pit
Quivera Pit
Horseshoe Basin
Liberty Pits
East Extension Pit
Central Pit
Atlantis Basin
Tunnel Hill Pit
South Knob Pit
SCALE (ft)
2000 0 2000 4000
Legend
Colado Mine Boundary
Diatomaceous Earth Resource Areas
BLM Leases
Franco - Nevada Leases
Mining Areas
Roads
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 3.1
MAP SHOWING
COLADO MINE
COLADO OPERATIONS
Pershing County, Nevada
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 4,000'
G:\CAD_GROUP\3076.017\FIGURE 3_1.DWG


E 2,675,000
E 2,685,000
N
N 15,130,000
N 15,120,000
N 15,110,000
UP
UP
80
80
Processing Plant
SCALE (ft)
1500 0 1500 3000
Legend
Colado Processing Plant Boundary
BLM Leases
U. S. Silica Fee
Tailing Waste Piles
Union Pacific Railroad
Roads
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 3.2
MAP SHOWING
COLADO PROCESSING PLANT
COLADO OPERATIONS
Pershing County, Nevada
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3,000'
O:\CAD_GROUP\3076.017\FIGURE 3_2.DWG

3.3 Encumbrances

3.3.1 Fees and Royalties

To maintain ownership of the Colado Operation properties, U.S. Silica must pay property taxes to the local government in Pershing County. To BOYD's knowledge, there are no liens against the properties.

The Franco-Nevada lease agreement requires: (1) annual payment of $45,000, (2) an indexed "per product ton shipped" royalty which is adjusted annually, and (3) a surcharge of 2.5% of total royalties. For 2022, approximately 54,830 tons were produced from the Franco-Nevada leases and subject to a $5.75 per ton ($5.90 per ton after 2.5% surcharge) royalty.

In 2022, the annual maintenance fees payable to the BLM were $165 per placer claim.

It is BOYD's understanding that there are no other royalties, overriding or limited royalties, working interests, production payments, net profit interests, or other mineral interests in the Colado Operation properties.

3.3.2 Permitting Requirements

Mining and processing activities at the Colado Operation are regulated by several federal and state laws. As mandated by these laws and regulations, numerous permits are required for mining, processing, and other incidental activities. U.S. Silica reports that necessary permits are in place or applied for to support immediate operations. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of the current regulations. Permitting and permitting conditions are discussed further in Chapter 17 of this report.

In BOYD's opinion, U.S. Silica has demonstrated their ability and cooperation to align their operating plans with any permitting requirements that may be encountered during the normal course of business.

BOYD is not aware of any current material violations or fines imposed by regulators on the Colado Operation.

3.3.3 Mining Restrictions

No significant encumbrances exist at the Colado Mine site.

3.3.4 Other Significant Factors or Risks

To the extent known to BOYD, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the Colado Operation that are not discussed in this report. However, the reported DE resources and reserves may be materially impacted by: U.S. Silica's failure to comply with permit conditions and rules; delays in obtaining required government or other regulatory approvals or permits; U.S. Silica's inability to obtain such required approvals or permits; or unforeseen changes in governmental regulations.

4.0 PHYSIOGRAPHY, ACCESSIBILITY, AND INFRASTRUCTURE

4.1 Topography, Elevation, and Vegetation

The Colado Operation lies within the Great Basin section of the Basin and Range physiographic province. The terrain is characterized as a north-south trending series of alternating mountain ranges and wide, flat valleys.

The Colado Mine is located on the western flank of the Trinity Range, a short north-south mountain range extending for about 58 miles. The Trinity Range is flanked to the west by Granite Springs and Sage Valley. The range is characterized by well-dissected topography with low to moderately steep slopes. Topographic relief within the project area is approximately 1,300 ft. Elevations range from 4,400 ft above mean sea-level (AMSL) in the northwest, to over 5,700 ft AMSL in the southeast.

There are not any natural surface waters present in and around the Colado Mine.

Vegetation is typical of the Basin and Range physiographic province. The property is covered by sagebrush, grass, and various other desert shrubs.

4.2 Accessibility

General access to the Colado Operation is via a network of primary and secondary roadways serviced by state and local governments. The existing roadways provide direct access to the mine and processing facilities and are generally accessible year-round.

Primary vehicular access to the mine and plant is via I-80, which runs northeast-southwest, from Reno through Lovelock, and adjacent to the Colado Processing Plant. A combination of state highways and county roads lead to the Colado Mine property, which is approximately 19 miles northwest of Lovelock, in a rather remote location.

4.3 Climate

The regional climate around the Colado Operation is typical of a high elevation arid desert: little rainfall, warm daytime temperatures, and cool nighttime temperatures, with seasonably hot summers and cold winters. Average daily high temperatures are well above freezing 12 months of the year, while daily low temperatures may drop below freezing roughly half of the year.

The primary cause of the region's arid climate is the rain shadow effect imparted on the area due to the height of the Sierra Nevada Mountains to the west. Annual precipitation in the region is approximately 6 to 9 in, however totals may vary widely from year to year. The evaporation potential greatly exceeds the precipitation on an average annual basis, which aids in drying the mined DE before processing.

4.4 Infrastructure Availability and Sources

The Colado Processing Plant is located adjacent to the Coal Canyon exit (Exit 112) of I-80 , facilitating the use of semi-trailer trucks to transport most of the Colado Operation's finished DE products to customers.

The Colado Processing Plant is also located on a Union Pacific (UP) rail line and can utilize bulk hopper rail cars to transport finished products, as needed.

Several regional airports are located within a 75-mile radius of the Colado Operation and the Reno-Tahoe International Airport located just over a 100-mile drive away.

Reliable sources of electrical power, water, gas, supplies, and materials are readily available for the Colado Processing Plant. Utilities are provided to the plant via suppliers that service the town of Lovelock. The Colado Mine uses diesel generators and solar panels to provide power to the repair shop and portable job-site office buildings. Diesel fuel must be trucked from the local supplier and is stored in tanks on site. Water for dust suppression is delivered by the local municipality using tanker trucks and stored on site in tanks.

5.0 HISTORY

5.1 Reserve Acquisition

U.S. Silica owns the Colado Operation as a direct result of their purchase of EP Minerals, LLC (EP Minerals) in May 2018. EP Mineral's history of developing the Colado Operation dates to the late 1950s, when EP Minerals predecessor, Eagle-Picher, Industries, Inc., first submitted an operational plan to conduct DE mining on what is the present-day Colado Mine property.

5.2 Exploration and Development

Extensive exploration and mining activities have been conducted at the Colado Mine since the late 1950s. Exploration programs ranging from geologic mapping, field sampling, drilling campaigns, and specialized survey techniques have been conducted to investigate the subsurface geology on the property. Early reconnaissance mapped the locations of DE outcrops at the surface of the Colado Mine property. Field samples were obtained while conducting mapping exercises to gain a general understanding of the physical and chemical characteristics of the various DE beds located throughout the property. Mapping data and sample testing results were utilized to identify areas to conduct exploration drilling and sampling. Throughout development of the Colado Mine, over 1,150 drill holes have been completed.

6.0 GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

6.1 Regional Geology

The Colado Operation is situated within the Great Basin, a geographical subdivision of the greater Basin and Range province of the western US. The Great Basin is bounded by the Sierra Nevada Mountains to the west and the Rocky Mountains to the east, covering much of the State of Nevada, and partially extending into portions of contiguous surrounding states.

Geologically, the Great Basin is predominantly characterized by regional crustal extension. One key characteristic related to this crustal extension is that all water that falls within the Great Basin watershed drains internally into low-lying areas. This is known as an endorheic watershed. This process occurs on a regional scale across the entire Great Basin; however smaller-scale sets of horst-graben structures are locally apparent, and are characterized by the numerous and repetitive sets of generally north-south trending mountains (horsts) and valleys (grabens). These mountains and valleys are respectively defined by parallel faulting. The lower-lying graben features, over time, would concentrate drainage, forming playa lakes. As a result, lacustrine (lake) sedimentation was deposited (DE and volcanic ash sequences mainly). These spatially and temporally related deposits resulted in the accumulation of similarly characteristic sequences of DE being deposited between 15 to 23 million years ago in the area of the Colado Operation.

6.2 Local Geology

6.2.1 Stratigraphy

The mineable DE on the Colado property is typically observed as consisting of between two to four beds (varies by pit) separated by friable tuffaceous (compacted volcanic ash) units. The DE beds are generally white or light pink in color and tend to be very clean, while the interbedded tuffaceous units are generally gray in color. The contrast in bed coloring makes visual selection during mining relatively easy.

Welded and lithic tuffs directly overlie the DE beds, with Miocene to Pliocene (Tertiary) age basalt flows forming a weathering-resistant capping unit, which has helped preserve the underlying strata from being eroded.

Bi-modal Tertiary volcanic units of rhyolitic, basaltic-andesitic, and basaltic composition underlie the DE beds.

A generalized stratigraphic chart of the surface and near-surface geologic units in Pershing County, Nevada is presented in Figure 6.1.

System	Series	Geologic Unit
Quaternary	Holocene / Pleistocene	Undifferentiated Alluvium
Neogene	Pliocene	Gravels
	Pliocene / Miocene	Basalt Flows
	Miocene	Welded Tuffs, Diatamaceous Earth, Tuffs
		Bi-Modal Volcanic Units

Figure 6.1: Generalized Stratigraphic Chart, Surface and Near-Surface Geologic Units, Pershing County, Nevada

The following text discusses the strata encountered in and around the Colado Operation in depositional (ascending) order:

Tertiary Bimodal Volcanic Units

The volcanic units underlying the DE bed sequences on the Colado property consist primarily of andesitic volcanic flows; however, some degree of additional units have been noted as well, which consist of rhyolitic and basaltic volcanic units. The primary difference between these types of volcanic deposits is the silica content present in the makeup of the magma at the time of the eruptions. The exact composition and thickness of the underlying volcanic units is currently unknown.

Tertiary Diatomaceous Earth and Tuff Beds

Miocene age deposits of DE began accumulating during earlier basin-and-range extensional periods in freshwater playa lake environments, continuing up to approximately 15 million years ago. Intense volcanism during DE depositional periods resulted in numerous sequences of the accumulating white DE beds being visibly interrupted by intervals of grey friable tuffs. These sequences are clearly visible in the open pits at the Colado Mine today, where the various DE and tuff beds within the property may vary in thickness from a few inches thick to more than 50 ft.

Tertiary Tuffs and Basalt Flows

The DE beds are immediately covered by a series of welded and lithic tuffs, most likely deposited after the playa lake environments that were accumulating the DE intervals had dried up. Welded and lithic tuffs are simply tuffs that were of such high temperatures when deposited, that they ended up fusing together while cooling.

These tuffs were then covered by sequences of basaltic lava flows, which may tend to cover very wide areas during eruptions. These lavas cooled, forming a weathering-resistant cap rock that helped to protect the underlying DE beds from erosion.

Quaternary Alluvium

Often, a thin cover stratum is present, consisting of mixed deposits of alluvium, gravels, sands, soils, or clays, which are typically concentrated in lower-lying areas where these materials are able to accumulate.

6.2.2 Structural Geology

The Trinity Range is the result of regional uplifting that occurred later during basin-and-range extension, after the target DE beds were deposited. Structure within the immediate area is considered to be relatively simple when compared to other uplifted blocks, as low dip angles (generally less than 10 degrees) are noted in most of the DE beds being mined.

Several high-angle displacement faults are present in and around the Colado Mine property, however throughout the typical course of mining (overburden removal and benching into deeper DE beds), these areas are well exposed, allowing modified mining operations when required.

6.3 Property Geology

Exploration and mining activities have identified several near-surface DE deposits—notably, the Antelope Basin, Atlantis, Horseshoe Basin, Liberty, Quivera, and Tunnel Hill deposits—on the Colado Mine property. The location of these deposits is illustrated in Figure 6.2, following this text. Figures 6.3 to 6.6, provide typical cross-sections through the various DE deposits on the property.

Surface stratigraphy at the Colado Mine property consists primarily of a combination of Quarternary Alluvium and Tertiary Age volcanic deposits overlying the target DE beds. U.S. Silica's drilling logs note variations in overburden materials consisting of soil, ash, clay, sand, and gravel units over different portions of the Colado Mine. These cover units may be completely absent, exposing DE at the surface, or they may reach thicknesses in

excess of 200 ft. When present, the alluvial units typically overlie an interval of more competent basalt material, which overlies a series of welded and lithic tuffs. The competent overburden intervals must be drilled and blasted in order to expose the DE beds prior to mining.

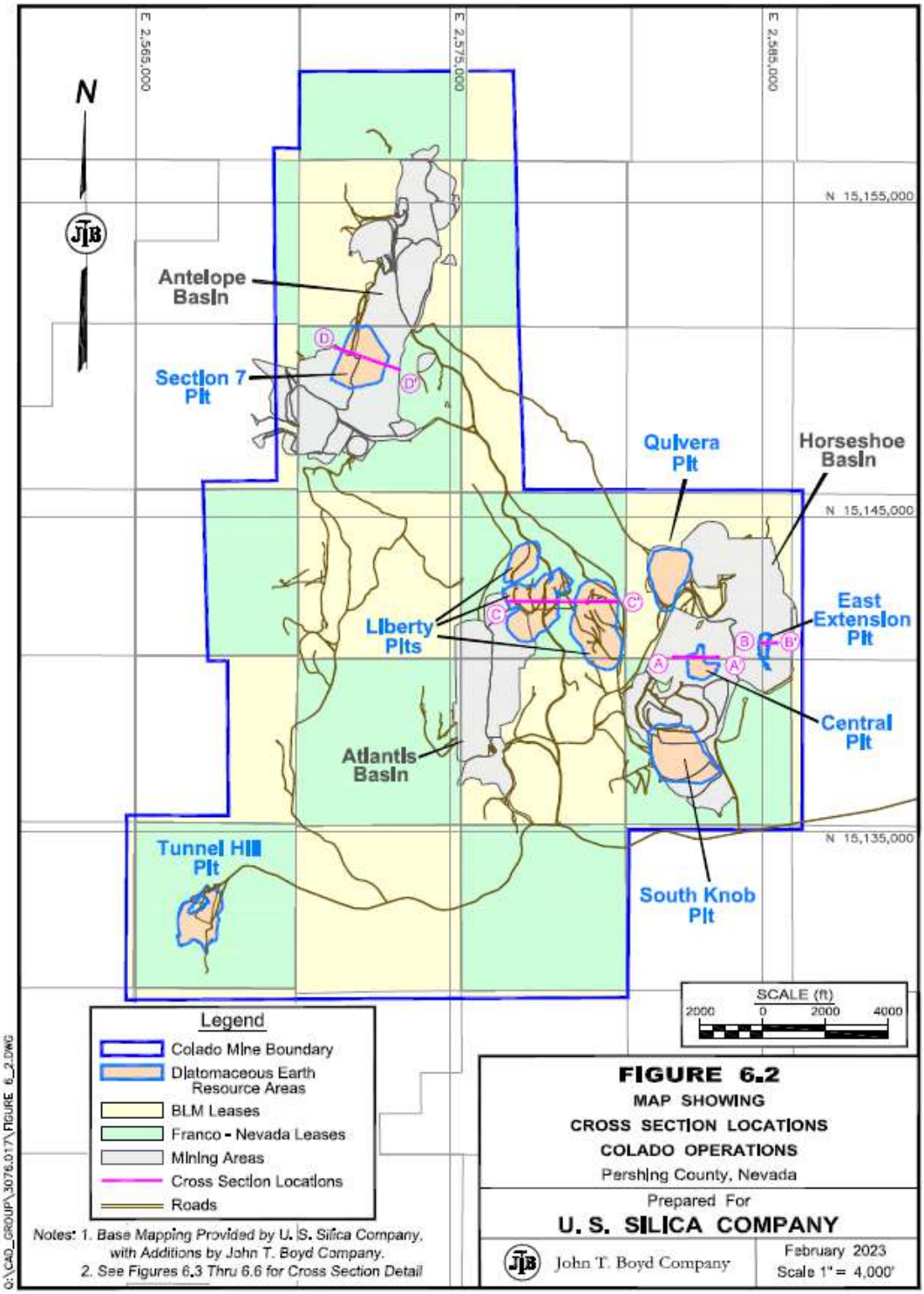
The DE beds horizons present as one or more tabular sedimentary units with varying depths, thicknesses, and physical and chemical characteristics. The DE beds at the Colado Mine are relatively shallow, quite thick, and are moderately dipping. Generally, the high-quality DE strata are easily distinguished from the surrounding interbedded tuffs and other inclusions by a distinct difference in color clearly visible in the exposed mining faces.

6.4 Diatomaceous Earth

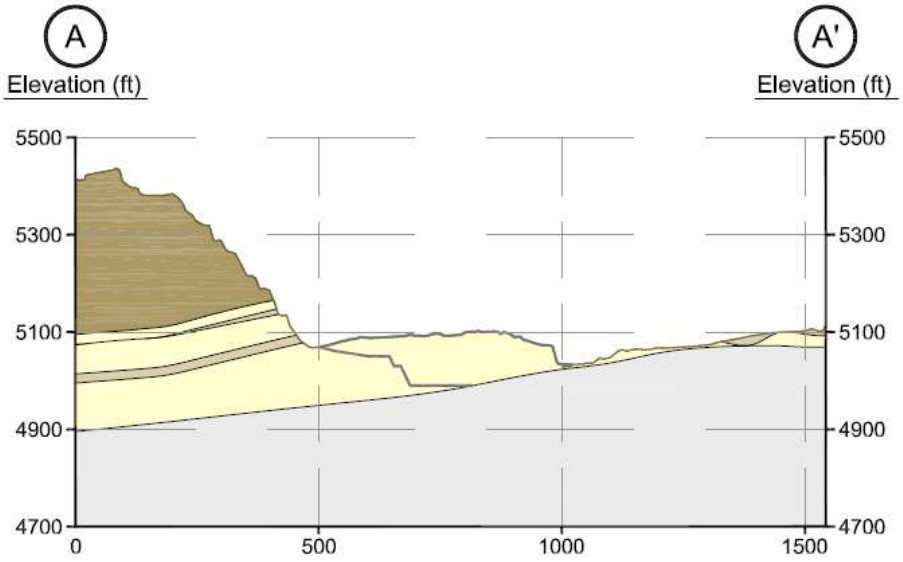
DE, commonly known as diatomite, is a naturally occurring sedimentary rock that is a result of the accumulation of skeletal remains of diatoms, which are microscopic single-celled aquatic algae.

Diatoms thrive in various pond, lake, and ocean environments with numerous specialized species in existence, depending on environmental characteristics. Diatoms convert carbon dioxide into oxygen and organic sugars through the process of photosynthesis during their short (usually only days long) lifecycle. It is estimated that diatoms produce 20–30% of Earth's oxygen and serve as a base food source for the entire aquatic food chain.

Diatom skeletons are composed primarily of amorphous silica (non-crystalline SiO_2). The cylindrical shape and high pore volume of these diatom skeletons provide high mechanical strength, natural filtration, and absorption capabilities. The properties which make DE valuable include low density, high porosity, high surface area, abrasiveness, insulating properties, inertness, absorptive capacity, brightness, and high silica content. It is mainly used as filter aids, fillers, and absorbents.


N
E 2,565,000
E 2,575,000
E 2,585,000
N 15,155,000
N 15,145,000
N 15,135,000
Antelope Basin
Section 7 Pit
Quivera Pit
Horseshoe Basin
Liberty Pits
East Extension Pit
Central Pit
Atlantis Basin
Tunnel Hill Pit
South Knob Pit
A
A'
B
B'
C
C'
D
D'
SCALE (ft)
2000 0 2000 4000
Legend
Colado Mine Boundary
Diatomaceous Earth Resource Areas
BLM Leases
Franco - Nevada Leases
Mining Areas
Cross Section Locations
Roads
Notes: 1. Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
2. See Figures 6.3 Thru 6.6 for Cross Section Detail
FIGURE 6.2
MAP SHOWING
CROSS SECTION LOCATIONS
COLADO OPERATIONS
Pershing County, Nevada
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 4,000'
Q:\CAD_GROUP\3076.017\FIGURE 6_2.DWG

Q:\CAD_GROUP\3076.017\FIGURE 6_3.DWG



Legend
- Plt
- Tuffs with Basalt Cover
- Tuffs
- Diatomaceous Earth
- Bimodal Volcanic Units

FIGURE 6.3
CROSS SECTION A - A'
HORSESHOE BASIN CENTRAL
COLADO OPERATION
Pershing County, Nevada

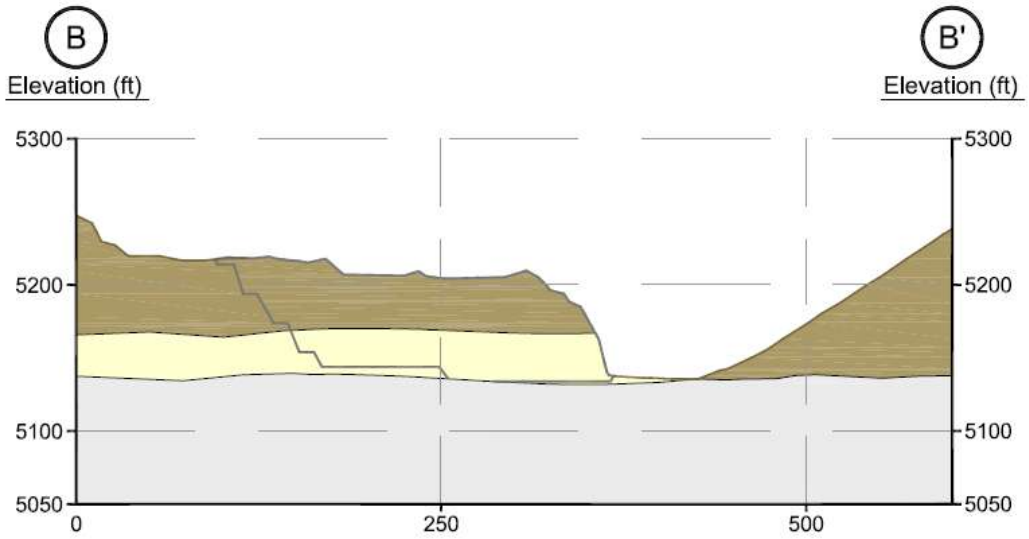
Prepared For
U. S. SILICA COMPANY

John T. Boyd Company

February 2023
Scale 1" = 300'

Note : See Figure 6.2 For Cross Section Location.

Q:\CAD_GROUP\3076.017\FIGURE 6_4.DWG



Legend
- Plt
- Tuffs with Basalt Cover
- Tuffs
- Diatomaceous Earth
- Bimodal Volcanic Units

Note : See Figure 6.2 For Cross Section Location.

FIGURE 6.4
CROSS SECTION B - B'
HORSESHOE BASIN EAST
COLADO OPERATION
Pershing County, Nevada

Prepared For
U. S. SILICA COMPANY

John T. Boyd Company

February 2023
Scale 1" = 100'

Q:\CAD_GROUP\3076.017\FIGURE 6_5.DWG

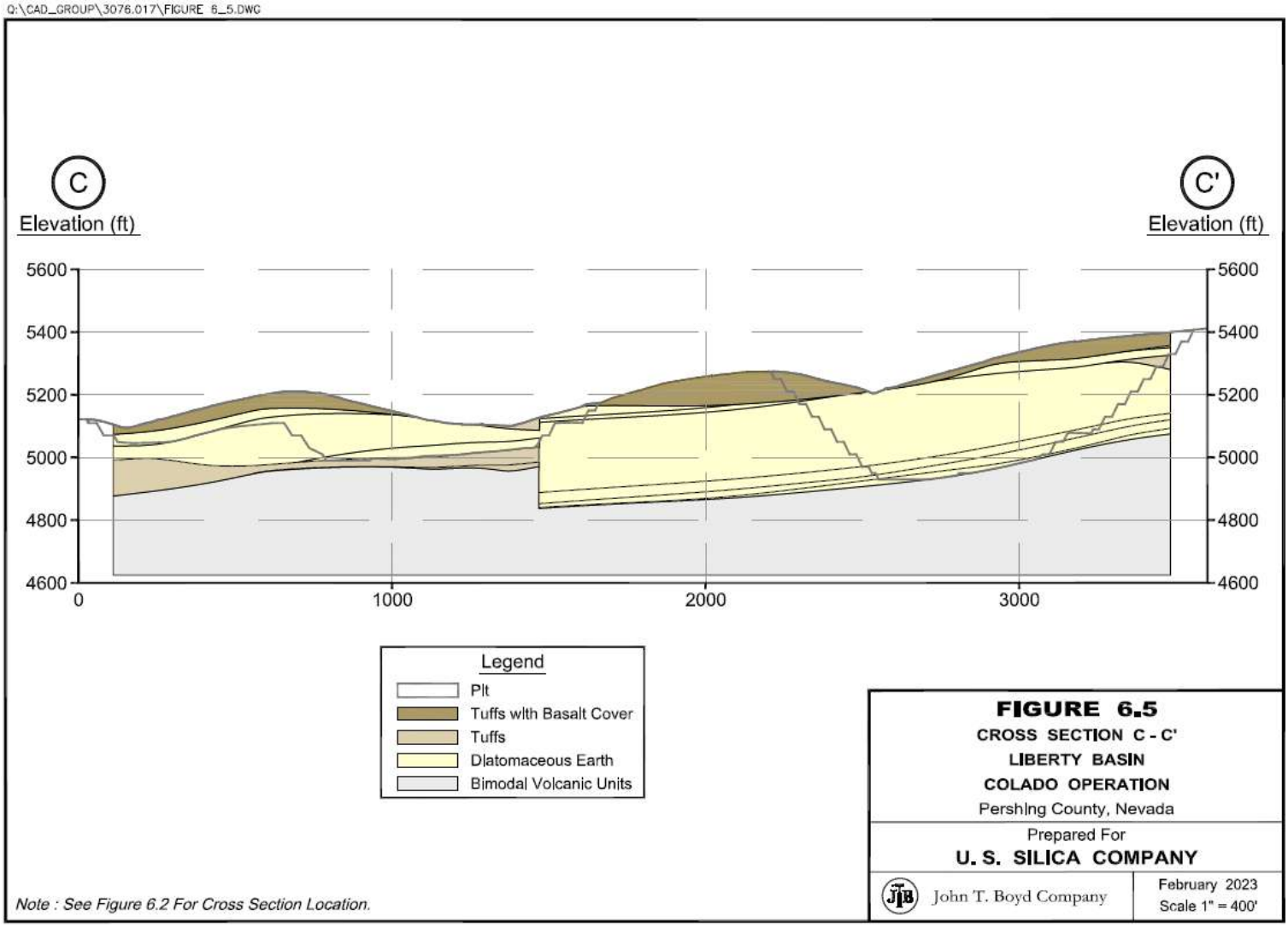


FIGURE 6.5
CROSS SECTION C - C'
LIBERTY BASIN
COLADO OPERATION
Pershing County, Nevada

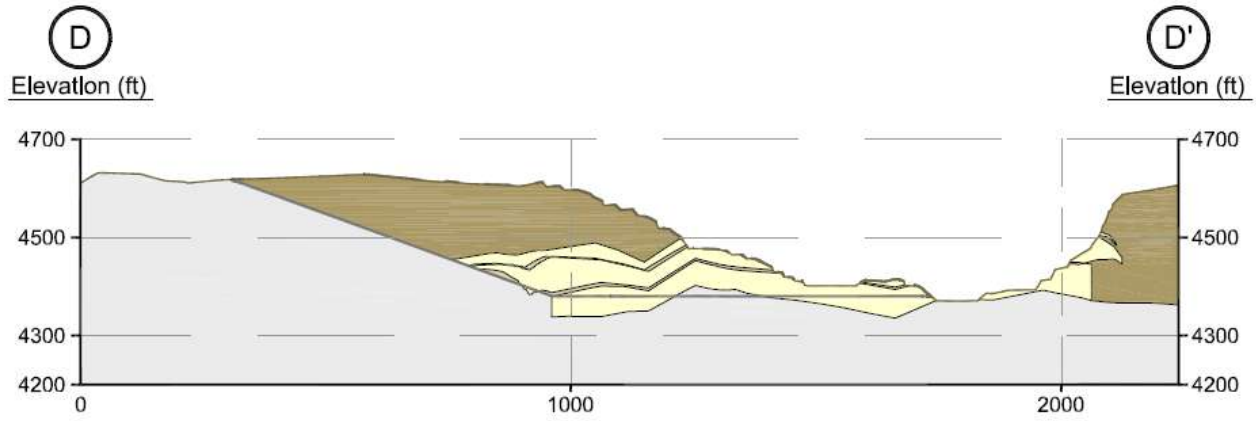
Prepared For
U. S. SILICA COMPANY

John T. Boyd Company

February 2023
Scale 1" = 400'

Note : See Figure 6.2 For Cross Section Location.

Q:\CAD_GROUP\3076.017\FIGURE 6_6.DWG



Legend
- Plt
- Tuffs with Basalt Cover
- Tuffs
- Diatomaceous Earth
- Bimodal Volcanic Units

FIGURE 6.6
CROSS SECTION D - D'
ANTELOPE BASIN
COLADO OPERATION
Pershing County, Nevada

Prepared For
U. S. SILICA COMPANY

John T. Boyd Company

February 2023
Scale 1" = 300'

Note : See Figure 6.2 For Cross Section Location.

7.0 EXPLORATION DATA

7.1 Background

The Colado Mine has been extensively explored and mined since the late 1950s. Throughout various exploration campaigns, the subject DE deposits have been identified and delineated through geologic mapping, outcrop sampling, trenching, geophysical surveys, and extensive exploration drilling.

BOYD was provided source records (drilling logs, testing results, and core photographs), summary reports, and/or databases compiling the results of 1,153 drill holes located in and around the Colado Mine property. Records indicate that these exploration data have been collected since the late 1950s.

Much of the exploration data collected prior to U.S. Silica's purchase of the Colado Mine, is available only in summarized form (i.e. source records no longer exist). Data verification methodologies outlined by U.S. Silica specifically notes the use of "judgement calls" to verify or validate exploration data originating before 2010. Verification of the data is often supported by observed geologic conditions in the expansive mine workings.

7.2 Exploration Procedures

BOYD's review of the reported methodologies and procedures indicate the exploration data obtained and utilized by U.S. Silica for the Colado Mine were collected, prepared, and documented, in reasonable compliance with prevailing industry standards, and are appropriate for use of evaluating and estimating DE resources and reserves.

7.2.1 Geologic Mapping

Basic surficial and mine mapping have been used extensively at the Colado Mine to develop understanding of the stratigraphic, depositional, and structural relationship of the various rock units.

7.2.2 Drilling

A variety of drilling techniques have been used during the various campaigns, including diamond core, air rotary, sonic, and reverse circulation.

Air rotary drilling was the primary method utilized to explore the Colado Mine. Records indicate that a truck mounted Reichdrill T-650-WII air rotary drill was commonly utilized.

The drill is equipped with a 6-in. hammer assembly, utilizes a 6-in. drill bit and 20-ft drill pipe, and is capable of drilling to depths of approximately 500 ft. Chipped sample material is continuously obtained during air rotary drilling by placing a 48-in diameter galvanized pan under the cuttings chute to catch the drill cuttings that are blown back up as the drill bit advances down the hole.

Diamond core drilling methods have also been utilized at the Colado Mine when higher quality samples of the DE intervals are required for chemical and physical testing. Diamond coring is also utilized in areas that exhibit more complex geologic structures, as complete core records assist in the definition of bed structure and thickness in such areas. Records indicate that wireline HQ (2.5 in diameter) drilling methods, capable of reaching depths of 400 ft, were utilized during diamond core drilling campaigns.

Discussions with U.S. Silica personnel indicated that the same general procedural standards in-place at their other operations have also been implemented since their involvement with the Colado Operation, in order to ensure consistent internal standards are being followed during drilling and sampling.

7.2.3 Sampling Procedures

Samples collected from the air rotary drilling rig were gathered in five-ft intervals. The cuttings recovered for each interval were mixed for two minutes in a paddle mixer and then split with a Gilson splitter in the field. The mixing and splitting allows field personnel to obtain smaller, but representative, samples of each five-ft interval. Samples were placed into canvas or woven cloth bags and labeled with drill hole identification and sample top and bottom depths. At the end of each day, bagged samples were delivered to a limited access area at the mine where they were stored before being taken to the company's internal "dry lab" at their Vale, Oregon plant for chemical and physical testing.

Cored DE samples, from diamond core drilling, were boxed and labeled at the drill site by U.S. Silica personnel. Boxed core samples were taken to U.S. Silica's Fernley, Nevada plant location daily, where the core was examined and geologically logged by geology staff before being transferred to the dry lab for testing.

7.2.4 Ore Testing

DE samples were analyzed at U.S. Silica's dry lab, at their Vale, Oregon operation. At the dry lab, the samples were dried, split, and prepared for chemical and physical testing. Testing was performed on the "natural" split sample and on a muffle burned split. Standard testing on all samples includes wet bulk density, permeability, and brightness. The muffle burden samples were tested for soluble metal concentrations.

Additional standardized testing may be performed for filter aid products on white and pink natural ore, and for natural filler products when necessary. Non-routine testing, such as x-ray fluorescence, centrifuge wet density, x-ray diffraction, and scanning electron microscope evaluations to determine diatom genus, are commonly performed at U.S. Silica's Research and Development Laboratory in Reno, Nevada.

7.2.5 Other Exploration Methods

BOYD notes that limited trenching and geophysical (gravity, seismic, remote sensing, resistivity) surveys have reportedly been conducted on the property; however, results from these studies were not provided for review.

7.3 Exploration Results

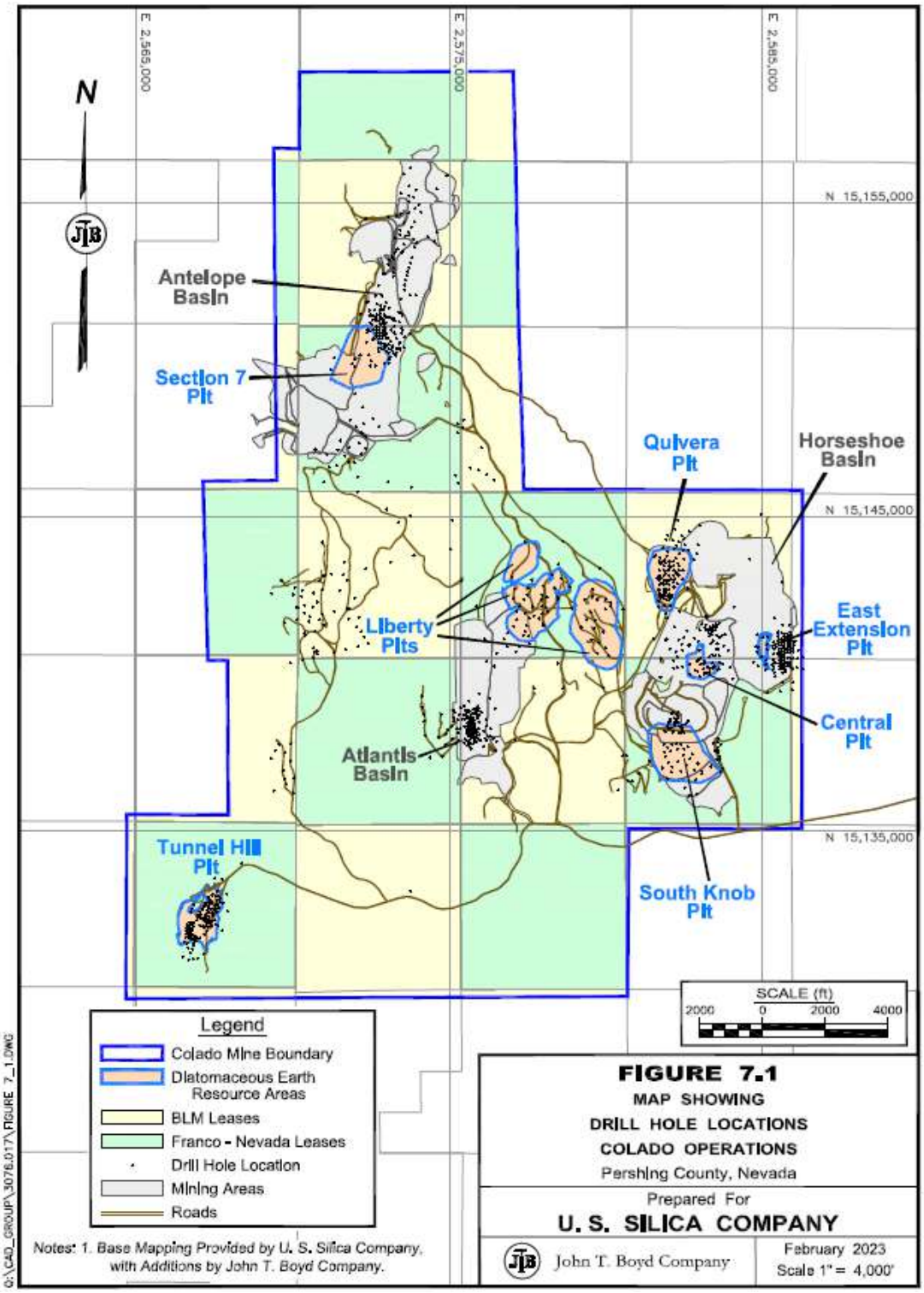
7.3.1 Summary of Exploration

Drilling records and summary data indicate that 1,153 drill holes totaling almost 165,000 ft in length—have been completed at the Colado Mine. The distribution of these drill holes is shown on Figure 7.1, following this page.

A summary of the drilling completed in and around the various DE deposits on the Colado Mine property is presented in Table 7.1:

Table 7.1: Drill Hole Summary By Area

Deposit	Number of Drill Hole Records	Total Drilled Length (ft)
Atlantis	162	20,488
Antelope Basin	241	29,381
Horse Shoe Basin	330	55,659
Liberty	78	24,618
Quivera	124	11,793
Tunnel Hill	122	12,357
Other Areas	96	10,420
Total	1,153	164,715


N
E 2,565,000
E 2,575,000
E 2,585,000
N 15,155,000
N 15,145,000
N 15,135,000
Antelope Basin
Section 7 Pit
Quivera Pit
Horseshoe Basin
Liberty Pits
East Extension Pit
Central Pit
Atlantis Basin
Tunnel Hill Pit
South Knob Pit
SCALE (ft)
2000 0 2000 4000
Legend
Colado Mine Boundary
Diatomaceous Earth Resource Areas
BLM Leases
Franco - Nevada Leases
Drill Hole Location
Mining Areas
Roads
Notes: 1. Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 7.1
MAP SHOWING
DRILL HOLE LOCATIONS
COLADO OPERATIONS
Pershing County, Nevada
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 4,000'
O:\CAD_GROUP\3076.017\FIGURE 7_1.DWG

7.3.2 Ore Quality

The Colado Operation produces a wide variety of finished DE products for numerous customers. While not all of the finished products must adhere to a published set of specifications, U.S. Silica utilizes samples obtained during exploration to ascertain the suitability of the various DE beds for producing the materials it supplies to customers. Additionally, U.S. Silica's extensive testing of stockpiled ore provides them flexibility in what, and how much, of a certain mined DE bed is delivered to the Colado Processing Plant. As such, the Colado Operation has flexibility to meet varying product demands over short timeframes.

7.4 Data Verification

For purposes of this report, BOYD did not verify historic drill hole data by conducting independent drilling. It is customary in preparing similar mining resource and reserve estimates to accept basic drilling and sample quality data as provided by the client subject to the reported results being judged representative and reasonable.

BOYD's efforts to judge the appropriateness and reasonability of the source exploration data included reviewing representative samples of provided drilling logs, sampling procedures, sample testing results, and discussing various aspects of the mining and processing operations with U.S. Silica personnel during our site visit. Reviewed drilling records were compared with their corresponding database records for transcription errors; of which none were found. Exploration data points were compared via visual and statistical inspection with geologic mapping and cross-sections.

7.5 Adequacy of Exploration and Sampling

BOYD's review indicates that in general, an acceptable level of drilling and sampling work has been performed at the Colado Operation. The work completed has been done so by competent personnel in a manner consistent with industry practices. The amount of data available, combined with the extensive history of mining and producing DE products at the Colado Operation are sufficient to confirm the extents, uniformity, and continuity of the delineated DE deposits. Similarly, BOYD's review of sampling data provided by U.S. Silica suggests that the analyses completed are generally appropriate to determine DE characteristics and determine the subsequent quality of finished DE products. As such, it is BOYD's opinion that the exploration and sampling data are suitable for use in the estimation of DE resources and reserves for the Colado Operation.

8.0 SAMPLE PREPARATION, ANALYSIS, AND SECURITY

The reader is referred to Sections 7.2 and 7.3 of this report for details regarding sample preparation, analysis, and security.

9.0 DATA VERIFICATION

BOYD, by way of the data verification processes described in various sections of this report, has used only that data, which were deemed by the QPs to have been generated with proper industry standard procedures, were accurately transcribed from the original source, and were suitable to be used for the purpose of preparing estimates of DE resources and reserves.

BOYD's subject-specific data verification efforts and our conclusions arising therefrom are discussed in the following sections of this report:

Topic	Report Section(s)
Exploration Data	Section 7.4
Sample Preparation, Analysis, and Security	Section 7.4
Diatomaceous Earth Resource Estimates	Section 11.2
Operating Plans	Chapters 13 and 1
Capital and Operating Costs	Chapter 18
Economic Analysis Inputs	Chapter 19

Based on our review, it is BOYD's overall conclusion that the information made available to us at the time of this report is representative and reliable for use in estimating the DE resources and reserves of the Colado Operation.

BOYD is not aware of any other limitations on nor failure to conduct appropriate data verification.

10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

Please refer to Chapter 7 for information regarding mineralogical and chemical testing of the Colado DE deposit.

11.0 DIATOMACEOUS EARTH RESOURCE ESTIMATE

11.1 Applicable Standards and Definitions

Unless noted, DE resource estimates disclosed herein are done so in accordance with the standards and definitions provided by S-K 1300. It should be noted that BOYD considers the terms “mineral” and “diatomaceous earth” to be generally interchangeable within the relevant sections of S-K 1300.

Estimates of mineral resources are always subject to a degree of uncertainty. The level of confidence that can be applied to a particular estimate is a function of, among other things: the amount, quality, and completeness of exploration data; the geological complexity of the deposit; and economic, legal, social, and environmental factors associated with mining the resource. By assignment, BOYD used the definitions provided in S-K 1300 to describe the varying degree of certainty associated with the estimates reported herein.

The definition of mineral resource provided by S-K 1300 is:

> *Mineral resource is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. A mineral resource is a reasonable estimate of mineralization, taking into account relevant factors such as cut-off grade, likely mining dimensions, location or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable. It is not merely an inventory of all mineralization drilled or sampled.*

Estimates of mineral resources are subdivided to reflect different levels of geological confidence into measured (highest geologic assurance), indicated, and inferred (lowest geologic assurance). Please refer to the Glossary of Abbreviations and Definitions for the meanings ascribed to these terms.

11.2 Diatomaceous Earth Resources

11.2.1 Methodology

Based on provided information, U.S. Silica's geologic modeling and DE resource estimation techniques generally consist of the following:

1. The top and bottom elevations of various DE beds, and the interbedded waste material intervals (tuff interburden beds), are interpreted from drill hole records.
2. Interpreted drill hole records are compiled and validated. The compiled drill hole data are imported into GEOVIA Surpac™ geologic modeling and mine planning software.
3. Wireframe models were developed for each correlated DE bed and geologic block models of the deposits were developed using industry standard stratigraphic modeling methods. The geologic models delineate the various DE beds and waste units utilizing blocks sizes ranging from 10 ft by 10 ft by 5 ft to 25 ft by 25 ft by 5 ft (in X, Y, and Z directions), depending on the deposit geology.
4. Sampling results (assays) were composited on 5-ft lengths constrained within the DE solid models. No grade capping was used.
5. Block grade values were estimated from composited assay values using inverse distance cubed weighting. Search ellipsoids using 10:10:1 anisotropy were oriented according to the local structure of the various deposits. Three passes with increasing search distances—200, 400, and 800 ft—were used to estimate the majority of the DE blocks. A maximum number of eight samples were utilized to estimate the grades of each block.
6. LOM pit shells with designed benches and access ramps were developed with Hexagon Project Evaluator's pit optimization and mine planning software. Optimization parameters were derived from historical operating costs and product prices.
7. Estimates of in-place waste and DE volumes were derived from the LOM pit shells and recent topographic (surface elevation) surveys.
8. An in-place dry bulk density of 0.35 tons per bank cubic yard (0.42 g/cm3) is used to convert the in-place DE volumes to tons.

11.2.2 Estimation Criteria

Development of the DE resource estimate for the Colado Operation assumes mining and processing methods and equipment which have been utilized successfully at the site for decades.

Within each mining area, the target DE mining horizons present as one or more tabular sedimentary units with varying depths, thicknesses, and physical and chemical characteristics. Generally, the high-quality DE strata are easily distinguished from the surrounding interbedded tuffs and other inclusions by a distinct difference in color clearly

visible in the exposed mining faces. Selective mining enables the extraction of relatively clean DE.

U.S. Silica has developed numerous pits at the Colado mine where various qualities of DE are mined. Extensive stockpiling capacity allows for targeted blending to meet finished product specification requirements. Additionally, the Colado Operation has a lengthy commercial history of producing numerous products with various specifications, allowing nearly all of the identified and mineable DE intervals to be utilized. As such, the application of cut-off grades is not generally considered in the estimation of DE resources for the Colado Operation.

The limits of the DE resources are constrained to those portions of the interpreted lithologies that:

- Are reasonably defined by available drilling and sampling data.
- Can produce finished DE products that meet generally accepted specifications.
- Honor any legal mining constraints (e.g., property boundaries, environmental setbacks, utility and infrastructure setbacks, etc.).
- Adhere to physical mining constraints.
- Contain products that can be sold at a profit (i.e., be economic).

DE resources for the Colado Operation are assessed for reasonable prospects for eventual economic extraction by reporting: (1) only those resources which have been subsequently converted to DE reserves after the application of all material modifying factors, or (2) those resources which have similar characteristics (i.e., mining conditions, and expected product yields and qualities) to those converted to DE reserves. The LOM pit shells which constrain the DE resources have been developed using standard pit optimization techniques and economic parameters derived historical performance.

BOYD has reviewed the criteria employed by U.S. Silica in developing their estimates of DE resources. The parameters are supported by historical results and align with those employed at similar operations. As such, it is BOYD’s opinion that the stated criteria are reasonable and appropriate for the estimation of DE resources at the Colado Operation.

11.2.3 Classification

Classification is generally based on the concentration or spacing of exploration data, geological understanding, continuity of mineralization relative to the style of mineralization, and data quality. The geologic models for the Colado Operation, and

consequently the estimates of DE resources derived from them, have been classified on basis of distance from and the number of assay composites uses to estimate block grades. That is, classification is assigned based on the number of samples available within defined distances. Table 11.1 provides the general criteria employed in the classification of the DE resources.

Table 11.1: Diatomaceous Earth Resoruce Classification Criteria

Classification (Geologic Confidence)	Maximum Search Distance (feet)	Minimum Number of Assay Composites
Measured	200	5
Indicated	400	3
Inferred	800	3

BOYD reviewed the classification criteria employed by U.S. Silica with regards to data density, data quality, geological continuity and/or complexity, and estimation quality. We believe these criteria appropriately reflect the interpreted geology and the estimation constraints of the deposit. DE resources are well-defined throughout all areas of the mine plan. Observed drill hole spacing averages approximately 75 ft to 100 ft through a majority of the active mining areas, with future mining areas exhibiting a general drill hole spacing averaging approximately 100 ft to 500 ft.

11.2.4 Diatomaceous Earth Resource Estimate

Resource estimates of in-situ DE at the Colado Operation as of December 31, 2022, as reported by U.S. Silica are shown in Table 11.2 below. Except as noted, the DE resources presented are inclusive of reserves, not in addition to reserves.

Table 11.2: Colado Operation Diatomaceous Earth Re
(as of December 31, 2022)

Classification	In-Place Tons (000)		
	Planned[1]	Additional[2]	Total
Measured	2,128	-	2,128
Indicated	3,736	-	3,736
Total Measured + Indicated	5,864	-	5,864
Inferred	-	689	689

Notes:
1. "Planned" resources are those included in the approved LOM plan.
2. "Additional" resources are those reported in addition to diatomaceous earth reserves.

As shown, U.S. Silica controls approximately 5.9 million in-place tons of measured and indicated DE resources, inclusive of DE reserves. In addition, they control approximately 689,000 in-place tons of inferred DE resources. DE resources are not DE reserves and do not have demonstrated economic viability.

The DE resources shown under the “Planned” column of Table 11.2 include only those in-place tons which are included in U.S. Silica’s LOM plan for the Colado Operation and therefore considered for conversion to DE reserves. The DE resources shown under the “Additional” column of Table 11.2 have not been included in the LOM plan and are considered exclusive of (i.e., “in addition to”) the reported DE reserves. These “Additional” DE resources are considered to have prospects for eventual economic extraction by virtue of their similarity, in terms of demonstrated extraction methods and expected finished product qualities, to those converted to DE reserves. However, further studies are required to convert the “Additional” DE resources to DE reserves.

11.2.5 Validation

BOYD was provided with U.S. Silica’s exploration data, geologic models, and volumetric estimates. We have reviewed this information, on a representative basis, by:

- Verifying the accuracy of geologic model inputs by comparison with drilling logs and laboratory reports.
- Comparing the geologic model with compiled drilling data.
- Confirming estimates of in-place tons and average grades for each pit shell.

It is BOYD’s opinion that the geologic model is representative of the informing data and that the data are of sufficient quality to support the DE resources estimate provided herein. Furthermore, it is our opinion that the estimation methods and criteria employed

are both appropriate and reasonable for the deposit type and proposed extraction methods.

BOYD is not aware of any technical, legal, economic, or other relevant factors that could materially affect the DE resource estimate. The accuracy of DE resource estimate is, in part, a function of the quality and quantity of available data and of engineering and geological interpretation and judgment. Given the data available at the time this report was prepared, the estimates presented herein are considered reasonable. However, they should be accepted with the understanding that additional data and analysis available after the date of the estimate may result in a change to the current estimate. These revisions may be material. There is no guarantee that all or any part of the estimated resources will be recoverable.

12.0 DIATOMACEOUS EARTH RESERVE ESTIMATE

12.1 Applicable Standards and Definitions

Unless noted, DE reserve estimates disclosed herein are done so in accordance with the standards and definitions provided by S-K 1300. It should be noted that BOYD considers the terms “mineral” and “diatomaceous earth” to be generally interchangeable within the relevant sections of S-K 1300.

Estimates of mineral reserves are always subject to a degree of uncertainty. The level of confidence that can be applied to a particular estimate is a function of, among other things: the amount, quality, and completeness of exploration data; the geological complexity of the deposit; and economic, legal, social, and environmental factors associated with mining the reserve. By assignment, BOYD used the definitions provided in S-K 1300 to describe the varying degree of certainty associated with the estimates reported herein.

The definition of mineral reserve provided by S-K 1300 is:

> *Mineral reserve is an estimate of tonnage and grade or quality of indicated and measured mineral resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated mineral resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted.*

Estimates of mineral reserves are subdivided to reflect geologic confidence, and potential uncertainties in the modifying factors, into proven (highest assurance) and probable. Please refer to the Glossary of Abbreviations and Definitions for the meanings ascribed to these terms.

Figure 12.1, below, illustrates the relationship between mineral resources and mineral reserves.

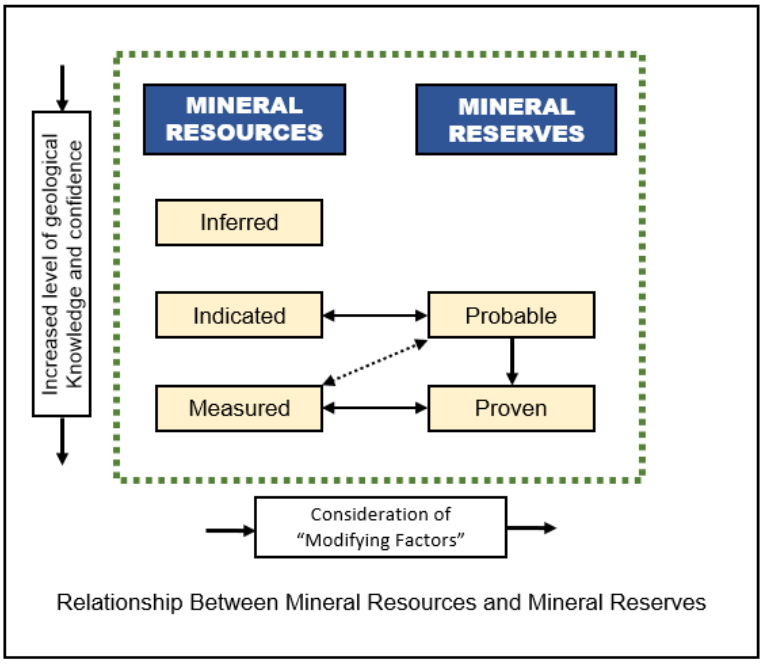


Figure 12.1: Relationship Between Mineral Resources and Mineral Reserves

By industry convention, DE reserves are presented on two bases: mineable and saleable. Mineable reserves represent the ROM tonnage available for excavation and processing. Saleable reserves represent the tonnage of finished DE available for sale after processing the mineable reserves.

12.2 Diatomaceous Earth Reserves

12.2.1 Methodology

Estimates of DE reserves for the Colado Operation are derived contemporaneously with estimates of DE resources. The Colado Operation utilizes commercially proven mining and processing methods to extract and process DE from the subject property. The operation's production plans are revised periodically to assure that the conversion of in-place to saleable product are: (1) in reasonable conformity with present and recent historical operational performance, and (2) reflective of expected mining and processing operations.

To derive estimates of mineable tons and saleable product tons (i.e., proven and probable DE reserves), the following modifying factors were applied to the in-place measured and indicated DE resources underlying the respective mine plan areas:

- Mining recovery factors vary by pit according to expected geologic and mining conditions, and are based on historical performance. In the LOM plan, mining recovery factors range from 60% to 85%, and average 76.4%. As such, the LOM plan assumes that approximately 23.6% of the mineable (in-place) DE resource will not be recovered for various reasons. Applying this recovery factor to the in-place resource results in the estimated ROM DE tonnage (i.e., the mineable DE reserves) that will be delivered to the process plant.
- An overall 81.6% processing yield. This factor accounts for removal of interbedded waste material and losses in the Colado Processing Plant due to minor inefficiencies.

The overall product yield (after mining and processing losses) for the Colado Operation is estimated at approximately 62.3%. That is, for every 100 tons of in-place DE, approximately 62 tons will be recovered and sold as product. Mining recovery and processing yield factors are derived from historical operating results.

Economic availability of the DE reserves is established by the financial analysis presented in Chapter 19. A long-range average selling price of $697.27 per product ton has been used to estimate DE reserves for the Colado Operation.

12.2.2 Classification

Proven and probable DE reserves are derived from measured and indicated DE resources, respectively, in accordance with S-K 1300. BOYD is satisfied that the stated DE reserve classification reflects the outcome of technical and economic studies.

12.2.3 Diatomaceous Earth Reserve Estimate

U.S. Silica's estimated surface mineable DE reserves for the Colado Operation total 3.7 million saleable product tons, as of December 31, 2022. The DE reserves reported in Table 12.1, on the following page, are based on the approved LOM plan which, in

BOYD's opinion, is technically achievable and economically viable after the consideration of all material modifying factors.

Table 12.1: Colado Operation
Diatomaceous Earth Reserves
(as of December 31, 2022)

	Tons (000)	
Classification	Mineable	Saleable
Proven	1,671	1,364
Probable	2,808	2,291
Total	4,479	3,655

All of the reported DE reserves are fully controlled by U.S. Silica through the various lease agreements and mineral claims described in Chapter 3.

The DE reserves of the Colado Operation are well-explored and defined. It is our conclusion that over 37% of the stated reserves can be classified in the proven reliability category (the highest level of assurance) with the remainder classified as probable. Given the overall geologic uniformity and history of mining the DE on the Colado property, it is reasonable to assume that some or all of the probable reserves will be converted to proven reserves upon completion of additional exploration and testing.

The Colado Operation has a well-established history of mining, processing, and selling DE products into various markets. BOYD has assessed that sufficient studies have been undertaken to enable the DE resources to be converted to DE reserves based on current and proposed operating methods and practices. Changes in the factors and assumptions employed in these studies may materially affect the DE reserve estimate.

The extent to which the DE reserves may be affected by any known geological, operational, environmental, permitting, legal, title, variation, socio-economic, marketing, political, or other relevant issues has been reviewed as warranted. It is the opinion of BOYD that U.S. Silica has appropriately mitigated, or has the operational acumen to mitigate, the risks associated with these factors. BOYD is not aware of any additional risks that could materially affect the development of the DE reserves.

Based on our independent review, we have a high degree of confidence that the estimates shown in this report accurately represent the available DE reserves controlled by U.S. Silica, as of December 31, 2022.

12.2.4 Reconciliation with Previous Estimates

When comparing U.S. Silica's DE reserve estimates as of December 31, 2022, with the estimates presented[1] for December 31, 2021, we note a net increase of approximately 18,000 mineable tons generally resulting from: (1) depletion due to mining of approximately 175,000 mineable tons, and (2) revisions to mine plans resulting in increases of approximately 193,000 mineable tons. BOYD does not consider this increase to represent a material change to the DE reserves of the Colado Operation.

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[1] U.S. Silica did not present reserves on a Saleable Tons basis for the 2021 financial year.

13.0 MINING METHODS

13.1 Mining Operations

DE mining has been conducted at the Colado Operation since the late 1950s. A number of mining pits have been developed across the various DE deposits identified on the property. Many of these mine areas have been idled, some depleted, and others included in the LOM plan for future mining. Table 13.1, below, lists the various mine areas of the Colado Operation.

Table 13.1: Colado Operation Mining Areas

Mine Area	Operating Status
Antelope Basin:	
Section 6	Idle
Section 7	Idle
Atlantis	Active
Horseshoe Basin:	
Central	Active
East Pit Extension	Idle
South Knob	Active
Liberty	Undevelopec
Quivera	Idle
Tunnel Hill	Idle

In 2022, mining activities took place in the Atlantis Pit, and in the Central and South Knob areas of the Horseshoe Basin deposit. All the other pits are currently idled. Decisions on which deposit(s) to mine is based on several factors including geology, operating costs, remaining DE reserves, and market demand.

The DE mining horizons at the Colado Mine are relatively shallow, quite thick, and are moderately dipping. These characteristics favor conventional surface mining techniques using excavators and trucks. Mining occurs on benches, in a stair-like fashion, to remove the overburden waste material and expose the DE beds. Bench heights vary at each pit but are generally between 20 and 40 ft high.

Sparse organic overburden consisting of sagebrush, juniper, and other desert vegetation is removed along with the basalt cap rock during overburden stripping campaigns. The basalt cap rock is drilled and blasted by an outside contractor during the winter months and is subsequently stockpiled for ongoing reclamation activities.

Interburden tuff, which is common between the layers of DE, is removed in a similar manner as the basalt cap rock. A third-party contractor is brought in as needed to drill and blast the interburden. This material is also used for backfilling depleted mining pits and other reclamation activities.

The DE beds are highly friable; as such, drilling and blasting is not needed to facilitate their excavation. Instead excavators “free dig” the DE material from the deposit and directly load it into haul trucks. Generally, several passes are needed to fully excavate each DE bed before the final bench height is reached due to mechanical limitations of the excavator fleet. Figure 13.1, below, shows the loading operations in the Colado Mine.

Figure 13.1: Loading Operations at the Colado Operation

Excavation of the DE beds occurs from late spring until early fall, a period of roughly 200 days, before wet winter weather impedes moisture control in the ROM stockpiles. During the winter months, the removal of overburden and other support activities continues as access to the site is typically available year-round.

The excavated DE is hauled to one of several different stockpiles located on the Colado Mine property where it is stockpiled for year-round transportation to the Colado Processing Plant. The Colado Operation maintains a stockpile of approximately 600,000 cubic yards at the mine site to meet the demands of the processing plant. Stockpiled DE usually remains stockpiled for at least one year to allow the material to dry. This “solar drying” process helps reduce the costs of drying the DE at the Colado Processing Plant.

A loader fills over-the-road semi-trailer trucks with stockpiled ROM material for transportation to the Colado Processing Plant. Transportation of the ROM material to the processing plant occurs day and night, most of the year.

Waste material from the processing operations is returned to the Colado Mine by the same semi-trailer trucks, where it is unloaded and used as backfill in exhausted pits.

13.2 Mine Equipment and Staffing

13.2.1 Mine Equipment

The primary mobile equipment involved in mining and transport at the Colado Mine includes:

- 7 Loaders.
- 3 Dozers.
- 13 Articulated Haul Trucks.
- 5 Excavators.
- 10 Semi-trailer Trucks.
- Motor Grader, Water Truck, and other ancillary equipment.

The mobile equipment fleet is comprised of both leased and owned equipment. Regular maintenance requirements and major rebuilds/repairs of mobile equipment are performed by U.S. Silica personnel or equipment service providers on site at the mine.

If maintained in good condition, the mobile equipment fleet should be capable of achieving production levels required by the LOM plan.

13.2.2 Staffing

The Colado Operation is staffed by 134 hourly and salaried personnel.

Table 13.2: Employees by Classification

Classification	Employees
Mine Operations	16
Mine & Shop Maintenance	6
Load and Haul Operations	7
Processing Operations	99
Salaried	6
Total	134

Staffing levels across the Colado Operation have largely been static since 2018, when U.S. Silica took over operations. The workforce can be expanded or reduced based on market and seasonal demands. Most employees live nearby in the town of Lovelock, Nevada.

13.3 Engineering and Planning

The primary mine planning consideration is the safe, economical, and regular supply of raw DE to the processing plant. In commercial mining terms, the quantities of overburden removed, and DE mined each year at the Colado Operation are considered modest. The DE deposits afford easy access with its shallow depth and large areal extents. As such, mining plans for the Colado Mine are relatively simple and very flexible, able to be modified based on demand in a relatively short time frame.

The following mine design criteria are used to develop the pits shells which constrain the estimated DE resources:

- Interramp (overall wall) angle of 45 degrees and bench face angle of 65 degrees.
- Bench heights of 20 or 40 ft depending on the dip of DE beds.
- Catch benches at least every 40 ft.

Dewatering before or during mining activities should be manageable with drainage ditches and sumps. Flood waters from localized flash floods are a manageable risk. Onsite water ponds can be used to hold any excessive storm water.

13.4 Mining Sequence and Production

Recent annual mine production results and forecasted production over the expected life of the Colado Mine are provided in Figure 13.2, below.

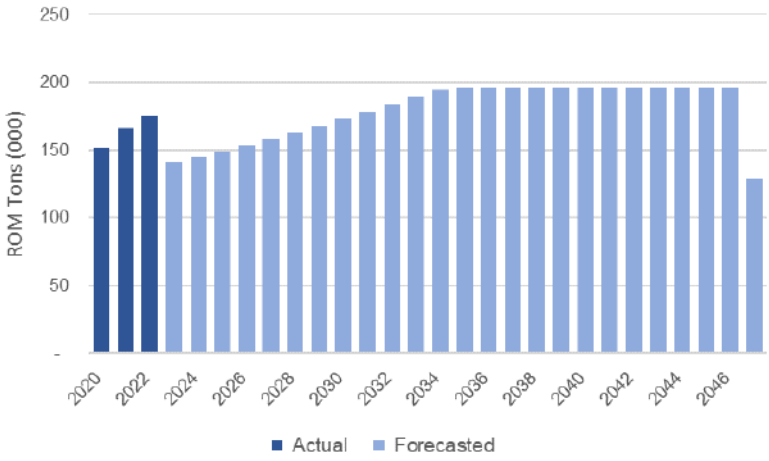


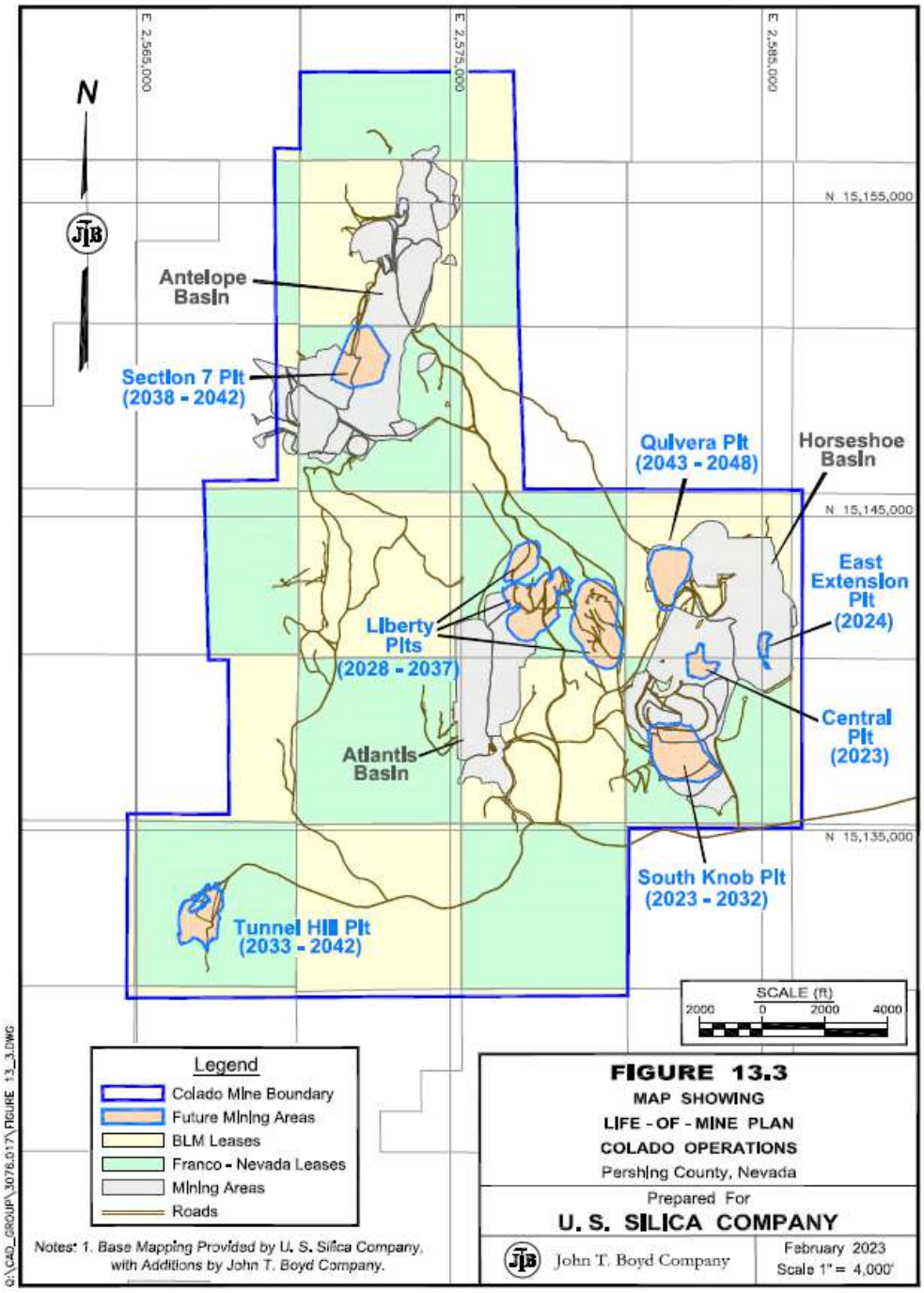
Figure 13.2: Recent Historical and LOM Forecasted Mining Production

The proposed mining sequence is illustrated in Figure 13.3, on the following page, and summarized in Table 13.4, below.

Table 13.3: Colado Operation Generalized Mining Sequence

Mine Area	2023	2024	2025	2026	2027	2028 to 2032	2033 to 2042	2042 to 2047
Antelope Basin - Section 7							■	
Horseshoe Basin	■							
Horseshoe Basin - East Pit Extension		■						
Horseshoe Basin - South Knob	■	■	■	■	■	■		
Liberty						■	■	
Quivera								■
Tunnel Hill							■	

BOYD reviewed the LOM plans for U.S. Silica's Colado Operation to determine whether the plans: (1) utilize generally accepted engineering practices, and (2) align with historical and industry norms. Based on our assessment, it is BOYD's opinion that the forecasted production levels for the Colado Operation are reasonable, logical, and consistent with typical surface mining practices and historical results achieved by U.S. Silica.


E 2,565,000
E 2,575,000
E 2,585,000
N
N 15,155,000
N 15,145,000
N 15,135,000
Antelope Basin
Section 7 Pit (2038 - 2042)
Quivera Pit (2043 - 2048)
Horseshoe Basin
East Extension Pit (2024)
Liberty Pits (2028 - 2037)
Central Pit (2023)
Atlantis Basin
South Knob Pit (2023 - 2032)
Tunnel Hill Pit (2033 - 2042)
SCALE (ft)
2000 0 2000 4000
Legend
Colado Mine Boundary
Future Mining Areas
BLM Leases
Franco - Nevada Leases
Mining Areas
Roads
Notes: 1. Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 13.3
MAP SHOWING
LIFE - OF - MINE PLAN
COLADO OPERATIONS
Pershing County, Nevada
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 4,000'
Q:\CAD_GROUP_3076.017\FIGURE 13_3.DWG

14.0 PROCESSING OPERATIONS

14.1 Overview

The Colado Operation's processing facilities are located 24 road miles east of the active mining area near the City of Lovelock, Nevada. Construction of the processing plant and related infrastructure began in 1959 and was completed shortly thereafter. U.S. Silica acquired the plant with the rest of the Colado Operation when it bought EP Minerals in 2018.

The production of finished DE products begins when the plant receives raw DE from the mine by truck. From this raw feed material, numerous products are generated through various processing methods. Figure 14.1, on the next page, presents a simplified process flow from raw feed delivery to the product distribution.

The processing facility operates 24 hours a day and close to 300 days a year based on a reported 82% average mechanical availability. The nominal capacity of the facility is currently at 162,000 tons of finished DE products.

BOYD is unaware of any reported interruptions, outages, shortages, or failures related to processing operations which have materially affected the Colado Operation. Given the operation is well-established, we believe the risk of such events materially affecting the estimates of DE reserves presented herein is low.

14.1.1 Colado Processing Plant

The processing plant receives its raw DE feed from a stockpile supplied by the mine that is transported by a fleet of semi-trailer trucks. The raw DE is fed into a hopper at the plant before it is conveyed into a crusher where it is appropriately sized for plant processes. Oversized material is returned to this crusher until the material is fine enough for processing.

The crude DE is fed into one of three product lines. If needed, crude DE from the bins is metered into a pneumatic conveying system which dries the material with hot air as it is conveyed. Various mills and cyclones beneficiate the in-process ore before it is introduced into one of three horizontal rotary kilns. Soda ash is introduced with the DE before entering the kilns as a flux. This helps the milling process and assists with product coloration. After calcining in the kiln, the DE goes through one final series of mills and sizing screens before it is: packaged in individual consumer bags and

Q:\CAD_GROUP\3076.017\FIGURE 14_1.DWG

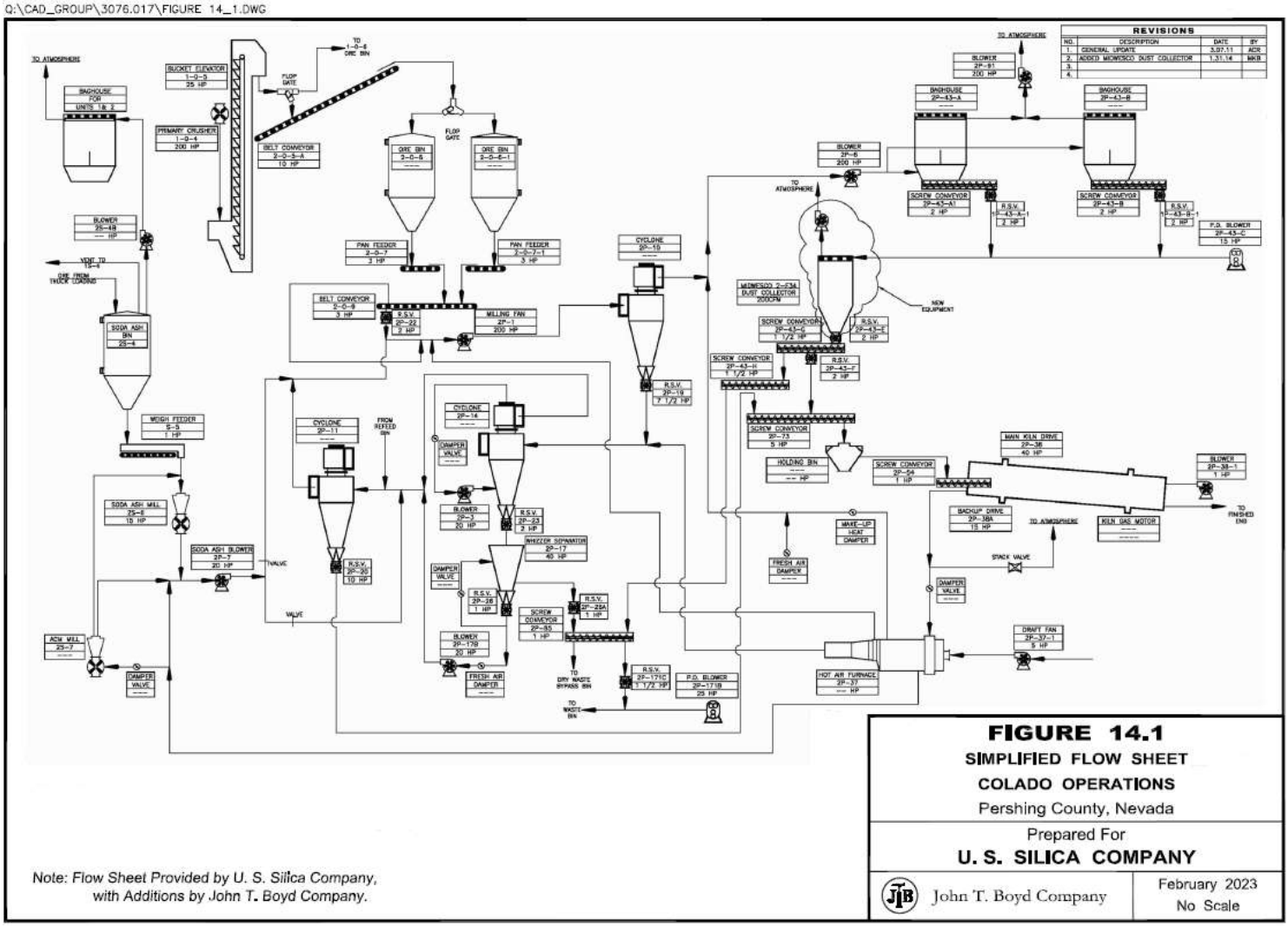


FIGURE 14.1
SIMPLIFIED FLOW SHEET
COLADO OPERATIONS
Pershing County, Nevada

Prepared For
U. S. SILICA COMPANY

John T. Boyd Company

February 2023
No Scale

Note: Flow Sheet Provided by U. S. Silica Company, with Additions by John T. Boyd Company.

palletized; packaged in bulk bags to supply larger industrial customers; or, loaded directly into rail cars.

14.2 Production

The Colado Operation's LOM plan forecasts increased production from the processing plant until the nominal production capacity is reached. Recent annual production results and forecasted production over the expected life of the operation are provided in Figure 14.2.

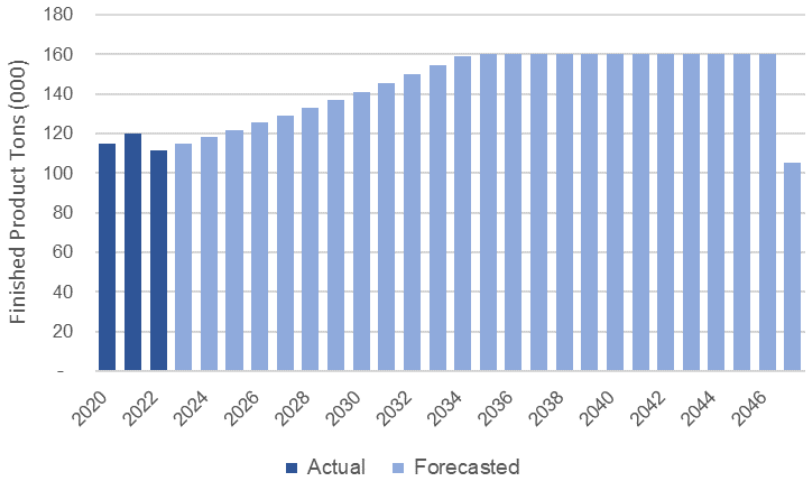


Figure 14.2: Recent Historical and Forecasted Saleable Processing Plant Production

14.3 Conclusion

Based on our review, it is BOYD's opinion that the processing methods and existing equipment at the Colado Processing Plant will be sufficient for the forecasted production of finished DE products.

15.0 MINE INFRASTRUCTURE

15.1 Overview

All of the basic infrastructure required for the ongoing operations is in place at the Colado Operation. Figures 3.1 and 3.2 (pages 3-3 and 3-4, respectively) illustrate the general layout of the infrastructure at the Colado Mine and Colado Processing Plant, respectively.

The surface facilities currently located at the operation are well constructed and have the necessary capacity/capabilities to support the Colado Operation's near-term operating plans. Operational preference may lead to the upgrading of some existing facilities if the operation expands in the future.

BOYD is unaware of any reported interruptions, outages, shortages, or failures related to infrastructure requirements which have materially affected the Colado Operation. Given the operation is well-established, we believe the risk of such events materially affecting the estimates of DE reserves presented herein is low.

15.2 Transportation

The Colado Operation is serviced by several roads maintained by the local municipality, county, and state governments. The Colado Mine site is accessed by using CR 399 (7 Troughs Road) which connects to I-80 near Lovelock, Nevada. The processing plant has access to Business Highway 95 (Upper Valley Road), which also provides direct access to I-80, east of the plant. These roads are either paved or well-maintained graded roadways. Road access is typically available year-round.

A rail siding for bulk transportation is in place at the Colado Processing Plant. This railhead is the mainline owned by the UP railroad along the I-80 corridor. U.S. Silica owns and operates rail loading infrastructure at the plant. In-plant switching is handled by U.S. Silica with a Trackmobile Railcar Mover to bring in empty cars from the mainline and return loaded ones for the UP to haul away.

15.3 Utilities

Electric power at the mine site is provided by diesel generators and solar power. The processing plant is supplied electric power by Nevada Energy. The power is delivered by an above-ground network of utility poles running parallel to I-80 from the east and into

the plant substation. Power is then distributed by a combination of above and below ground power lines.

Natural gas used by the processing plant is currently supplied by Paiute Pipeline Company (a subsidiary of Southwest Gas) via an underground pipeline that runs parallel to I-80. The mine site is not supplied with natural gas.

Water for the mine site is primarily used for dust suppression and is trucked in by tanker from a municipal water source. Potable water is provided by bottles and jugs. Both industrial and potable water for the processing plant is provided by the local municipality utility company and is delivered via a series of underground pipes.

15.4 Tailings Disposal

The processing of DE at the Colado Processing Plant creates a substantial amount of waste tailings. This waste byproduct is primarily a combination of opalite, basalt, and clay. The tailings are hauled by U.S. Silica's semi-trailer truck fleet on their return trip to the mine site. At the mine site, the tailings are dumped into exhausted pits to be used as fill material during reclamation.

15.5 Other Structures

The mine site has few structures. Currently a maintenance shelter used to service the mining equipment and a small portable office reside on site.

The processing plant has undergone several upgrades and changes over its 50+ years of operation. In addition to the plant itself, the site also contains:

- Office buildings that host engineering, financial and administrative staff.
- Several support buildings for housing machinery and maintenance activities.
- A warehouse for material storage and product bagging.
- Several product loadouts.
- Various pump structures and outbuildings.

16.0 MARKET STUDIES

16.1 Product Specifications

The Colado Operation is part of U.S. Silica's Industrial & Specialty Products (ISP) business segment. The ISP unit produces products that 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 Colado Operation produces a wide range of finished DE products, which generally fall into one of the following categories:

- Food grade products (filter-aids) sold into the filtration markets are used extensively to filter out contaminants from fruit juices, wine, beer, sugar, bio-diesel fuel, high fructose corn syrup, and water.
- Fine-filler products are used as additives in paints, rubber, paper, and plastics.
- Aggregate products, which are used primarily as industrial absorbents, catalysts, and carriers for pesticides.

In terms of sales volume, the aggregate products are significantly smaller compared to the filtration and filler products.

16.2 Historical Sales

Recent historical sales figures provided by U.S. Silica for the Colado Operation are summarized in Table 16.1, below.

Table 16.1: Historical Sales Data

	Units	2020	2021	2022
Product Sales	000 tons	115	120	111
Average Selling Price	$/ton sold	491.94	565.91	697.27

Over the past three years, the average selling price (ASP) for the Colado Operation's finished DE products increased almost 42%.

According to sales information provided by U.S. Silica for the Colado Operation:

- Contract sales account for roughly 30% of total product sales.
- The top-five customer by sales revenue account for approximately 18% of total sales.

Based on estimates provided by the USGS, the Colado Operation accounted for approximately 10% of the total production of finished DE products in the U.S. during 2022.

BOYD is not aware of any material contracts for the sale of finished DE products from the Colado Operation.

16.3 Market Outlook

The market for DE is driven by the increasing demand for natural and eco-friendly products, as well as the growing awareness of the benefits of DE in agriculture and sanitation, as well as the increasing use of DE in the construction, paint, and coatings industries.

The DE market is segmented by product type, application, and geography. By product type, the market is segmented into food and filter grade. By application, the market is segmented into agriculture, construction, paint and coatings, animal feed, and others. Geographically, the market is driven by transportation costs. While many materials can be substituted for DE, its unique properties assure its continued use in many applications.

According to the USGS, the amount of produced DE sold in US has generally increased year-over-year, excepting a small dip in 2019 and 2020 as the result of decreased demand due to the COVID-19 pandemic. It should be noted that the Colado Operation production did not suffer a similar dip during COVID-19 pandemic. Based on the USGS's estimates, the CAGR for domestic DE production between 2018 and 2022 is 3.5%, while the post-COVID (2019–2022) CAGR is 12.7%.

Strong growth in demand and increased prices for finished DE products from the Colado Operation are expected. BOYD believes it is reasonable to assume that pricing will sustain over the remaining life of the Colado Operation.

17.0 PERMITTING AND COMPLIANCE

17.1 Permitting

Numerous permits are required by federal, state, and municipal law for mining, processing, and related activities at the Colado Operation. U.S. Silica reports that necessary permits to support current and near-term operations are in place or pending approval. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of current regulations.

A description of the salient permitting requirements for the Colado Operation follows.

Surface mining of private and BLM land at Colado is authorized under U.S. Silica's Mine Plan of Operations NVN-065329 and Nevada Reclamation Permit No. 0182. U.S. Silica has updated or amended the permits over the course of operation to enable mining of increasing areas of the property. Surety bonds totaling approximately $16.1 million have been submitted to the BLM in Nevada to underwrite permit reclamation requirements.

U.S. Silica utilizes a Spill Prevention, Controls and Countermeasure (SPCC) Plan at the Colado Operation to address requirements of the Federal Oil Pollution Prevention Regulations (40 CFR Part 112). The SPCC Plan establishes oil spill preparedness, prevention, planning, response, and notification procedures per the federal regulations and addresses state-specific oil spill reporting notification and response requirements as administered by the Nevada State Emergency Response Commission.

The Nevada Division of Water Resources authorizes the annual use of up to 1,052 acre-feet of groundwater through Permit Nos. 87089, 18091, 24074, 7558, and 5238. Monthly reporting and metering are required. This water is trucked to the mine site for dust suppression.

U.S. Silica holds several permits authorized by the NDEP, including a Class I Air Quality Operating Permit No. AP1499-3768, Class II Surface Area Disturbance Permit No. AP1499-0862.04, and a Class III Landfill Waiver No. SWW1713.

The Nevada State Fire Marshal has issued the following Hazardous Materials Permits to U.S. Silica:

- Hazardous Materials Permit No. 95886 for hazardous materials/fuels at the mine.
- Hazardous Materials Permit No. 95888 for hazardous materials/fuels at the mine shop.
- Hazardous Materials Permit No. 101676 for hazardous materials/fuels at the processing plant.

U.S. Silica is in the process of acquiring a Nevada Industrial Stormwater Multisector General Permit No. NVR050000 which will authorize the discharge of water from the processing plant site in the event of a 2-year, 24-hour storm. This permit is currently pending approval.

17.2 Compliance

U.S. Silica reports having an extensive environmental management and compliance process designed to follow or to exceed industry standards.

In their 2021 corporate sustainability report, U.S. Silica reports:

- Increasing the use of renewable energy sources.
- Improving the quality of local water by utilizing best-in-class tailings management techniques.
- Recycling or reusing tailings waste for land reclamation.

Mine safety is regulated by the MSHA. MSHA inspects the facilities a minimum of twice yearly. U.S. Silica's safety record compares favorably with its regional peers.

Based on our review of information provided by U.S. Silica and available public information, it is BOYD's opinion that the Colado Operation's record of compliance with applicable mining, water quality, and environmental regulations is generally typical for that of the industry. BOYD is not aware of any regulatory violation or compliance issue which would materially impact the DE reserve estimate.

17.3 Post-Mining Land Use and Reclamation

Disturbed areas at the Colado Operation must be reclaimed in accordance with approved reclamation and abandonment plans. These plans are a condition of U.S. Silica's operating permits and licenses and generally require:

- Regrading and landscaping of all disturbed areas.
- Regrading and landscaping of stockpiles.
- Removal of all equipment and structures.
- Regrading and landscaping of disused roads.
- Destruction or breaching of any dams or impoundments.
- Disposal of all hazardous wastes.

Mine site reclamation costs are funded from U.S. Silica's Asset Retirement Obligations (ARO) account. Funding of the ARO account is included in the Colado Operation's operating costs discussed in Chapter 18 and included in the economic analysis presented in Chapter 19. ARO costs estimates are reviewed annually and current estimated at approximately $16.1 million for the Colado Operation. As a matter of good mining practice, U.S. Silica seeks to conduct progressive reclamation throughout the operation's mining life to minimize risk and costs at closure.

17.4 Community Engagement

The Colado Operation has been a fixture in the Lovelock, Nevada community since the late-1950s. U.S. Silica is one of the major employers and economic contributors in the area. BOYD is unaware of any plans, negotiations, agreements with local individuals or groups or commitments to ensure local procurement and hiring.

U.S. Silica's corporate sustainability report outlines the components of its core community engagement initiatives. It's stated priorities include increasing charitable contributions to organizations that support the local community and actively seeking opportunities for volunteering and community engagement.

18.0 CAPITAL AND OPERATING COSTS

18.1 Historical Financial Performance

Table 18.1 summarizes the past three years of financial data for the Colado Operation.

Table 18.1: Historical Financials

	Units	2020	2021	2022
Production:				
ROM Production	000 tons	151	166	175
Process Yield	%	76.1	72.3	63.7
Product Sales	000 tons	115	120	111
Gross Revenues	$ 000	56,544	67,948	77,719
Average Selling Price	$/ton sold	491.94	565.91	697.27
Total Cash Costs of Sales	$ 000	37,799	48,367	60,800
Average Cash Cost of Sales	$/ton sold	328.86	402.84	545.48
Capital Expenditures	$ 000	1,731	4,835	5,897

Gross revenues include income from product sales and shipping.

Total cash costs of sales include operating costs (i.e., mining, ongoing reclamation, processing, product loadout, and other related costs) in addition to selling, general, and administrative expenses.

Capital expenditures include maintenance (sustaining) expenses and discretionary spending on continuous improvement projects to drive and maintain cost efficiencies.

Based on the financial data presented above:

- Average realization (selling price) for finished DE products increased from $491.94 per ton sold in 2020 to $697.27 per ton sold in 2022.
- Total cash cost of sales also increased from $328.86 per ton sold in 2020 to $545.48 per ton sold in 2022.
- EBITDA margin decreased from 33.2% in 2020 to 21.8% in 2022.
- Capital expenditures totaled almost $12.5 million over the three years, averaging $35.97 per ton sold.

18.2 Estimated Costs

The production and unit cost estimates provided by U.S. Silica are based on actual past performance and their customary internal budget review and approvals process. Operating volumes are well-defined and understood, as are mining and processing productivities. As such, it is BOYD's opinion that the production and financial projections are reasonable and are likely to be within ±20% accuracy level.

This section contains forward-looking information related to capital and operating cost estimates for the Colado Operation.

There are inherent known and unknown risks and uncertainties associated with all mining operations. These risks, uncertainties, and other factors are not quantifiable, but include or are not limited to, adverse general economic conditions, operating hazards, inherent uncertainties in interpreting engineering and geologic data, fluctuations in commodity prices and prices for operational services, government regulation and political risks, as well as other risks commonly associated with the mining industry.

18.2.1 Projected Capital Expenditures

The Colado Operation and related facilities are fully developed and should not require any near-term major capital investment to maintain full commercial production. Historically, the timing and amount of capital expenditures has been largely discretionary and within U.S. Silica's control. Their budgetary allocations for sustaining and discretionary capital expenditures over the next three years is provided in Table 18.2, below.

Table 18.2: Projected Capital Costs

Year	CapEx ($ 000)
2023	5,527
2024	5,883
2025	5,876
Total	17,286

BOYD considers the near-term detailed capital expenditure schedule as presented by U.S. Silica to be reasonable and representative of the capital necessary to operate the Colado Operation.

After 2025, capital expenditures are projected to increase 3% per year from 2025s level until the end of operation's life. As the Colado Operation is in a steady state of production, the projected capital expenditures are considered reasonable and expected.

18.2.2 Projected Operating Costs

Operating cost estimates were developed based on recent actual costs and considering specific operational activity levels and cost drivers. The estimates consider current and expected labor headcount and salaries, major consumables and unit prices, power costs, and equipment and maintenance costs. The total operating cost estimate includes all site costs related to mining, processing, and general and administrative activities.

In the near-term, U.S. Silica expects their unit operating costs to stay relatively consistent (on an uninflated basis). As such, the projected total cash cost of sales over the life of the mine is $545.48 per ton sold. As the operation is in a steady state, BOYD considers the future operating cost estimates to be reasonable and appropriate.

19.0 ECONOMIC ANALYSIS

19.1 Approach

The economic analysis presented in this chapter was made for the purposes of confirming the commercial viability of the Colado Operation's reported DE reserves and not for the purposes of valuing U.S. Silica, the Colado Operation, or its assets. The economic analysis contains forward-looking information related to the projected operating and financial performance of the Colado Operation and therefore involves inherent known and unknown risks and uncertainties, some of which may be outside of U.S. Silica's control. U.S. Silica, as with all mining companies, actively evaluates, changes, and modifies business and operating plans in response to various factors that may affect operational and/or financial results. Actual results, production levels, operating expenses, sales realizations, and all other modifying factors could vary significantly from the assumptions and estimates provided in this analysis. Risk is subjective, as such, BOYD recommends that each reader should evaluate the project based on their own investment criteria.

The financial model used for the purposes of the economic analysis has been prepared in-house by U.S. Silica as part of their annual budgeting process. The model forecasts future free cash flow from DE production and sales over the life cycle of the Colado Operation using the annual forecasts of production, sales revenues, and operating and capital costs discussed earlier in this report. A DCF analysis, in which future free cash flows are discounted to present value, is used to derive a NPV for the DE reserves. Use of DCF-NPV analysis is a standard method within the mining industry to assess the economic value of a project after allowing for the cost of capital invested.

The financial evaluation of the Colado Operation has been undertaken on a simplified after-tax basis and does not reflect U.S. Silica's corporate tax structure. NPV is calculated using an after-tax discount rate of 12.5% ($NPV_{12.5}$). Cash flows were assumed to occur in the middle of each year and are discounted to mid-year 2022. Cost estimates and other inputs to the cash flow model for the project have been prepared using constant 2022 money terms, i.e., without provision for inflation. IRR and project payback were not calculated, as there was no initial investment (sunk costs) considered in the financial model provided herein.

A suite of sensitivities was calculated to evaluate the effect of the main drivers of economic performance, including variations in sales prices, operating costs, and capital costs.

BOYD has reviewed the financial model and its inputs in detail. It is our opinion that the financial model provides a reasonable and accurate reflection of the Colado Operation's expected economic performance based on the assumptions and information available at the time of our review.

19.2 Assumptions and Limitations

Cash flow projections for the Colado Operation have been generated from the annual forecasts of production, sales revenues, and operating and capital costs discussed earlier in this report. A summary of the key assumptions and limitations is provided below:

- Sales volumes of finished DE are expected to increase 3% per annum (limited by processing plant capacity of 160,000 product tons per year) while maintaining a consistent product mix.
- ROM production requirements are based on an expected processing yield of 81.6% (the historic average) and are also projected to increase 3% per annum until plant capacity is reached. Forecasted ROM production is at or below the capacity of the existing mining equipment and related infrastructure.
- Forecasted revenues are based on sales of various grades of finished DE with a weighted-average sales price of $697.27 per ton.
- Capital and operating costs are discussed in Chapter 18. Capital expenditures are derived from budgetary allocations for the first three years of the forecast and escalated thereafter at 3% per annum. Unit operating costs are expected to remain relatively constant over the life of the operation at $545.48 per sold ton.
- Taxes are based on combined Federal and State Tax rates totaling 26%.
- Buildup of net working capital is equal to 25% of positive cash (operating) margins.
- Depreciation and amortization expenses are estimated as the average of the proceeding three years.
- No asset recovery/salvage values were included in the valuation.

19.3 Financial Model Results

Estimated LOM pre-tax and after-tax cash flows for DE production from the Colado Operation are presented in Table 19.1, on the following page.

Table 19.1

ANNUAL PRODUCTION AND CASH FLOW FORECAST
COLADO OPERATION
Prepared For
U.S. SILICA COMPANY
By
John T. Boyd Company
Mining and Geological Consultants
February 2023

Description	Units	2023	2024	2025	2026	2027	2028 to 2032	2033 to 2042	2043 to 2047	Total
Production:										
ROM Production	000 tons	141	145	149	154	158	866	1,952	914	4,479
Product Sales	000 tons	115	118	122	125	129	707	1,593	746	3,655
Total Revenues	$ 000	80,051	82,452	84,926	87,474	90,098	492,692	1,110,896	519,839	2,548,427
Average Selling Price	$/ton sold	697.27	697.27	697.27	697.27	697.27	697.27	697.27	697.27	697.27
Total Cash Costs of Sales	$ 000	62,624	64,503	66,438	68,431	70,484	385,437	869,063	406,675	1,993,655
Average Cash Cost of Sales	$/ton sold	545.48	545.48	545.48	545.48	545.48	545.48	545.48	545.48	545.48
EBITDA	$ 000	17,426	17,949	18,488	19,042	19,614	107,255	241,833	113,165	554,772
Depreciation & Amortization	$ 000	7,154	7,186	7,102	7,147	7,145	35,689	71,388	35,694	178,506
EBIT	$ 000	10,272	10,763	11,386	11,895	12,468	71,566	170,445	77,471	376,265
Taxes	$ 000	2,671	2,798	2,960	3,093	3,242	18,607	44,316	20,142	97,829
Operating Income	$ 000	7,601	7,965	8,425	8,802	9,227	52,958	126,129	57,328	278,436
Capital Expenditures	$ 000	5,527	5,883	5,876	6,052	6,234	34,089	85,332	53,110	202,103
Net Working Capital Contribution	$ 000	127	131	135	139	143	781	387	-	1,842
Net Income	$ 000	1,948	1,951	2,415	2,611	2,850	18,088	40,410	4,219	74,491
Pre-tax Cash Flow	$ 000	11,773	11,935	12,477	12,851	13,237	72,385	156,114	60,055	350,827
Discounted at 12.5%	$ 000	11,099	10,003	9,295	8,510	7,791	30,130	28,519	4,459	109,805
After-tax Cash Flow	$ 000	9,102	9,137	9,517	9,759	9,995	53,778	111,798	39,912	252,998
Discounted at 12.5%	$ 000	8,581	7,657	7,089	6,462	5,883	22,412	20,533	2,982	81,600

Table 19.2, below, provides a summary of the estimated remaining life of mine financial results for the Colado Operation.

Table 19.2: Financial Results

	Units	Remaining Life of Mine Total
Remaining Life	years	25
Production:		
ROM Production	000 tons	4,479
Product Sales	000 tons	3,655
Total Revenues	$ millions	2,548.4
Total Cash Costs of Sales	$ millions	1,993.7
Capital Expenditures	$ millions	202.1
Pre-Tax:		
Cash Flow	$ millions	350.8
$NPV_{12.5}$	$ millions	109.8
After-tax:		
Cash Flow	$ millions	253.0
$NPV_{12.5}$	$ millions	81.6

DCF-NPV on a pre-tax and after-tax basis, using discount rates of 10%, 12.5% (the base case), and 15%, were calculated utilizing the projected cash flows. Table 19.3 summarizes the results of the pre-tax and after-tax DCF-NPV analyses:

Table 19.3: DCF-NPV Analysis

	NPV ($ millions)		
	10%	12.5%	15%
Pre-Tax	131.2	109.8	93.8
After-Tax	97.0	81.6	70.0

As shown, the pre-tax DCF-NPV ranges from approximately $93.8 million to $131.2 million. The after-tax DCF-NPV ranges from approximately $70 million to $97 million.

The economic analysis confirms that the Colado Operation generates positive pre- and after-tax financial results and a real $NPV_{12.5}$ of $81.6 million. As such, it is BOYD's opinion that the Colado Operation's DE reserves have demonstrated economic viability.

19.4 Sensitivity Analysis

Table 19.4, below, shows the sensitivity of the project after-tax for a cash flow discounted at 12.5% ($NPV_{12.5}$) to a variation over a range of 20% above and below the base case in: (1) average selling prices and (2) operating costs.

Table 19.4: After-Tax $NPV_{12.5}$ Sensitivity Analysis ($ millions)

Cash Costs of Sales \ Revenues	-20%	-15%	-10%	-5%	0%	5%	10%	15%	20%
-20%	57.3	85.1	112.2	139.2	166.3	193.4	220.4	247.5	274.6
-15%	35.5	63.4	91.0	118.1	145.1	172.2	199.3	226.3	253.4
-10%	13.9	41.6	69.5	96.9	123.9	151.0	178.1	205.2	232.2
-5%	-	19.8	47.7	75.6	102.8	129.8	156.9	184.0	211.0
0%	-	0.7	25.9	53.7	**81.6**	108.7	135.7	162.8	189.9
5%	-	-	5.2	31.9	59.8	87.5	114.6	141.6	168.7
10%	-	-	-	10.6	38.0	65.9	93.4	120.5	147.5
15%	-	-	-	-	16.3	44.1	72.0	99.3	126.3
20%	-	-	-	-	-	22.3	50.1	78.1	105.2

As might be expected, the project is most sensitive to changes in product pricing and operating costs. The Colado Operation generates negative value only if costs are increased substantially and/or selling prices are reduced significantly.

The project is less sensitive to capital costs. There is little to no impact varying the capital costs from 70% to 130% of the base case.

This analysis demonstrates the project value to be relatively robust; with positive NPVs reported across the range of values assessed.

20.0 ADJACENT PROPERTIES

There is no information used in this report that has been sourced from adjacent properties. BOYD is unaware of any mining or exploration activities having occurred on the adjacent properties.

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21.0 OTHER RELEVANT DATA AND INFORMATION

BOYD is not aware of any additional information which would materially impact the DE resource and reserve estimates reported herein.

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22.0 INTERPRETATION AND CONCLUSIONS

22.1 Audit Findings

BOYD's independent technical assessment was conducted in accordance with S-K 1300 and concludes:

- Sufficient data have been obtained through site exploration and sampling programs and mining operations to support the geological interpretations of the DE deposit within the controlled property of the Colado Operation. The data are of sufficient quantity and reliability to reasonably support the DE resource and reserve estimates presented in this report.
- BOYD is of the opinion that our data verification efforts: (1) adequately confirm the reasonableness of the geologic interpretations, resource estimation criteria, and economic assumptions; and (2) support the use of the data in DE resource/reserve estimation.
- The nearly 3.7 million saleable product tons of DE reserves (as of December 31, 2022) identified on the property are reasonably and appropriately supported by technical studies, which consider expected geologic conditions, planned mining and processing operations, forecasted product revenues, and operating and capital cost estimates. As such, BOYD is of the opinion that there are reasonable expectations that the stated DE reserves for the Colado Operation are technically, economically, and legally extractable as of December 31, 2022.
- In addition to the reported reserves, U.S. Silica controls approximately 689,000 in-place tons of inferred DE resources at the Colado Operation. It is BOYD's opinion that the stated DE resources have been reported using economic and mining assumptions which support the reasonable potential for eventual economic extraction.
- There is no other relevant information material to the Colado Operation that is necessary to make this technical report summary not misleading.

22.2 Significant Risks and Uncertainties

As a mining operation with a lengthy operating history, the purpose of U.S. Silica's periodic mine planning exercises is to: (1) collect and analyze sufficient data to reduce or to eliminate risk in the technical components of the project, and (2) to refine economic projections based on current data. There is a high degree of certainty for this project under the current and foreseeable operating environment. A general assessment of risk is presented in the relevant sections of this report.

23.0 RECOMMENDATIONS

Based on the scope of our assignment, BOYD has no recommendations regarding the Colado Operation. It is our understanding that U.S. Silica continuously reviews and improves operating practices as a matter of course.

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24.0 REFERENCES

A list of supporting information is provided in Section 2.4. Additional references are cited as footnotes in the report as required.

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25.0 RELIANCE ON INFORMATION PROVIDED BY REGISTRANT

In the preparation of this report, BOYD has relied, exclusively and without independent verification, upon information furnished by U.S. Silica as presented in Table 25.1, below.

Table 25.1: Information Relied Upon from Registrant

Subject Matter	Information	Report Chapter(s)
Environmental	Permits, bond, and reclamation liability	3, 17
	Sustainability initiatives	17
	Surface tailings management	15
	Mine closure requirements and plans	17
	Monitoring/compliance requirements for protected areas/species	3, 17
Governmental	Income tax rates	19
Legal	Property title and status	3
	Encumbrances, easements, and right-of-ways	3
Macroeconomics	Inflation, interest, and discount rates	19
Markets	Market overview and strategy	16
	Long-term product price projections	11, 12, 16, 19
	Product specifications	16
	Marketing and sales contracts	16
Social	Community relations	17

BOYD exercised due care in reviewing the information provided by U.S. Silica within the scope of our expertise and experience (which is in technical and financial mining issues) and concluded the data are reasonable and appropriate considering the status of the subject properties and the purpose for which this report was prepared. We have no reason to believe that any material facts have been withheld or misstated, or that further analysis may reveal additional material information. However, the accuracy of the results and conclusions of this report are reliant on the accuracy of the information provided by U.S. Silica.

TECHNICAL REPORT SUMMARY
PROPPANT SAND RESOURCES AND RESERVES
LAMESA OPERATION

Dawson County, Texas

Prepared For

U.S. SILICA COMPANY

Katy, Texas

By

John T. Boyd Company

Mining And Geological Consultants

Pittsburgh, Pennsylvania

Report No. 3076.018

FEBRUARY 2023

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February 22, 2023

JOHN T. BOYD COMPANY

Mining and Geological Consultants

File: 3076.018

U.S. Silica Company
24275 Katy Freeway, Suite 600
Katy, TX 77494-7271

Attention: Mr. Terry Lackey
Mining Director

Subject: Technical Report Summary
Proppant Sand Resources and Reserves
Lamesa Operation
Dawson County, Texas

Ladies and Gentlemen:

The John T. Boyd Company (BOYD) was retained by U.S. Silica Company (U.S. Silica) to complete an independent technical assessment of the proppant sand resource and reserve estimates for the Lamesa Operation as of December 31, 2022.

This technical report summary: (1) summarizes material technical and geoscientific information for the subject mining property, (2) provides the conclusions of our technical assessment, and (3) provides a statement of proppant sand resources and reserves for the Lamesa Operation.

Respectfully submitted,

JOHN T. BOYD COMPANY

By:

John T. Boyd II
President and CEO

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GLOSSARY OF ABBREVIATIONS AND DEFINITIONS

000	:	Thousand(s)
$	:	US dollar(s)
%	:	Percent or percentage
AEI	:	Associated Environmental Industries, Corp.
AMSL	:	Above mean sea level
API	:	American Petroleum Institute
ARO	:	Asset Retirement Obligation(s)
ASP	:	Average Selling Price
ASTM	:	ASTM International (formerly American Society for Testing and Materials)
BNSF	:	BNSF Railway Company
BOYD	:	John T. Boyd Company
CapEx	:	Capital expenditures
Constant Dollar	:	A monetary measure that is not influenced by inflation and used to compare time periods. Sometimes referred to as “real dollars”.
CSX	:	CSX Transportation
DCF	:	Discounted Cash Flow
Discount Rate	:	A rate of return used to discount future cash flows based on the return investors expect to receive from their investment.
E&P	:	Exploration and Production
EBIT	:	Earnings before interest and taxes
EBITDA	:	Earnings before interest, taxes, depreciation, and amortization
ESA	:	Environmental Site Assessment
Frac Sand	:	*See “Proppant Sand”*

GLOSSARY OF ABBREVIATIONS AND DEFINITIONS - Continued

ft	:	Foot/feet
Indicated Proppant Sand Resource	:	That part of a proppant sand resource for which quantity and quality are estimated based on adequate geological evidence and sampling. The level of geological certainty associated with an indicated proppant sand resource is sufficient to allow a qualified person to apply modifying factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Because an indicated proppant sand resource has a lower level of confidence than the level of confidence of a measured proppant sand resource, an indicated proppant sand resource may only be converted to a probable proppant sand reserve.
Inferred Proppant Sand Resource	:	That part of a proppant sand resource for which quantity and quality are estimated based on limited geological evidence and sampling. The level of geological uncertainty associated with an inferred proppant sand resource is too high to apply relevant technical and economic factors likely to influence the prospects of economic extraction in a manner useful for evaluation of economic viability. Because an inferred proppant sand resource has the lowest level of geological confidence of all proppant sand resources, which prevents the application of the modifying factors in a manner useful for evaluation of economic viability, an inferred proppant sand resource may not be considered when assessing the economic viability of a mining project, and may not be converted to a proppant sand reserve.
IRR	:	Internal rate-of-return
ISO		International Organization for Standardization
ISP	:	Industrial and Specialty Products
lb	:	Pound
LOM	:	Life-of-Mine
Lyntegar	:	Lyntegar Electric Cooperative, Inc.

Measured Proppant Sand Resource	:	That part of a proppant sand resource for which quantity and quality are estimated based on conclusive geological evidence and sampling. The level of geological certainty associated with a measured proppant sand resource is sufficient to allow a qualified person to apply modifying factors, as defined herein, in sufficient detail to support detailed mine planning and final evaluation of the economic viability of the deposit. Because a measured proppant sand resource has a higher level of confidence than the level of confidence of either an indicated proppant sand resource or an inferred proppant sand resource, a measured proppant sand resource may be converted to a proven proppant sand reserve or to a probable proppant sand reserve
Mesh	:	A measurement of particle size often used in determining the size distribution of granular material.
Mineral Reserve	:	*See "Proppant Sand Reserve"*
Mineral Resource	:	*See "Proppant Sand Resource"*
Modifying Factors		The factors that a qualified person must apply to indicated and measured proppant sand resources and then evaluate to establish the economic viability of proppant sand reserves. A qualified person must apply and evaluate modifying factors to convert measured and indicated proppant sand resources to proven and probable proppant sand reserves. These factors include but are not restricted to: mining; processing; infrastructure; economic; marketing; legal; environmental compliance; plans, negotiations, or agreements with local individuals or groups; and governmental factors. The number, type and specific characteristics of the modifying factors applied will necessarily be a function of and depend upon the mineral, mine, property, or project.
MSHA	:	Mine Safety and Health Administration. A division of the U.S. Department of Labor
MSGP	:	Multi-Sector General Permit
NTU	:	Nephelometric turbidity units.
NPV	:	Net Present Value
O&G	:	Oil and Gas

GLOSSARY OF ABBREVIATIONS AND DEFINITIONS - Continued

Probable Proppant Sand Reserve	:	The economically mineable part of an indicated and, in some cases, a measured proppant sand resource.
Production Stage Property	:	A property with material extraction of proppant sand reserves.
Proppant Sand	:	Proppant (frac) sand is a naturally occurring, high silica content quartz sand, with grains that are generally well rounded and exhibit high compressive strength characteristics relative to other proppant sand. It is utilized as a prop or “proppant” in unconventional shale frac well completions.
Proppant Sand Reserve	:	Proppant sand reserve is an estimate of tonnage and grade or quality of indicated and measured proppant sand resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated Proppant sand resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted.
Proppant Sand Resource	:	Proppant sand resource is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. A proppant sand resource is a reasonable estimate of mineralization, taking into account relevant factors such as cut-off grade, likely mining dimensions, location or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable. It is not merely an inventory of all mineralization drilled or sampled.
Proven Proppant Sand Reserve	:	The economically mineable part of a measured proppant sand resource which can only result from conversion of a measured proppant sand resource.
PSI	:	Pounds per square inch
PST	:	Petroleum Storage Tank
QP	:	Qualified Person

Qualified Person	:	An individual who is: 1. A mineral industry professional with at least five years of relevant experience in the type of mineralization and type of deposit under consideration and in the specific type of activity that person is undertaking on behalf of the registrant; and 2. An eligible member or licensee in good standing of a recognized professional organization at the time the technical report is prepared. For an organization to be a recognized professional organization, it must: a. Be either: i. An organization recognized within the mining industry as a reputable professional association; or ii. A board authorized by U.S. federal, state, or foreign statute to regulate professionals in the mining, geoscience, or related field; b. Admit eligible members primarily based on their academic qualifications and experience; c. Establish and require compliance with professional standards of competence and ethics; d. Require or encourage continuing professional development; e. Have and apply disciplinary powers, including the power to suspend or expel a member regardless of where the member practices or resides; and f. Provide a public list of members in good standing.
ROM	:	Run-of-Mine. The processing feed material, including proppant sand and any inseparable waste, excavated from the mine.
SEC	:	U.S. Securities and Exchange Commission
S-K 1300	:	Subpart 1300 and Item 601(b)(96) of the U.S. Securities and Exchange Commission's Regulation S-K
SWPPP	:	Stormwater Pollution Prevention Plan
Ton	:	Short Ton. A unit of weight equal to 2,000 pounds
TCEQ	:	Texas Commission on Environmental Quality
U.S. Silica	:	U.S. Silica Company, its parent company (U.S. Silica Holdings, Inc.) and its consolidated subsidiaries as a combined entity.
WIP	:	Work-in-progress

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Commissioned in 2018, U.S. Silica's Lamesa Operation is an active surface mining and processing operation that produces a range of finished proppant (frac) sand products.

BOYD prepared this technical report summary for U.S. Silica in support of their disclosure of proppant sand reserves for the Lamesa Operation in accordance with Subpart 1300 and Item 601(b)(96) of the SEC's Regulation S-K (S-K 1300). The purpose of this report is threefold: (1) to summarize material technical and geoscientific information for the subject mining property, (2) to provide the conclusions of our technical assessment, and (3) to provide a statement of proppant sand resources and/or reserves for the Lamesa Operation.

Information used in our assessment was obtained from: (1) files provided by U.S. Silica, (2) discussions with U.S. Silica personnel, (3) records on file with regulatory agencies, (4) public sources, and (5) nonconfidential information in BOYD's possession.

Unless otherwise noted, the effective date of the information, including estimates of proppant sand resources and reserves, is December 31, 2022.

Weights and measurements are expressed in the US customary measurement system throughout this report.

1.2 Property Description

U.S. Silica's Lamesa Operation is located northwest of the City of Lamesa in Dawson County, Texas. The cities of Lubbock and Dallas, Texas, are located approximately 56 miles northeast and 312 miles east, respectively, of the Lamesa Operation. The general location of the Lamesa Operation is provided in Figure 1.1, following this page.

The property comprises ±3,523 generally contiguous acres of surface and mineral rights wholly owned by U.S. Silica. The Lamesa Operation's mine offices, maintenance facilities, processing plant, loadout facilities, and tailings ponds are located on the northeast corner of the property, while the active and future mining areas are located to the west.

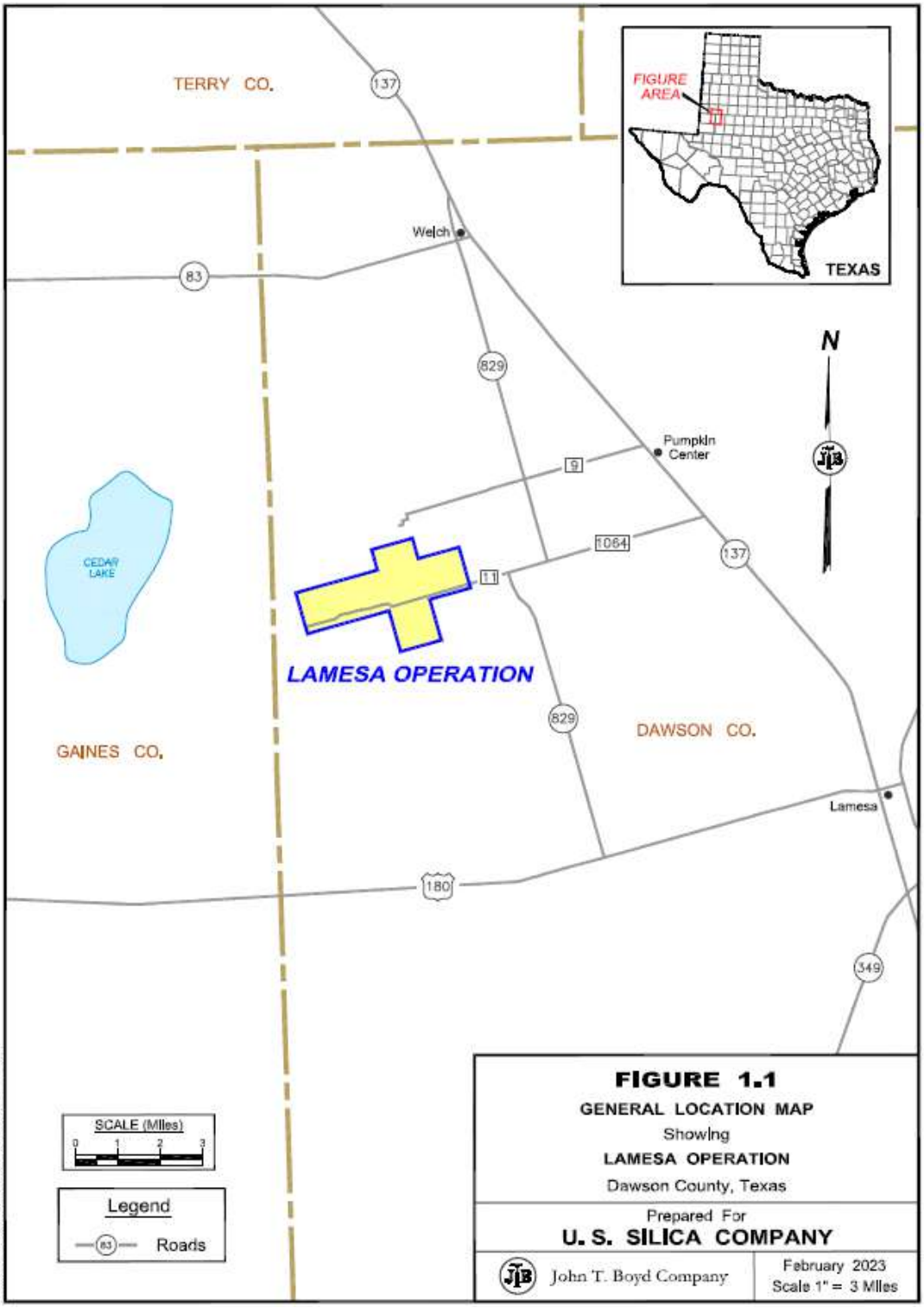


FIGURE 1.1

GENERAL LOCATION MAP

Showing

LAMESA OPERATION

Dawson County, Texas

Prepared For

U. S. SILICA COMPANY

John T. Boyd Company

February 2023

Scale 1" = 3 Miles

1.3 Geology

Most of the Lamesa property is covered by gently rolling Quaternary sheet and dune sands. Two surficial sand units have been targeted for mining—an upper clean sand unit and an underlying clayey cover sand unit.

Exploration data indicate the clean sand unit generally consists of unconsolidated, fine- to medium-grained, well sorted and subangular to rounded sand grains, ranging in thickness from 13 to 46 ft. The clean sand is noted as containing generally less than 10% to 15% of very fine (clay) material. The central and western extents of the Lamesa property exhibit the clean sand unit at the surface, thinning to the east, and the unit is absent over the eastern-most third of the property. The limit of the clean sand deposit is delineated by a clearly visible “dune line” running north to south and bisecting the subject property.

East of the dune line, the cover sand unit is present at the surface. The cover sand is also present and underlies nearly all the clean sand west of the dune line on the Lamesa property. Geologic logs describe this unit as consisting of a clayey, hard sandstone interval, with very fine- to medium-grained, subangular to rounded sand grains, ranging in thickness from 0 to 25 ft. The cover sand is noted as consisting of 15% to 45% fine material due to this unit’s higher clay content.

Where covered, the sand is overlain by a negligible layer of overburden material consisting of vegetation and oversize rock. The two sand units are generally mineable from the ground surface down to the basal red clay unit. Combined thickness of both sand units ranges from 25 to 65 ft across the property.

1.4 Exploration

During 2017 and 2018, U.S. Silica has completed three geologic exploration campaigns in and around the Lamesa property. U.S. Silica provided data collected from 49 drill holes completed in and around the Lamesa property that were utilized to define the lateral extent, thickness, particle size distribution, and proppant sand characteristics of the target sand deposit.

BOYD’s audit indicates that in general: (1) U.S. Silica has performed extensive drilling and sampling work on the subject property, (2) the work completed has been done by competent personnel, and (3) the amount of data available combined with extensive knowledge and recent production of the Llano Estacado deposit are sufficient to confirm the thickness, lateral extents, and quality characteristics of the Lamesa proppant sand reserves.

1.5 Proppant Sand Resources and Reserves

As shown in Table 1.1, below, U.S. Silica owns approximately 5.4 million in place tons of measured and indicated proppant sand resources and 5.0 million in place tons of inferred proppant sand resources, *exclusive* of proppant sand reserves, at the Lamesa Operation, as of December 31, 2022.

Table 1.1: Lamesa Operation Proppant Sand Resources[1] (as of December 31, 2022)

Classification	In-Place Tons (000)
Measured	622
Indicated	4,748
Total Measured + Indicated	5,370
Inferred	5,002

Notes:
1. Proppant sand resources are reported *in addition to* proppant sand reserves.

While these “additional” proppant sand resources have not been included in the Lamesa Operation’s life-of-mine (LOM) plan, they are considered to have prospects for eventual economic extraction by virtue of their similarity—in terms of demonstrated extraction methods and expected finished product qualities—to those converted to proppant sand reserves.

U.S. Silica’s estimated surface mineable proppant sand reserves for the Lamesa Operation total 79.6 million saleable product tons remaining as of December 31, 2022. The proppant sand reserves are fully owned by U.S. Silica and are summarized in Table 1.2, below.

Table 1.2: Lamesa Operation Proppant Sand Reserves (as of December 31, 2022)

	Tons (000)	
Classification	Mineable	Saleable
Proven	93,311	69,983
Probable	12,800	9,600
Total	106,111	79,583

The Lamesa Operation has a well-established commercial history of mining, processing, and selling proppant sand products to a variety of customers. BOYD has concluded that sufficient studies have been undertaken to enable the proppant sand resources to be converted to proppant sand reserves based on proposed operating methods and forecasted costs and revenues.

1.6 Operations

1.6.1 Mining

Contractors are employed to conduct surface mining on the central and western portions of the Lamesa property. The Llano Estacado sand is excavated using conventional truck and excavator methods. The negligibly thin layer of overburden is mined with the unconsolidated sand dunes. The sand does not require drilling or blasting. A front-end loader is used to load articulated haul trucks with disaggregated sand. The haul trucks deliver raw sand material to run-of-mine (ROM) stockpile located near processing facilities.

Over the past four years, the operation has mined almost 20 million tons of raw sand. During late 2019 and 2020, production fell due to the COVID-19 pandemic from roughly 4.8 million ROM tons per year to 4.2 million ROM tons. U.S. Silica's LOM plan forecasts mining 106.1 million ROM tons of sand at a rate of 6.1 million tons in 2023 increasing to 8.0 million by 2037 and ending in 2038.

BOYD reviewed the LOM plans for U.S. Silica's Lamesa Operation to determine whether the plans: (1) utilize generally accepted engineering practices, and (2) align with historical and industry norms. Based on our assessment, it is BOYD's opinion that the forecasted production levels for the Lamesa Operation are reasonable, logical, and consistent with typical sand mining practices in the west Texas region and historical results achieved by U.S. Silica.

1.6.2 Processing

The Lamesa Operation's Wet and Dry Processing Plants are located toward the eastern end of the site.

Mined ROM material from the pit arrives at the Wet Processing Plant by truck, where it is screened and washed to remove vegetation, oversize (> 40-mesh) and fine waste (< 200-mesh) material. The remaining material is mixed with water to create a slurry that is passed through a series of desliming cyclones and attrition scrubbers to remove clay and undersized (very fine) particles. The deslimed material is then processed through a

series of hydrosizers, hydro-cyclones, and vacuum filters to remove excess water. The remaining “work-in-progress” (WIP) material is stockpiled outside on a drain pad to further reduce moisture before it is recovered and enters the Dry Processing Plant. . Within the Dry Processing Plant, the WIP sand is dried, sized and sorted. The 40/70-mesh and 100-mesh dry finished products are stored in silos prior to loading in bulk truck for shipment to customers in the Permian Basin.

The processing operations have a nominal capacity of 6.0 million tons of finished sand per year. Based on our review, it is BOYD’s opinion that the processing methods and existing equipment at the plant will be sufficient for the forecasted production levels over the life of the operation.

1.6.3 Other Infrastructure

The Lamesa Operation is supported by various utilities and transportation networks needed to allow processing and transportation of finished proppant sands.

Electricity to the Lamesa site is delivered through an above-ground network that terminates at a substation at the processing facility, and from there electricity is distributed via several underground and above-ground powerlines.

Industrial water is recovered and recycled for reuse whenever possible. Makeup water is obtained from wells drilled on the Lamesa site and neighboring properties. Potable water is delivered in water jugs and bottles.

Natural gas is supplied via several underground pipelines.

Tailings from processing consist generally of clays, silts, and very fine sands, which are typically disposed of in old mining pit impoundments. The tailings ponds are currently located west of the processing plant and are designed to accommodate rejects produced during the next several years of production. At that time, it is expected that mining will have advanced to the west, and the then available mined pits will be used for tailings disposal.

Transportation needs are met through a well-developed road network on both paved and graded dirt roads. The Lamesa Operation is not served by any railroads.

1.7 Financial Analysis

1.7.1 Market Analysis

U.S. Silica supplies a range of proppant sand products to major Oilfield Services companies and Exploration and Production (E&P) companies operating in the Permian Basin. The Lamesa Operation is U.S. Silica's largest of two proppant sand operations in west Texas. Finished proppant sand products supplied by the Lamesa Operation primarily consist of non-API standard 40/140-mesh and "100-mesh" (50/140-mesh) sized sand, with lesser amounts of API standard 40/70-mesh sized sand.

U.S. Silica operates in a highly competitive market that is characterized by a small number of large, national proppant sand producers and a larger number of small, regional or local, privately-owned producers. Competition in the industry is based on: (1) delivered price; (2) product consistency and quality; (3) supply capacity and reliability; and (4) customer service and technical support. The Lamesa Operation's substantial on-site product storage capacity and its strategic, in-basin location allows shipping finished products to regional customers by truck. Since transportation costs are a significant portion of the total cost to customers of proppant sands, development of the Lamesa, Texas plant as a regional frac sand facility in the Permian Basin allows U.S. Silica to compete against proppant sand products being shipped from regional producers as well as from distant states like Wisconsin, Illinois, and Missouri.

U.S. Silica's product sales were materially impacted by the COVID-19 pandemic, with sales dropping precipitously in 2020. However, their sales volumes and revenues have recovered substantially, and continued growth is expected over the long-term.

1.7.2 Capital and Operating Cost Estimates

The Lamesa Operation's financial performance over the last years is summarized as follows:

- Average realization (selling price) for finished proppant sand products increased significantly from $21.85 per ton sold in 2020 to $31.39 per ton sold in 2022.
- Total cash cost of sales increased from $10.23 per ton sold in 2020 to $13.94 per ton sold in 2022.
- EBITDA margin increased slightly from 53.2% in 2020 to 55.6% in 2022.
- Capital expenditures totaled almost $4.2 million over the last three years, averaging $0.37 per ton sold.

Forward-looking production and unit cost estimates are based on actual past performance and subject to U.S. Silica's customary internal budget review and approvals

process. In BOYD's opinion, operating volumes are well-defined and understood, as are mining and processing productivities.

The Lamesa Operation and related facilities are fully developed and should not require any near-term major capital investment to maintain full commercial production. Historically, the timing and amount of capital expenditures has been largely discretionary and within U.S. Silica's control. Their budgetary allocations for sustaining and discretionary capital expenditures over the next three years totals $2.8 million. Thereafter, capital expenditures are expected to rise yearly at a rate of 3% annually starting in 2026. BOYD considers the near-term detailed capital expenditure schedule as presented by U.S. Silica to be reasonable and representative of the capital necessary to operate the Lamesa Operation.

Operating cost estimates were developed based on recent actual costs and considering specific operational activity levels and cost drivers. In the near-term, U.S. Silica expects their unit operating costs to stay relatively consistent (on an uninflated basis). As such, the projected total cash cost of sales over the life of the mine is $13.94 per ton sold. As the operation is in a steady state, BOYD considers the future operating cost estimates to be reasonable and appropriate.

1.7.3 Economic Analysis

An economic analysis of the Lamesa Operation was prepared in-house by U.S. Silica as part of their annual budgeting process. The financial model forecasts future free cash flow from proppant sand production and sales over the remaining life of the Lamesa Operation using the annual forecasts of production, sales revenues, and operating and capital costs.

Table 1.3, below, provides a summary of the estimated financial results for the remaining life of the Lamesa Operation.

Table 1.3: Financial Results

	Units	Remaining Life of Mine Total
Remaining Life	years	16
Production:		
ROM Production	000 tons	106,111
Product Sales	000 tons	79,583
Total Revenues	$ millions	1,902.0
Total Cash Costs of Sales	$ millions	1,109.4
Capital Expenditures	$ millions	10.9
Pre-Tax:		
Cash Flow	$ millions	778.3
$NPV_{12.5}$	$ millions	349.8
After-tax:		
Cash Flow	$ millions	658.7
$NPV_{12.5}$	$ millions	296.1

Table 1.4 summarizes the results of the pre-tax and after-tax discounted cash flows (DCF) and net present value (NPV) analyses for the Lamesa Operation.

Table 1.4: DCF-NPV Analysis

	NPV ($ millions)		
	10%	12.5%	15%
Pre-Tax	399.6	349.8	309.6
After-Tax	338.2	296.1	262.2

The NPV estimate was made for purposes of confirming the economic viability of the reported proppant sand reserves and not for purposes of valuing U.S. Silica, the Lamesa Operation, or its assets. Internal rate-of-return (IRR) and project payback were not calculated, as there was no initial investment considered in the financial analysis presented herein.

BOYD reviewed the financial model and its inputs in detail, and opined that model provides a reasonable and accurate reflection of the Lamesa Operation’s expected

economic performance based on the assumptions and information available at the time of our review.

1.8 Permitting Requirements

Numerous permits are required by federal and state law for mining, processing, and related activities at the Lamesa Operation, which U.S. Silica reports are in place or pending approval. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of current regulations.

U.S. Silica reports having an extensive environmental management and compliance process designed to follow or to exceed industry standards.

Mine safety is regulated by the U.S. Department of Labor's Mine Safety and Health Administration (MSHA). MSHA inspects the facilities a minimum of twice yearly. U.S. Silica's safety record compares favorably with its regional peers.

BOYD is not aware of any regulatory violation or compliance issue which would materially impact the proppant sand reserve estimate.

1.9 Conclusions

It is BOYD's overall conclusion that U.S. Silica's estimates of proppant sand reserves for the Lamesa Operation, as reported herein: (1) were prepared in conformance with accepted industry standards and practices, and (2) are reasonably and appropriately supported by technical evaluations, which consider all relevant modifying factors.

It is BOYD's opinion that extraction of the proppant sands reported herein is technically, legally, and economically achievable after the consideration of potentially material modifying factors. The ability of U.S. Silica, or any mine operator, to recover all the reported proppant sand reserves is dependent on numerous factors that are beyond the control of, and cannot be anticipated by, BOYD. These factors include mining and geologic conditions, the capabilities of management and employees, the securing of required approvals and permits in a timely manner, future proppant sand prices, etc. Unforeseen changes in regulations could also impact performance.

2.0 INTRODUCTION

2.1 Registrant

U.S. Silica is a US-based mining company headquartered in Katy, Texas. The company's common stock is listed on the New York Stock Exchange (NYSE:SLCA). U.S. Silica is actively engaged in the production and marketing of commercial silica sand and performance materials (diatomaceous earth, calcium bentonite clay, calcium montmorillonite clay, and perlite products). Their whole grain silica products are used as proppant (frac) sand for oil and natural gas recovery, and in the manufacture of glass, foundry, and building products. U.S. Silica's performance materials are used in: (1) filtration for foods and beverages, pharmaceuticals, and swimming pools; (2) as additives in paint and coatings, plastics and rubber, and agriculture products; and (3) for bleaching, catalysis and adsorption in edible oil processing, aromatics purification, and industrial and chemical applications. Additional information regarding U.S. Silica can be found on their website: www.ussilica.com.

2.2 Terms of Reference and Purpose

U.S. Silica retained BOYD to complete an independent technical assessment of their internally-prepared proppant sand resource and reserve estimates and supporting information for the Lamesa Operation.

BOYD prepared this technical report summary for U.S. Silica in support of their disclosure of proppant sand reserves for the Lamesa Operation in accordance with S-K 1300. The purpose of this report is threefold: (1) to summarize material technical and geoscientific information for the subject mining property, (2) to provide the conclusions of our technical assessment, and (3) to provide a statement of proppant sand resources and/or reserves for the Lamesa Operation.

BOYD's findings are based on our detailed examination of the supporting geologic and other scientific, technical, and economic information provided by U.S. Silica, as well as our assessment of the methodology and practices applied by U.S. Silica in formulating the estimates of proppant sand resources and reserves disclosed in this report. We did not independently estimate proppant sand resources or reserves from first principles.

We used standard engineering and geoscience methods, or a combination of methods, that we considered to be appropriate and necessary to establish the conclusions set forth herein. As in all aspects of mining property evaluation, there are uncertainties

inherent in the interpretation of engineering and geoscience data; therefore, our conclusions necessarily represent only informed professional judgment.

The ability of U.S. Silica, or any mine operator, to recover all of the estimated proppant sand reserves presented in this report is dependent on numerous factors that are beyond the control of, and cannot be anticipated by, BOYD. These factors include mining and geologic conditions, the capabilities of management and employees, the securing of required approvals and permits in a timely manner, future sand prices, etc. Unforeseen changes in regulations could also impact performance. Opinions presented in this report apply to the site conditions and features as they existed at the time of BOYD's investigations and those reasonably foreseeable.

This report is intended for use by U.S. Silica, subject to the terms and conditions of its professional services agreement with BOYD. We also consent to U.S. Silica filing this report as a technical report summary with the SEC pursuant to S-K 1300. Except for the purposes legislated under US securities law, any other uses of or reliance on this report by any third party is at that party's sole risk.

2.3 Expert Qualifications

BOYD is an independent consulting firm specializing in mining-related engineering and financial consulting services. Since 1943, BOYD has completed over 4,000 projects in the United States and more than 60 other countries. Our full-time staff comprises mining experts in: civil, environmental, geotechnical, and mining engineering; geology; mineral economics; and market analysis. Our extensive experience in proppant sand resource and reserve estimation combined with our knowledge of the subject property, provides BOYD an informed basis on which to opine on the reasonableness of the estimates provided by U.S. Silica. An overview of BOYD can be found on our website at www.jtboyd.com.

The individuals primarily responsible for completing this technical assessment and the preparation of this report are by virtue of their education, experience, and professional association considered qualified persons (QPs) as defined in S-K 1300.

Neither BOYD nor its staff employed in the preparation of this report have any beneficial interest in U.S. Silica, and are not insiders, associates, or affiliates of U.S. Silica. The results of our assessment were not dependent upon any prior agreements concerning the conclusions to be reached, nor were there any undisclosed understandings concerning any future business dealings between U.S. Silica and BOYD. This report was

prepared in return for fees based upon agreed commercial rates, and the payment for our services was not contingent upon our opinions regarding the project or approval of our work by U.S. Silica and its representatives.

2.4 Principal Sources of Information

Information used in this assignment was obtained from: (1) files provided by U.S. Silica, (2) discussions with U.S. Silica personnel, (3) records on file with regulatory agencies, (4) public sources, and (5) nonconfidential information in BOYD's possession.

The following information was provided by U.S. Silica:

- Year-end reserve statements and reports for 2021 and 2022.
- Exploration records (e.g., drilling logs and lab sheets).
- Geologic databases of lithology and sand quality.
- Computerized geologic models.
- Mapping data, with:
  - Land ownership boundaries.
  - Infrastructure locations.
  - Easement and right-of-way boundaries.
  - Surveyed topography (surface elevation).
- Mine plans, production schedules, and supporting data.
- Overview of processing operations and detailed flow sheets.
- Copies of mining and operating permits.
- Historical information, including:
  - Production reports.
  - Financial statements.
  - Product sales and pricing.

Information from sources external to BOYD and/or U.S. Silica are referenced accordingly.

The data and work papers used in the preparation of this report are on file in our offices.

2.5 Personal Inspections

A site visit and inspection of the Lamesa Operation was completed on October 26, 2022,
by BOYD's QPs responsible for the preparation of this report. The site visit included: (1) observation of the active mining operations, (2) a tour of the mine site's surface infrastructure, and (3) a tour of the process plant and truck loadouts. BOYD's representatives were accompanied by senior U.S. Silica engineering and management

personnel who openly and cooperatively answered questions regarding, but not limited to: site history; deposit geology; mining and processing operations; near- and long-range mining plans; and proppant sand marketing.

2.6 Report Version

The proppant sand resources and reserves presented in this Technical Report Summary are effective as of December 31, 2022. The effective (i.e., “as of”) date of the report is December 31, 2022.

This is the third Technical Report Summary filed by U.S. Silica for the Lamesa Operation and supersedes the following previously filed reports:

Westward Environmental; February 2022; Technical Report Summary Lamesa Site, Dawson County, Texas.

Westward Environmental; September 2022; Technical Report Summary Lamesa Site, Dawson County, Texas.

The user of this document should ensure that this is the most recent disclosure of proppant sand resources and reserves for the Lamesa Operation as it is no longer valid if more recent estimates have been issued.

2.7 Units of Measure

The US customary measurement system has been used throughout this report. Tons are short tons of 2,000 pounds-mass. Unless otherwise stated, currency is expressed in US Dollars ($). Historic prices and costs are presented in nominal (unadjusted) dollars. Future dollars values are expressed on a constant (unescalated) basis.

3.0 PROPERTY DESCRIPTION

3.1 Location

U.S. Silica's Lamesa Operation is a surface proppant sand mining and processing operation located 11 miles northwest of the City of Lamesa in Dawson County, Texas. The cities of Dallas and Lubbock, Texas, are located approximately 312 miles east and 56 miles northeast, respectively, of the Lamesa Operation. Figure 1.1 (page 1-2) provided the general location of the Lamesa Operation.

The property is contiguous with the exception of pre-existing oil production infrastructure easements for roads, storage areas, pipelines and pump jack stations. The mine offices, maintenance facilities, processing plant, loadout facilities, and former mining pits are located on the northeast edge of the property. Figure 3.1, on the following page, illustrates the general layout of the Lamesa Operation.

Geographically, the Lamesa Operation's processing plant is located at approximately 32° 48' 22.522" N latitude and 102° 7' 33.823" W longitude.

3.2 Property Rights

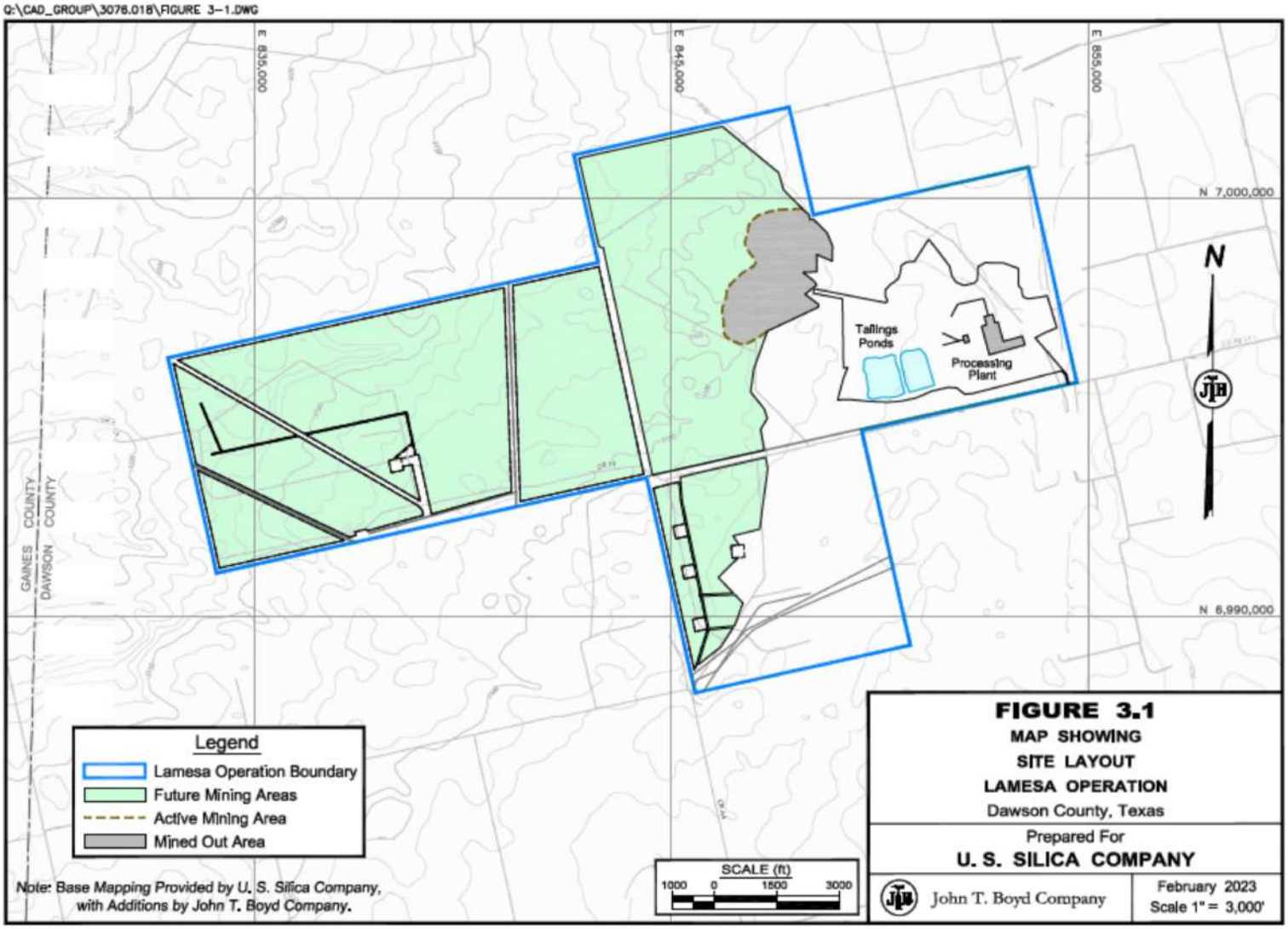
The Lamesa Operation comprises approximately 3,523 acres of surface and minerals rights fully owned by U.S. Silica. The land with mineral rights was purchased by U.S. Silica for the purposes of developing a new proppant sand mine in the Permian Basin.

3.3 Encumbrances

3.3.1 Fees and Royalties

To maintain ownership of the Lamesa Operation property, U.S. Silica must pay property taxes to the local government in Dawson County. To BOYD's knowledge, there are no liens against the properties.

It is BOYD's understanding that there are no royalties, overriding or limited royalties, working interests, production payments, net profit interests, or other mineral interests in the Lamesa Operation properties.


Q:\CAD_GROUP\3076.018\FIGURE 3-1.DWG
E 835,000
E 845,000
E 855,000
N 7,000,000
N 6,990,000
N
Tailings Ponds
Processing Plant
GAINES COUNTY
DAWSON COUNTY
Legend
Lamesa Operation Boundary
Future Mining Areas
Active Mining Area
Mined Out Area
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
SCALE (ft)
1000 0 1500 3000
FIGURE 3.1
MAP SHOWING
SITE LAYOUT
LAMESA OPERATION
Dawson County, Texas
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3,000'

3.3.2 Permitting Requirements

Mining and processing activities on the Lamesa Operation properties are regulated by several federal and state laws. As mandated by these laws and regulations, numerous permits are required for mining, processing, and other incidental activities. U.S. Silica reports that necessary permits are in place or applied for to support immediate operations. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of the current regulations. Permitting and permitting conditions are discussed further in Chapter 17 of this report.

In BOYD's opinion, U.S. Silica has demonstrated their ability and cooperation to align their operating plans with any permitting requirements that may be encountered during the normal course of business.

BOYD is not aware of any current material violations or fines imposed by regulators on the Lamesa Operation.

3.3.3 Mining Restrictions

Several man-made features have been identified in and around the Lamesa Operation which may limit the mineable areas of the property. As of this report, these features include:

- Setbacks from neighboring properties.
- Setbacks from oil production infrastructure.
- Setbacks from existing utility corridors.

U.S. Silica has included suitable setbacks in their mining plans to avoid disturbing these areas. As such, these areas have been excluded from the estimates of proppant sand resources and reserves presented herein.

There are no designated wetland areas or other environmentally sensitive areas which must be excluded from mining activities on the property.

3.3.4 Other Significant Factors or Risks

To the extent known to BOYD, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the Lamesa Operation property that are not discussed in this report. However, the reported proppant sand resources and reserves may be materially impacted by: U.S. Silica's failure to comply

with permit conditions and rules; delays in obtaining required government or other regulatory approvals or permits; U.S. Silica's inability to obtain such required approvals or permits; or unforeseen changes in governmental regulations.

4.0 PHYSIOGRAPHY, ACCESSIBILITY, AND INFRASTRUCTURE

4.1 Topography, Elevation, and Vegetation

The Lamesa Operation lies within the Llano Estacado, a Southern High Plains extension of the Great Plains of North America. This region is relatively flat, with windblown sand dunes in various locations.

Surface elevations in and around the property range from approximately 3,065 ft above mean sea-level (AMSL) near the southeast property corner, to over 3,190 ft AMSL on the western edge of the property.

There are not any surface waters present in and around the Lamesa Operation.

Land cover in the immediate area consists predominantly of a mixture of shinnery oak, grasses, and other various scrub vegetation.

4.2 Accessibility

General access to the Lamesa Operation is via a well-developed network of paved private, county, and state roads. These roads provide direct access to the mine and processing facilities and are generally open year-round.

4.3 Climate

Climate in and around the Lamesa Operation is characteristic for the southwest US, with four seasons ranging from mild winters to very hot and dry summers, with generally moderate falls and springs. The average daily high temperatures typically reach above freezing all 12 months of the year, while the low temperatures can drop below freezing during 4 months of the year. Winter temperatures typically range from 32 degrees Fahrenheit (° F) to 71° F, while summer temperatures usually range from 68° F to 94° F. Average annual precipitation for the area is approximately 15 to 20 inches of rain and less than 4 inches of snow.

In general, the operating season for the Lamesa Operation is year-round. Adverse weather conditions seldom limit mining, processing, and loading operations; however, extreme weather conditions may temporarily impact operations. Periodic flooding is possible during heavy rainfall.

4.4 Infrastructure Availability and Sources

The Lamesa Operation lies within a rural region of western Texas and has been operating in a region dominated by the oil and gas industry and agricultural development. The City of Lamesa has population of 8,674 and 12,456 people live in Dawson County according to 2020 US census data.

Finished proppant sand products from the Lamesa Operation are transported to customers by bulk truck and supported by U.S. Silica's extensive on-site loading, storage, and handling facility.
Several regional airports are located within an hour's drive from the Lamesa Operation, and the Midland International Airport is just over an hour away by car.

Reliable sources of electrical power, water, supplies, and materials are readily available. Electrical power is provided to the operation by regional utility companies. Water is supplied by neighboring private properties, surface impoundments, or water wells. The Lamesa Operation has an abundance of recycled processing water available.

5.0 HISTORY

5.1 Reserve Acquisition

U.S. Silica purchased the property upon which the Lamesa Operation is situated in July 2017 from the Medlin Ranch. U.S. Silica made the purchase after completing an initial reconnaissance-level exploration campaign in March and April 2017.

U.S. Silica is the first owner to explore for and mine proppant sand from the property. Prior to U.S. Silica's purchase, the property remained relatively undeveloped aside from sparse agricultural activity located in the far southeast corner of the property and various oil and gas wells and related infrastructure.

5.2 Mine Development

The Lamesa property was purchased by U.S. Silica as a source of proppant sand to service the booming oil and gas industry in the Permian Basin of west Texas. Prior to the development of proppant sand mining and processing operations in West Texas, nearly all proppant sand was imported from other out-of-state producing regions. In order to lower operational costs, the oil and gas industry began looking for cheaper (i.e., local) sources of proppant sand. U.S. Silica has actively developed several proppant sand operations in west Texas, including the Lamesa Operation, to serve this market.

U.S. Silica began construction of the processing plant shortly after purchasing the property. First sales of finished proppant sand from the Lamesa Operation were made in mid-2018.

6.0 GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

6.1 Regional Geology

The Lamesa Operation is located within the Llano Estacado, situated in the Texas High Plains. This region comprises the southern-most portion of the Great Plains, which extends into northeastern New Mexico and northwestern Texas. The Llano Estacado forms a vast elevated plain (high mesa) that is almost completely covered with sand deposits of various types. In the region, the ground surface is covered by windblown sheet sands and active sand dunes reaching heights of almost 45 ft.

The Lamesa Operation is also located near the north-central portion of the Permian Basin, which is well known for its long-producing petroleum and natural gas fields. While the subject of this report concentrates on the surficial geology (sand deposits) of west Texas, the Lamesa Operation currently sells its proppant sand products to the oil and gas producers working in the Permian Basin.

6.2 Local Geology

6.2.1 General Stratigraphy

Surficial geologic units overlying the area in and around the Lamesa Operation are predominantly comprised of undifferentiated Quaternary Age unconsolidated deposits, ranging from aeolian (windblown) sheet sands and dunes to alluvial sands, silts, clays, and caliche. Geologic mapping shows additional surficial stratigraphic units present in the vicinity of the project; however, the surface geology of the Lamesa Property is primarily comprised of these aeolian sand deposits.

A generalized stratigraphic chart of the geologic units in Dawson County, Texas is presented in Figure 6.1.

System	Series	Geologic Unit
Quaternary	Undivided Sand, Silt, Clay, and Gravel; Windblown; Locally Indurated with Calcium Carbonate (Caliche).	
	Holocene	Sheet Sand Deposits
	Pleistocene	Blackwater Draw Formation
Neogene	Pliocene / Miocene	Ogallala Formation

Figure 6.1: Generalized Stratigraphic Chart, Surficial Deposits of Dawson County, Texas

The following text discusses the strata encountered in and around the Lamesa Operation in ascending depositional order.

Ogallala Formation

The Ogallala Formation is predominantly comprised of weakly cemented to unconsolidated fine- to medium-grained sands, which may be silty and calcareous in places. A caliche caprock is frequently exhibited, which resists weathering and forms ledges. Thickness of this formation has been recorded up to 550 ft.

Blackwater Draw Formation

The Blackwater Draw Formation covers a majority of the surface of Dawson County. While not clearly present on the surface at the Lamesa Operation, the Blackwater Draw Formation is predominantly comprised of fine- to medium-grained sand that is silty, calcareous, and locally clayey. Caliche nodules may be present, and deposition is noted as being massive; however, the unit generally is found to be less than 25 ft thick.

Quaternary Sheet and Dune Sands

Most of the subject property is covered by Quaternary sheet and dune sands generally consisting of fine- to medium-grained quartz sand grains, mixed with varying degrees of clays and silts. Exploration completed on the Lamesa Property indicates two surficial sand units being present, an upper clean sand unit and an underlying clayey cover sand unit.

General geologic descriptions from the Dawson County area also indicate that some local Quaternary deposits may include gravel or be locally indurated with calcium carbonate (caliche). These deposits are the result of various geologic processes during deposition, such as the formation of levees, point bars, stream channels, alluvial fans, and terrace or playa deposits.

6.2.2 Structural Geology

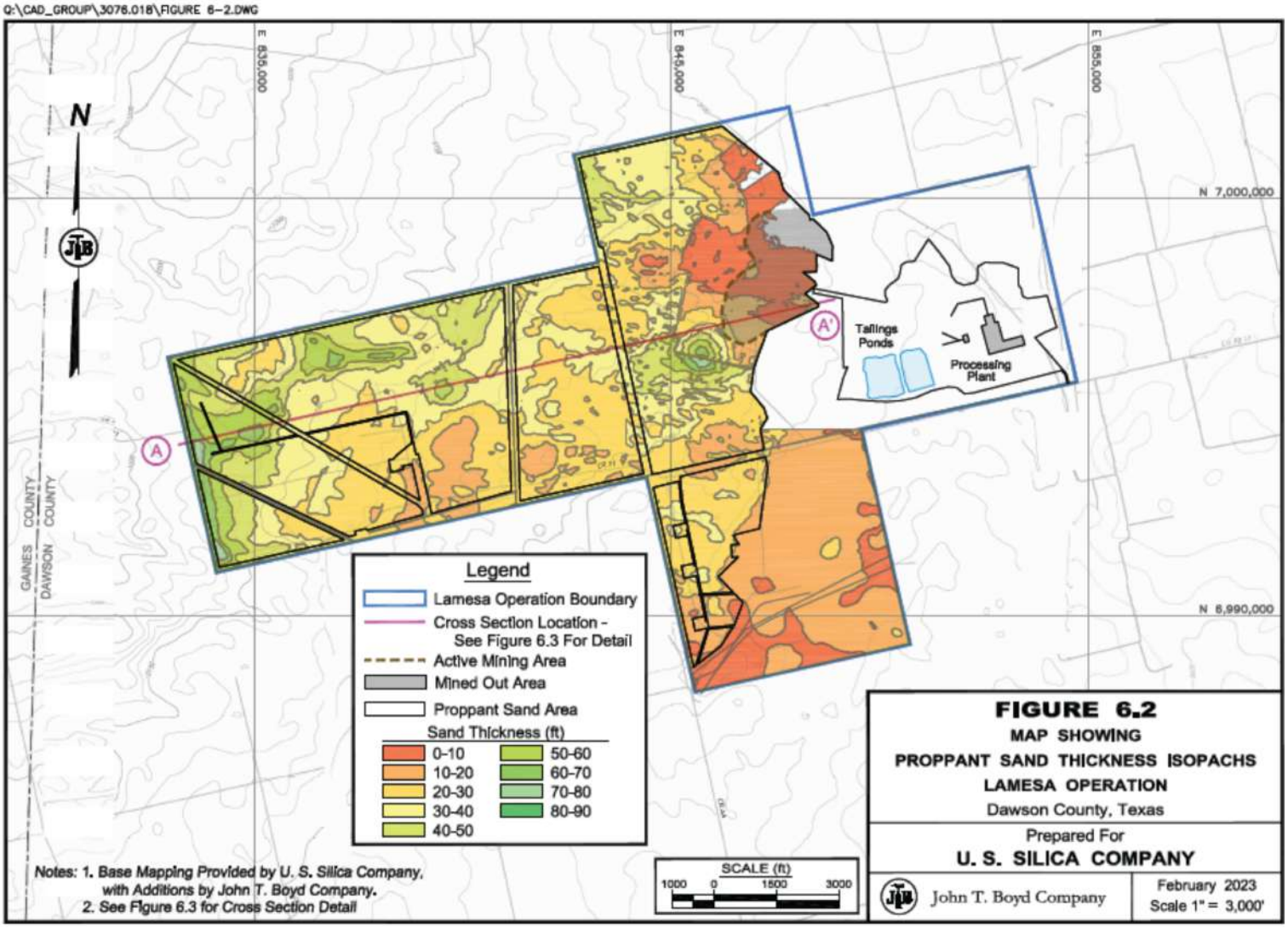
The structural features of the Quaternary sands in and around the Lamesa Operation are relatively non-descript. While the unit exhibits variable thickness over the area, it is unaffected by folding or faulting. Underlying the surficial sand units is a red clay basal unit, which defines the limit of the mineable surface sand deposits. Due to the lack of structural features encountered, there are no know geological features that are believed to materially affect a proppant sand mining operation in the immediate area; as such, the deposit is considered to be of low geologic complexity.

6.3 Property Geology

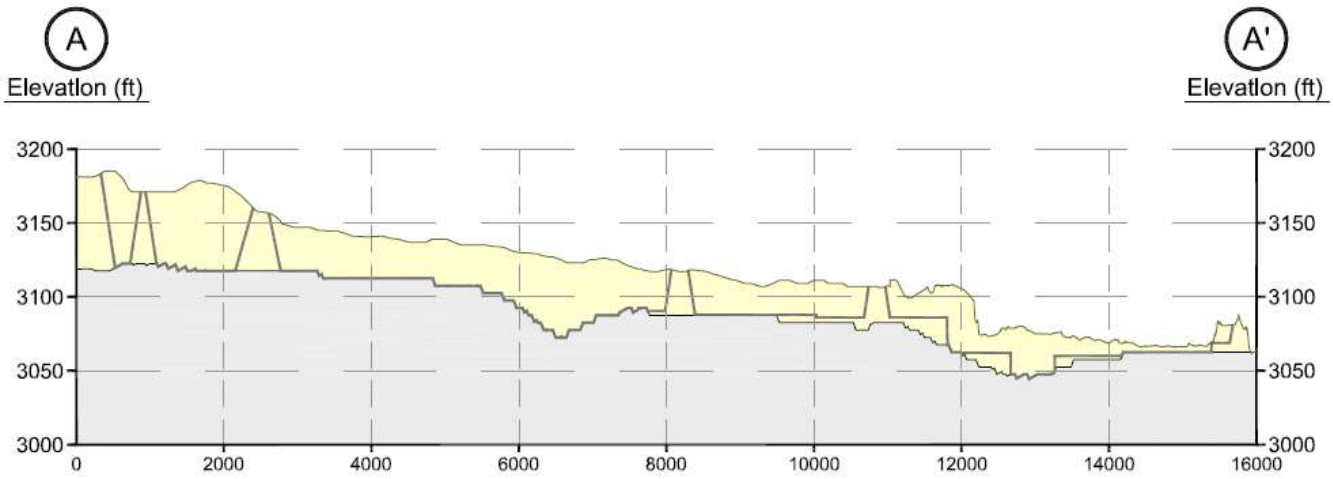
As described above, surficial geologic strata at the Lamesa Operation are predominantly comprised of aeolian (windblown) sand deposits. There is not any discernable overburden material present except for sparse areas of vegetation and roots, which are easily removed during early phases of the processing operations. Figure 6.2, following this page, provides a map of the sand thickness. A cross-section through the deposit is provided in Figure 6.3.

The surface sheet and dune sands deposited on the subject property consist of two distinct intervals of mineable sand: 1) an upper “clean sand” unit, and 2) a lower “cover sand” unit. Underlying the surface sand deposits is a hard, red clay basal unit, commonly referred to as hardpan.

Exploration data suggest the clean sand unit generally consists of unconsolidated, fine- to medium-grained, well sorted and subangular to rounded sand grains. Thickness of this unit ranges from 13 to 46 ft. The clean sand is noted as containing generally less than 10% to 15% very fine (clay) material. The central and western extents of the Lamesa Property exhibit the clean sand unit at the surface, thinning to the east, and is absent over the eastern-most third of the property. The limit of the clean sand deposit is delineated by a clearly visible “dune line” running north to south and bisecting the subject property.


Q:\CAD_GROUP\3076.018\FIGURE 6-2.DWG
N
E 835,000
E 845,000
E 855,000
N 7,000,000
N 6,990,000
A
A'
Tailings Ponds
Processing Plant
GAINES COUNTY
DAWSON COUNTY
Legend
Lamesa Operation Boundary
Cross Section Location - See Figure 6.3 For Detail
Active Mining Area
Mined Out Area
Proppant Sand Area
Sand Thickness (ft)
0-10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
SCALE (ft)
1000 0 1500 3000
Notes: 1. Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
2. See Figure 6.3 for Cross Section Detail
FIGURE 6.2
MAP SHOWING
PROPPANT SAND THICKNESS ISOPACHS
LAMESA OPERATION
Dawson County, Texas
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3,000'

Q:\CAD_GROUP\3076.018\FIGURE 6_3.DWG



Legend
- Plts
- Proppant Sand
- Underburden

FIGURE 6.3
CROSS SECTION A - A'
LAMESA OPERATION
Dawson County, Texas

Prepared For
U. S. SILICA COMPANY

Horizontal 1" = 2,000'
Vertical 1" = 100'
Vertical Exaggeration 20X

John T. Boyd Company

February 2023
Scales As Shown

Note : See Figure 6.2 For Cross Section Location.

East of the dune line, the cover sand unit is present at the surface. The cover sand is also present and underlies nearly all the clean sand west of the dune line on the Lamesa property. Geologic logs describe this unit as consisting of a clayey, hard sandstone interval, with very fine- to medium-grained, subangular to rounded sand grains, and ranging in thickness from 0 to 25 ft. The cover sand is noted as consisting of 15% to 45% fine material due to the higher clay content.

The two sand units are generally mineable from the ground surface down to the basal red clay unit. Combined thickness of both sand units ranges from 25 to 65 ft across the property.

The sand mined at the Lamesa Operation is processed to produce proppant sand. Proppant sand is a naturally occurring, high silica content quartz sand, with grains that are generally well-rounded. The main difference between proppant sand and other sands is that proppant sand grains are relatively pure in composition, consisting almost entirely of quartz; other sands have numerous impurities that may be cemented to the quartz grains. The pure quartz composition of proppant sand grains, along with being well-rounded and spherical in shape, gives these sands the characteristics (crush strength, high acid solubility, low turbidity) that are sought after by oil and gas producers for use in developing wells.

7.0 EXPLORATION DATA

7.1 Background

In developing the Lamesa Operation, U.S. Silica has completed three separate geologic exploration campaigns. Records from these campaigns were provided and comprise the primary data used in the evaluation of the proppant sand resources. A total of 49 drill holes (totaling 2,268 ft of drilling) are distributed across the property and results have been compiled into a database. Maps illustrating the extents of the sand deposit, electronic copies of drilling and sampling logs, as well as laboratory testing summaries, were provided for our review.

7.2 Exploration Procedures

U.S. Silica provided BOYD with various information, including exploration reports and internal guidelines, regarding drilling, sampling, preparing, and testing procedures utilized during the three exploration campaigns conducted on the Lamesa Operation.

7.2.1 Drilling

To date, U.S. Silica has performed three drilling campaigns on the Lamesa property. All of these campaigns were completed by third-party contractors using rotosonic (sonic drilling) equipment. Sonic drilling is an advanced drilling technique that is widely accepted as one of the best methods to recover core when exploring unconsolidated sand deposits.

Phase 1 Exploration Campaign

Prior to purchasing the property, U.S. Silica completed a reconnaissance-level exploration campaign in March 2017 with the aim of evaluating the quantity and quality of the dune sand deposit on the property,

Drilling was planned and supervised by U.S. Silica's Mine Planning Department, who also conducted core logging and sampling in the field. Cascade Environmental, LLC performed the drilling and a total of five rotosonic holes were completed. The drill holes were laid out in a general east to west trending line across an area of the property with visible sand dunes.

Phase 2 Exploration Campaign

An infill drilling campaign, consisting of 11 rotosonic drill holes, was planned and completed in April 2017 on the Lamesa property. The campaign was designed to support detailed mine planning and the estimation proppant sand reserves.

A geologist from Summit Envirosolutions, Inc. was engaged to log and sample core and supervise this phase of exploration work. Associated Environmental Industries, Corp. (AEI) performed the drilling.

After the completion of this exploration campaign, U.S. Silica prepared an initial proppant sand reserve estimate for the Lamesa Operation, and subsequently finalized the purchase of the property in July 2017.

Phase 3 Exploration Campaign

In September 2018, U.S. Silica's Mine Planning Department completed a larger exploration campaign. This exploration campaign was designed to increase confidence in the delineation (i.e., areal extent and thickness) of the sand deposit, and identify areas with preferred sand qualities.

AEI was contracted to complete the 33 rotosonic drill holes. An independent geologic consultant, Geological Consulting Services, Inc., was engaged to supervise drilling activities, and to log and sample the recovered core.

7.2.2 Sampling Procedures

Sampling procedures indicate that after a drill hole's recovered core was measured and geologically logged, the core was boxed and transported to U.S. Silica's Berkeley Springs, West Virginia, laboratory. At the lab, separate homogenous and representative composite samples were taken of the clean sand and cover sand units for analysis.

U.S. Silica maintained control of exploration core samples throughout the entirety of each drilling campaign, which included: (1) logging and boxing of recovered cores in the field, (2) transportation and delivery of core samples to their internal laboratories, and (3) performing preparation and analyses on each of the samples.

Available testing results were reviewed by BOYD during our assessment. Our review of the preceding field and sampling procedures showed that the general description and sampling work were conducted to appropriate standards. Based on the stated standards, both in the field and in the laboratory, BOYD concludes that the sample preparation and

analytical procedures were adequate for the purposes of evaluating and estimating proppant sand resources and reserves at the Lamesa Operation.

7.2.3 Sand Testing

Samples obtained from the exploration campaigns were taken to the company's Berkeley Springs laboratory, where they were inventoried and then prepared for analyses. Samples were split and prepared following standardized company procedures (i.e., U.S. Silica's ISO 9001 Quality System of Corporate Analytical Procedures) to ensure analytical consistency throughout each of the various exploration campaigns. These procedures are designed to closely match the operational capabilities of the Lamesa Operation's processing plant.

Preparation of each sample consisted of initially splitting the recovered core in half. One half of the core is placed back into the core boxes which are then stored for archival purposes, while the other half of the core is further prepared and processed for lab testing purposes.

Analytical samples were crushed, quartered, and mixed to create a uniform and representative composite sample of the core interval, and then the composite sample was divided into appropriately sized samples, depending on the type and amount of testing to be performed. The sample is then run through various crushing techniques to disaggregate the sand grains and fine materials as much as possible before beginning the washing and scrubbing procedures.

After splitting, the sample is dried, and an approximately 1,500-gram split is obtained. The sample split is washed through a 200-mesh sieve to remove slimes, before being dried and reweighed to measure the recovery of plus-200-mesh material. The dried sample is then run through a 16-mesh sieve to simulate the scalping procedure in the plant to remove the "coarse waste" sized particles. The remaining material is then approximately equivalent to the material that would typically be washed in the wet processing plant. This remaining material is weighed and labeled as a prepared "washed sample".

The washed sample is further prepared by simulating the wet processing plant conditions, which consist of placing the sample into scrubbers for three minutes, rinsing and decanting, and then drying to arrive at a "scrubbed sample", which represents material that would be output from the wet processing plant. The scrubbed samples are then dried and prepared for API RP 19C/ISO-13503-2 standard testing for proppant materials.

7.2.4 Other Exploration Methods

There were not any other methods of exploration (such as airborne or ground geophysical surveys) reported for the Lamesa Operation.

7.3 Exploration Results

7.3.1 Summary of Exploration

Exploration work to date includes a total of 49 drill holes completed in and around the Lamesa property, through the course of three separate exploration campaigns. The overall drill hole spacing exhibited across a majority of the Lamesa Operation ranges from approximately 1,000 to 1,500 ft. The distribution of these drill holes is illustrated on Figure 7.1, following this page.

Data collected as a result of completing these drilling campaigns confirm the generally uniform nature of the deposit underlying the Lamesa property and supports the general interpretation of the sand deposit thickness, as illustrated in Figure 6.2 (page 6-4).

Information provided from the exploration campaigns indicates U.S. Silica identified two separate sand intervals at Lamesa: 1) an “upper clean sand” unit, which covers the surface of the western and central portions of the property, and 2) a “lower cover sand” unit, found on the surface of the eastern portion of the property and underlying nearly all of the clean sand unit.

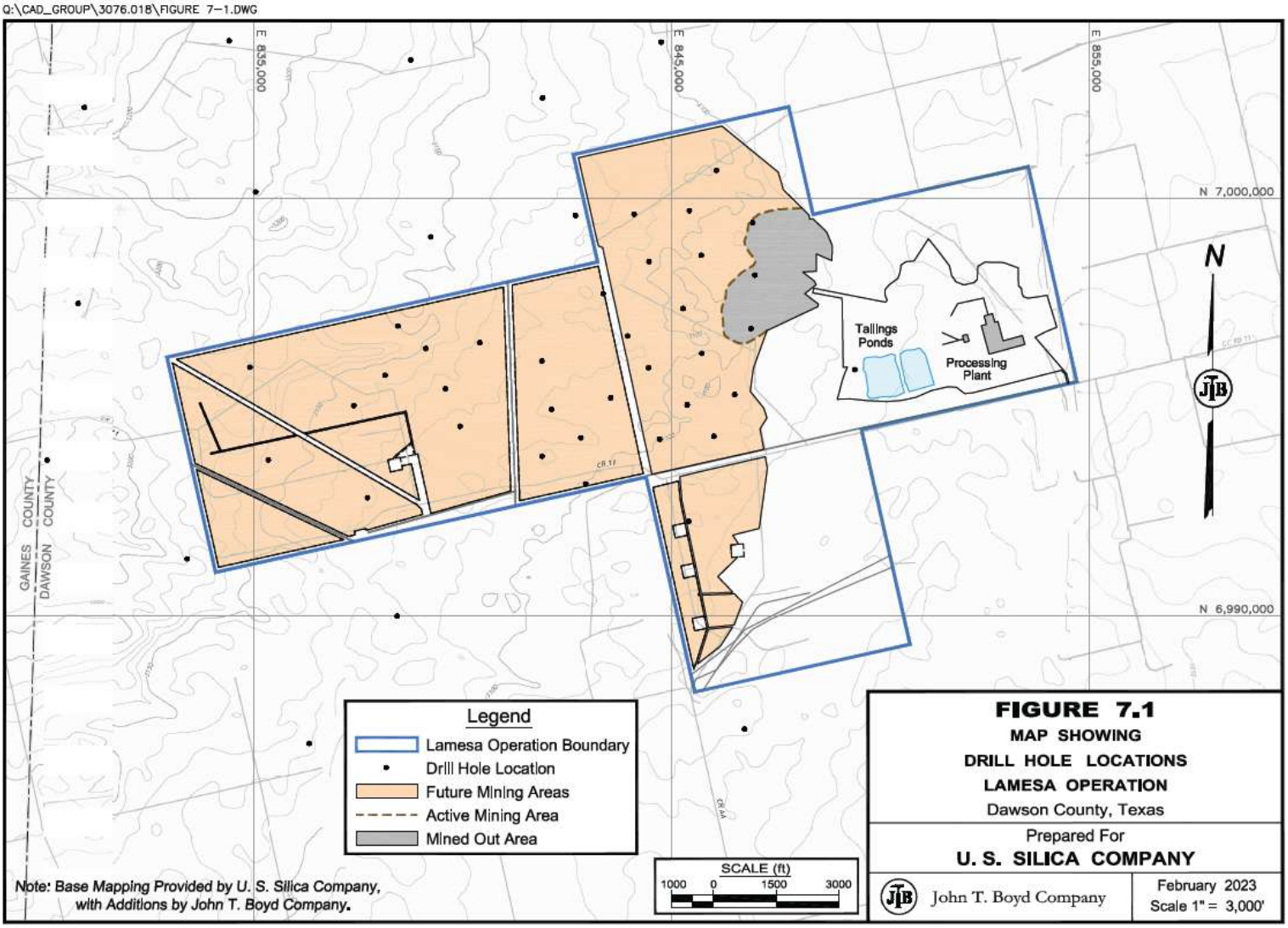
7.3.2 Sand Quality

The Lamesa Operation produces two varieties of proppant sand for use in local oil and gas applications: a 40/70-mesh proppant sand product, and a 100-mesh proppant sand product. U.S. Silica reportedly performs testing at their laboratories for API/ISO specifications.

Historically, API RP 19C/ISO 13503-2 proppant sand characteristics were strictly adhered to in order to determine the suitability of a sand product for use during fracking stages of oil and gas well development. Over time, these specifications have become merely guidelines, and the suitability of a proppant sand product is now ultimately determined by customers, who will typically perform their own sample testing of the products that they purchase to determine if they meet their internal specifications.

BOYD notes that U.S. Silica has demonstrated continued commercial success in producing and marketing the finished proppant sand products; as such, it is BOYD’s

Q:\CAD_GROUP\3076.018\FIGURE 7-1.DWG



opinion that sand quality data provided are representative of the mined deposit and are considered suitable for the estimation of proppant sand resources and reserves.

7.3.3 Grain Size Distribution

Grain size distribution was analyzed according to API RP 19C/ISO 13503-2, Section 6.

A table of weighted average grain size distribution of the in-situ sand deposit, based on laboratory testing results, is shown in Table 7.1, below.

Table 7.1: Weighted Average Particle Size Distribution

% Retained By Mesh Size				% Product	
>40	40/70	70/140	<140	40/70	70/140
1.8	26.6	58.5	13.1	31.2	68.8

The preceding table highlights the relative fineness of the sand found at the Lamesa Operation, indicating a majority of the sand particles are concentrated between the “passing 40-mesh” and “retained 140-mesh” size fraction. Accordingly, the predominant marketable proppant sand product consists of the 40/140-mesh sand.

7.3.4 Proppant Sand Quality

Samples gathered during exploration work were prepared into composite product-size samples by U.S. Silica’s internal laboratory, and sent to an third-party laboratory (Prop Tester, Inc.) in Cyprus, Texas for analysis of the following API RP19C/ ISO 13503-2 proppant sand characteristics.

Grain Shape (Sphericity and Roundness)

Grain shape is defined under API RP19C/ ISO 13503-2, Section 7. Under this standard, recommended sphericity and roundness values for proppants are 0.6 or greater. As part of the grain shape analysis, the presence of grain clusters (weakly cemented grain aggregates) and their approximate proportion in the sample are reported.

Crush Resistance

Crush resistance is a key test that determines the amount of pressure a sand grain can withstand under laboratory conditions for a two-minute duration. It is analyzed according to API RP19C/ ISO 13503-2, Section 11. Under this standard, the highest stress level (psi) in which the proppant produces no more than 10% crushed fine material is rounded down to the nearest 1,000 psi and reported as the “K-value” of the material.

Acid Solubility

Acid solubility was analyzed according to API RP19C/ ISO 13503-2, Section 8. Under this standard, 5 grams of sand is treated with 100 milliliters of 12:3 hydrochloric acid to hydrofluoric acid at 150 ˚F for 30 minutes. The recommended maximum acid solubility for proppants in the 40/70 size range and finer is 3.0%.

Turbidity

Turbidity was analyzed according to API RP19C/ ISO 13503-2, Section 9. Under this standard, the suggested maximum frac sand turbidity should be equal to or less than 250 nephelometric turbidity units (NTU).

Results from these analyses are shown below in Table 7.2:

Table 7.2: Lamesa Operation Proppant Sand Characteristics

	Average API/ISO Test Results By Product Size		
	40/70-mesh		100-mesh[1]
Characteristic	Result	Recommended Specification	Result
Sphericity	0.9	≥0.6	0.7
Roundness	0.8	≥0.6	0.6
Acid Solubility (%)	2.9	≤3.0	2.8
Turbidity (NTU)	62	≤250	79
K-Value (000 psi)	7	-	9

Note:
1. 100-mesh proppant sand material currently does not have an API/ISO specification.

The composite sample testing suggests the Lamesa Operation can produce proppant sands which meet minimum API/ISO recommended specifications. Moreover, U.S. Silica has a demonstrated commercial success producing and selling proppant sand to Permian Basin oil and gas producers, where ultimately the sand has been shown to meet customer specifications.

7.4 Data Verification

For purposes of this report, BOYD did not verify historic drill hole data by conducting independent drilling. It is customary in preparing similar mining resource and reserve estimates to accept basic drilling and sample quality data as provided by the client, subject to the reported results being judged representative and reasonable.

BOYD's efforts to judge the appropriateness and reasonability of the source exploration data included reviewing representative samples of provided drilling logs, sampling procedures, sand quality testing results, and discussing aspects of developing the Lamesa Operation with U.S. Silica personnel during our site visit. Reviewed drilling records were compared with their corresponding database records for transcription errors; of which none were found. Lithologic and sand quality data points were compared via visual and statistical inspection with geologic mapping and cross-sections.

7.5 Adequacy of Exploration and Sampling

BOYD's review of the reported methodologies and procedures indicate the exploration data obtained and utilized by U.S. Silica for the Lamesa site were: (1) carefully and professionally collected, prepared, and documented, (2) conform with general industry standards, and (3) are appropriate for use of evaluating and estimating proppant sand resources and reserves. Similarly, BOYD's review of testing data provided by U.S. Silica suggests that the analyses completed are generally appropriate to determine proppant sand characteristics and determine the subsequent quality of finished proppant sand products. As such, it is BOYD's opinion that the exploration and sampling data are suitable for use in the estimation of proppant sand resources and reserves for the Lamesa Operation.

8.0 SAMPLE PREPARATION, ANALYSIS, AND SECURITY

The reader is referred to Sections 7.3 and 7.4 of this report for details regarding sample preparation, analysis, and security.

9.0 DATA VERIFICATION

BOYD, by way of the data verification processes described in various sections of this report, has used only that data deemed by the QPs to have been generated with proper industry standard procedures, were accurately transcribed from the original source and were suitable to be used for the purpose of preparing estimates of proppant sand resources and reserves.

BOYD's subject-specific data verification efforts and our conclusions arising therefrom are discussed in the following sections of this report:

Topic	Report Section(s)
Exploration Data	Section 7.4
Sample Preparation, Analysis, and Security	Section 7.4
Proppant Sand Resource Estimates	Section 11.2
Operating Plans	Chapters 13 and 1
Capital and Operating Costs	Chapter 18
Economic Analysis Inputs	Chapter 19

Based on our review, it is BOYD's overall conclusion that the information made available to us at the time of this report is representative and reliable for use in estimating the proppant sand resources and reserves of the Lamesa Operation.

BOYD is not aware of any other limitations on nor failure to conduct appropriate data verification.

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10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

Please refer to Chapter 7 for information regarding grain size distribution and proppant sand characteristics testing.

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11.0 PROPPANT SAND RESOURCE ESTIMATE

11.1 Applicable Standards and Definitions

Unless noted, proppant sand resource estimates disclosed herein are done so in accordance with the standards and definitions provided by S-K 1300. It should be noted that BOYD considers the terms “mineral” and “proppant sand” to be generally interchangeable within the relevant sections of S-K 1300.

Estimates of mineral resources are always subject to a degree of uncertainty. The level of confidence that can be applied to a particular estimate is a function of, among other things: the amount, quality, and completeness of exploration data; the geological complexity of the deposit; and economic, legal, social, and environmental factors associated with mining the resource. By assignment, BOYD used the definitions provided in S-K 1300 to describe the varying degree of certainty associated with the estimates reported herein.

The definition of mineral resource provided by S-K 1300 is:

> *Mineral resource is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. A mineral resource is a reasonable estimate of mineralization, taking into account relevant factors such as cut-off grade, likely mining dimensions, location or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable. It is not merely an inventory of all mineralization drilled or sampled.*

Estimates of mineral resources are subdivided to reflect different levels of geological confidence into measured (highest geologic assurance), indicated, and inferred (lowest geologic assurance). Please refer to the Glossary of Abbreviations and Definitions for the meanings ascribed to these terms.

11.2 Proppant Sand Resources

11.2.1 Methodology

Based on provided information, U.S. Silica's geologic modeling and proppant sand resource estimation techniques generally consist of following:

1. The top and bottom elevations of the mineable proppant sand interval is interpreted from drill hole records and sand particle size analyses. As the sands mined at the Lamesa Operation are present at the surface, no overburden material is included in the geologic model. Strata below the sand unit—generally, the red clay basal unit, are considered waste.
2. Interpreted drill hole records are compiled and validated. Strata thicknesses are aggregated, and sand particle size analyses of the sand unit are composited for each data point. The compiled drill hole data are imported into GEOVIA Surpac™ geologic modeling and mine planning software.
3. A geologic block model of the deposit is developed using industry standard stratigraphic modeling methods. The geologic model delineates the top and bottom of the mineable sand horizon.
4. Contiguous regions of mineable sand are outlined (applying criteria discussed below in Section 11.2.2), and LOM pit shells are created.
5. Estimates of in-place mineable sand volumes are derived from the LOM pit shells and recent topographic (surface elevation) surveys.
6. An in-place dry density of 100 pounds per cubic foot is used to convert the in-place sand volumes to in-place sand tons.

11.2.2 Estimation Criteria

Development of the proppant sand resource estimate for the Lamesa Operation assumes mining and processing methods and equipment which have been utilized successfully at the site for decades.

The target surface sheet and dune sand mining horizon at U.S. Silica's Lamesa Operation is manifested as continuous, low rolling sand dunes with relatively consistent depth, thickness, and quality. The high-quality sand is easily distinguished from the underlying clay unit, aiding in the interpretation of the mineable horizon. Generally, all of the sand unit is mined and sold under various product specifications. Based on the uniformity of the sand deposit being mined, cut-off grade, strip ratios, and other typical mining factors do not define economic mineability. Production of proppant sand is driven by market demand and production can be modified in response to that demand. As such, the application of minimum mining thicknesses, maximum stripping ratios (the ratio of waste to sand excavated), or cut-off grades is not generally considered in the estimation of proppant sand resources for the Lamesa Operation.

The limits of the proppant sand resources are constrained to those portions of the interpreted sand deposit that:

- Are reasonably defined by available drilling and sampling data.
- Contain products that meet generally accepted specifications.
- Honor any legal mining constraints (e.g., property boundaries, environmental setbacks, utility and infrastructure setbacks, etc.).
- Adhere to physical mining constraints.
- Contain products that can be sold at a profit (i.e., be economic).

U.S. Silica applied the following offsets to define the proppant sand resource boundaries for the Lamesa Operation:

- 300-ft x 300-ft buffer around a single active pumpjack on the property.
- 100-ft offsets from neighboring property boundaries.
- 200-ft right-of-ways around roadways, oil and gas pipelines, and utility corridors.

The pits shells which constrain the estimated proppant sand resources utilized overall wall slope of 3:1 (horizonal to vertical) in unconsolidated sand. There were not any other pit design criteria employed.

Proppant sand resources for the Lamesa Operation are assessed for reasonable prospects for eventual economic extraction by reporting: (1) only those resources which have been subsequently converted to proppant sand reserves after the application of all material modifying factors, or (2) those resources which have similar characteristics (i.e., mining conditions, and expected product yields and qualities) to those converted to proppant sand reserves.

BOYD has reviewed the criteria employed by U.S. Silica in developing their estimates of proppant sand resources. The parameters are supported by historical results and align with those employed at similar operations. As such, it is BOYD's opinion that the stated criteria are reasonable and appropriate for the estimation of proppant sand resources at the Lamesa Operation.

11.2.3 Classification

Geologic assuredness is established by the availability of both structural (thickness and elevation) and particle size distribution for the proppant sand. Classification is generally based on the concentration or spacing of exploration data, geological understanding,

continuity of mineralization relative to the style of mineralization, and uncertainty with the exploration data.

Table 11.1 provides the general criteria employed in the classification of the proppant sand resources.

Table 11.1: Proppant Sand Resource Classification Criteria

Classification (Geologic Confidence)	Data Point Spacing (feet)		
Measured	0	–	2,640
Indicated	2,640	–	5,280
Inferred	5,280	–	10,560

Extrapolation or projection of resources in any category beyond any data point does not exceed half the point spacing distance.

BOYD reviewed the classification criteria employed by U.S. Silica with regards to data density, data quality, geological continuity and/or complexity, and estimation quality. The surficial sand dune deposit on the Lamesa property is of low geologic complexity. We believe these criteria appropriately reflect their implied levels of geologic assurance with respect to the estimation of proppant sand resources..

Mineable sand resources on the property are well-defined throughout all areas of the mine plan. Observed drill hole spacing averages approximately 1,000 ft through a majority of the active mining area, with future mining areas exhibiting a general drill hole spacing averaging approximately 1,000 ft to 2,500 ft.

11.2.4 Proppant Sand Resource Estimate

Resource estimates of in-place proppant sand at the Lamesa Operation as of December 31, 2022, reported by U.S. Silica are shown in Table 11.2 below.

Table 11.2: Lamesa Operation Proppant Sand Resources (as of December 31, 2022)

Classification	In-Place Tons (000)		
	Planned	Additional	Total
Measured	98,222	622	98,844
Indicated	13,473	4,748	18,221
Total Measured + Indicated	111,695	5,370	117,065
Inferred	-	5,002	5,002

Notes:
1. "Planned" resources are those included in the approved LOM plan.
2. "Additional" resources are those reported in addition to proppant sand reser

As shown, U.S. Silica controls approximately 117 million in-place tons of measured and indicated proppant sand resources, *inclusive* of proppant sand reserves. In addition, they control approximately 5 million in-place tons of inferred proppant sand resources. Proppant sand resources are not proppant sand reserves and do not have demonstrated economic viability.

The proppant sand resources shown under the “Planned” column of Table 11.2 include only those in-place tons which are included in U.S. Silica’s LOM plan for the Lamesa Operation and therefore considered for conversion to proppant sand reserves. The proppant sand resources shown under the “Additional” column of Table 11.2 have not been included in the LOM plan and are considered *exclusive* of (i.e., “in addition to”) the reported proppant sand reserves. These “Additional” proppant sand resources are considered to have prospects for eventual economic extraction by virtue of their similarity, in terms of demonstrated extraction methods and expected finished product qualities, to those converted to proppant sand reserves. However, further studies are required to convert the “Additional” proppant sand resources to proppant sand reserves.

11.2.5 Validation

BOYD was provided with U.S. Silica’s exploration data, geologic models, and volumetric estimates. We have reviewed this information, on a representative basis, by:

- Verifying the accuracy of geologic model inputs by comparison with drilling logs and laboratory reports.

- Comparing the geologic model with compiled drilling data.
- Preparing a stratigraphic grid model of the sand unit and independently estimating pit shell volumes.

It is BOYD's opinion that the geologic model is representative of the informing data and that the data are of sufficient quality to support the proppant sand resources estimate provided herein. Furthermore, it is our opinion that the resources estimation methods and criteria employed are both appropriate and reasonable for the deposit type and proposed extraction methods.

BOYD is not aware of any technical, legal, economic, or other relevant factors that could materially affect the silica sand resource estimate. The accuracy of silica sand resource estimate is, in part, a function of the quality and quantity of available data and of engineering and geological interpretation and judgment. Given the data available at the time this report was prepared, the estimates presented herein are considered reasonable. However, they should be accepted with the understanding that additional data and analysis available after the date of the estimate may result in a change to the current estimate. These revisions may be material. There is no guarantee that all or any part of the estimated resources will be recoverable.

12.0 PROPPANT SAND RESERVE ESTIMATE

12.1 Applicable Standards and Definitions

Unless noted, proppant sand reserve estimates disclosed herein are done so in accordance with the standards and definitions provided by S-K 1300. It should be noted that BOYD considers the terms “mineral” and “proppant sand” to be generally interchangeable within the relevant sections of S-K 1300.

Estimates of mineral reserves are always subject to a degree of uncertainty. The level of confidence that can be applied to a particular estimate is a function of, among other things: the amount, quality, and completeness of exploration data; the geological complexity of the deposit; and economic, legal, social, and environmental factors associated with mining the reserve. By assignment, BOYD used the definitions provided in S-K 1300 to describe the varying degree of certainty associated with the estimates reported herein.

The definition of mineral reserve provided by S-K 1300 is:

> *Mineral reserve is an estimate of tonnage and grade or quality of indicated and measured mineral resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated mineral resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted.*

Estimates of mineral reserves are subdivided to reflect geologic confidence, and potential uncertainties in the modifying factors, into proven (highest assurance) and probable. Please refer to the Glossary of Abbreviations and Definitions for the meanings ascribed to these terms.

Figure 12.1, below, illustrates the relationship between mineral resources and mineral reserves.

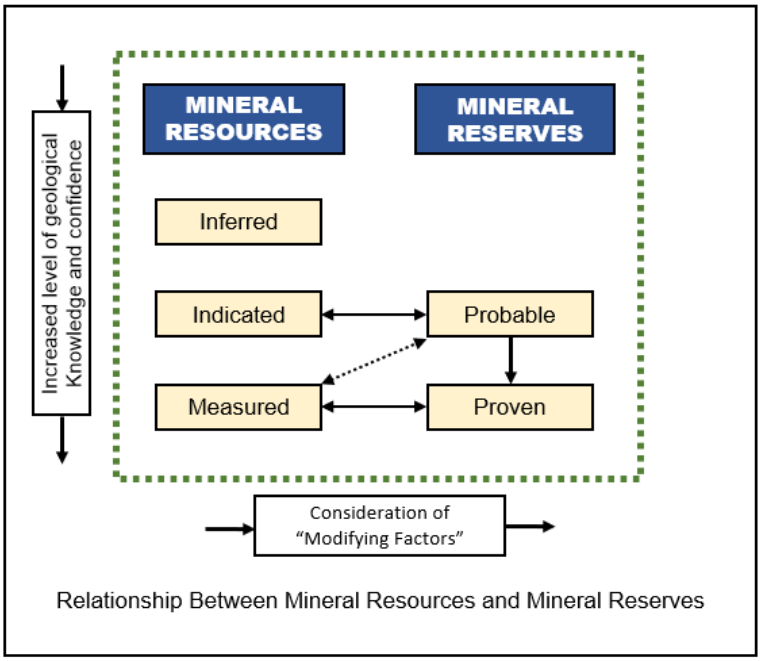


Figure 12.1: Relationship Between Mineral Resources and Mineral Reserves

By industry convention, proppant sand reserves are presented on two bases: mineable and saleable. Mineable reserves represent the ROM tonnage available for excavation and processing. Saleable reserves represent the tonnage of finished proppant sand available for sale after processing the mineable reserves.

12.2 Proppant Sand Reserves

12.2.1 Methodology

Estimates of proppant sand reserves for the Lamesa Operation are derived contemporaneously with estimates of proppant sand resources. The Lamesa Operation utilizes commercially proven mining and processing methods to extract and process proppant sand from the subject property. The operation's production plans are revised periodically to assure that the conversion of in-place sand to saleable product are: (1) in reasonable conformity with present and recent historical operational performance, and (2) reflective of expected mining and processing operations.

To derive estimates of mineable tons and saleable product tons (i.e., proven and probable proppant sand reserves), the following modifying factors were applied to the in-place measured and indicated proppant sand resources underlying the respective mine plan areas:

- A 95% mining recovery factor, which assumes that 5% of the mineable (in-place) proppant sand resource will not be recovered for various reasons. Applying this recovery factor to the in-place resource results in the estimated ROM sand tonnage (i.e., the mineable proppant sand reserves) that will be delivered to the wet process plant.
- An overall 75% processing yield. This factor accounts for removal of out-sized (i.e., larger than 20-mesh and smaller than 140-mesh) sand and losses in the wet and dry processing plants due to minor inefficiencies.

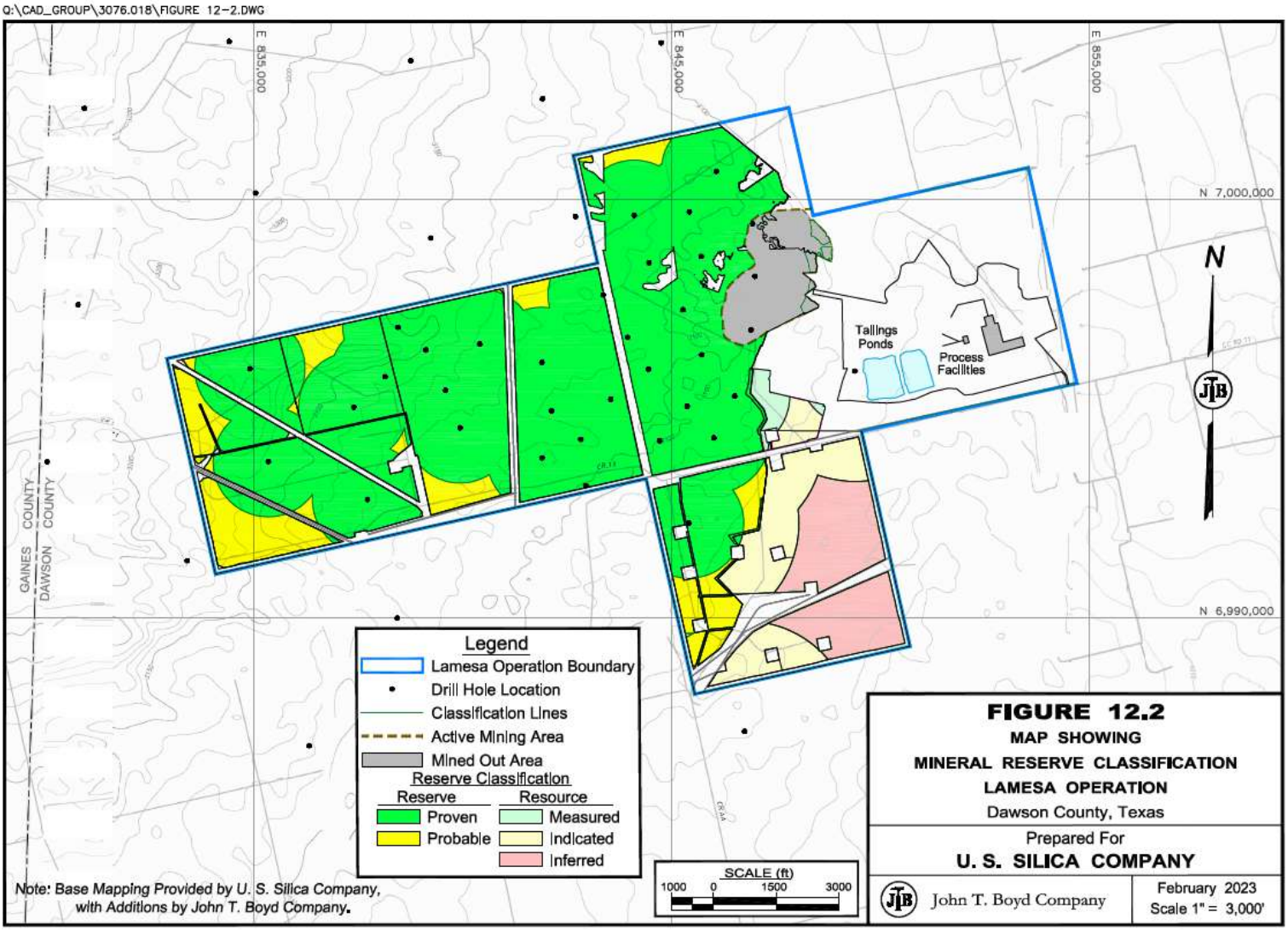
The overall product yield (after mining and processing losses) for the Lamesa Operation is estimated at approximately 71.3%. That is, for every 100 tons of in-place proppant sand, approximately 71 tons will be recovered and sold as product. Mining recovery and processing yield factors are derived from historical operating results.

Economic availability of the proppant sand reserves is established by the financial analysis presented in Chapter 19. A long-range average selling price of $23.90 per product ton has been used to estimate proppant sand reserves for the Lamesa Operation.

12.2.2 Classification

Proven and probable proppant sand reserves are derived from measured and indicated proppant sand resources, respectively, in accordance with S-K 1300. BOYD is satisfied that the stated proppant sand reserve classification reflects the outcome of technical and economic studies. Figure 12.2, on the following page, illustrates the classification of the proppant sand resources and reserves at the Lamesa Operation.

Q:\CAD_GROUP\3076.018\FIGURE 12-2.DWG



12.2.3 Proppant Sand Reserve Estimate

U.S. Silica's estimated surface mineable proppant sand reserves for the Lamesa Operation total 79.6 million saleable product tons, as of December 31, 2022. The proppant sand reserves reported in Table 12.1, below, are based on the approved LOM plan which, in BOYD's opinion, is technically achievable and economically viable after the consideration of all material modifying factors.

Table 12.1: Lamesa Operation Proppant Sand Reserves (as of December 31, 2022)

	Tons (000)	
Classification	Mineable	Saleable
Proven	93,311	69,983
Probable	12,800	9,600
Total	106,111	79,583

All of the reported proppant sand reserves are wholly owned by U.S. Silica.

The proppant sand reserves of the Lamesa Operation are well-explored and defined. It is our conclusion that almost 87% of the stated reserves can be classified in the proven reliability category (the highest level of assurance) with the remainder classified as probable. Given the geologic uniformity and history of mining the proppant sand on the Lamesa Operation properties, it is reasonable to assume that the small portion of probable reserves will be converted to proven reserves upon completion of additional exploration and testing.

The Lamesa Operation has a well-established history of mining, processing, and selling proppant sand products into various markets. BOYD has assessed that sufficient studies have been undertaken to enable the proppant sand resources to be converted to proppant sand reserves based on current and proposed operating methods and practices. Changes in the factors and assumptions employed in these studies may materially affect the silica proppant reserve estimate.

The extent to which the proppant sand reserves may be affected by any known geological, operational, environmental, permitting, legal, title, variation, socio-economic, marketing, political, or other relevant issues has been reviewed as warranted. It is the opinion of BOYD that U.S. Silica has appropriately mitigated, or has the operational acumen to mitigate, the risks associated with these factors. BOYD is not aware of any

additional risks that could materially affect the development of the proppant sand reserves.

Based on our independent review, we have a high degree of confidence that the estimates shown in this report accurately represent the available proppant sand reserves controlled by U.S. Silica, as of December 31, 2022.

12.2.4 Reconciliation with Previous Estimates

When comparing U.S. Silica's proppant sand reserve estimates as of December 31, 2022, with the estimates presented[1] for December 31, 2021, we note a net increase of approximately 13.6 million mineable tons resulting from: (1) depletion due to mining of approximately 5.9 million mineable tons, and (2) revisions to mine plans resulting in increases of approximately 19.5 million mineable tons. BOYD does not consider these adjustments, either individually or combined, to represent material changes to the proppant sand reserves of the Lamesa Operation.

[1] U.S. Silica did not present reserves on a Saleable Tons basis for the 2021 financial year.

13.0 MINING METHODS

13.1 Mining Operations

The sheet sands and sand dunes in and around the Lamesa Operation are loosely consolidated and overlain by minimal overburden; characteristics which favor conventional surface mining techniques. Since the target sands formation does not extend below the water table, the quarry is ‘dry-mined’ using truck and excavator mining methods. Mining occurs in a series of benches arranged in a stair-like fashion to recover sand from the top of the formation (in elevation) down to the lowest practical elevation (generally 1 to 2 ft above the basal red clay unit).

Since the overburden is very thin, it is not stripped prior to sand excavation. Any vegetation, oversize material or clay that is present is removed at the processing plant using screens and scrubbers. Oversize material and vegetation are stored at the dry tailings stockpile for use in future reclamation.

Drilling and blasting are not required for the loosely consolidated sand. A front-end loader is used to load the excavated ROM sand into trucks which transport the sand to a ROM stockpile near the wet process plant. Usually, the sand horizon is mined in a single 25 ft vertical bench. If the depth of the deposit exceeds 25 ft, a second lower bench is mined down to the top of the clay rich zone. The ROM sand recovered from these two benches are blended at the wet feed plant stockpile to maximize sand recovery. Figure 13.1, below, shows the loading operations in the Lamesa mine.

Figure 13.1: Loading Operations at the Lamesa Operation

These surface mining techniques have been utilized at the Lamesa Operation since it began production in 2018. The mining operations are typically conducted year-round.

13.2 Mine Equipment and Staffing

13.2.1 Mine Equipment

An independent contractor conducts the mining operation and owns and operates the mobile equipment fleet, which includes:

- Caterpillar 992 Front End Loader.
- Two Caterpillar 349F Excavators.
- Two Caterpillar static haul trucks and 8 Volvo articulated haul trucks.
- Caterpillar D8T Dozer.
- Water Truck and other ancillary equipment.

Regular and major repair maintenance is the responsibility of the contractor. Currently the contractor is responsible for delivering up to 715,000 tons of ROM sand per month to the plant.

If maintained in good condition, the mobile equipment fleet should be capable of achieving production levels required by the LOM plan.

13.2.2 Staffing

The Lamesa Operation is staffed by 150 hourly and salaried personnel. A breakdown of employees by classification is provided in Table 13.1.

Table 13.1: Employees by Classificatio

Classification	Employee
Mine Operations	15
Plant Operations & Maintenance	121
Salaried	14
Total	150

Except for a drop in employment in 2020 and 2021 (attributed to poor market conditions during the COVID-19 pandemic), the trend in staffing levels across the Lamesa Operation has been increasing. The workforce can be expanded or reduced based on market and seasonal demands.

13.3 Engineering and Planning

The primary mine planning consideration is the safe, economical, and regular supply of raw high-quality sand feed to the processing plant. In commercial mining terms, the quantities of sand mined each year at the Lamesa Operation are considered modest. The sand deposit affords easy access with its shallow depth and large areal extent. As such, mining plans for the Lamesa Mine are relatively simple and very flexible, able to be modified based on demand in a relatively short time frame.

Geotechnically, the sand deposit is relatively competent and the mining depths so shallow such that slumping, or collapsing has not been a detriment to the mining process. The pit design parameters discussed in Section 11.2.2 have been used with success at similar proppant sand operations for decades.

Excessive inflow of groundwater into the pit is not expected. As such, dewatering before or during mining activities should be manageable with drainage ditches and sumps. Flood waters from localized flash floods are a manageable risk. Onsite water ponds can be used to hold any excessive ground or storm water.

13.4 Mining Sequence and Production

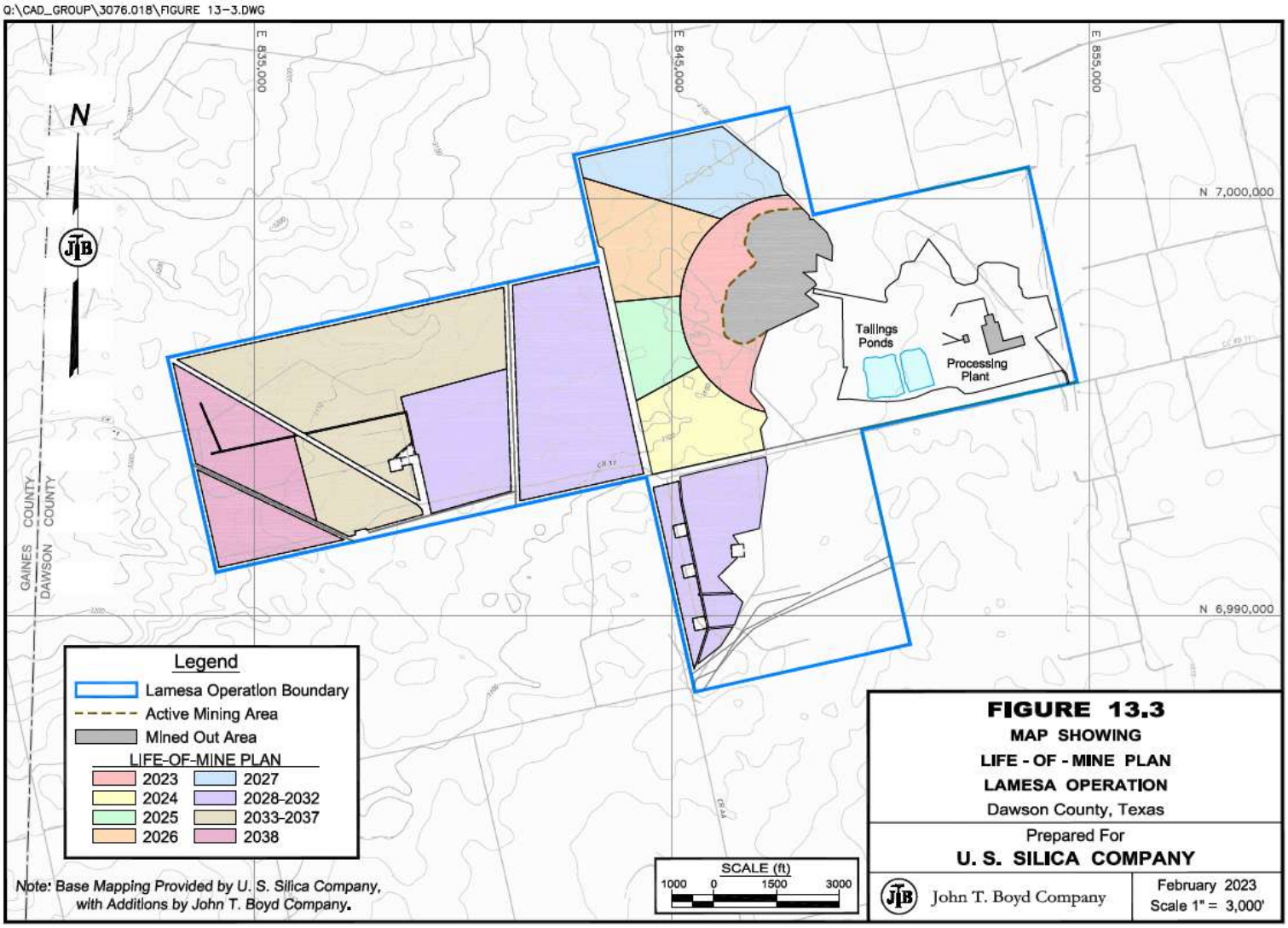
Mining of the sand deposit at the Lamesa Operation commenced in the third quarter of 2018 and have continued to the present day without interruption. Over the past five years, the operation has mined almost 20 million tons of raw sand. During 2020, production was reduced from approximately 4.8 million tons per year to 3.3 million tons in response to decreased customer demand due to the COVID-19 pandemic. Production rebounded in 2021 and 2022 and is forecasted to rise in the LOM plan as illustrated in Figure 13.2, below.

Figure 13.2: Recent Historical and LOM Forecasted Mining Production

The proposed mining sequence is illustrated in Figure 13.3, on the following page. As shown, the proposed mining sequence anticipates that the remaining northeastern quarter of the deposit will be mined out in a series of cuts from south to north (by 2027). Production will then shift to the southern half of the Lamesa Pit and commence in a general north to south direction in 2028. At which point, mining will shift to the western half of the deposit in 2029. Mining will be carried out in an east to west general direction until depletion of the deposit in 2039. Any remaining reserves in the southern half of the deposit will be mined in 2032. Reclamation will occur concurrently with production as depleted mining areas are returned to agreed-upon final design.

BOYD reviewed the LOM plans for U.S. Silica's Lamesa Operation to determine whether the plans: (1) utilize generally accepted engineering practices, and (2) align with historical and industry norms. Based on our assessment, it is BOYD's opinion that the forecasted production levels for the Lamesa Operation are reasonable, logical, and consistent with typical surface sand mining practices in west Texas and historical results achieved by U.S. Silica.

Q:\CAD_GROUP\3076.018\FIGURE 13-3.DWG



14.0 PROCESSING OPERATIONS

14.1 Overview

The Lamesa Operation's processing facilities are located east of the active mining area on the same property as the mine. Construction of the processing facilities and related infrastructure began in early 2018 and the first finished proppant sands were produced in late 2018.

The production of finished proppant sand requires the processing of raw sand from the mine through two plants—the Wet Processing Plant and the Dry Processing Plant. Figure 14.1, following this page, presents a simplified process flow from the mine to the product distribution.

The processing facilities have a nominal capacity of 6.0 million tons of finished sand per year, based on operating 24 hours a day and nearly 365 days per year.

BOYD is unaware of any reported interruptions, outages, shortages, or failures related to processing operations which have materially affected the Lamesa Operation. Given the operation is well-established, we believe the risk of such events materially affecting the estimates of silica sand reserves presented herein is low.

14.1.1 Wet Processing Plant

The Wet Processing Plant receives its raw sand feed from a ROM stockpile supplied by the mine. The raw sand is reclaimed by a front-end loader and passed through a static grizzly to remove any organics and oversize material. After passing the grizzly screen, the sand is washed to remove any material larger than ¼". The remaining material is mixed with water to create a slurry that is passed through a series of desliming cyclones and attrition scrubbers to remove clay and undersized (very fine) particles. The deslimed material is then processed through a series of hydrosizers, hydro-cyclones, and vacuum filters to remove excess water. The remaining WIP material is stockpiled outside on a drain pad to further reduce moisture before it is recovered and enters the Dry Processing Plant.

The oversized and organics waste material produced by the Wet Processing Plant is stored in a dry waste stockpile for use in future reclamation activities. The clay and very fine "slimes", or tailings, are pumped to settling ponds where the water is recovered for

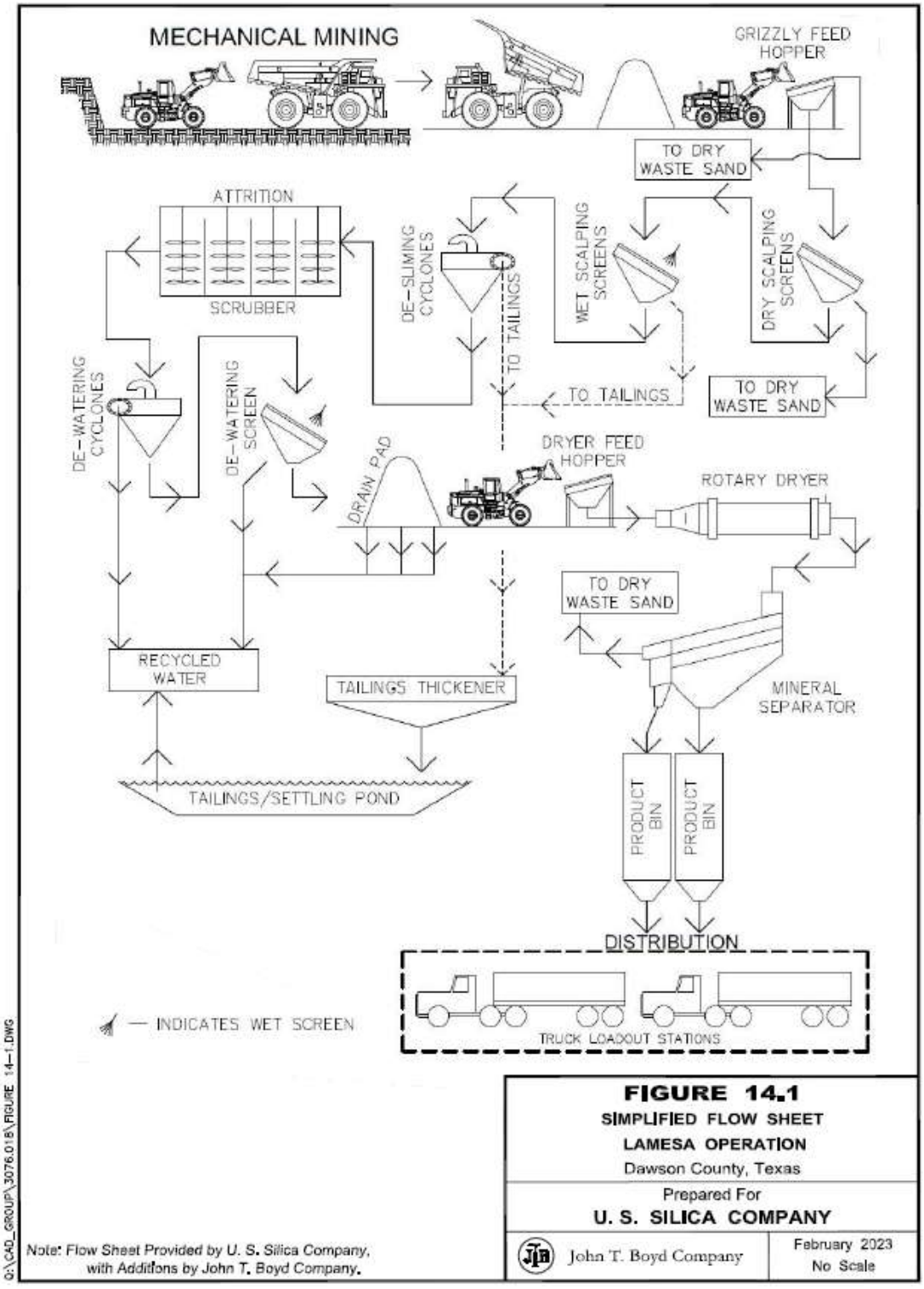


FIGURE 14.1
SIMPLIFIED FLOW SHEET
LAMESA OPERATION
Dawson County, Texas
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
No Scale

Note: Flow Sheet Provided by U. S. Silica Company, with Additions by John T. Boyd Company.

Q:\CAD_GROUP\3076.018\FIGURE 14-1.DWG

future use. The water extracted by the hydrosizers, hydro-cyclones, vacuum filters, and drain pad is also recycled for use in the processing operations.

14.1.2 Dry Processing Plant

A front-end loader is used to recover the WIP material from the drain pad and feed it into one of two dryer feed hoppers in the Dry Processing Plant. The dryer feed hoppers feed sand through one of three rotary dryers. After drying, the sand is sized and sorted using screens into 40/70-mesh, 40/140-mesh, and 100-mesh products. Any remaining oversize material at this point is screened off and deposited in the dry waste stockpile. The final products are stored in truck loadout silos for eventual transfer to bulk trucks for shipment to customers.

14.2 Production

The Lamesa Operation's LOM plan forecasts increased production from the processing plant until the nominal production capacity is reached. Recent annual production results and forecasted production over the expected life of the operation are provided in Figure 14.2.

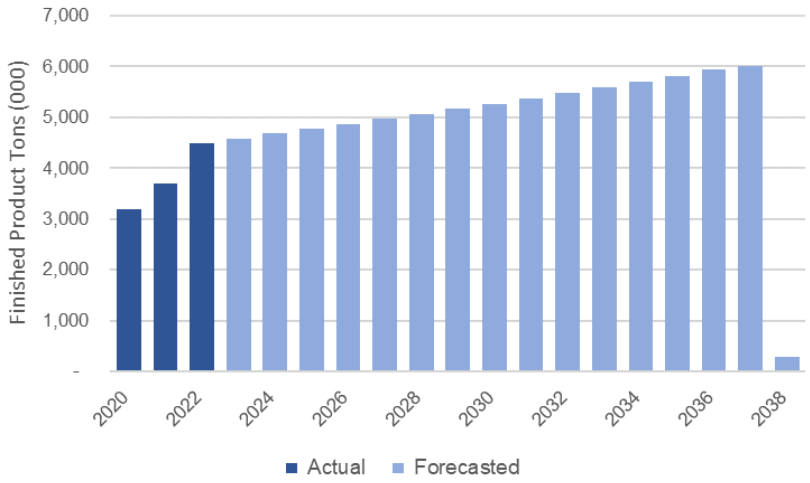


Figure 14.2: Recent Historical and LOM Forecasted Processing Plant Production

14.3 Conclusion

Based on our review, it is BOYD's opinion that the processing methods and existing equipment at the Lamesa Operation are sufficient to achieve the forecasted production of finished proppant sand products.

15.0 MINE INFRASTRUCTURE

15.1 Overview

All of the basic infrastructure required for the ongoing operations is in place at the Lamesa Operation. Figure 3.1 (page 3-2) illustrates the general layout of the infrastructure at the Lamesa Operation.

The surface facilities currently located at the operation are well constructed and have the necessary capacity/capabilities to support the Lamesa Operation's near-term operating plans. Operational preference may lead to the upgrading of some existing facilities if the operation expands in the future.

BOYD is unaware of any reported interruptions, outages, shortages, or failures related to infrastructure requirements which have materially affected the Lamesa Operation. Given the operation is well-established, we believe the risk of such events materially affecting the estimates of silica sand reserves presented herein is low.

15.2 Transportation

The Lamesa Operation is serviced by several roads maintained by the local municipality, county, and state governments. These roads are either paved or well-maintained graded roadways. Road access is available year-round.

There is not any rail infrastructure available at the Lamesa Operation. All products are shipped via bulk trucks. The nearest railhead is the Lubbock and Western in Brownfield, Texas, and the Plainsman Switching Company in Lubbock, Texas. Transloading is required to use existing rail networks and U.S. Silica has no immediate plans to transport their products from the Lamesa Operation using rail.

15.3 Utilities

Electric power for the processing plant is supplied by Lyntegar Electric Cooperative, Inc. (Lyntegar). A substation was built by Lyntegar on the Lamesa site to distribute power to the facility. Power is transmitted by a series of above ground poles running parallel to CR 9, then along CR C to the substation located east of the property. From the substation, power is distributed by a series of overhead lines and buried power cords.

Natural gas used by the processing plant is currently supplied by West Texas Gas Marketing, Inc. The gas is delivered by several underground pipes running parallel to the CR 1064.

Water for industrial purposes is supplied by agreements to purchase with neighboring landowners and two onsite wells. Given the semi-arid climate, recycling of industrial water is a priority. Potable water for consumption is delivered by truck in jugs and bottles. There are no plans for connecting to a water utility network.

15.4 Tailings Disposal

The mining and processing of silica sand at the Lamesa Operation creates a substantial amount of waste tailings, a mixture of clay, very fine sand, and other non-silica minerals. Tailings are typically disposed of in ponds (former mining pits) where the solid materials settle to the bottom and water is decanted for reuse.

Existing tailings ponds are located directly to the west of the Lamesa Processing Plant. As mining progresses west, depleted pits will become new tailing disposal sites. A freshwater pond is maintained on the property so water can be stored after reclaiming from the tailings ponds.

15.5 Other Structures

Several other buildings are located on the property, including:

- Office buildings that house engineering, financial and administrative staff.
- Several support buildings used for machinery and maintenance activities.
- A warehouse for material storage and product bagging.
- Several product loadouts.
- Various pump structures and outbuildings.

16.0 MARKET STUDIES

16.1 Market Overview

The Permian Basin's proppant sand market is driven by unconventional horizontal drilling in the oil and gas industry. In the late 1990s, rapid advances in horizontal drilling and hydraulic fracturing (fracking) in North America ushered in large-scale commercial oil and gas production. This fracking technique has been increasingly successful and modified over time to extract oil and gas held in dense layers of shale rocks, whose low permeability had previously prevented the flow of hydrocarbons.

Hydraulic fracturing uses a mixture of water, chemicals, and proppant (natural sand or man-made sand-like substances) to fracture shale rock and release hydrocarbons such as oil, natural gas and natural gas liquids. The proppant acts to keep the fractures open (prop) while the pressurized fluids flow back up the well piping. Wells have become more productive with the addition of horizontal drilling capabilities, longer lateral lengths, and multi-stage fracks.

To reduce costs, many Oilfield Services companies and E&P companies shifted from using only premium branded proppant sands, which had higher delivered costs, to locally sourced and lower-priced "in-basin" proppant sands. The first in-basin proppant sand deposits mined (late-2017) in the U.S. were located in the Permian Basin of Texas. Permian Basin E&P companies noted favorable results from locally sourced proppant sands, and as such, nearly every other energy basin has experienced a period of exploration to locate suitable local sources of proppant sands.

U.S. Silica operates in a highly competitive market that is characterized by a small number of large, national proppant sand producers and a larger number of small, regional or local, privately-owned producers. Competition in the industry is based on: (1) delivered price; (2) product consistency and quality; (3) supply capacity and reliability; and (4) customer service and technical support. The Lamesa Operation's substantial on-site product storage capacity and its strategic, in-basin location allows shipping finished products to regional customers by truck. Since transportation costs are a significant portion of the total cost to customers of proppant sands, development of the Lamesa, Texas plant as a regional frac sand facility in the Permian Basin allows U.S. Silica to compete against proppant sand products being shipped from distant states like Wisconsin, Illinois, and Missouri.

16.2 Historical Sales

U.S. Silica supplies a range of proppant sand products to major Oilfield Services companies and E&P companies operating in the Permian Basin. The Lamesa Operation is the larger of two U.S. Silica proppant sand operations in west Texas. Finished proppant sand products supplied by the Lamesa Operation primarily consist of non-API standard 40/140-mesh and “100-mesh” (50/140-mesh) sized sand, with lesser amounts of API standard 40/70-mesh sized sand.

Recent historical sales data provided by U.S. Silica for the Lamesa Operation are summarized in Table 16.1, below.

Table 16.1: Historical Sales Data

	Units	2020	2021	2022
Product Sales	000 tons	3,187	3,691	4,499
Average Selling Price	$/ton sold	21.85	18.45	31.39

Proppant sand demand dropped in 2020, as compared to 2019, due to the COVID-19 pandemic. However, recovery began in the fourth quarter of 2020 and continued throughout 2021 and 2022. In 2020, the average selling price (ASP) for the Lamesa Operation’s finished proppant sand products was $21.85 per sold ton. In 2021, the ASP dropped to $18.45 per sold ton; however, the ASP rose to $31.39 per sold ton in 2022.

According to sales information provided by U.S. Silica for the Lamesa Operation:

- Contract sales account for approximately 60% of total product sales.
- The top-five customer by sales revenue account for approximately 76% of total sales. U.S. Silica has a range of minimum purchase supply agreements with customers with initial terms spanning through 2034.

BOYD is not aware of any material contracts for the sale of proppant sand from the Lamesa Operation.

16.3 Market Outlook

Despite rises in production, the Permian Basin’s demand for in-basin proppant sand outstripped supply in 2022. Consequently, prices for in-basin finished proppant sand products rose significantly during the year. Sustained growth in demand for in-basin proppant sand products is expected. Although it operates in a highly competitive market,

it is expected that the Lamesa Operation will experience increased demand for its products due, in part, to its low costs and established customer base.

Having survived the challenging environment of 2019 and 2020, BOYD believes the Lamesa Operation should continue to prove viable into the future notwithstanding a sustained and significant energy price collapse. Their low-cost mining and processing operations, strategic in-basin location, and high-quality products help to create an advantage compared with other regional and national proppant sand producers.

17.0 PERMITTING AND COMPLIANCE

17.1 Permitting

Numerous permits are required by federal, state, and municipal law for mining, processing, and related activities at the Lamesa Operation. U.S. Silica reports that necessary permits to support current and near-term operations are in place or pending approval. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of current regulations.

A description of the salient permitting requirements for the Lamesa Operation follows.

The Texas Commission on Environmental Quality (TCEQ) requires an Industrial Hazardous Waste (IHW) Solid Waste Registration (#97503) which covers cleanup of hydraulic or lubricating oils from mobile equipment, general trash, and other hydrocarbon contaminated materials.

A Phase I Environmental Site Assessment (ESA) was performed prior to construction of the Lamesa Operation. The assessment included observations of oil and gas infrastructure including several gas and crude oil pipelines, one active oil well, several abandoned and plugged oil and gas wells, historic oil and gas water ponds and several active and abandoned water wells. Evidence of past crude oil leaks from pipelines adjacent to the property are also present. There were not any historical or environmentally sensitive habitats found during the assessment.

U.S. Silica maintains a Stormwater Pollution Prevention Plan (SWPPP) at the Lamesa Operation to address requirements of the federal Oil Pollution Prevention Regulations (40 CFR Part 122). The SWPPP outlines the treatment measures and best management practices used on site to maintain stormwater discharges within the permit limitations. Stormwater that leaves the site is authorized and outlined in the Stormwater Multi-Sector General Permit (MSGP) by the TCEQ (TXR05EB75).

A Petroleum Storage Tank (PST) registration (#89889) is held by the third-party contractor (O’Rourke Distribution Company) in charge of mining operations for a double walled fuel tank used to fuel mobile equipment on site.

Air emissions resulting from the processing plant and associated equipment at the Lamesa Operation are authorized by the TCEQ Air Permit Program Permit #151650. Provisions of the permit specify the authorized maximum operating hours at the facility, currently at 8,760 hours per year. The permit also allows for certain visible emissions at specific opacity. Quarterly visible emissions and fugitive emissions determinations are required, as well as ambient air monitoring at the request of the TCEQ.

U.S. Silica maintains an annual Aggregate Production Operation registration with the TCEQ for annual production reporting.

Under current regulations, the State of Texas does not require reclamation or remediation of surface mined lands by aggregate (including proppant sand) operations.

17.2 Compliance

U.S. Silica reports having an extensive environmental management and compliance process designed to follow or to exceed industry standards.

In their 2021 corporate sustainability report, U.S. Silica reports:

- Increasing the use of renewable energy sources.
- Enhancing water conservation and recycling efforts across our footprint, ensuring that drawing, using, and discharging fresh water is done responsibly and in compliance with water management regulations and standards.
- Employing pollution prevention measures, such as increased operational efficiency and the reuse and recycling of materials, to minimize the impact of our activities on the environment.
- Conducting annual evaluations of policies, procedures, and programs related to habitat conservation.

Mine safety is regulated by MSHA. They inspect the facilities a minimum of twice yearly. U.S. Silica’s safety record compares favorably with its regional peers.

Based on our review of information provided by U.S. Silica and available public information, it is BOYD’s opinion that the Lamesa Operation’s record of compliance with applicable mining, water quality, and environmental regulations is generally typical for that of the industry. BOYD is not aware of any regulatory violation or compliance issue which would materially impact the proppant sand reserve estimate.

17.3 Post-Mining Land Use and Reclamation

There are no formal state or federal reclamation plans or permits required for the Lamesa Operation. However, general requirements of U.S. Silica's operating permits and licenses include:

- Stabilization of disturbed areas to prevent exposure of significant materials to stormwater which could discharge off-site.
- Demolition of water wells and septic tanks.
- Disposal of hazardous wastes.

Mine site reclamation costs are funded from U.S. Silica's Asset Retirement Obligations (ARO) account. Funding of the ARO account is included in the Lamesa Operation's capital and operating costs discussed in Chapter 18 and included in the economic analysis presented in Chapter 19. ARO cost estimates are reviewed annually. As a matter of good mining practice, U.S. Silica seeks to conduct progressive reclamation throughout the operation's mining life to minimize risk and costs at closure.

17.4 Community Engagement

BOYD is unaware of any plans, negotiations, agreements with local individuals or groups or commitments to ensure local procurement and hiring.

U.S. Silica's corporate sustainability report outlines the components of its core community engagement initiatives. It's stated priorities include increasing charitable contributions to organization that support the local community and actively seeking opportunities for volunteering and community engagement.

18.0 CAPITAL AND OPERATING COSTS

18.1 Historical Financial Performance

Table 18.1 summarizes the past three years of financial data for the Lamesa Operation. We remind the reader that the COVID-19 pandemic caused severe economic, market, and other disruptions which began to affect U.S. Silica's proppant sand operations in the second quarter of 2020.

Table 18.1: Historical Financials

	Units	2020	2021	2022
Production:				
ROM Production	000 tons	3,271	4,692	5,871
Process Yield	%	97.4	78.7	76.6
Product Sales	000 tons	3,187	3,691	4,499
Gross Revenues	$ 000	69,644	68,108	141,203
Average Selling Price	$/ton sold	21.85	18.45	31.39
Total Cash Costs of Sales	$ 000	32,594	38,061	62,728
Average Cash Cost of Sales	$/ton sold	10.23	10.31	13.94
Capital Expenditures	$ 000	3,510	159	524

Gross revenues include income from product sales and shipping.

Total cash costs of sales include operating costs (i.e., mining, ongoing reclamation, processing, product loadout, and other related costs) in addition to selling, general, and administrative expenses.

Capital expenditures include maintenance (sustaining) expenses and discretionary spending on continuous improvement projects to drive and maintain cost efficiencies.

Based on the financial data presented above:

- Average realization increased from $21.85 per ton sold in 2020 to $31.39 per ton sold in 2022.
- Total cash cost of sales also increased from $10.23 per ton sold in 2020 to $13.94 per ton sold in 2022.
- EBITDA margin increased marginally from 53.2% in 2020 to 55.6% in 2022.
- Capital expenditures totaled almost $4.2 million over the three years, averaging $0.37 per ton sold.

18.2 Estimated Costs

The production and unit cost estimates provided by U.S. Silica are based on actual past performance and their customary internal budget review and approvals process. Operating volumes are well-defined and understood, as are mining and processing productivities. As such, it is BOYD's opinion that the production and financial projections are reasonable and are likely to be within ± 20% accuracy level.

This section contains forward-looking information related to capital and operating cost estimates for the Lamesa Operation.

There are inherent known and unknown risks and uncertainties associated with all mining operations. These risks, uncertainties, and other factors are not quantifiable, but include, but are not limited to, adverse general economic conditions, operating hazards, inherent uncertainties in interpreting engineering and geologic data, fluctuations in commodity prices and prices for operational services, government regulation and political risks, as well as other risks commonly associated with the mining industry.

18.2.1 Projected Capital Expenditures

The Lamesa Operation and related facilities are fully developed and should not require any near-term major capital investment to maintain full commercial production. Historically, the timing and amount of capital expenditures has been largely discretionary and within U.S. Silica's control. Their budgetary allocations for sustaining and discretionary capital expenditures over the next three years is provided in Table 18.2, below.

Table 18.2: Projected Capital Costs

Year	CapEx ($ 000)
2023	540
2024	556
2025	573
Total	1,668

BOYD considers the near-term detailed capital expenditure schedule as presented by U.S. Silica to be reasonable and representative of the capital necessary to operate the Lamesa Operation.

After 2025, capital expenditures are projected to increase 3% annually per year from 2025's expenditures until the end of operation's life. As the Lamesa Operation is in a steady state of production, the projected capital expenditures are considered reasonable and expected.

18.2.2 Projected Operating Costs

Operating cost estimates were developed based on recent actual costs and considering specific operational activity levels and cost drivers. The estimates consider current and expected labor headcount and salaries, major consumables and unit prices, power costs, and equipment and maintenance costs. The total operating cost estimate includes all site costs related to mining, processing, and general and administrative activities.

In the near-term, U.S. Silica expects their unit operating costs to stay relatively consistent (on an uninflated basis). As such, the projected total cash cost of sales over the life of the mine is $13.94 per ton sold. As the operation is in a steady state, BOYD considers the future operating cost estimates to be reasonable and appropriate.

19.0 ECONOMIC ANALYSIS

19.1 Approach

The economic analysis presented in this chapter was made for the purposes of confirming the commercial viability of the Lamesa Operation's reported proppant sand reserves and not for the purposes of valuing U.S. Silica, the Lamesa Operation, or its assets. The economic analysis contains forward-looking information related to the projected operating and financial performance of the Lamesa Operation and therefore involves inherent known and unknown risks and uncertainties, some of which may be outside of U.S. Silica's control. U.S. Silica, as with all mining companies, actively evaluates, changes, and modifies business and operating plans in response to various factors that may affect operational and/or financial results. Actual results, production levels, operating expenses, sales realizations, and all other modifying factors could vary significantly from the assumptions and estimates provided in this analysis. Risk is subjective, as such, BOYD recommends that each reader should evaluate the project based on their own investment criteria.

The financial model used for the purposes of the economic analysis has been prepared in-house by U.S. Silica as part of their annual budgeting process. The model forecasts future free cash flow from proppant sand production and sales over the life cycle of the Lamesa Operation using the annual forecasts of production, sales revenues, and operating and capital costs discussed earlier in this report. A DCF analysis, in which future free cash flows are discounted to present value, is used to derive an NPV for the proppant sand reserves. Use of DCF-NPV analysis is a standard method within the mining industry to assess the economic value of a project after allowing for the cost of capital invested.

The financial evaluation of the Lamesa Operation has been undertaken on a simplified after-tax basis and does not reflect U.S. Silica's corporate tax structure. NPV is calculated using an after-tax discount rate of 12.5% ($NPV_{12.5}$). Cash flows were assumed to occur in the middle of each year and are discounted to mid-year 2022. Cost estimates and other inputs to the cash flow model for the project have been prepared using constant 2022 money terms, i.e., without provision for inflation. Internal rate of return and project payback were not calculated, as there was no initial investment (sunk costs) considered in the financial model provided herein.

A suite of sensitivities was calculated to evaluate the effect of the main drivers of economic performance, including variations in sales prices, operating costs, and capital costs.

BOYD has reviewed the financial model and its inputs in detail. It is our opinion that the financial model provides a reasonable and accurate reflection of the Lamesa Operation's expected economic performance based on the assumptions and information available at the time of our review.

19.2 Assumptions and Limitations

Cash flow projections for the Lamesa Operation have been generated from the annual forecasts of production, sales revenues, and operating and capital costs discussed earlier in this report. A summary of the key assumptions and limitations is provided below:

- Sales volumes of finished proppant sand are expected to increase 2% per annum.
- ROM production requirements are based on an expected processing yield of 75% (the historic average) and are also projected to increase 2% per annum. Forecasted ROM production is at or below the capacity of the existing mining equipment and related infrastructure.
- Forecasted revenues are based on sales of various grades of finished proppant sand with a weighted-average sales price of $23.90 per ton.
- Capital and operating costs are discussed in Chapter 18. Capital expenditures are derived from budgetary allocations for the first three years of the forecast and escalated thereafter at 3% per annum. Unit operating costs are expected to remain relatively constant over the life of the operation at $13.94 per sold ton.
- Taxes are based on combined Federal and State Tax rates totaling 26%
- Buildup of net working capital is equal to 25% of positive cash (operating) margins.
- Depreciation and amortization expenses are estimated as the average of the proceeding three years.
- Asset recovery/salvage values were not included in the valuation.

19.3 Financial Model Results

Estimated LOM pre-tax and after-tax cash flows for proppant sand production from the Lamesa Operation are presented in Table 19.1, on the following page.

Table 19.1

ANNUAL PRODUCTION AND CASH FLOW FORECAST
LAMESA OPERATION
Prepared For
U.S. SILICA COMPANY
By
John T. Boyd Company
Mining and Geological Consultants
February 2023

Description	Units	2023	2024	2025	2026	2027	2028 to 2032	2033 to 2038	Total
Production:									
ROM Production	000 tons	6,118	6,241	6,365	6,493	6,623	35,153	39,119	106,111
Product Sales	000 tons	4,589	4,680	4,774	4,869	4,967	26,365	29,339	79,583
Total Revenues	$ 000	109,668	111,861	114,099	116,381	118,708	630,118	701,204	1,902,040
Average Selling Price	$/ton sold	23.90	23.90	23.90	23.90	23.90	23.90	23.90	23.90
Total Cash Costs of Sales	$ 000	63,965	65,245	66,550	67,881	69,238	367,525	408,987	1,109,391
Average Cash Cost of Sales	$/ton sold	13.94	13.94	13.94	13.94	13.94	13.94	13.94	13.94
EBITDA	$ 000	45,703	46,617	47,549	48,500	49,470	262,593	292,217	792,649
Depreciation & Amortization	$ 000	20,199	20,777	21,112	20,696	20,862	104,258	125,092	332,996
EBIT	$ 000	25,504	25,839	26,437	27,804	28,608	158,335	167,126	459,654
Taxes	$ 000	6,631	6,718	6,874	7,229	7,438	41,167	43,453	119,510
Operating Income	$ 000	18,873	19,121	19,564	20,575	21,170	117,168	123,673	340,144
Capital Expenditures	$ 000	540	556	573	590	607	3,322	4,692	10,879
Net Working Capital Contribution	$ 000	-	229	233	238	243	1,287	1,285	3,514
Net Income	$ 000	18,333	18,337	18,758	19,747	20,320	112,559	117,696	325,750
Pre-tax Cash Flow	$ 000	45,163	45,832	46,743	47,673	48,620	257,984	286,240	778,256
Discounted at 12.5%	$ 000	42,580	38,410	34,821	31,567	28,617	107,635	66,152	349,782
After-tax Cash Flow	$ 000	38,532	39,114	39,870	40,444	41,182	216,817	242,788	658,746
Discounted at 12.5%	$ 000	36,328	32,780	29,700	26,780	24,239	90,513	55,784	296,125

Table 19.2, below, provides a summary of the estimated remaining life of mine financial results for the Lamesa Operation.

Table 19.2: Financial Results

	Units	Remaining Life of Mine Total
Remaining Life	years	16
Production:		
ROM Production	000 tons	106,111
Product Sales	000 tons	79,583
Total Revenues	$ millions	1,902.0
Total Cash Costs of Sales	$ millions	1,109.4
Capital Expenditures	$ millions	10.9
Pre-Tax:		
Cash Flow	$ millions	778.3
$NPV_{12.5}$	$ millions	349.8
After-tax:		
Cash Flow	$ millions	658.7
$NPV_{12.5}$	$ millions	296.1

DCF-NPV on a pre-tax and after-tax basis, using discount rates of 10%, 12.5% (the base case), and 15%, were calculated utilizing the projected cash flows. Table 19.3 summarizes the results of the pre-tax and after-tax DCF-NPV analyses:

Table 19.3: DCF-NPV Analysis

	NPV ($ millions)		
	10%	12.5%	15%
Pre-Tax	399.6	349.8	309.6
After-Tax	338.2	296.1	262.2

As shown, the pre-tax DCF-NPV ranges from approximately $309.6 million to $399.6 million. The after-tax DCF-NPV ranges from approximately $262.2 million to $338.2 million.

The economic analysis confirms that the Lamesa Operation generates positive pre- and after-tax financial results and a real $NPV_{12.5}$ of $296.1 million. As such, it is BOYD's

opinion that the Lamesa Operation's proppant sand reserves have demonstrated economic viability.

19.4 Sensitivity Analysis

Table 19.4, below, shows the sensitivity of the project after-tax for a cash flow discounted at 12.5% ($NPV_{12.5}$) to a variation over a range of 20% above and below the base case in: (1) average selling prices and (2) operating costs.

Table 19.4: After-Tax $NPV_{12.5}$ Sensitivity Analysis ($ millions)

Cash Costs of Sales \ Revenues	-20%	-15%	-10%	-5%	0%	5%	10%	15%	20%
-20%	243.8	275.2	306.6	338.0	369.4	400.8	432.2	463.7	494.6
-15%	225.4	256.9	288.3	319.7	351.1	382.5	413.9	445.3	476.7
-10%	207.1	238.5	269.9	301.4	332.8	364.2	395.6	427.0	458.4
-5%	188.8	220.2	251.6	283.0	314.4	345.9	377.3	408.7	440.1
0%	170.5	201.9	233.3	264.7	**296.1**	327.5	359.0	390.4	421.8
5%	152.2	183.6	215.0	246.4	277.8	309.2	340.6	372.0	403.5
10%	133.8	165.2	196.7	228.1	259.5	290.9	322.3	353.7	385.1
15%	115.5	146.9	178.3	209.7	241.2	272.6	304.0	335.4	366.8
20%	97.2	128.6	160.0	191.4	222.8	254.2	285.7	317.1	348.5

As might be expected, the project is most sensitive to changes in product pricing and operating costs. The project is less sensitive to capital costs. There is little to no impact varying the capital costs from 70% to 130% of the base case.

This analysis demonstrates the project value to be relatively robust, with positive NPVs reported across the range of values assessed.

20.0 ADJACENT PROPERTIES

Exploration data, including the results of drilling and sampling campaigns conducted by U.S. Silica, have been collected from properties located adjacent to the Lamesa Operation (refer to Figure 7.1 on page 7-5) and used in the estimation of proppant sand resources and reserves as reported herein.

A competitor proppant sand producer recently began mining operations on the property located immediately north of the Lamesa Operation. BOYD is unaware of any other mining or exploration activities having occurred on adjacent properties.

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21.0 OTHER RELEVANT DATA AND INFORMATION

BOYD is not aware of any additional information which would materially impact the proppant sand resource and reserve estimates reported herein.

22.0 INTERPRETATION AND CONCLUSIONS

22.1 Audit Findings

BOYD's independent technical assessment was conducted in accordance with S-K 1300 and concludes:

- Sufficient data have been obtained through site exploration and sampling programs and mining operations to support the geological interpretations of the sand deposit within the controlled property of the Lamesa Operation. The data are of sufficient quantity and reliability to reasonably support the proppant sand resource and reserve estimates presented in this report.
- BOYD is of the opinion that our data verification efforts: (1) adequately confirm the reasonableness of the geologic interpretations, resource estimation criteria, and economic assumptions; and (2) support the use of the data in proppant sand resource/reserve estimation.
- The 79.6 million saleable product tons of proppant sand reserves (as of December 31, 2022) identified on the property are reasonably and appropriately supported by technical studies, which consider expected geologic conditions, planned mining and processing operations, forecasted product revenues, and operating and capital cost estimates. As such, BOYD is of the opinion that there are reasonable expectations that the stated proppant sand reserves for the Lamesa Operation are technically, economically, and legally extractable as of December 31, 2022.
- In addition to the reported reserves, U.S. Silica controls approximately 5.4 million in-place tons of measured and indicated proppant sand resources and 5.0 million in-place tons of inferred proppant sand resources at the Lamesa Operation. It is BOYD's opinion that the stated proppant sand resources have been reported using economic and mining assumptions to support the reasonable potential for eventual economic extraction.
- There is no other relevant information material to the Lamesa Operation that is necessary to make this technical report summary not misleading.

22.2 Significant Risks and Uncertainties

As a mining operation with an established operating history, the purpose of U.S. Silica's periodic mine planning exercises is to: (1) collect and analyze sufficient data to reduce or to eliminate risk in the technical components of the project, and (2) to refine economic projections based on current data. There is a high degree of certainty for this project under the current and foreseeable operating environment. A general assessment of risk is presented in the relevant sections of this report.

23.0 RECOMMENDATIONS

Based on the scope of our assignment, BOYD has no recommendations regarding the Lamesa Operation. It is our understanding that U.S. Silica continuously reviews and improves operating practices as a matter of course.

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24.0 REFERENCES

A list of supporting information is provided in Section 2.4. Additional references are cited as footnotes in the report as required.

25.0 RELIANCE ON INFORMATION PROVIDED BY REGISTRANT

In the preparation of this report, BOYD has relied, exclusively and without independent verification, upon information furnished by U.S. Silica as presented in Table 25.1, below.

Table 25.1: Information Relied Upon from Registrant

Subject Matter	Information	Report Chapter(s)
Environmental	Permits, bond, and reclamation liability	3, 17
	Sustainability initiatives	17
	Surface tailings management	15
	Mine closure requirements and plans	17
	Monitoring/compliance requirements for protected areas/species	3, 17
Governmental	Income tax rates	19
Legal	Property title and status	3
	Encumbrances, easements, and right-of-ways	3
Macroeconomics	Inflation, interest, and discount rates	19
Markets	Market overview and strategy	16
	Long-term product price projections	11, 12, 16, 19
	Product specifications	16
	Marketing and sales contracts	16
Social	Community relations	17

BOYD exercised due care in reviewing the information provided by U.S. Silica within the scope of our expertise and experience (which is in technical and financial mining issues) and concluded the data are reasonable and appropriate considering the status of the subject properties and the purpose for which this report was prepared. We have no reason to believe that any material facts have been withheld or misstated, or that further analysis may reveal additional material information. However, the accuracy of the results and conclusions of this report are reliant on the accuracy of the information provided by U.S. Silica.

TECHNICAL REPORT SUMMARY

PROPPANT SAND RESOURCES AND RESERVES

CRANE OPERATION

Crane County, Texas

Prepared For

U.S. SILICA COMPANY

Katy, Texas

By

John T. Boyd Company

Mining and Geological Consultants

Pittsburgh, Pennsylvania

Report No. 3076.020
FEBRUARY 2023

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February 22, 2023

File: 3076.020

John T. Boyd Company
Mining and Geological Consultants

U.S. Silica Company
24275 Katy Freeway, Suite 600
Katy, TX 77494-7271

Attention: Mr. Terry Lackey
Mining Director

Subject: Technical Report Summary
Proppant Sand Resources and Reserves
Crane Operation
Crane County, Texas

Ladies and Gentlemen:

The John T. Boyd Company (BOYD) was retained by U.S. Silica Company (U.S. Silica) to complete an independent technical assessment of the proppant sand resource and reserve estimates for the Crane Operation as of December 31, 2022.

This technical report summary: (1) summarizes material technical and geoscientific information for the subject mining property, (2) provides the conclusions of our technical assessment, and (3) provides a statement of proppant sand resources and reserves for the Crane Operation.

Respectfully submitted,

JOHN T. BOYD COMPANY
By:

John T. Boyd II
President and CEO

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LETTER OF TRANSMITTAL

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GLOSSARY OF ABBREVIATIONS AND DEFINITIONS

000	:	Thousand(s)
$	:	US dollar(s)
%	:	Percent or percentage
AEI	:	Associated Environmental Industries, Corp.
AMSL	:	Above mean sea level
API	:	American Petroleum Institute
ARO	:	Asset Retirement Obligation(s)
ASP	:	Average Selling Price
ASTM	:	ASTM International (formerly American Society for Testing and Materials)
BNSF	:	BNSF Railway Company
BOYD	:	John T. Boyd Company
CapEx	:	Capital expenditures
Constant Dollar	:	A monetary measure that is not influenced by inflation and used to compare time periods. Sometimes referred to as “real dollars”.
CSX	:	CSX Transportation
DCF	:	Discounted Cash Flow
Discount Rate	:	A rate of return used to discount future cash flows based on the return investors expect to receive from their investment.
E&P	:	Exploration and Production
EBIT	:	Earnings before interest and taxes
EBITDA	:	Earnings before interest, taxes, depreciation, and amortization
ESA	:	Environmental Site Assessment
Frac Sand	:	*See “Proppant Sand”*

GLOSSARY OF ABBREVIATIONS AND DEFINITIONS - Continued

ft	:	Foot/feet
Indicated Proppant Sand Resource	:	That part of a proppant sand resource for which quantity and quality are estimated based on adequate geological evidence and sampling. The level of geological certainty associated with an indicated proppant sand resource is sufficient to allow a qualified person to apply modifying factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Because an indicated proppant sand resource has a lower level of confidence than the level of confidence of a measured proppant sand resource, an indicated proppant sand resource may only be converted to a probable proppant sand reserve.
Inferred Proppant Sand Resource	:	That part of a proppant sand resource for which quantity and quality are estimated based on limited geological evidence and sampling. The level of geological uncertainty associated with an inferred proppant sand resource is too high to apply relevant technical and economic factors likely to influence the prospects of economic extraction in a manner useful for evaluation of economic viability. Because an inferred proppant sand resource has the lowest level of geological confidence of all proppant sand resources, which prevents the application of the modifying factors in a manner useful for evaluation of economic viability, an inferred proppant sand resource may not be considered when assessing the economic viability of a mining project, and may not be converted to a proppant sand reserve.
IRR	:	Internal rate-of-return
ISO		International Organization for Standardization
ISP	:	Industrial and Specialty Products
lb	:	Pound
LOM	:	Life-of-Mine
Lyntegar	:	Lyntegar Electric Cooperative, Inc.

GLOSSARY OF ABBREVIATIONS AND DEFINITIONS - Continued

Measured Proppant Sand Resource	:	That part of a proppant sand resource for which quantity and quality are estimated based on conclusive geological evidence and sampling. The level of geological certainty associated with a measured proppant sand resource is sufficient to allow a qualified person to apply modifying factors, as defined herein, in sufficient detail to support detailed mine planning and final evaluation of the economic viability of the deposit. Because a measured proppant sand resource has a higher level of confidence than the level of confidence of either an indicated proppant sand resource or an inferred proppant sand resource, a measured proppant sand resource may be converted to a proven proppant sand reserve or to a probable proppant sand reserve
Mesh	:	A measurement of particle size often used in determining the size distribution of granular material.
Mineral Reserve	:	*See "Proppant Sand Reserve"*
Mineral Resource	:	*See "Proppant Sand Resource"*
Modifying Factors		The factors that a qualified person must apply to indicated and measured proppant sand resources and then evaluate to establish the economic viability of proppant sand reserves. A qualified person must apply and evaluate modifying factors to convert measured and indicated proppant sand resources to proven and probable proppant sand reserves. These factors include but are not restricted to: mining; processing; infrastructure; economic; marketing; legal; environmental compliance; plans, negotiations, or agreements with local individuals or groups; and governmental factors. The number, type and specific characteristics of the modifying factors applied will necessarily be a function of and depend upon the mineral, mine, property, or project.
MSHA	:	Mine Safety and Health Administration. A division of the U.S. Department of Labor
MSGP	:	Multi-Sector General Permit
NTU	:	Nephelometric turbidity units.
NPV	:	Net Present Value
O&G	:	Oil and Gas

GLOSSARY OF ABBREVIATIONS AND DEFINITIONS - Continued

Probable Proppant Sand Reserve	:	The economically mineable part of an indicated and, in some cases, a measured proppant sand resource.
Production Stage Property	:	A property with material extraction of proppant sand reserves.
Proppant Sand	:	Proppant (frac) sand is a naturally occurring, high silica content quartz sand, with grains that are generally well rounded and exhibit high compressive strength characteristics relative to other proppant sand. It is utilized as a prop or “proppant” in unconventional shale frac well completions.
Proppant Sand Reserve	:	Proppant sand reserve is an estimate of tonnage and grade or quality of indicated and measured proppant sand resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated Proppant sand resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted.
Proppant Sand Resource	:	Proppant sand resource is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. A proppant sand resource is a reasonable estimate of mineralization, taking into account relevant factors such as cut-off grade, likely mining dimensions, location or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable. It is not merely an inventory of all mineralization drilled or sampled.
Proven Proppant Sand Reserve	:	The economically mineable part of a measured proppant sand resource which can only result from conversion of a measured proppant sand resource.
PSI	:	Pounds per square inch
PST	:	Petroleum Storage Tank
QP	:	Qualified Person

GLOSSARY OF ABBREVIATIONS AND DEFINITIONS - Continued

Qualified Person	:	An individual who is: 1. A mineral industry professional with at least five years of relevant experience in the type of mineralization and type of deposit under consideration and in the specific type of activity that person is undertaking on behalf of the registrant; and 2. An eligible member or licensee in good standing of a recognized professional organization at the time the technical report is prepared. For an organization to be a recognized professional organization, it must: a. Be either: i. An organization recognized within the mining industry as a reputable professional association; or ii. A board authorized by U.S. federal, state, or foreign statute to regulate professionals in the mining, geoscience, or related field; b. Admit eligible members primarily based on their academic qualifications and experience; c. Establish and require compliance with professional standards of competence and ethics; d. Require or encourage continuing professional development; e. Have and apply disciplinary powers, including the power to suspend or expel a member regardless of where the member practices or resides; and f. Provide a public list of members in good standing.
ROM	:	Run-of-Mine. The processing feed material, including proppant sand and any inseparable waste, excavated from the mine.
SEC	:	U.S. Securities and Exchange Commission
S-K 1300	:	Subpart 1300 and Item 601(b)(96) of the U.S. Securities and Exchange Commission's Regulation S-K
SWPPP	:	Stormwater Pollution Prevention Plan
Ton	:	Short Ton. A unit of weight equal to 2,000 pounds
TCEQ	:	Texas Commission on Environmental Quality
U.S. Silica	:	U.S. Silica Company, its parent company (U.S. Silica Holdings, Inc.) and its consolidated subsidiaries as a combined entity.
WIP	:	Work-in-progress

1.0 EXECUTIVE SUMMARY

1.1 Introduction

U.S. Silica's Crane Operation is an active surface proppant sand mining and processing operation that has been producing finished proppant (frac) sand products since 2018.

BOYD prepared this technical report summary for U.S. Silica in support of their disclosure of proppant sand reserves for the Crane Operation in accordance with Subpart 1300 and Item 601(b)(96) of the SEC's Regulation S-K (S-K 1300). The purpose of this report is threefold: (1) to summarize material technical and geoscientific information for the subject mining property, (2) to provide the conclusions of our technical assessment, and (3) to provide a statement of proppant sand resources and/or reserves for the Crane Operation.

Information used in our assessment was obtained from: (1) files provided by U.S. Silica, (2) discussions with U.S. Silica personnel, (3) records on file with regulatory agencies, (4) public sources, and (5) nonconfidential information in BOYD's possession.

Unless otherwise noted, the effective date of the information, including estimates of proppant sand reserves, is December 31, 2022.

Weights and measurements are expressed in the US customary measurement system throughout this report.

1.2 Property Description

U.S. Silica's Crane Operation is a surface proppant sand mining and processing operation located 25 miles west of the City of Odessa in Crane County, Texas. The cities of Lubbock and Dallas, Texas, are located approximately 147 miles northeast and 355 miles east, respectively, of the Crane Operation. The general location of the Crane Operation is provided in Figure 1.1, following this page.

The property comprises ±3,200 generally contiguous acres of surface and mineral rights wholly owned by U.S. Silica. A royalty of $1 per ton of finished sand sold is payable to the former owners of the property. The mine offices, maintenance facilities, processing plant, loadout facilities, and tailings ponds are located on the northeast corner of the property while the active and future mining areas are located to the south and west.

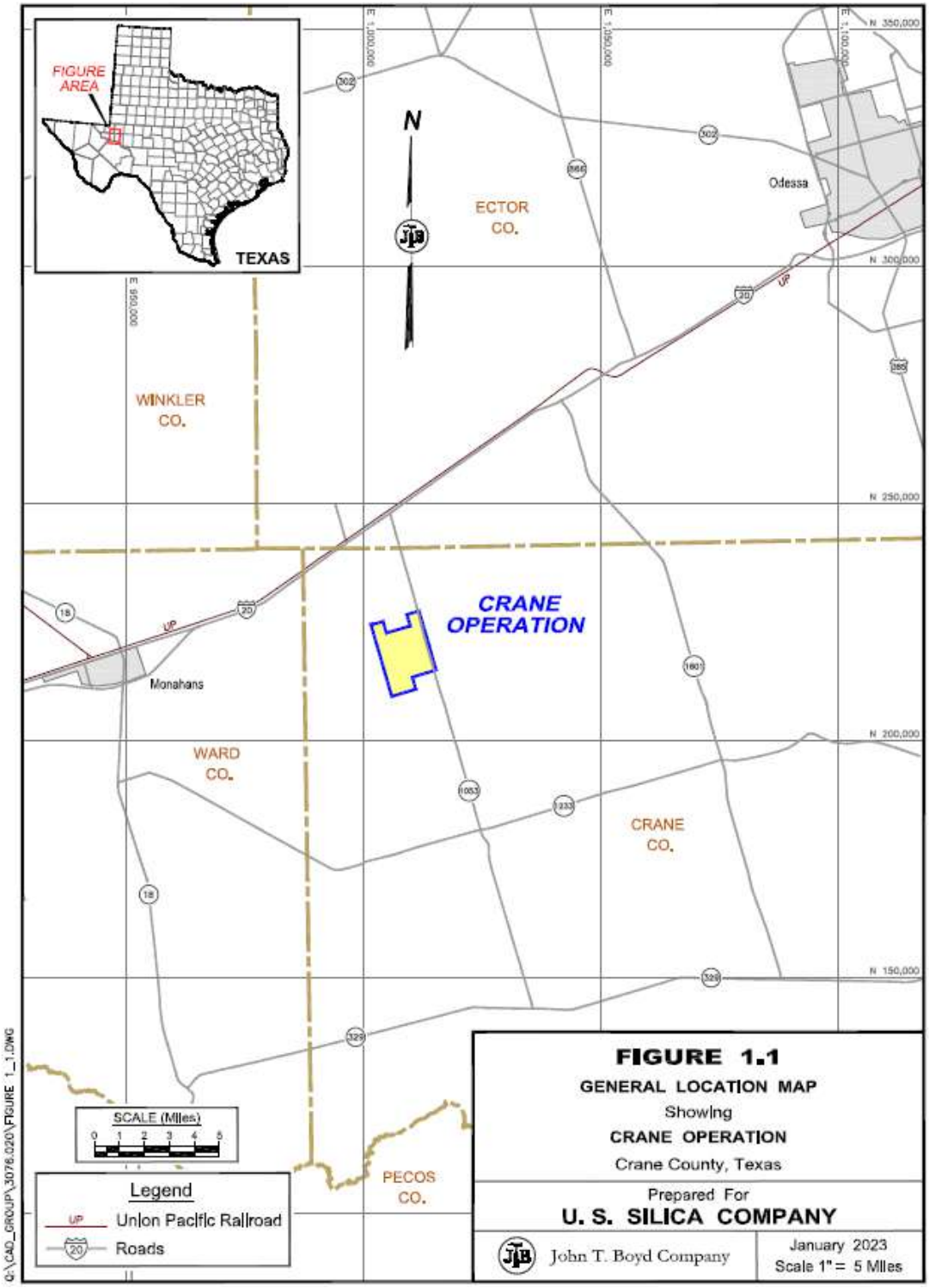


FIGURE AREA
TEXAS
N
ECTOR CO.
Odessa
WINKLER CO.
CRANE OPERATION
Monahans
WARD CO.
CRANE CO.
PECOS CO.
UP
SCALE (Miles)
0 1 2 3 4 5
Legend
Union Pacific Railroad
Roads
FIGURE 1.1
GENERAL LOCATION MAP
Showing
CRANE OPERATION
Crane County, Texas
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
January 2023
Scale 1" = 5 Miles
Q:\CAD_GROUP\3076.020\FIGURE 1_1.DWG

1.3 Geology

The Crane Operation's target sand bearing formation is the unconsolidated sand dunes of the Llano Estacado, which is a series of dune fields of varying extent and thickness. Locally these sand dunes are known as the "Monahan's Sandhills."

At the Crane Operation, the Monahan Sandhills are a series of gently rolling sand dunes overlying a sandstone unit. The formation is a white to buff, fine- to medium-grained ortho-quartzite. It contains rounded, clear polished sand quartz grains with minor secondary silica and clay cement. The sandstone unit is in turn underlain by a predominantly limestone unit. Where covered, the sand is overlain by a negligible layer of overburden material consisting of vegetation and oversize rock. The two sand units are generally mineable from the ground surface down to the basal limestone unit. Combined thickness of both sand units ranges from 10 to 80 ft across the property.

1.4 Exploration

U.S. Silica has conducted two exploration campaigns on the Crane property. The 26 drill holes completed in and around the property were utilized to define the lateral extent, thickness, particle size distribution, and mineralogy of the target sand deposit at the Crane Operation.

BOYD's audit indicates that in general: (1) U.S. Silica has performed extensive drilling and sampling work on the subject property, (2) the work completed has been done by competent personnel, and (3) the amount of data available combined with extensive knowledge and recent production of the sand deposit, are sufficient to confirm the thickness, lateral extents, and quality characteristics of the Crane proppant sand reserves.

1.5 Proppant Sand Resources and Reserves

As shown in Table 1.1, following this page, U.S. Silica owns approximately 2.2 million in place tons of indicated proppant sand resources and 16.4 million in place tons of

inferred proppant sand resources, *exclusive* of proppant sand reserves, at the Crane Operation, as of December 31, 2022.

Table 1.1: Crane Operation Proppant Sand Resources[1]
(as of December 31, 2022)

Classification	In-Place Tons (000)
Measured	-
Indicated	2,246
Total Measured + Indicated	2,246
Inferred	16,396

Notes:
1. Proppant sand resources are reported *in addition to* proppant sand reserves.

While these “additional” proppant sand resources have not been included in the Crane Operation’s life-of-mine (LOM) plan, they are considered to have prospects for eventual economic extraction by virtue of their similarity—in terms of demonstrated extraction methods and expected finished product qualities—to those converted to proppant sand reserves.

U.S. Silica’s estimated surface mineable proppant sand reserves for the Crane Operation total 121.9 million saleable product tons remaining as of December 31, 2022. The proppant sand reserves are fully owned by U.S. Silica and are summarized in Table 1.2, below.

Table 1.2: Crane Operation Proppant Sand Reserves
(as of December 31, 2022)

	Tons (000)	
Classification	Mineable	Saleable
Proven	110,156	90,879
Probable	37,632	31,046
Total	147,788	121,925

The Crane Operation has a well-established practice of mining, processing, and selling proppant sand products into Oil and Gas market. BOYD has concluded that sufficient studies have been undertaken to enable the proppant sand resources to be converted to

proppant sand reserves based on proposed operating methods and forecasted costs and revenues.

1.6 Operations

1.6.1 Mining

Contractors are employed to conduct surface mining on the Crane property. The target sand deposit is excavated using conventional truck and excavator methods. Generally, the negligibly thin layer of overburden is mined with the unconsolidated sand dunes; however, small areas of caliche overburden are present and must be removed prior to mining the sand. The sand does not require drilling or blasting. Excavators and/or front-end loaders are used to load articulated haul trucks with disaggregated sand. The haul trucks deliver raw sand material to run-of-mine (ROM) stockpile located near the processing facilities.

Over the past three years, the operation has mined almost 7.8 million tons of raw sand. During mid-2020, production was halted due to the COVID-19 pandemic. Production resumed in April of the following year. U.S. Silica's LOM plan forecasts mining 147.8 million tons of ROM proppant sand at a rate of 4.2 million tons in 2023 increasing to 4.8 million in 2030 and continuing until the forecasted end of life for the operation in 2053.

1.6.2 Processing

The Crane Operation's Wet and Dry Processing Plants are located in the northeastern corner of the property.

Mined ROM material from the pit arrives at the Wet Processing Plant by truck, where it is screened and washed to remove vegetation, oversize (> 40-mesh) and fine waste (<200-mesh) material. The remaining material is mixed with water to create a slurry that is passed through a series of desliming cyclones and attrition scrubbers to remove clay and undersized (very fine) particles. The deslimed material is then processed through a series of hydrosizers, hydro-cyclones, and vacuum filters to remove excess water. The remaining "work-in-progress" (WIP) material is stockpiled outside on a drain pad to further reduce moisture before it is recovered and enters the Dry Processing Plant. Within the Dry Processing Plant, the WIP sand is dried, sized and sorted. The 40/70-mesh and 100-mesh dry finished products are stored in silos prior to loading in bulk truck for shipment to customers in the Permian Basin.

The processing operations have a nominal capacity of 4 million tons of finished sand per year. Based on our review, it is BOYD's opinion that the processing methods and

existing equipment at the plant will be sufficient for the forecasted production levels over the life of the operation.

1.6.3 Other Infrastructure

The Crane Operation is supported by various utilities and transportation networks needed to allow processing and transportation of finished proppant sands.

Electricity to the Crane site is delivered through an above-ground network that terminates at a substation at the processing facility, and from there electricity is distributed via several underground and above-ground powerlines.

Initial makeup water for industrial use is obtained through a regional water gathering and transport system for mining and oil and gas operators in west Texas. Potable water is delivered by truck in jugs and bottles.

Natural gas is supplied via several underground pipelines.

Tailings from processing consist generally of clays, silts, and very fine sands, which are typically disposed of in old mining pit impoundments. The tailings ponds are currently located north of the processing plant and are designed to accommodate rejects produced during the next several years of production. At that time, it is expected that mining will have advanced to the westward, and the mined pits will be used for tailings.

Transportation needs are met through a well-developed road network on both paved and graded dirt roads. No local railheads are present.

1.7 Financial Analysis

1.7.1 Market Analysis

U.S. Silica supplies a range of proppant sand products to major Oilfield Services companies and Exploration and Production (E&P) companies operating in the Permian Basin. The Crane Operation is one of U.S. Silica's two proppant sand operations in west Texas. Finished proppant sand products supplied by the Crane Operation primarily consist of non-API standard 40/140-mesh and "100-mesh" (50/140-mesh) sized sand, with lesser amounts of API standard 40/70-mesh sized sand.

U.S. Silica operates in a highly competitive market that is characterized by a small number of large, national proppant sand producers and a larger number of small, regional or local, privately-owned producers. Competition in the industry is based on: (1)

delivered price; (2) product consistency and quality; (3) supply capacity and reliability; and (4) customer service and technical support. The Crane Operation's substantial on-site product storage capacity and its strategic, in-basin location allows shipping finished products to reginal customers by truck. Since transportation costs are a significant portion of the total cost to customers of proppant sands, development of the Crane, Texas plant as a regional sand facility in the Permian Basin allows U.S. Silica to compete against products being shipped from regional producers as well as distant states like Wisconsin, Illinois, and Missouri.

U.S. Silica's product sales were materially impacted by the COVID-19 pandemic, with production suspending in mid-2020. However, their sales volumes and revenues have recovered substantially, and continued growth is expected over the long-term.

1.7.2 Capital and Operating Cost Estimates

The Crane Operation's financial performance over the last years is summarized as follows:

- Average realization increased from $22.06 per ton sold in 2020 to $30.78 per ton sold in 2022.
- Total cash cost of sales decreased from $16.67 per ton sold in 2020 to $14.15 per ton sold in 2022.
- EBITDA margin increased marginally from 24.4% in 2020 to 54.0% in 2022.
- Capital expenditures totaled almost $3.8 million over the three years, averaging $0.54 per ton sold.

Forward-looking production and unit cost estimates are based on actual past performance and subject to U.S. Silica's customary internal budget review and approvals process. In BOYD's opinion, operating volumes are well-defined and understood, as are mining and processing productivities.

The Crane Operation and related facilities are fully developed and should require no near-term major capital investment to maintain full commercial production. Historically, the timing and amount of capital expenditures has been largely discretionary and within U.S. Silica's control. Their budgetary allocations for sustaining and discretionary capital expenditures over the next three years totals $2.2 million. Thereafter, capital expenditures are expected to rise yearly at a rate of 3% annually starting in 2024. BOYD considers the near-term detailed capital expenditure schedule as presented by U.S. Silica to be reasonable and representative of the capital necessary to operate the Crane Operation.

Operating cost estimates were developed based on recent actual costs and considering specific operational activity levels and cost drivers. In the near-term, U.S. Silica expects their unit operating costs to stay relatively level (on an uninflated basis). As such, the projected total cash cost of sales over the life of the mine is $14.15 per ton sold. As the operation is in a steady state, BOYD considers the future operating cost estimates to be reasonable and appropriate.

1.7.3 Economic Analysis

An economic analysis of the Crane Operation was prepared in-house by U.S. Silica as part of their annual budgeting process. The financial model forecasts future free cash flow from proppant sand production and sales over the life cycle of the Crane Operation using the annual forecasts of production, sales revenues, and operating and capital costs.

Table 1.3, below, provides a summary of the estimated financial results for the remaining life of the Crane Operation.

Table 1.3: Financial Results

	Units	Remaining Life of Mine Total
Remaining Life	years	31
Production:		
ROM Production	000 tons	147,788
Product Sales	000 tons	121,925
Total Revenues	$ millions	2,916.4
Total Cash Costs of Sales	$ millions	1,725.2
Capital Expenditures	$ millions	35.4
Pre-Tax:		
Cash Flow	$ millions	1,154.6
$NPV_{12.5}$	$ millions	299.6
After-tax:		
Cash Flow	$ millions	968.6
$NPV_{12.5}$	$ millions	252.5

Table 1.4 summarizes the results of the pre-tax and after-tax discounted cash flows (DCF) and net present value (NPV) analyses for the Crane Operation.

Table 1.4: DCF-NPV Analysis

	NPV ($ millions)		
	10%	12.5%	15%
Pre-Tax	362.4	299.6	254.4
After-Tax	305.2	252.5	214.6

The NPV estimate was made for purposes of confirming the economic viability of the reported proppant sand reserves and not for purposes of valuing the U.S. Silica, Crane Operation, or its assets. Internal rate-of-return (IRR) and project payback were not calculated, as there was no initial investment considered in the financial analysis presented herein.

BOYD reviewed the financial model and its inputs in detail, and opined that model provides a reasonable and accurate reflection of the Crane Operation's expected economic performance based on the assumptions and information available at the time of our review.

1.8 Permitting Requirements

Numerous permits are required by federal and state law for mining, processing, and related activities at the Crane Operation, which U.S. Silica reports are in place or pending approval. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of current regulations.

U.S. Silica reports having an extensive environmental management and compliance process designed to follow or to exceed industry standards.

Mine safety is regulated by the U.S. Department of Labor's Mine Safety and Health Administration (MSHA). MSHA inspects the facilities a minimum of twice yearly. U.S. Silica's safety record compares favorably with its regional peers.

BOYD is not aware of any regulatory violation or compliance issue which would materially impact the proppant sand reserve estimate.

1.9 Conclusions

It is BOYD's overall conclusion that U.S. Silica's estimates of proppant sand reserves, as reported herein: (1) were prepared in conformance with accepted industry standards and practices, and (2) are reasonably and appropriately supported by technical evaluations, which consider all relevant modifying factors.

Given the operating history and status of evolution, residual uncertainty (future risk) for this operation is considered minor under the current and foreseeable operating environment. It is BOYD's opinion that extraction of the proppant sands reported herein is technically, legally, and economically achievable after the consideration of potentially material modifying factors. The ability of U.S. Silica, or any mine operator, to recover all the reported proppant sand reserves is dependent on numerous factors that are beyond the control of, and cannot be anticipated by, BOYD. These factors include mining and geologic conditions, the capabilities of management and employees, the securing of required approvals and permits in a timely manner, future proppant sand prices, etc. Unforeseen changes in regulations could also impact performance.

2.0 INTRODUCTION

2.1 Registrant

U.S. Silica is a US-based mining company headquartered in Katy, Texas. The company's common stock is listed on the New York Stock Exchange (NYSE:SLCA). U.S. Silica is actively engaged in the production and marketing of commercial silica sand and performance materials (diatomaceous earth, calcium bentonite clay, calcium montmorillonite clay, and perlite products). Their whole grain silica products are used as proppant (frac) sand for oil and natural gas recovery, and in the manufacture of glass, foundry, and building products. U.S. Silica's performance materials are used in: (1) filtration for foods and beverages, pharmaceuticals, and swimming pools; (2) as additives in paint and coatings, plastics and rubber, and agriculture products; and (3) for bleaching, catalysis and adsorption in edible oil processing, aromatics purification, and industrial and chemical applications. Additional information regarding U.S. Silica can be found on their website: www.ussilica.com.

2.2 Terms of Reference and Purpose

U.S. Silica retained BOYD to complete an independent technical assessment of their internally-prepared proppant sand resource and reserve estimates and supporting information for the Crane Operation.

BOYD prepared this technical report summary for U.S. Silica in support of their disclosure of proppant sand reserves for the Crane Operation in accordance with S-K 1300. The purpose of this report is threefold: (1) to summarize material technical and geoscientific information for the subject mining property, (2) to provide the conclusions of our technical assessment, and (3) to provide a statement of proppant sand resources and/or reserves for the Crane Operation.

BOYD's findings are based on our detailed examination of the supporting geologic and other scientific, technical, and economic information provided by U.S. Silica, as well as our assessment of the methodology and practices applied by U.S. Silica in formulating the estimates of proppant sand resources and reserves disclosed in this report. We did not independently estimate proppant sand resources or reserves from first principles.

We used standard engineering and geoscience methods, or a combination of methods, that we considered to be appropriate and necessary to establish the conclusions set forth herein. As in all aspects of mining property evaluation, there are uncertainties

inherent in the interpretation of engineering and geoscience data; therefore, our conclusions necessarily represent only informed professional judgment.

The ability of U.S. Silica, or any mine operator, to recover all of the estimated proppant sand reserves presented in this report is dependent on numerous factors that are beyond the control of, and cannot be anticipated by, BOYD. These factors include mining and geologic conditions, the capabilities of management and employees, the securing of required approvals and permits in a timely manner, future sand prices, etc. Unforeseen changes in regulations could also impact performance. Opinions presented in this report apply to the site conditions and features as they existed at the time of BOYD's investigations and those reasonably foreseeable.

This report is intended for use by U.S. Silica, subject to the terms and conditions of its professional services agreement with BOYD. We also consent to U.S. Silica filing this report as a technical report summary with the SEC pursuant to S-K 1300. Except for the purposes legislated under US securities law, any other uses of or reliance on this report by any third party is at that party's sole risk.

2.3 Expert Qualifications

BOYD is an independent consulting firm specializing in mining-related engineering and financial consulting services. Since 1943, BOYD has completed over 4,000 projects in the United States and more than 60 other countries. Our full-time staff comprises mining experts in: civil, environmental, geotechnical, and mining engineering; geology; mineral economics; and market analysis. Our extensive experience in proppant sand resource and reserve estimation combined with our knowledge of the subject property, provides BOYD an informed basis on which to opine on the reasonableness of the estimates provided by U.S. Silica. An overview of BOYD can be found on our website at www.jtboyd.com.

The individuals primarily responsible for completing this technical assessment and the preparation of this report are by virtue of their education, experience, and professional association considered qualified persons (QPs) as defined in S-K 1300.

Neither BOYD nor its staff employed in the preparation of this report have any beneficial interest in U.S. Silica, and are not insiders, associates, or affiliates of U.S. Silica. The results of our assessment were not dependent upon any prior agreements concerning the conclusions to be reached, nor were there any undisclosed understandings concerning any future business dealings between U.S. Silica and BOYD. This report was

prepared in return for fees based upon agreed commercial rates, and the payment for our services was not contingent upon our opinions regarding the project or approval of our work by U.S. Silica and its representatives.

2.4 Principal Sources of Information

Information used in this assignment was obtained from: (1) files provided by U.S. Silica, (2) discussions with U.S. Silica personnel, (3) records on file with regulatory agencies, (4) public sources, and (5) nonconfidential information in BOYD's possession.

The following information was provided by U.S. Silica:

- Year-end reserve statements and reports for 2021 and 2022.
- Exploration records (e.g., drilling logs and lab sheets).
- Geologic databases of lithology and sand quality.
- Computerized geologic models.
- Mapping data, with:
  - Land ownership boundaries.
  - Infrastructure locations.
  - Easement and right-of-way boundaries.
  - Surveyed topography (surface elevation).
- Mine plans, production schedules, and supporting data.
- Overview of processing operations and detailed flow sheets.
- Copies of mining and operating permits.
- Historical information, including:
  - Production reports.
  - Financial statements.
  - Product sales and pricing.

Information from sources external to BOYD and/or U.S. Silica are referenced accordingly.

The data and work papers used in the preparation of this report are on file in our offices.

2.5 Personal Inspections

A site visit and inspection of the Crane Operation was completed on October 25, 2022,
by BOYD's QPs responsible for the preparation of this report. The site visit included: (1) observation of the active mining operations, (2) a tour of the mine site's surface infrastructure, and (3) a tour of the process plant and truck loadouts. BOYD's representatives were accompanied by senior U.S. Silica engineering and management

personnel who openly and cooperatively answered questions regarding, but not limited to: site history; deposit geology; mining and processing operations; near- and long-range mining plans; and proppant sand marketing.

2.6 Report Version

The proppant sand resources and reserves presented in this Technical Report Summary are effective as of December 31, 2022. The effective (i.e., “as of”) date of the report is December 31, 2022.

This is the first Technical Report Summary filed by U.S. Silica for the Crane Operation. The user of this document should ensure that this is the most recent disclosure of proppant sand resources and reserves for the Crane Operation as it is no longer valid if more recent estimates have been issued.

2.7 Units of Measure

The US customary measurement system has been used throughout this report. Tons are short tons of 2,000 pounds-mass. Unless otherwise stated, currency is expressed in US Dollars ($). Historic prices and costs are presented in nominal (unadjusted) dollars. Future dollars values are expressed on a constant (unescalated) basis.

3.0 PROPERTY DESCRIPTION

3.1 Location

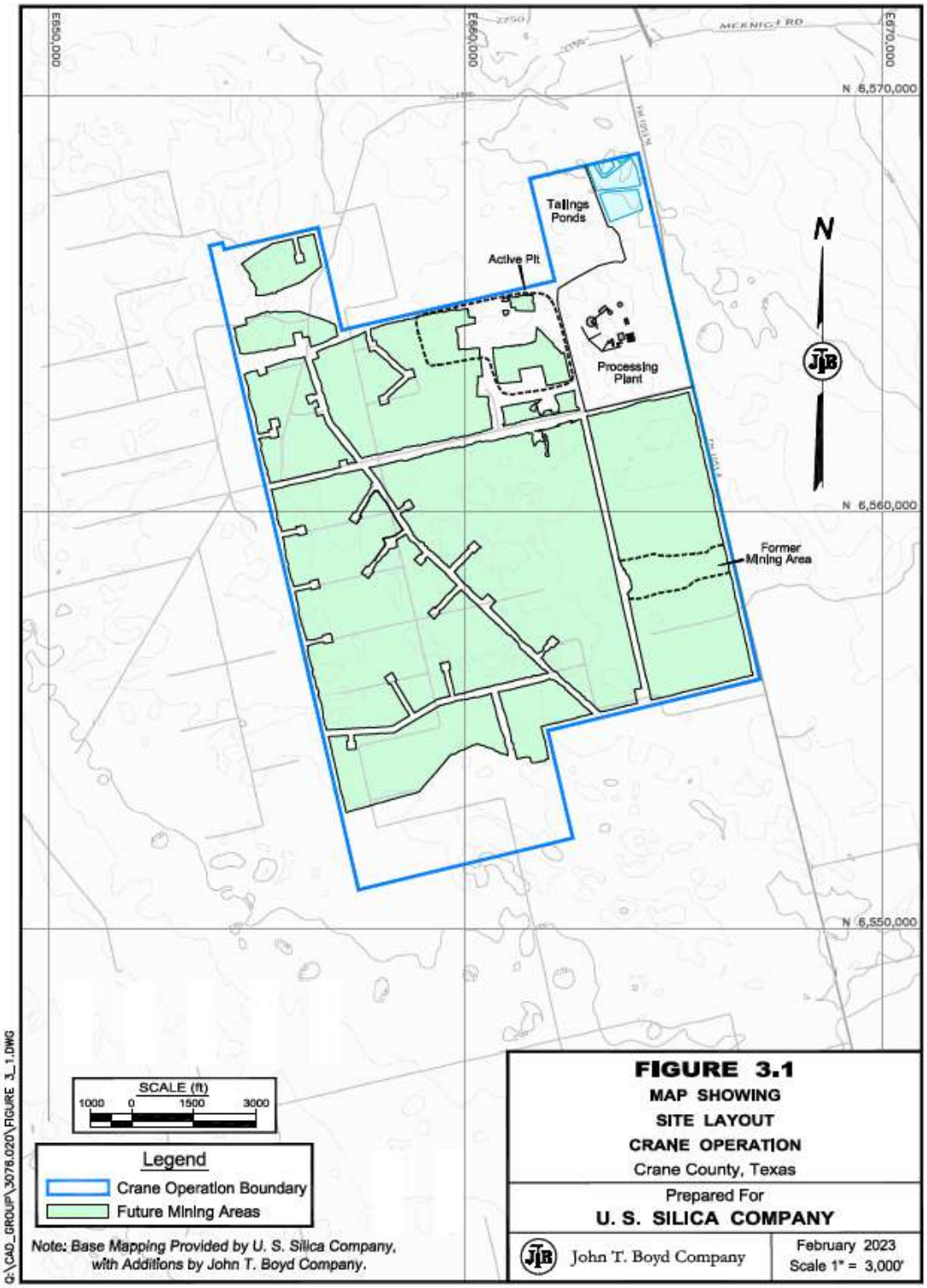
U.S. Silica's Crane Operation is a surface proppant sand mining and processing operation located 25 miles west of the City of Odessa in Crane County, Texas. The cities of Lubbock and Dallas, Texas, are located approximately 147 miles northeast and 355 miles east, respectively, of the Crane Operation. Figure 1.1 (page 1-2) illustrates the general location of the Crane Operation.

The property is contiguous with the exception of pre-existing oil production infrastructure easements for roads, storage areas, pipelines and pump jack stations. The mine offices, maintenance facilities, processing plant, loadout facilities, and former mining pits are located on the northeast edge of the property. Figure 3.1, on the following page, shows the general layout of the Crane Operation.

Geographically, the Crane Operation's processing plant is located at approximately 31° 38' 58.34" N latitude and 102° 42' 2.52" W longitude.

3.2 Property Rights

The Crane Operation comprises approximately 3,200 acres of surface and minerals rights fully owned by U.S. Silica. The land with mineral rights was purchased by U.S. Silica for the purposes of developing a new proppant sand mine in the Permian Basin.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MEKNIC LRD
Tailings Ponds
Active Pit
Processing Plant
Former Mining Area
N
SCALE (ft)
1000 0 1500 3000
Legend
Crane Operation Boundary
Future Mining Areas
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 3.1
MAP SHOWING
SITE LAYOUT
CRANE OPERATION
Crane County, Texas
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3,000'
Q:\CAD_GROUP\3078.020\FIGURE 3_1.DWG

3.3 Encumbrances

3.3.1 Fees and Royalties

To maintain ownership of the Crane Operation property, U.S. Silica must pay property taxes to the local government in Crane County. To BOYD's knowledge, there are no liens against the properties.

The purchase agreement for the property included a royalty payable to the sellers (McKnight Natural Resources and Flying U Properties). The royalty rate is $1.00 per ton of processed proppant sand sold.

It is BOYD's understanding that there are no additional royalties, overriding or limited royalties, working interests, production payments, net profit interests, or other mineral interests in the Crane Operation properties.

3.3.2 Permitting Requirements

Mining and processing activities on the Crane Operation properties are regulated by several federal and state laws. As mandated by these laws and regulations, numerous permits are required for mining, processing, and other incidental activities. U.S. Silica reports that necessary permits are in place or applied for to support immediate operations. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of the current regulations. Permitting and permitting conditions are discussed further in Chapter 17 of this report.

In BOYD's opinion, U.S. Silica has demonstrated their ability and cooperation to align their operating plans with any permitting requirements that may be encountered during the normal course of business.

BOYD is not aware of any current material violations or fines imposed by regulators on the Crane Operation.

3.3.3 Mining Restrictions

Several natural and man-made features have been identified in and around the Crane Operation which may limit the mineable areas of the property. As of this report, these features include:

- Setbacks from neighboring properties.
- Setbacks from oil production infrastructure.
- Setbacks from existing utility corridors.

U.S. Silica has included suitable setbacks in their mining plans to avoid disturbing these sensitive areas. As such, these areas have been excluded from the estimates of proppant sand resources and reserves presented herein.

3.3.4 Other Significant Factors or Risks

To the extent known to BOYD, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the Crane Operation property that are not discussed in this report. However, the reported proppant sand resources and reserves may be materially impacted by: U.S. Silica's failure to comply with permit conditions and rules; delays in obtaining required government or other regulatory approvals or permits; U.S. Silica's inability to obtain such required approvals or permits; or unforeseen changes in governmental regulations.

4.0 PHYSIOGRAPHY, ACCESSIBILITY, AND INFRASTRUCTURE

4.1 Topography, Elevation, and Vegetation

The Crane Operation lies within the Llano Estacado, the Southern High Plains extension of the Great Plains of North America. This region is relatively flat, with windblown sand dunes in various locations. The sand deposits at the Crane Operation are locally known as the Monahans Sandhills.

Surface elevations in and around the property range from approximately 2,705 ft above mean sea-level (AMSL) near the southeast property corner to over 2,750 ft AMSL on the western edge of the property.

No natural surface waters are present at the Crane Operation.

Land cover in the immediate area consists predominantly of a mixture of shinnery oak, grasses, and other various scrub vegetation.

4.2 Accessibility

General access to the Crane Operation is via a well-developed network of very close proximity primary and secondary roads serviced by private, state, and local governments. These roads provide direct access to the mine and processing facilities and are generally open year-round. These roads are a combination of paved and graveled and are well maintained year-round.

4.3 Climate

Climate in and around the Crane Operation is characteristic for the southwest US, with four seasons ranging from mild winters to very hot and dry summers, with generally moderate falls and springs. The average daily high temperatures typically reach above freezing all 12 months of the year, while the low temperatures can drop below freezing during four months of the year. Winter temperatures typically range from 31 degrees Fahrenheit (° F) to 73° F, while summer temperatures usually range from 64° F to 95° F. Average annual precipitation for the area is approximately 15–20 inches of rain and less than four inches of snow.

In general, the operating season for the Crane Operation is year-round. Adverse weather conditions seldom limit mining, processing, and loading operations; however, extreme

weather conditions may temporarily impact operations. Periodic flooding is possible during heavy rainfall.

4.4 Infrastructure Availability and Sources

The Crane Operation lies within a rural region of western Texas and has been operating in a region of heavy oil and gas industry and agricultural development. The City of Crane has a population of 3,682, and 4,675 people live in Crane County according to 2020 U.S. Census data.

Finished proppant sand products from the Crane Operation are transported to customers by bulk truck and supported by U.S. Silica's extensive on-site loading, storage, and handling facility.

Several regional airports are located within an hour's drive from the Crane Operation, and the Midland International Airport is less than an hour away by car.

Reliable sources of electrical power, water, supplies, and materials are readily available. Electrical power is provided to the operation by regional utility companies. Water is supplied by a private water gathering and transportation network, surface impoundments, or water wells. The Crane Operation has an abundance of recycled processing water available.

5.0 HISTORY

5.1 Reserve Acquisition

U.S. Silica purchased the Crane property in May 2017 from the McKnight Natural Resources and Flying U Properties after completing an initial reconnaissance-level exploration drilling campaign on the subject property.

U.S. Silica is the first landowner to mine proppant sand at this location. Other than sparse agricultural activity and various oil and gas infrastructure, previous landowners have not developed the site. No known mining-related exploration work had been performed prior to U.S. Silica ownership.

5.2 Mine Development

The Crane property was purchased by U.S. Silica to service the booming oil and gas industry in the Permian Basin. Prior, most proppant sand was imported from out-of-state. In order to lower operational costs in the oil and gas industry, companies began looking at developing local sources of proppant sands. U.S. Silica has developed several proppant sand sites in the west Texas area, including the Crane Operation.

Prior to the property acquisition, a two-phase rotosonic exploration program referred to as “Project Thunderhead” was completed in March-April 2017, consisting of 25 rotosonic drill holes being completed between 15–65 ft in depth.

Plant construction commenced shortly after purchasing Crane, and first sales from the operation occurred by mid-2018.

6.0 GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

6.1 Regional Geology

The Crane Operation is located within the Llano Estacado, situated in the Texas High Plains. This region comprises the southern-most portion of the Great Plains, which extends into northeastern New Mexico and northwestern Texas. The Llano Estacado forms a vast elevated plain (high mesa) that is almost completely covered with sand deposits of various types. In the region, the ground surface is covered by windblown sheet sands and active sand dunes reaching heights of almost 45 ft.

The Crane Operation is also located near the central portion of the Permian Basin, which is well known for its long-producing petroleum and natural gas fields. While the subject of this report concentrates on the surficial geology (sand deposits) of west Texas, the Crane Operation currently sells its proppant sand products to the oil and gas producers working in the Permian Basin.

6.2 Local Geology

6.2.1 General Stratigraphy

Surficial geologic units overlying the area in and around the Crane Operation are predominantly comprised of undifferentiated Quaternary Age unconsolidated deposits, ranging from aeolian (windblown) sheet sands and dunes to alluvial sands, silts, clays, and caliche. Geologic mapping shows additional surficial stratigraphic units present in the vicinity of the project; however, the surface geology in and around the Crane Operation is primarily comprised of these aeolian sand deposits.

A generalized stratigraphic chart of the geologic units in Crane County, Texas is presented in Figure 6.1.

System	Series	Geologic Unit
Quaternary	Undivided Sand, Silt, Clay, and Gravel; Winc Locally Indurated with Calcium Carbonate (C	
	Holocene	Dune, Sheet Sand, ar Terrace Deposits
	Pleistocene	Judkins (Blackwater Dr Equivalent) Formatio
Cretaceous	Fredericksburg Group	

Figure 6.1: Generalized Stratigraphic Chart, Surficial Dep
Crane County, Texas

Exploration completed on the Crane property indicate two surficial sand units being present, an upper clean sand unit (dune and sheet sands) and an underlying clayey cover sand unit (Judkins Formation). The following text discusses the strata encountered in and around the Crane Operation, in depositional order:

Fredericksberg Group

A thick unit of limestone, dolomite, marl, and caliche, which represents the basal unit encountered at the Crane Operation. An unconformity separates this unit from the overlying Judkins formation, which differs significantly in age.

Judkins (Blackwater Draw Equivalent) Formation

The Judkins Formation is a brownish-red, argillaceous (clay-rich) sand body consisting of fine- to medium-grained quartz which may be silty and calcareous. This formation represents the first major period of dune building to affect the area and includes minor amounts of interdune pond sediments.

Quaternary Sheet and Dune Sands

Most of the subject property is covered by Quaternary sheet and dune sands generally consisting of fine- to medium-grained quartz sand grains, mixed with varying degrees of clays and silts.

General geologic descriptions from the Crane County area also indicate some local Quaternary deposits may also include gravel or be locally indurated with calcium carbonate (caliche). These deposits are the result of various geologic processes during

deposition, such as the formation of levees, point bars, stream channels, alluvial fans, and terrace or playa deposits.

6.2.2 Structural Geology

The structural features of the Quaternary sands in and around the Crane Operation are relatively non-descript. While the unit exhibits variable thickness over the area, it is unaffected by folding or faulting. Underlying the surficial sand units is the limestone basal unit, which defines the mineable limit of the sands on and around the subject property. Due to the lack of structural features encountered, there are no known geological features that are believed to materially affect a proppant sand mining operation in the immediate area; as such, the deposit is considered to be of low geologic complexity.

6.3 Property Geology

As described above, surficial geologic units overlying the Crane Operation are predominantly comprised of undifferentiated Quaternary age unconsolidated deposits, ranging from aeolian (windblown) sheet sands and dunes to alluvial sands, silts, clays, and caliche. The top 12 in. of the sand unit is generally contaminated with surface debris and organic content and is considered overburden. Figure 6.2 (page 6-5) provides a map of the sand thickness. A cross-section through the deposit is provided in Figure 6.3 (page 6-6).

The surface sands on the property consist of two distinct intervals that are both mineable sand: 1) an upper loose sand unit, and 2) a lower “sandstone” unit. Underlying the total mineable surface sand deposits is the hard, limestone basal unit which commonly results in the presence of caliches. The upper sand as generally consisting of unconsolidated, fine- to medium-grained, well sorted and subangular to rounded sand grains, ranging in thickness from 13 to 46 ft. The clean sand is noted as containing generally less than 15% fine (clay) material. The lower sand is described as a clayey, hard sandstone interval, with very fine- to medium-grained, subangular to rounded sand grains, ranging in thickness from 0 to 25 ft. The lower sand is noted having a higher (15–45%) clay content. The two sand units are generally mineable from the ground surface down to the basal limestone unit. Combined thickness of both sand units ranges from 10 to 80 ft across the property.

The sand mined at the Crane Operation is processed to produce proppant sand. Proppant sand is a naturally occurring, high silica content quartz sand with grains that are generally well-rounded. The main difference between proppant sand and other sands is that proppant sand grains are relatively pure in composition and consisting

almost entirely of quartz; other sands have numerous impurities that may be cemented to the quartz grains. The pure quartz composition of proppant sand grains, along with being well-rounded and spherical in shape, gives these sands the characteristics (crush strength, high acid solubility, low turbidity) that are sought after by oil and gas producers for use in developing wells.

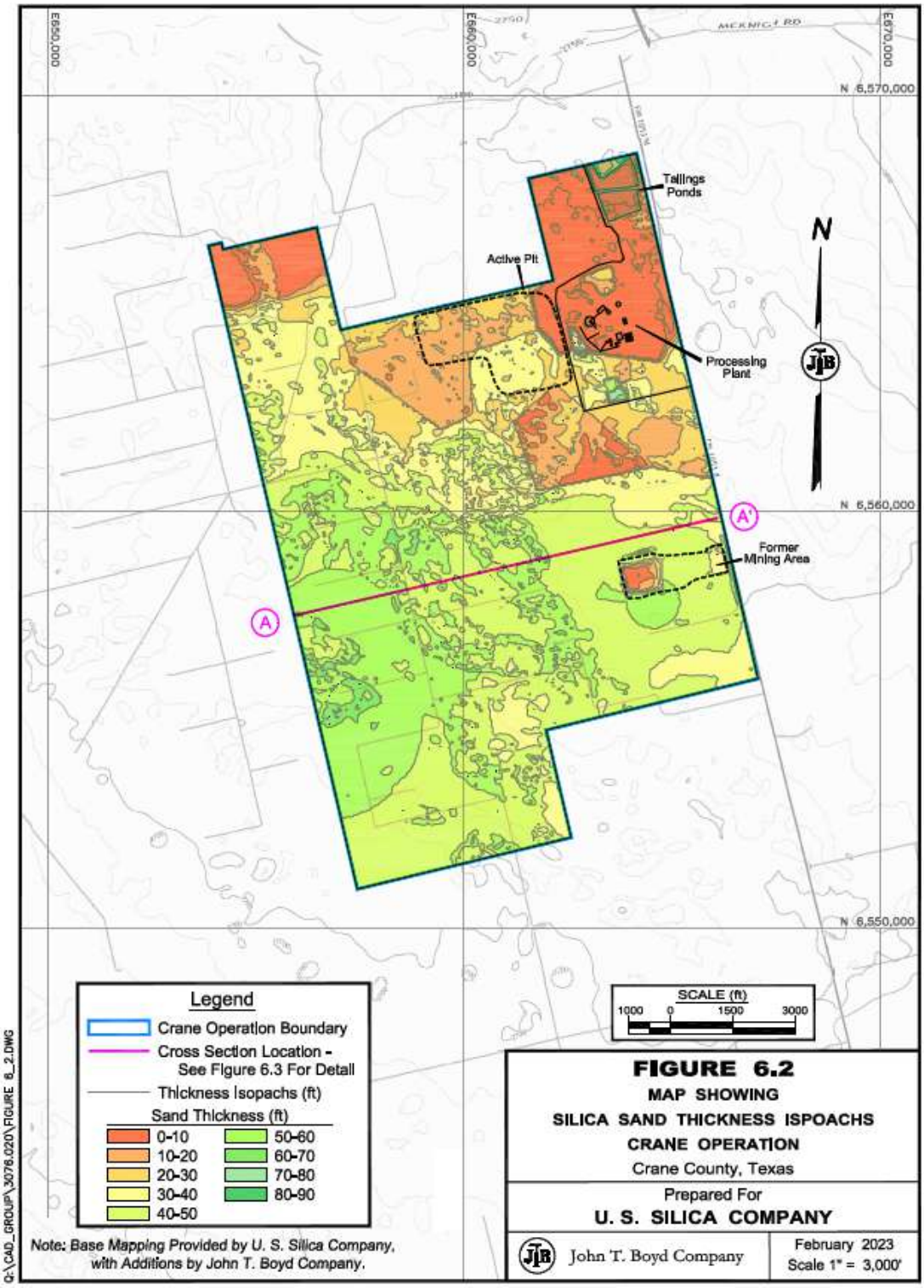


FIGURE 6.2

MAP SHOWING

SILICA SAND THICKNESS ISPOACHS

CRANE OPERATION

Crane County, Texas

Prepared For

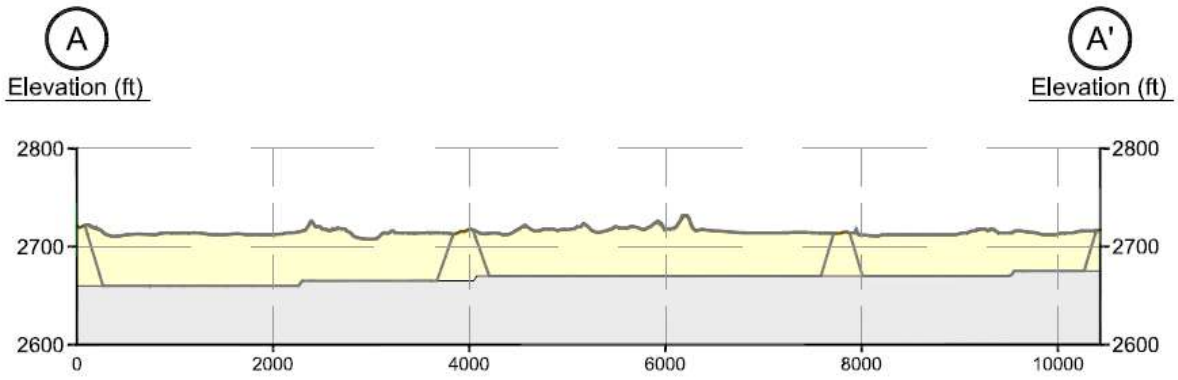
U. S. SILICA COMPANY

John T. Boyd Company

February 2023

Scale 1" = 3,000'

O:\CAD_GROUP\3076.020\FIGURE 6_3.DWG



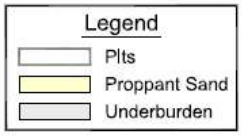


FIGURE 6.3
CROSS SECTION A - A'
CRANE OPERATION
Crane County, Texas

Prepared For
U. S. SILICA COMPANY

Horizontal 1" = 1,500'
Vertical 1" = 150'
Vertical Exaggeration 10X

John T. Boyd Company

February 2023
Scales As Shown

Note : See Figure 6.2 For Cross Section Location.

7.0 EXPLORATION DATA

7.1 Background

In developing the Crane Operation, U.S. Silica has completed two different exploration campaigns. Records from these campaigns were provided and comprise the primary data used in the evaluation of the proppant sand resources. A total of 26 drill holes (totaling 1,003 ft of drilling) are distributed across the property and their results have been compiled into a database. Maps illustrating the extents of the sand deposit, electronic copies of drilling and sampling logs, as well as laboratory testing summaries, were provided for our review.

7.2 Exploration Procedures

U.S. Silica provided BOYD with various information including exploration reports and internal guidelines, regarding drilling, sampling, and testing procedures utilized during the two exploration campaigns completed on the Crane property.

7.2.1 Drilling

To date, U.S. Silica has performed two drilling campaigns on the Crane property. Both campaigns were completed by third-party contractors using rotosonic (sonic drilling) equipment. Sonic drilling methods are widely accepted as one of the best methods to recover core when exploring unconsolidated sand deposits.

Phase 1 Exploration Campaign

U.S. Silica completed a preliminary reconnaissance-level exploration campaign at the Crane Operation in March 2017. The purpose of this campaign, known as the Kermit/Gallop portion, was to gain an initial understanding of the potential quantity and quality of the dune sand deposit on the property, and to delineate the extents of the potentially mineable sand, by areal extent and depth.

Drilling was planned and supervised by U.S. Silica's Mine Planning Department, who also conducted core logging and sampling in the field. Cascade Environmental, LLC was contracted to conduct drilling in this phase of drilling, with a total of 16 rotosonic drill holes completed. The completed drill holes were laid out in a general east-west trending line across the areas of the property containing sand dunes.

Phase 2 Exploration Campaign

After the initial phase of exploration and testing provided positive results, a second infill drilling campaign was planned and completed in April 2017. This campaign, known as Outpost, consisted of completing 10 additional rotosonic drill holes at the Crane Operation. Focus was placed on maximizing the potential of Proven and Probable reserves and obtaining enough additional data to begin mine planning exercises.

U.S. Silica contracted Associated Environmental Industries, Corp. (AEI) to complete the rotosonic drilling for Phase 2, and hired a contract geologist from Summit Envirosolutions, Inc. to log and sample core and supervise this phase of exploration work. After completing Phase 2 drilling, U.S. Silica utilized all of the site-specific data thus far to complete an initial proppant sand reserve estimate, and subsequently finalized the purchase of the Crane Operation in July 2017.

7.2.2 Sampling Procedures

Records indicate the drill core was measured and geologically logged before being boxed and transported to U.S. Silica's in-house laboratory in Berkeley Springs, West Virginia. At the lab, sample composites were created by reviewing geologic logs, and then splitting and thoroughly mixing the desired composite intervals to create homogenous and representative samples for testing purposes.

U.S. Silica maintained control of exploration core samples throughout the entirety of each drilling campaign from the point of logging and boxing of recovered cores in the field to transportation and delivery of core samples to their internal laboratories through the preparation and analyses on each of the samples.

Available testing results were reviewed by BOYD during our assessment, and our review of the field and sampling procedures indicated that the general description and sampling work were conducted to appropriate standards. Based on the stated standards, both in the field and in the laboratory, BOYD concludes that the sample preparation and analytical procedures were adequate for the purposes of evaluating and estimating proppant sand resources and reserves at the Crane Operation.

7.2.3 Sand Testing

Samples obtained from the exploration campaigns were taken to the company's in-house laboratory where they were inventoried and then prepared for analyses. Samples were split and prepared following standardized company procedures (i.e., U.S. Silica's ISO 9001 Quality System of Corporate Analytical Procedures) to ensure analytical consistency throughout each exploration campaign. These procedures are

designed to closely match the operational capabilities of the Crane Operation's processing plant.

Preparation of each sample consisted of initially splitting the recovered core in half. One half of the core is placed back into the core boxes which are then stored for archival purposes, while the other half of the core is further prepared and processed for lab testing purposes.

Analytical samples were crushed, quartered, and mixed to create a uniform and representative composite of the core interval, and then the composite sample was divided into appropriately sized samples depending on the type and amount of testing to be performed. The sample is then run through various crushing techniques to disaggregate the sand grains and fine materials as much as possible before beginning the washing and scrubbing procedures.

After splitting, the sample is dried, and an approximately 1,500-gram split is obtained. The sample split is washed through a 200-mesh sieve to remove slimes, before being dried and reweighed to measure the recovery of plus-200-mesh material. The dried sample is then run through a 16-mesh sieve to simulate the scalping procedure in the plant to remove the "coarse waste" sized particles. The remaining material is then approximately equivalent to the material that would typically be washed in the wet processing plant. This remaining material is weighed and labeled as a prepared "washed sample".

The washed sample is further prepared by simulating the wet processing plant conditions, which consist of placing the sample into scrubbers for three minutes, rinsing and decanting, and then drying to arrive at a "scrubbed sample", which represents material that would be output from the wet processing plant. The scrubbed samples are then dried and prepared for API RP 19C/ISO-13503-2 standard testing for proppant materials.

7.2.4 Other Exploration Methods

There were not any other methods of exploration (such as airborne or ground geophysical surveys) reported for the Crane Operation.

7.3 Exploration Results

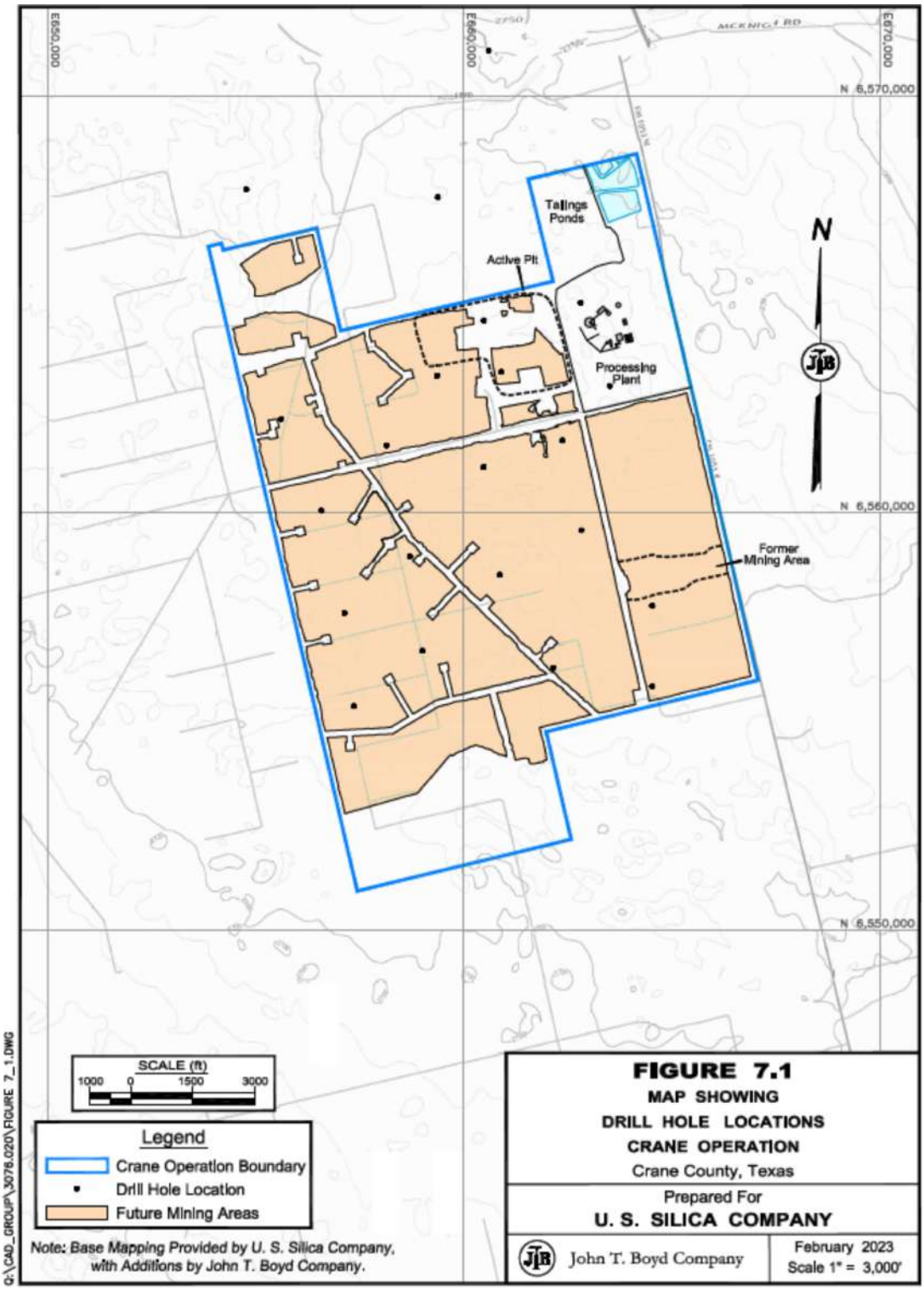
7.3.1 Summary of Exploration

Exploration work to date has resulted in a total of 26 drill holes completed in and around the Crane property, through the course of two separate exploration campaigns. Information obtained from the exploration campaigns indicates U.S. Silica identified a clean surface sand unit that consists of recently active sand dunes which overlies a separate clayey-sand unit containing older and more variable depositional sequences. Both of these sand intervals are mined together at the Crane Operation.

The overall drill hole spacing exhibited across a majority of the subject property ranges from approximately 1,300 ft to 5,000 ft. The distribution of these drill holes is illustrated on Figure 7.1, following this page.

Data collected as a result of completing these drilling campaigns highlights some of the variability of the lithologic nature of the deposit underlying the Crane property. However, looking at the overall mineable interval; overall trends show the mineable interval generally getting thicker towards the west-southwest portions of the property. The data obtained on the total mineable sand unit supports the general interpretation of the sandstone's thickness, as illustrated in Figure 6.2 (page 6-5).

BOYD's review of the reported sampling methodology and procedures provided indicate the data obtained by U.S. Silica for the Crane Operation was carefully and professionally collected, prepared, and documented in conformance with generally accepted industry standards, and are appropriate for use of evaluating and estimating frac sand resources and reserves.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MCKNIGHT RD
Tailings Ponds
Active Pit
Processing Plant
Former Mining Area
N
SCALE (ft)
1000 0 1500 3000
Legend
Crane Operation Boundary
Drill Hole Location
Future Mining Areas
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 7.1
MAP SHOWING
DRILL HOLE LOCATIONS
CRANE OPERATION
Crane County, Texas
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3,000'
Q:\CAD_GROUP\3078.020\FIGURE 7_1.DWG

7.3.2 Sand Quality

The Crane Operation produces two varieties of proppant sand for use in local oil and gas applications: a 40/70-mesh proppant sand product and a 100-mesh proppant sand product. U.S. Silica performs testing at their laboratories for API/ISO specifications.

Historically, API RP 19C/ISO 13503-2 proppant sand characteristics were strictly adhered to in order to determine the suitability of a sand product for use during fracking stages of oil and gas well development. Over time, these specifications have become merely guidelines, and the suitability of a proppant sand product is now ultimately determined by customers, who will typically perform their own sample testing of the products that they purchase to determine if they meet their internal specifications.

BOYD notes that U.S. Silica has demonstrated continued commercial success in producing and marketing the finished proppant sand products; as such, it is BOYD's opinion that sand quality data provided are representative of the mined deposit and are considered suitable for the estimation of proppant sand resources and reserves.

7.3.3 Grain Size Distribution

Grain size distribution was analyzed according to API RP 19C/ISO 13503-2, Section 6.
A table of weighted average grain size distribution of the in-situ sand deposit, based on laboratory testing results, is shown in Table 7.1, below.

Table 7.1: Weighted Average Particle Size Distribution

% Retained By Mesh Size				% Product	
>40	40/70	70/140	<140	40/70	70/140
2.1	34.4	46.9	16.6	42.3	57.7

The preceding table highlights the relative fineness of the sand found at the Crane Operation; indicating a majority of the sand particles are concentrated between the "passing 40-mesh" and "retained 140-mesh" size fraction. Accordingly, the predominant marketable proppant sand product consists of the 40/140-mesh sand.

Grain Shape (Sphericity and Roundness)

Grain shape is defined under API RP19C/ ISO 13503-2, Section 7. Under this standard, recommended sphericity and roundness values for proppants are 0.6 or greater. As part of the grain shape analysis, the presence of grain clusters (weakly cemented grain aggregates) and their approximate proportion in the sample are reported.

Crush Resistance

Crush resistance is a key test that determines the amount of pressure a sand grain can withstand under laboratory conditions for a two-minute duration. It is analyzed according to API RP19C/ ISO 13503-2, Section 11. Under this standard, the highest stress level (psi) in which the proppant produces no more than 10% crushed fine material is rounded down to the nearest 1,000 psi and reported as the “K-value” of the material.

Acid Solubility

Acid solubility was analyzed according to API RP19C/ ISO 13503-2, Section 8. Under this standard, 5 grams of sand is treated with 100 milliliters of 12:3 hydrochloric acid to hydrofluoric acid at 150°F for 30 minutes. The recommended maximum acid solubility for proppants in the 40/70 size range and finer is 3.0%.

Turbidity

Turbidity was analyzed according to API RP19C/ ISO 13503-2, Section 9. Under this standard, the suggested maximum frac sand turbidity should be equal to or less than 250 nephelometric turbidity units (NTU).

Results from these analyses are shown below in table 7.2:

Table 7.2: Crane Operation Proppant Sand Characteristics

	Average API/ISO Test Results By Product Size		
	40/70-mesh		100-mesh[1]
Characteristic	Result	Recommended Specification	Result
Sphericity	0.6	≥ 0.6	0.6
Roundness	0.6	≥ 0.6	0.6
Acid Solubility (%)	2.7	≤ 3.0	2.7
Turbidity (NTU)	42	≤ 250	42
K-Value (000 psi)	6	-	9

Note:
1. 100-mesh proppant sand material currently does not have an API/ISO specification.

The composite sample testing suggests the Crane Operation can produce proppant sands which meet minimum API/ISO recommended specifications. Moreover, U.S. Silica has a demonstrated commercial success producing and selling proppant sand to Permian Basin oil and gas producers, where ultimately the sand has been shown to meet customer specifications.

7.4 Data Verification

For purposes of this report, BOYD did not verify historic drill hole data by conducting independent drilling. It is customary in preparing similar mining resource and reserve estimates to accept basic drilling and sample quality data as provided by the client, subject to the reported results being judged representative and reasonable.

BOYD's efforts to judge the appropriateness and reasonability of the source exploration data included reviewing representative samples of provided drilling logs, sampling procedures, sand quality testing results, and discussing aspects of developing the Crane Operation with U.S. Silica personnel during our site visit. Reviewed drilling records were compared with their corresponding database records for transcription errors; of which none were found. Lithologic and sand quality data points were compared via visual and statistical inspection with geologic mapping and cross-sections.

7.5 Adequacy of Exploration and Sampling

BOYD's review of the reported methodologies and procedures indicate the exploration data obtained and utilized by U.S. Silica for the Crane Operation were: (1) carefully and professionally collected, prepared, and documented, (2) conform with general industry standards, and (3) are appropriate for use of evaluating and estimating proppant sand resources and reserves. Similarly, BOYD's review of testing data provided by U.S. Silica suggests that the analyses completed are generally appropriate to determine proppant sand characteristics and determine the subsequent quality of finished proppant sand products. As such, it is BOYD's opinion that the exploration and sampling data are suitable for use in the estimation of proppant sand resources and reserves for the Crane Operation.

8.0 SAMPLE PREPARATION, ANALYSIS, AND SECURITY

The reader is referred to Sections 7.3 and 7.4 of this report for details regarding sample preparation, analysis, and security.

9.0 DATA VERIFICATION

BOYD, by way of the data verification processes described in various sections of this report, has used only that data deemed by the QPs to have been generated with proper industry standard procedures, were accurately transcribed from the original source, and were suitable to be used for the purpose of preparing estimates of proppant sand resources and reserves.

BOYD's subject-specific data verification efforts and our conclusions arising therefrom are discussed in the following sections of this report:

Topic	Report Section(s)
Exploration Data	Section 7.4
Sample Preparation, Analysis, and Security	Section 7.4
Proppant Sand Resource Estimates	Section 11.2
Operating Plans	Chapters 13 and 1
Capital and Operating Costs	Chapter 18
Economic Analysis Inputs	Chapter 19

Based on our review, it is BOYD's overall conclusion that the information made available to us at the time of this report is representative and reliable for use in estimating the proppant sand resources and reserves of the Crane Operation.

BOYD is not aware of any other limitations on nor failure to conduct appropriate data verification.

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10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

Please refer to Chapter 7 for information regarding grain size distribution and proppant sand characteristics testing.

11.0 PROPPANT SAND RESOURCE ESTIMATE

11.1 Applicable Standards and Definitions

Unless noted, proppant sand resource estimates disclosed herein are done so in accordance with the standards and definitions provided by S-K 1300. It should be noted that BOYD considers the terms “mineral” and “proppant sand” to be generally interchangeable within the relevant sections of S-K 1300.

Estimates of mineral resources are always subject to a degree of uncertainty. The level of confidence that can be applied to a particular estimate is a function of, among other things: the amount, quality, and completeness of exploration data; the geological complexity of the deposit; and economic, legal, social, and environmental factors associated with mining the resource. By assignment, BOYD used the definitions provided in S-K 1300 to describe the varying degree of certainty associated with the estimates reported herein.

The definition of mineral resource provided by S-K 1300 is:

> *Mineral resource is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. A mineral resource is a reasonable estimate of mineralization, taking into account relevant factors such as cut-off grade, likely mining dimensions, location or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable. It is not merely an inventory of all mineralization drilled or sampled.*

Estimates of mineral resources are subdivided to reflect different levels of geological confidence into measured (highest geologic assurance), indicated, and inferred (lowest geologic assurance). Please refer to the Glossary of Abbreviations and Definitions for the meanings ascribed to these terms.

11.2 Proppant Sand Resources

11.2.1 Methodology

Based on provided information, U.S. Silica's geologic modeling and proppant sand resource estimation techniques generally consist of following:

1. The top and bottom elevations of the mineable proppant sand interval is interpreted from drill hole records and sand particle size analyses. The sands mined at the Crane Operation are present at the surface. The uppermost 12 in. of the sand unit is considered overburden since it is generally contaminated with surface debris and organic matter. Strata below the sand unit—generally, the limestone basal unit—are considered waste.
2. Interpreted drill hole records are compiled and validated. Strata thicknesses are aggregated, and sand particle size analyses of the sand unit are composited for each data point. The compiled drill hole data are imported into GEOVIA Surpac™ geologic modeling and mine planning software.
3. A geologic block model of the deposit is developed using industry standard stratigraphic modeling methods. The geologic model delineates the top and bottom of the mineable sand horizon.
4. Contiguous regions of mineable sand are outlined (applying criteria discussed below in Section 11.2.2), and LOM pit shells are created.
5. Estimates of in-place mineable sand volumes are derived from the LOM pit shells and recent topographic (surface elevation) survey elevations.
6. An in-place dry density of 100 pounds per cubic foot is used to convert the in-place sand volumes to in-place sand tons.

11.2.2 Estimation Criteria

Development of the proppant sand resource estimate for the Crane Operation assumes mining and processing methods and equipment which have been utilized successfully at the site for decades.

The target surface sand mining horizon at the Crane Operation is manifested as continuous low rolling sand dunes overlying an older sand dune complex. The sand unit exhibits relatively consistent depth, thickness, and quality. The sand interval is easily distinguished from the underlying limestone unit; aiding in the interpretation of the mineable horizon. Generally, all of the sand unit is mined and sold under various product specifications. Based on the uniformity of the sand deposit being mined, cut-off grade, strip ratios, and other typical mining factors do not define economic mineability. Production of proppant sand is driven by market demand and production can be modified in response to that demand. As such, the application of minimum mining thicknesses, maximum stripping ratios (the ratio of waste to sand excavated), or cut-off

grades is not generally considered in the estimation of proppant sand resources for the Crane Operation.

The limits of the proppant sand resources are constrained to those portions of the interpreted sand deposit that:

- Are reasonably defined by available drilling and sampling data.
- Contain products that meet generally accepted specifications.
- Honor any legal mining constraints (e.g., property boundaries, environmental setbacks, utility and infrastructure setbacks, etc.).
- Adhere to physical mining constraints.
- Contain products that can be sold at a profit (i.e., be economic).

U.S. Silica applied the following offsets to define the proppant sand resource boundaries for the Crane Operation:

- 100-ft offsets from neighboring property boundaries.
- 200-ft right-of-ways around roadways, oil and gas pipelines, and utility corridors.

The pits shells which constrain the estimated proppant sand resources utilized overall wall slope of 3:1 (horizonal to vertical) in unconsolidated sand. There were not any other pit design criteria employed.

Proppant sand resources for the Crane Operation are assessed for reasonable prospects for eventual economic extraction by reporting: (1) only those resources which have been subsequently converted to proppant sand reserves after the application of all material modifying factors, or (2) those resources which have similar characteristics (i.e., mining conditions, and expected product yields and qualities) to those converted to proppant sand reserves.

BOYD has reviewed the criteria employed by U.S. Silica in developing their estimates of proppant sand resources. The parameters are supported by historical results and align with those employed at similar operations. As such, it is BOYD's opinion that the stated criteria are reasonable and appropriate for the estimation of proppant sand resources at the Crane Operation.

11.2.3 Classification

Geologic assuredness is established by the availability of both structural (thickness and elevation) and particle size distribution for the proppant sand. Classification is generally

based on the concentration or spacing of exploration data, geological understanding, continuity of mineralization relative to the style of mineralization, and uncertainty with the exploration data.

Table 11.1 provides the general criteria employed in the classification of the proppant sand resources.

Table 11.1: Proppant Sand Resource Classification Criteria

Classification (Geologic Confidence)	Data Point Spacing (feet)		
Measured	0	–	2,640
Indicated	2,640	–	5,280
Inferred	5,280	–	10,560

Extrapolation or projection of resources in any category beyond any data point does not exceed half the point spacing distance.

BOYD reviewed the classification criteria employed by U.S. Silica with regards to data density, data quality, geological continuity and/or complexity, and estimation quality. The surficial sand dune deposit on the Crane property is of low geologic complexity. We believe these criteria appropriately reflect their implied levels of geologic assurance with respect to the estimation of proppant sand resources.

Mineable sand resources on the property are well-defined throughout all areas of the mine plan. Observed drill hole spacing ranges from 1,300 to 5,000 ft across the defined resource area.

11.2.4 Proppant Sand Resource Estimate

Resource estimates of in-place proppant sand at the Crane Operation as of December 31, 2022, reported by U.S. Silica are shown in Table 11.2, below.

Table 11.2: Crane Operation Proppant Sand Resources (as of December 31, 2022)

Classification	In-Place Tons (000)		
	Planned[1]	Additional[2]	Total
Measured	115,954	-	115,954
Indicated	39,613	2,246	41,859
Total Measured + Indicated	155,567	2,246	157,813
Inferred	-	16,396	16,396

Notes:
1. "Planned" resources are those included in the approved LOM plan.
2. "Additional" resources are those reported in addition to proppant sand reserves.

As shown, U.S. Silica controls approximately 157.8 million in-place tons of measured and indicated proppant sand resources, *inclusive* of proppant sand reserves. In addition, they control approximately 16.4 million in-place tons of inferred proppant sand resources. Proppant sand resources are not proppant sand reserves and do not have demonstrated economic viability.

The proppant sand resources shown under the “Planned” column of Table 11.2 include only those in-place tons which are included in U.S. Silica’s LOM plan for the Crane Operation and therefore considered for conversion to proppant sand reserves. The proppant sand resources shown under the “Additional” column of Table 11.2 have not been included in the LOM plan and are considered *exclusive* of (i.e., “in addition to”) the reported proppant sand reserves. These “Additional” proppant sand resources are considered to have prospects for eventual economic extraction by virtue of their similarity, in terms of demonstrated extraction methods and expected finished product qualities, to those converted to proppant sand reserves. However, further studies are required to convert the “Additional” proppant sand resources to proppant sand reserves.

11.2.5 Validation

BOYD was provided with U.S. Silica’s exploration data, geologic models, and volumetric estimates. We have reviewed this information, on a representative basis, by:

- Verifying the accuracy of geologic model inputs by comparison with drilling logs and laboratory reports.

- Comparing the geologic model with compiled drilling data.
- Preparing a stratigraphic grid model of the sand unit and independently estimating pit shell volumes.

It is BOYD's opinion that the geologic model is representative of the informing data and that the data are of sufficient quality to support the proppant sand resources estimate provided herein. Furthermore, it is our opinion that the resources estimation methods and criteria employed are both appropriate and reasonable for the deposit type and proposed extraction methods.

BOYD is not aware of any technical, legal, economic, or other relevant factors that could materially affect the proppant sand resource estimate. The accuracy of the proppant sand resource estimate is, in part, a function of the quality and quantity of available data and of engineering and geological interpretation and judgment. Given the data available at the time this report was prepared, the estimates presented herein are considered reasonable. However, they should be accepted with the understanding that additional data and analysis available after the date of the estimate may result in a change to the current estimate. These revisions may be material. There is no guarantee that all or any part of the estimated resources will be recoverable.

12.0 PROPPANT SAND RESERVE ESTIMATE

12.1 Applicable Standards and Definitions

Unless noted, proppant sand reserve estimates disclosed herein are done so in accordance with the standards and definitions provided by S-K 1300. It should be noted that BOYD considers the terms “mineral” and “proppant sand” to be generally interchangeable within the relevant sections of S-K 1300.

Estimates of mineral reserves are always subject to a degree of uncertainty. The level of confidence that can be applied to a particular estimate is a function of, among other things: the amount, quality, and completeness of exploration data; the geological complexity of the deposit; and economic, legal, social, and environmental factors associated with mining the reserve. By assignment, BOYD used the definitions provided in S-K 1300 to describe the varying degree of certainty associated with the estimates reported herein.

The definition of mineral reserve provided by S-K 1300 is:

> *Mineral reserve is an estimate of tonnage and grade or quality of indicated and measured mineral resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated mineral resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted.*

Estimates of mineral reserves are subdivided to reflect geologic confidence, and potential uncertainties in the modifying factors, into proven (highest assurance) and probable. Please refer to the Glossary of Abbreviations and Definitions for the meanings ascribed to these terms.

Figure 12.1, below, illustrates the relationship between mineral resources and mineral reserves.

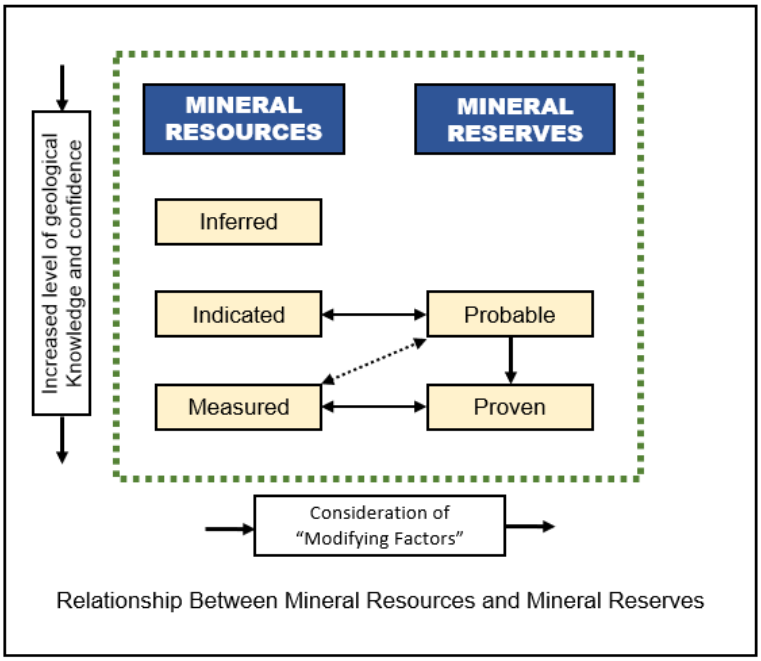


Figure 12.1: Relationship Between Mineral Resources and Mineral Reserves

By industry convention, proppant sand reserves are presented on two bases: mineable and saleable. Mineable reserves represent the ROM tonnage available for excavation and processing. Saleable reserves represent the tonnage of finished proppant sand available for sale after processing the mineable reserves.

12.2 Proppant Sand Reserves

12.2.1 Methodology

Estimates of proppant sand reserves for the Crane Operation are derived contemporaneously with estimates of proppant sand resources. The Crane Operation utilizes commercially proven mining and processing methods to extract and process proppant sand from the subject property. The operation's production plans are revised periodically to assure that the conversion of in-place sand to saleable product are: (1) in reasonable conformity with present and recent historical operational performance, and (2) reflective of expected mining and processing operations.

To derive estimates of mineable tons and saleable product tons (i.e., proven and probable proppant sand reserves), the following modifying factors were applied to the in-place measured and indicated proppant sand resources underlying the respective mine plan areas:

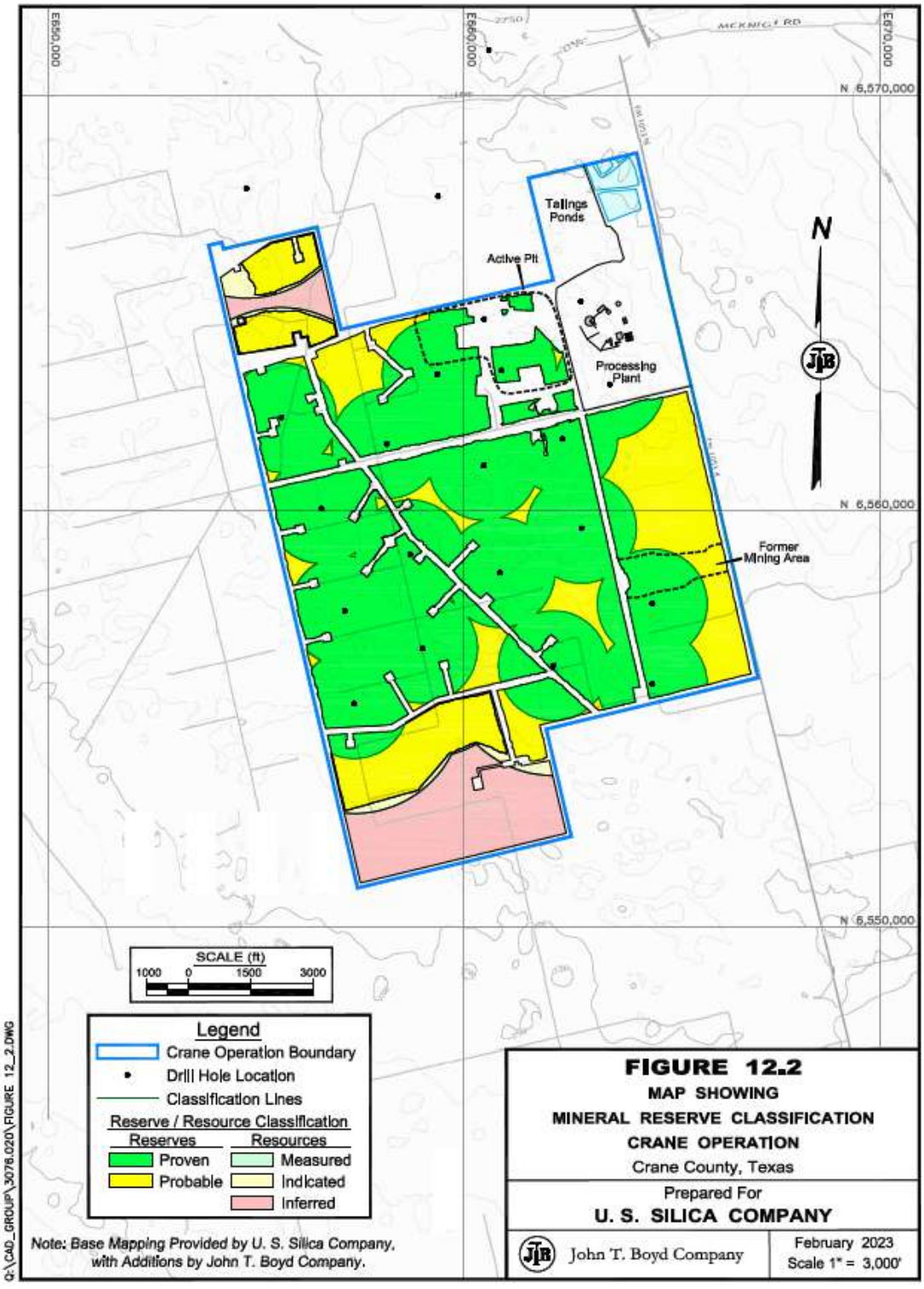
- A 95% mining recovery factor, which assumes that 5% of the mineable (in-place) proppant sand resource will not be recovered for various reasons. Applying this recovery factor to the in-place resource results in the estimated ROM sand tonnage (i.e., the mineable proppant sand reserves) that will be delivered to the wet process plant.
- An overall 82.5% processing yield. This factor accounts for removal of out-sized (i.e., larger than 20-mesh and smaller than 140-mesh) sand and losses in the wet and dry processing plants due to minor inefficiencies.

The overall product yield (after mining and processing losses) for the Crane Operation is estimated at approximately 78.4%. That is, for every 100 tons of in-place proppant sand, approximately 78 tons will be recovered and sold as product. Mining recovery and processing yield factors are derived from historical operating results.

Economic availability of the proppant sand reserves is established by the financial analysis presented in Chapter 19. A long-range average selling price of $23.92 per product ton has been used to estimate proppant sand reserves for the Crane Operation.

12.2.2 Classification

Proven and probable proppant sand reserves are derived from measured and indicated proppant sand resources, respectively, in accordance with S-K 1300. BOYD is satisfied that the stated proppant sand reserve classification reflects the outcome of technical and economic studies. Figure 12.2, following this page, illustrates the classification of the proppant sand resources and reserves at the Crane Operation.


E690,000
E695,000
E700,000
N 6,570,000
N 6,560,000
N 6,550,000
MCKNIGHT RD
Tailings Ponds
Active Pit
Processing Plant
Former Mining Area
N
SCALE (ft)
1000 0 1500 3000
Legend
Crane Operation Boundary
Drill Hole Location
Classification Lines
Reserve / Resource Classification
Reserves
Proven
Probable
Resources
Measured
Indicated
Inferred
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 12.2
MAP SHOWING
MINERAL RESERVE CLASSIFICATION
CRANE OPERATION
Crane County, Texas
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3,000'
Q:\CAD_GROUP\3078.020\FIGURE 12_2.DWG

12.2.3 Proppant Sand Reserve Estimate

U.S. Silica's estimated surface mineable proppant sand reserves for the Crane Operation total 121.9 million saleable product tons, as of December 31, 2022. The proppant sand reserves reported in Table 12.1, below, are based on the approved LOM plan which, in BOYD's opinion, is technically achievable and economically viable after the consideration of all material modifying factors.

Table 12.1: Crane Operation Proppant Sand Reserves (as of December 31, 2022)

	Tons (000)	
Classification	Mineable	Saleable
Proven	110,156	90,879
Probable	37,632	31,046
Total	147,788	121,925

All of the reported proppant sand reserves are wholly owned by U.S. Silica.

The proppant sand reserves of the Crane Operation are relatively well-explored and defined. It is our conclusion that almost 75% of the stated reserves can be classified in the proven reliability category (the highest level of assurance) with the remainder classified as probable. Given the geologic continuity and U.S. Silica's history of mining the proppant sand on similar properties, it is reasonable to assume that the portion of probable reserves will be converted to proven reserves upon completion of additional exploration and testing.

U.S. Silica has a well-established history of mining, processing, and selling proppant sand products into various markets. BOYD has assessed that sufficient studies have been undertaken for the Crane Operation to enable the proppant sand resources to be converted to proppant sand reserves based on current and proposed operating methods and practices. Changes in the factors and assumptions employed in these studies may materially affect the proppant sand reserve estimate.

The extent to which the proppant sand reserves may be affected by any known geological, operational, environmental, permitting, legal, title, variation, socio-economic, marketing, political, or other relevant issues has been reviewed as warranted. It is the opinion of BOYD that U.S. Silica has appropriately mitigated, or has the operational acumen to mitigate, the risks associated with these factors. BOYD is not aware of any additional risks that could materially affect the development of the proppant sand reserves.

Based on our independent review, we have a high degree of confidence that the estimates shown in this report accurately represent the available proppant sand reserves controlled by U.S. Silica, as of December 31, 2022.

12.2.4 Reconciliation with Previous Estimates

As this is the first technical report summary filed by U.S. Silica for the Crane Operation, no comparison with previous estimates was performed.

13.0 MINING METHODS

13.1 Mining Operations

The sheet sands and sand dunes in and around the Crane Operation are loosely consolidated and overlain by minimal overburden; characteristics which favor conventional surface mining techniques. Since the target sands formation does not extend below the water table, the quarry is ‘dry-mined’ using truck and excavator mining methods. Mining occurs in a series of benches arranged in a stair-like fashion to recover sand from the top of the formation (in elevation) down to the lowest practical elevation (generally 1 to 2 ft above the basal limestone unit).

In some areas of the deposit, the sand is overlain by up to 20 ft of caliche overburden which must be stripped prior to sand mining. An outside contractor is used to perform this work on an as needed basis. Generally, though, overburden at the Crane Operation is very thin and not stripped prior to sand excavation. Any vegetation, oversize material or clay that is present is removed at the processing plant using screens and scrubbers. Oversize material and vegetation are stored at the dry tailings stockpile for use in future reclamation.

Drilling and blasting are not required for the loosely compacted sand. Excavators and front-end loaders are used to load articulated haul trucks which transport the sand to a ROM stockpile near the wet process plant. Usually, the sand horizon is mined in a single 30-ft vertical bench. If the depth of the deposit exceeds 30 ft, a second lower bench is mined down to the top of the underlying limestone. The ROM sand recovered from these two benches are blended at the wet feed plant stockpile to maximize sand recovery. Figure 13.1, on the next page, shows the current active mining face at the Crane Operation.

These surface mining techniques have been utilized at the Crane Operation since it began production in 2018. The mining operations are typically conducted year-round.

Figure 13.1: Active Quarry Face at the Crane Operations

13.2 Mine Equipment and Staffing

13.2.1 Mine Equipment

The primary mobile equipment involved in sand excavation includes:

- Front End Loaders.
- Caterpillar Excavators.
- Articulated haul trucks.
- Dozer.
- Water Truck and other ancillary equipment.

The mobile equipment fleet is owned and operated by an outside contractor. Regular and major repair maintenance is the responsibility of the contractor.

If maintained in good condition, the mobile equipment fleet should be capable of achieving production levels required by the LOM plan.

13.2.2 Staffing

The Crane Operation is staffed by 85 hourly and salaried personnel.

Table 13.1: Employees by Classificatio

Classification	Employee
Mine & Plant Operations	43
Maintenance & Logistics	33
Salaried	9
Total	85

Except for a drop in employment in 2020 (attributed to the closure of the Crane Operation due to poor market conditions experienced during the COVID pandemic), staffing levels across the operational sites have largely been increasing. The workforce can be expanded or reduced based on market and seasonal demands.

13.3 Engineering and Planning

The primary mine planning consideration is the safe, economical, and regular supply of raw high-quality sand feed to the processing plant. In commercial mining terms, the quantities of overburden removed, and sand mined each year at the Crane Operation are considered modest. The sand deposit affords easy access with its shallow depth and large areal extent. As such, mining plans for the Crane Operation are relatively simple and very flexible; able to be modified based on demand in a relatively short time frame.

Geotechnically, the sand deposit is relatively competent and the mining depths so shallow such that slumping, or collapsing, has not been a detriment to the mining process. The pit design parameters discussed in Section 11.2.2 have been used with success at similar proppant sand operations for decades.

Excessive inflow of groundwater into the pit is not expected. As such, dewatering before or during mining activities should be manageable with drainage ditches and sumps. Flood waters from localized flash floods are a manageable risk. Onsite water ponds can be used to hold any excessive ground or storm water.

13.4 Mining Sequence and Production

Mining of the sand deposit at the Crane Operation commenced in 2018. Aside from a brief shutdown in late-2020 through early-2021 due to poor market condition, the operation has been running continuously. Since 2020, the Crane Operation has mined

7.8 million tons of raw sand. During 2020, production fell due to the COVID-19 pandemic to approximately 0.7 million ROM tons. Production rebounded in 2021 and by 2022 rose to 3.9 million ROM tons. The LOM plan as illustrated in Figure 13.2, below, shows forecasted production for the Crane Operation.

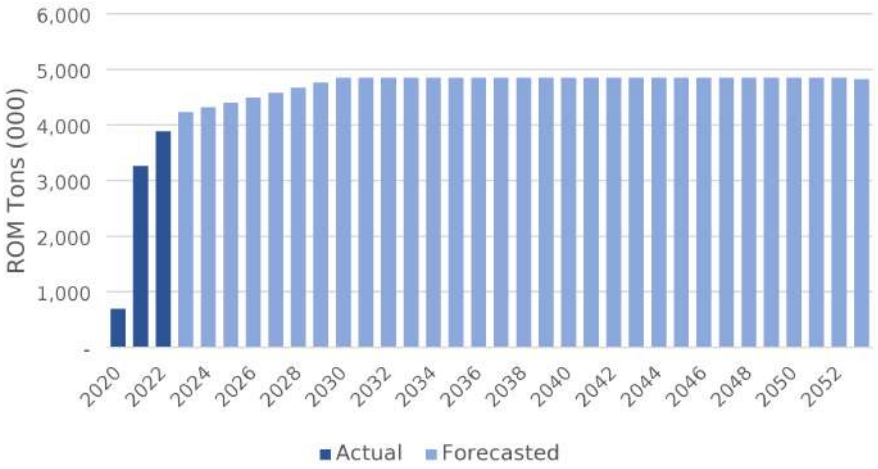
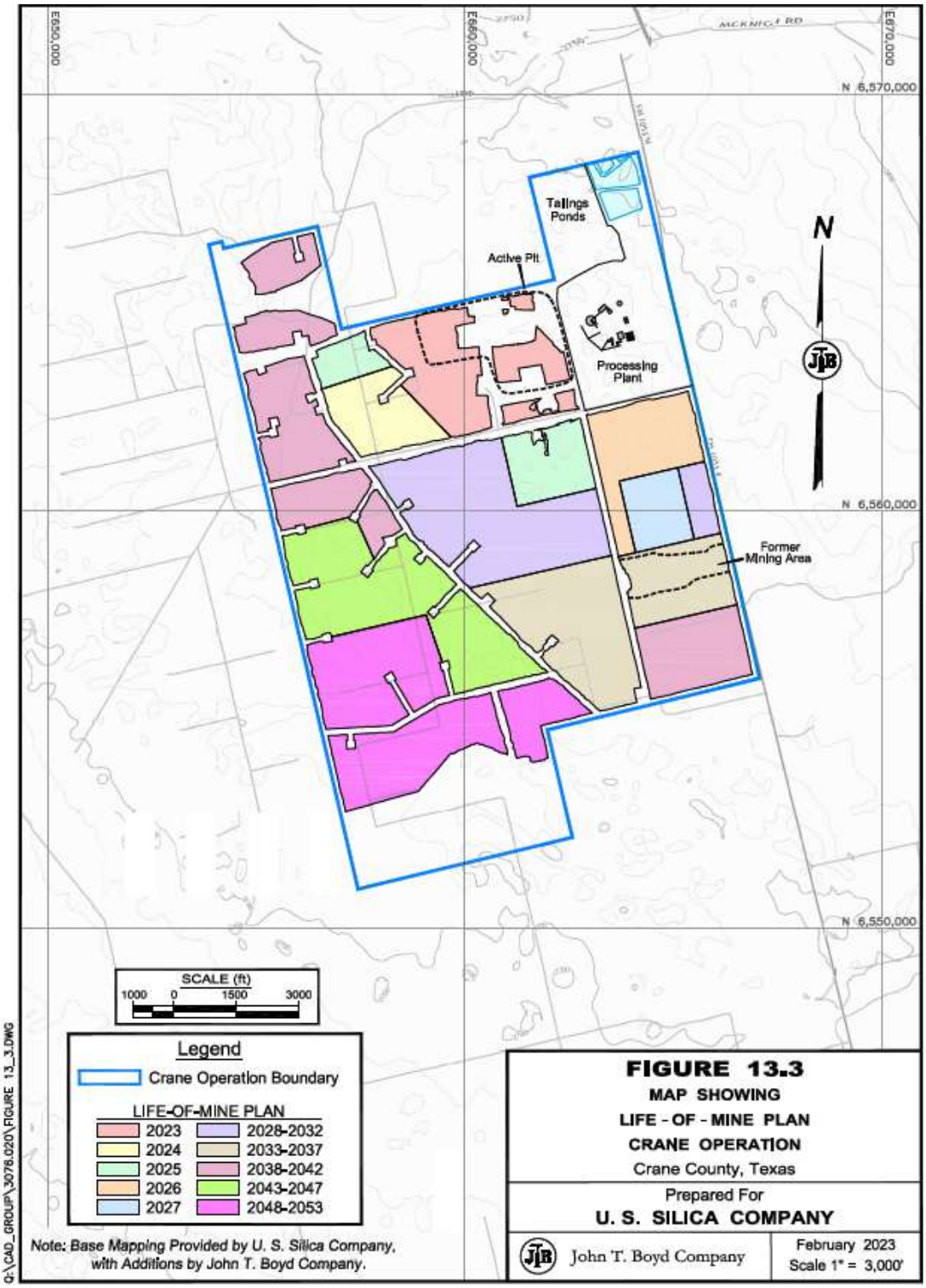


Figure 13.2: Recent Historical and LOM Forecasted Mining Production

The proposed mining sequence is illustrated in Figure 13.3, on the following page. As shown, the proposed mining sequence anticipates the remaining sand nearest to the processing facility will be mined out in a north-south fashion until 2027. Production will continue in a north-south direction in 2028 until the eastern half of the deposit is depleted after 2037. At which point, mining will shift to the western half of the deposit in 2038. Mining will be carried out in a north to south general direction until depletion of the deposit in 2053. Any reclamation will occur concurrently with production as exhausted mining areas are returned to the agreed-upon final design.

BOYD reviewed the LOM plans for U.S. Silica's Crane Operation to determine whether the plans: (1) utilize generally accepted engineering practices, and (2) align with historical and industry norms. Based on our assessment, it is BOYD's opinion that the forecasted production levels for the Crane Operation are reasonable, logical, and consistent with typical sand surface mining practices in the Monahan Sandhill sands and historical results achieved by U.S. Silica.


E650,000
E660,000
E670,000
N 6,570,000
N 6,560,000
N 6,550,000
MCKNIGHT RD
Tailings Ponds
Active Pit
Processing Plant
Former Mining Area
N
SCALE (ft)
1000 0 1500 3000
Legend
Crane Operation Boundary
LIFE-OF-MINE PLAN
2023
2024
2025
2026
2027
2028-2032
2033-2037
2038-2042
2043-2047
2048-2053
Note: Base Mapping Provided by U. S. Silica Company, with Additions by John T. Boyd Company.
FIGURE 13.3
MAP SHOWING
LIFE - OF - MINE PLAN
CRANE OPERATION
Crane County, Texas
Prepared For
U. S. SILICA COMPANY
John T. Boyd Company
February 2023
Scale 1" = 3,000'
Q:\CAD_GROUP\3078.020\FIGURE 13_3.DWG

14.0 PROCESSING OPERATIONS

14.1 Overview

The Crane Operation's processing facilities are located east of the active mining area on the same property as the mine. Construction of the processing facilities and related infrastructure began in early 2018 and the first finished proppant sands were produced in late 2018.

The production of finished proppant sand requires the processing of raw sand from the mine through two plants—the Wet Processing Plant and the Dry Processing Plant. Figure 14.1, on page 14-3, presents a simplified process flow from the mine to the product distribution.

The plan has a nominal capacity of 4.0 million tons of finished sand per year based on operating 24 hours a day and nearly 365 days per year.

BOYD is unaware of any reported interruptions, outages, shortages, or failures related to processing operations which have materially affected the Crane Operation. Given the operation is well-established, we believe the risk of such events materially affecting the estimates of proppant sand reserves presented herein is low.

14.1.1 Wet Processing Plant

The Wet Processing Plant receives its raw sand feed from a ROM stockpile supplied by the mine. The raw sand is reclaimed by a front-end loader and passed through a static grizzly to remove any organics and oversize material. After passing the grizzly screen, the sand is washed to remove any material larger than 1/4 in. The remaining material is mixed with water to create a slurry that is passed through a series of desliming cyclones and attrition scrubbers to remove clay and undersized (very fine) particles. The deslimed material is then processed through a series of hydrosizers, hydro-cyclones, and vacuum filters to remove excess water. The remaining WIP material is stockpiled outside on a drain pad to further reduce moisture before it is recovered and enters the Dry Processing Plant.

The oversized and organics waste material produced by the Wet Processing Plant is stored in a dry waste stockpile for use in future reclamation activities. The clay and very fine "slimes", or tailings, are pumped to settling ponds where the water is recovered for future use. The water extracted by the hydrosizers, hydro-cyclones, vacuum filters, and drain pad is also recycled for use in the processing operations.

14.1.2 Dry Processing Plant

A front-end loader is used to recover the WIP material from the drain pad and feed it into one of two dryer feed hoppers in the Dry Processing Plant. The dryer feed hoppers feed sand through one of three rotary dryers. After drying, the sand is sized and sorted using screens into 40/70-mesh, 40/140-mesh, and “100-mesh” (50/140-mesh) products. Any remaining oversize material at this point is screened off and deposited in the dry waste stockpile. The final products are stored in truck loadout silos for eventual transfer to bulk trucks for shipment to customers.

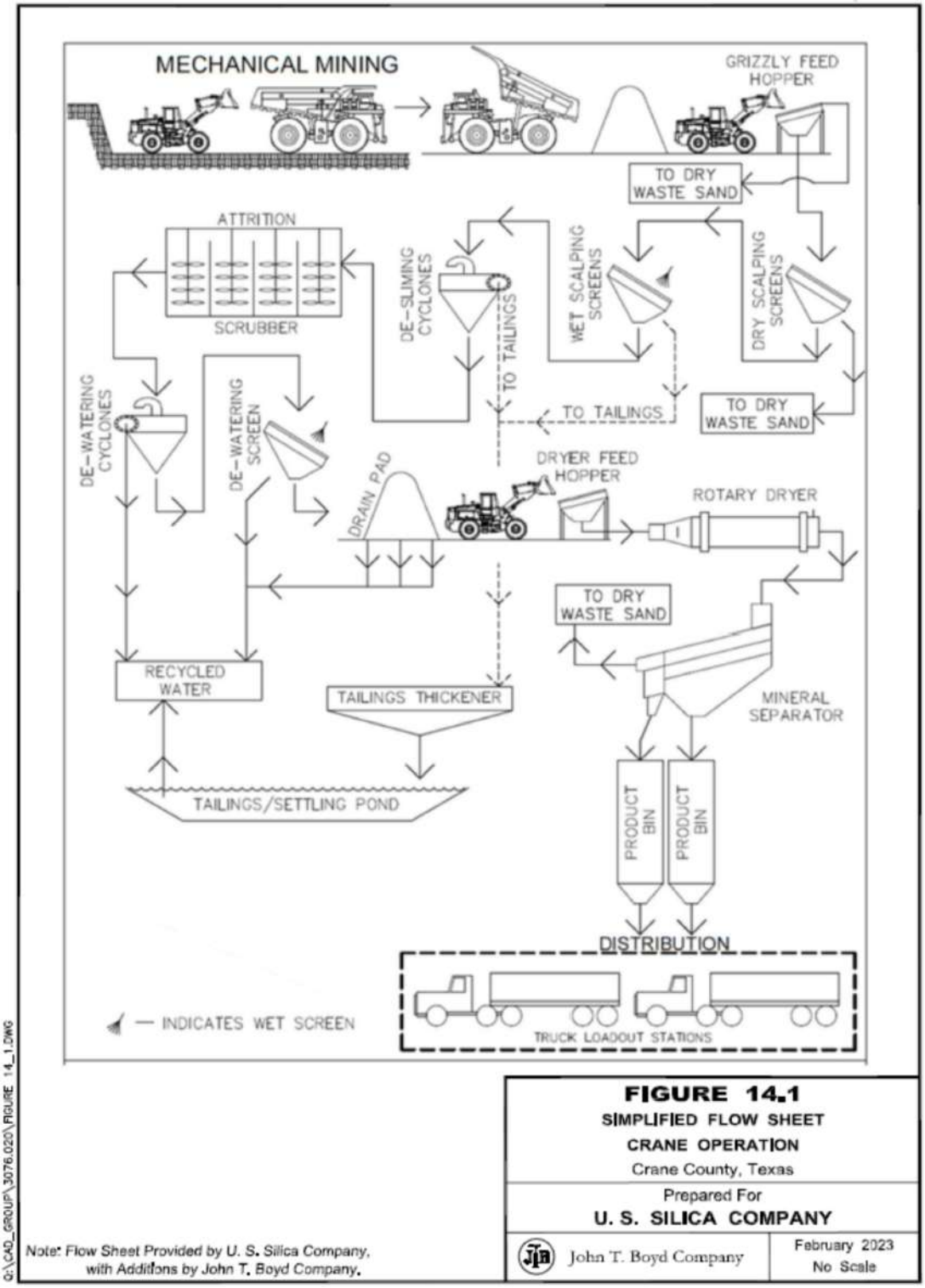


FIGURE 14.1
SIMPLIFIED FLOW SHEET
CRANE OPERATION
Crane County, Texas
Prepared For
U. S. SILICA COMPANY

John T. Boyd Company | February 2023 | No Scale

Note: Flow Sheet Provided by U. S. Silica Company, with Additions by John T. Boyd Company.

Q:\CAD_GROUP\3076.020\FIGURE 14_1.DWG

14.2 Production

The Crane Operation's LOM plan forecasts increased production from the processing plant until the nominal production capacity is reached. Recent annual production results and forecasted production over the expected life of the operation are provided in Figure 14.2.

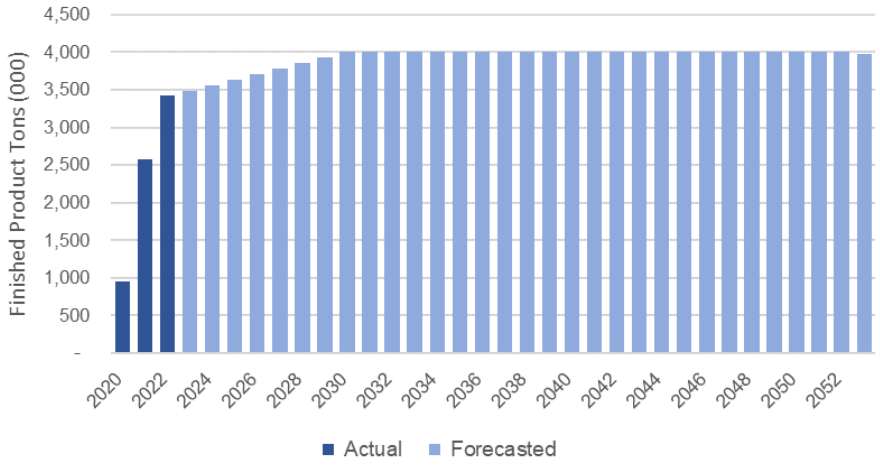


Figure 14.2: Recent Historical and LOM Forecasted Processing Plant Production

14.3 Conclusion

Based on our review, it is BOYD's opinion that the processing methods and existing equipment at the plant will be sufficient for the forecasted production of finished proppant sand products.

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15.0 MINE INFRASTRUCTURE

15.1 Overview

All of the basic infrastructure required for the ongoing operations is in place at the Crane Operation. Figure 3.1 (page 3-2) illustrates the general layout of the infrastructure at the Crane Operation.

The surface facilities currently located at the operation are well constructed and have the necessary capacity/capabilities to support the Crane Operation's near-term operating plans. Operational preference may lead to the upgrading of some existing facilities if the operation expands in the future.

BOYD is unaware of any reported interruptions, outages, shortages, or failures related to infrastructure requirements which have materially affected the Crane Operation. Given the operation is well-established, we believe the risk of such events materially affecting the estimates of proppant sand reserves presented herein is low.

15.2 Transportation

The Crane Operation is serviced by several roads maintained by the local municipality, county, and state governments. These roads are either paved or well-maintained graded roadways. Road access is available year-round.

There is not any rail infrastructure available at the Crane Operation. All products are shipped via bulk trucks. Transloading is required to use existing rail networks and U.S. Silica has no immediate plans to transport their products from the Crane Operation using rail.

15.3 Utilities

Electric power for the processing plant is supplied by TXU Retail Energy Company.

Natural gas used by the processing plant is currently supplied by West Texas Gas Marketing, Inc.

Water for industrial purposes is supplied by Kermit Pipeline, LLC. Kermit operates a water gathering and transport system to provide water to mining, oil, and gas operators

in west Texas. Potable water for consumption is delivered by truck in jugs and bottles. There are no plans for connecting to a water utility network.

15.4 Tailings Disposal

The mining and processing of proppant sand at the Crane Operation creates a substantial amount of waste tailings. These tailings are typically a mixture of clay, very fine sand, and other non-silica minerals. Tailings are typically disposed of in ponds (former mining pits) where the solid materials settle to the bottom and water is recovered for reuse.

These tailings ponds are currently located directly to the north of the Crane Operation's processing plant. As mining progresses westward, depleted pits will become new tailing disposal sites. A freshwater pond is maintained on the property so water can be stored after processing through the tailings ponds.

15.5 Other Structures

Several other buildings are located on the property, including:

- Office buildings that host engineering, financial, and administrative staff.
- Several support buildings for housing machinery and maintenance activities.
- A warehouse for material storage and product bagging.
- Several product loadouts.
- Various pump structures and outbuildings.

16.0 MARKET STUDIES

16.1 Market Overview

The Permian Basin's proppant sand market is driven by unconventional horizontal drilling in the oil and gas industry. In the late 1990s, rapid advances in horizontal drilling and hydraulic fracturing (fracking) in North America ushered in large-scale commercial oil and gas production. This fracking technique has been increasingly successful and modified over time to extract oil and gas held in dense layers of shale rocks, whose low permeability had previously prevented the flow of hydrocarbons.

Hydraulic fracturing uses a mixture of water, chemicals, and proppant (natural sand or man-made sand-like substances) to fracture shale rock and release hydrocarbons such as oil, natural gas, and natural gas liquids. The proppant acts to keep the fractures open (prop) while the pressurized fluids flow back up the well piping. Wells have become more productive with the addition of horizontal drilling capabilities, longer lateral lengths, and multi-stage fracks.

To reduce costs, many oilfield services companies and E&P companies shifted from using only premium branded proppant sands, which had higher delivered costs, to locally sourced and lower-priced "in-basin" proppant sands. The first in-basin proppant sand deposits mined (late-2017) in the U.S. were located in the Permian Basin of Texas. Permian Basin E&P companies noted favorable results from locally sourced proppant sands, and as such, nearly every other energy basin has experienced a period of exploration to locate suitable local sources of proppant sands.

U.S. Silica operates in a highly competitive market that is characterized by a small number of large, national proppant sand producers and a larger number of small, regional or local, privately-owned producers. Competition in the industry is based on: (1) delivered price; (2) product consistency and quality; (3) supply capacity and reliability; and (4) customer service and technical support. The Crane Operation's substantial on-site product storage capacity and its strategic, in-basin location allows shipping finished products to regional customers by truck. Since transportation costs are a significant portion of the total cost to customers of proppant sands, development of the Crane, Texas plant as a regional frac sand facility in the Permian Basin allows U.S. Silica to compete against proppant sand products being shipped from distant states like Wisconsin, Illinois, and Missouri.

16.2 Historical Sales

U.S. Silica supplies a range of proppant sand products to major oilfield services companies and E&P companies operating in the Permian Basin. The Crane Operation is one of U.S. Silica's two proppant sand operations in west Texas. Finished proppant sand products supplied by the Crane Operation primarily consist of non-API standard 40/140-mesh and "100-mesh" (50/140-mesh) sized sand, with lesser amounts of API standard 40/70-mesh sized sand.

Recent historical sales data provided by U.S. Silica for the Crane Operation are summarized in Table 16.1, below.

Table 16.1: Historical Sales Data

	Units	2020	2021	2022
Product Sales	000 tons	949	2,581	3,422
Average Selling Price	$/ton sold	22.06	18.91	30.78

Proppant sand demand dropped in 2020, as compared to 2019, due to the COVID-19 pandemic. However, recovery began in the fourth quarter of 2020 and continued throughout 2021 and 2022. In 2020, the average selling price (ASP) for the Crane Operation's finished proppant sand products was $22.06 per sold ton. In 2021, the ASP dropped to $18.91 per sold ton; however, the ASP rose to $30.78 per sold ton in 2022.

According to sales information provided by U.S. Silica for the Crane Operation:

- Contract sales account for approximately 60% of total product sales.
- The top-five customer by sales revenue account for approximately 65% of total sales. U.S. Silica has a range of minimum purchase supply agreements with customers with initial terms spanning through 2034.

BOYD is not aware of any material contracts for the sale of proppant sand from the Crane Operation.

16.3 Market Outlook

Despite rises in production, the Permian Basin's demand for in-basin proppant sand outstripped supply in 2022. Consequently, prices for in-basin finished proppant sand products rose significantly during the year. Sustained growth in demand for in-basin proppant sand products is expected. Although it operates in a highly competitive market,

it is expected that the Crane Operation will experience increased demand for its products due, in part, to its low costs and established customer base.

Having survived the challenging environment of 2019 and 2020, BOYD believes the Crane Operation should continue to prove viable into the future notwithstanding a sustained and significant energy price collapse. Their low-cost mining and processing operations, strategic in-basin location, and high-quality products help to create an advantage compared with other regional and national proppant sand producers.

17.0 PERMITTING AND COMPLIANCE

17.1 Permitting

Numerous permits are required by federal, state, and municipal law for mining, processing, and related activities at the Crane Operation. U.S. Silica reports that necessary permits to support current and near-term operations are in place or pending approval. New permits or permit revisions may be necessary from time to time to facilitate future operations. Given sufficient time and planning, U.S. Silica should be able to secure new permits, as required, to maintain its planned operations within the context of current regulations.

A description of the salient permitting requirements for the Crane Operation follows.

The Texas Commission on Environmental Quality (TCEQ) requires an Industrial Hazardous Waste (IHW) Solid Waste Registration (#97544) which covers cleanup of hydraulic or lubricating oils from mobile equipment, general trash, and other hydrocarbons contaminated materials.

A Phase I Environmental Site Assessment (ESA) was performed prior to construction of the Crane Operation. The assessment included observations of oil and gas infrastructure including several gas and crude oil pipelines, one active oil well, several abandoned and plugged oil and gas wells, historic oil and gas water ponds, and several active and abandoned water wells. Evidence of past crude oil leaks from pipelines adjacent to the property are also present. No historical or environmentally sensitive habitats were found during the assessment.

U.S. Silica maintains a Stormwater Pollution Prevention Plan (SWPPP) at the Crane Operation to address requirements of the federal Oil Pollution Prevention Regulations (40 CFR Part 122). The SWPPP outlines the treatment measures and best management practices used on site to maintain stormwater discharges within the permit limitations. Stormwater that leaves the site is authorized and outlined in the Stormwater Multi-Sector General Permit (MSGP) by the TCEQ (TXR05DW69).

A Petroleum Storage Tank (PST) registration (#90261) is held by the third-party contractor in charge of mining operations for a double walled fuel tank used to fuel mobile equipment on site.

Air emissions resulting from the processing plant and associated equipment at the Crane Operation are authorized by the TCEQ Air Permit Program Permit #150360. Provisions of the permit specify the authorized maximum operating capacity at the facility, currently at 345 tph for each dryer. The permit also allows for certain visible emissions at specific opacity. Quarterly visible emissions and fugitive emissions determinations are required, as well as ambient air monitoring at the request of the TCEQ.

U.S. Silica maintains an annual Aggregate Production Operation registration (APO002546) with the TCEQ for annual production reporting.

Under current regulations, the State of Texas does not require reclamation or remediation of surface mined lands by aggregate (including proppant sand) operations.

17.2 Compliance

U.S. Silica reports having an extensive environmental management and compliance process designed to follow or to exceed industry standards.

In their 2021 corporate sustainability report, U.S. Silica reports:

- Increasing the use of renewable energy sources.
- Enhancing water conservation and recycling efforts across our footprint, ensuring that drawing, using, and discharging fresh water is done responsibly and in compliance with water management regulations and standards.
- Employing pollution prevention measures, such as increased operational efficiency and the reuse and recycling of materials, to minimize the impact of our activities on the environment.
- Conducting annual evaluations of policies, procedures, and programs related to habitat conservation.

Specifically at the Crane Operation, the following practices have been implemented to enhance the sustainability of the site:

- Install a vacuum pad to enhance recovery of water from stockpiled sand; reducing water consumption and energy needed to dry the material.
- Conducting habitat surveys in 2018 and 2021 for the Dunes Sagebrush Lizard; a rare species found only in southeastern New Mexico and western Texas.

Mine safety is regulated by MSHA. MSHA inspects the facilities a minimum of twice yearly. U.S. Silica's safety record compares favorably with its regional peers.

Based on our review of information provided by U.S Silica and available public information, it is BOYD's opinion that the Crane Operation's record of compliance with applicable mining, water quality, and environmental regulations is generally typical for that of the industry. BOYD is not aware of any regulatory violation or compliance issue which would materially impact the proppant sand reserve estimate.

17.3 Post-Mining Land Use and Reclamation

There are no formal state or federal reclamation plans or permits required for the Crane Operation. However, general requirements of U.S. Silica's operating permits and licenses include:

- Stabilization of disturbed areas to prevent exposure of significant materials to stormwater which could discharge off-site.
- Demolition of water wells and septic tanks.
- Disposal of hazardous wastes.

Mine site reclamation costs are funded from U.S. Silica's Asset Retirement Obligations (ARO) account. Funding of the ARO account is included in the Crane Operation's capital and operating costs discussed in Chapter 18 and included in the economic analysis presented in Chapter 19. ARO cost estimates are reviewed annually. As a matter of good mining practice, U.S. Silica seeks to conduct progressive reclamation throughout the operation's mining life to minimize risk and costs at closure.

17.4 Community Engagement

BOYD is unaware of any plans, negotiations, agreements with local individuals or groups or commitments to ensure local procurement and hiring.

U.S. Silica's corporate sustainability report outlines the components of its core community engagement initiatives. It's stated priorities include increasing charitable contributions to organization that support the local community and actively seeking opportunities for volunteering and community engagement.

18.0 CAPITAL AND OPERATING COSTS

18.1 Historical Financial Performance

Table 18.1 summarizes the past three years of financial data for the Crane Operation. We remind the reader that the COVID-19 pandemic caused severe economic, market, and other disruptions which began to affect U.S. Silica's proppant sand operations in the second quarter of 2020. The Crane Operation temporarily shut down in 2020 and reopened in 2021.

Table 18.1: Historical Financials

	Units	2020	2021	2022
Production:				
ROM Production	000 tons	697	3,263	3,886
Process Yield	%	-	79.1	88.1
Product Sales	000 tons	949	2,581	3,422
Gross Revenues	$ 000	20,941	48,825	105,326
Average Selling Price	$/ton sold	22.06	18.91	30.78
Total Cash Costs of Sales	$ 000	15,822	30,749	48,424
Average Cash Cost of Sales	$/ton sold	16.67	11.91	14.15
Capital Expenditures	$ 000	2,647	454	687

The Crane Operation processed stockpiled "non-resource" sand in 2020 that was excavated from the processing plant construction site. Consequently, the reported product sales tonnage for 2020 is higher than the stated tonnage mined.

Gross revenues include income from product sales and shipping.

Total cash costs of sales include operating costs (i.e., mining, ongoing reclamation, processing, product loadout, and other related costs) in addition to selling, general, and administrative expenses.

Capital expenditures include maintenance (sustaining) expenses and discretionary spending on continuous improvement projects to drive and maintain cost efficiencies.

Based on the financial data presented above:

- Average realization increased from $22.06 per ton sold in 2020 to $30.78 per ton sold in 2022.

- Total cash cost of sales decreased from $16.67 per ton sold in 2020 to $14.15 per ton sold in 2022.
- EBITDA margin increased marginally from 24.4% in 2020 to 54.0% in 2022.
- Capital expenditures totaled almost $3.8 million over the three years, averaging $0.54 per ton sold.

18.2 Estimated Costs

The production and unit cost estimates provided by U.S. Silica are based on actual past performance and their customary internal budget review and approvals process. Operating volumes are well-defined and understood, as are mining and processing productivities. As such, it is BOYD's opinion that the production and financial projections are reasonable and are likely to be within ±20% accuracy level.

This section contains forward-looking information related to capital and operating cost estimates for the Crane Operation.

There are inherent known and unknown risks and uncertainties associated with all mining operations. These risks, uncertainties, and other factors are not quantifiable, but include, but are not limited to, adverse general economic conditions, operating hazards, inherent uncertainties in interpreting engineering and geologic data, fluctuations in commodity prices and prices for operational services, government regulation and political risks, as well as other risks commonly associated with the mining industry.

18.2.1 Projected Capital Expenditures

The Crane Operation and related facilities are fully developed and should not require any near-term major capital investment to maintain full commercial production. Historically, the timing and amount of capital expenditures has been largely discretionary and within U.S. Silica's control. Their budgetary allocations for sustaining and

discretionary capital expenditures over the next three years is provided in Table 18.2, below.

Table 18.2: Projected Capital Costs

Year	CapEx ($ 000)
2023	708
2024	729
2025	751
Total	2,187

BOYD considers the near-term detailed capital expenditure schedule as presented by U.S. Silica to be reasonable and representative of the capital necessary to operate the Crane Operation.

After 2025, capital expenditures are projected to increase 3% annually per year from 2025's expenditures until the end of operation's life. As the Crane Operation is in a steady state of production, the projected capital expenditures are considered reasonable and expected.

18.2.2 Projected Operating Costs

Operating cost estimates were developed based on recent actual costs and considering specific operational activity levels and cost drivers. The estimates consider current and expected labor headcount and salaries, major consumables and unit prices, power costs, and equipment and maintenance costs. The total operating cost estimate includes all site costs related to mining, processing, and general and administrative activities.

In the near-term, U.S. Silica expects their unit operating costs to stay relatively consistent (on an uninflated basis). As such, the projected total cash cost of sales over the life of the mine is $14.15 per ton sold. As the operation is in a steady state, BOYD considers the future operating cost estimates to be reasonable and appropriate.

19.0 ECONOMIC ANALYSIS

19.1 Approach

The economic analysis presented in this chapter was made for the purposes of confirming the commercial viability of the Crane Operation's reported proppant sand reserves and not for the purposes of valuing U.S. Silica, the Crane Operation, or its assets. The economic analysis contains forward-looking information related to the projected operating and financial performance of the Crane Operation and therefore involves inherent known and unknown risks and uncertainties, some of which may be outside of U.S. Silica's control. U.S. Silica, as with all mining companies, actively evaluates, changes, and modifies business and operating plans in response to various factors that may affect operational and/or financial results. Actual results, production levels, operating expenses, sales realizations, and all other modifying factors could vary significantly from the assumptions and estimates provided in this analysis. Risk is subjective, as such, BOYD recommends that each reader should evaluate the project based on their own investment criteria.

The financial model used for the purposes of the economic analysis has been prepared in-house by U.S. Silica as part of their annual budgeting process. The model forecasts future free cash flow from proppant sand production and sales over the life cycle of the Crane Operation using the annual forecasts of production, sales revenues, and operating and capital costs discussed earlier in this report. A DCF analysis, in which future free cash flows are discounted to present value, is used to derive an NPV for the proppant sand reserves. Use of DCF-NPV analysis is a standard method within the mining industry to assess the economic value of a project after allowing for the cost of capital invested.

The financial evaluation of the Crane Operation has been undertaken on a simplified after-tax basis and does not reflect U.S. Silica's corporate tax structure. NPV is calculated using an after-tax discount rate of 12.5% ($NPV_{12.5}$). Cash flows were assumed to occur in the middle of each year and are discounted to mid-year 2022. Cost estimates and other inputs to the cash flow model for the project have been prepared using constant 2022 money terms, i.e., without provision for inflation. Internal rate of return and project payback were not calculated, as there was no initial investment (sunk costs) considered in the financial model provided herein.

A suite of sensitivities was calculated to evaluate the effect of the main drivers of economic performance, including variations in sales prices, operating costs, and capital costs.

BOYD has reviewed the financial model and its inputs in detail. It is our opinion that the financial model provides a reasonable and accurate reflection of the Crane Operation's expected economic performance based on the assumptions and information available at the time of our review.

19.2 Assumptions and Limitations

Cash flow projections for the Crane Operation have been generated from the annual forecasts of production, sales revenues, and operating and capital costs discussed earlier in this report. A summary of the key assumptions and limitations is provided below:

- Sales volumes of finished proppant sand are expected to increase 2% per annum.
- ROM production requirements are based on an expected processing yield of 82.5% (the historic average) and are also projected to increase 2% per annum. Forecasted ROM production is at or below the capacity of the existing mining equipment and related infrastructure.
- Forecasted revenues are based on sales of various grades of finished proppant sand with a weighted-average sales price of $23.92 per ton.
- Capital and operating costs are discussed in Chapter 18. Capital expenditures are derived from budgetary allocations for the first three years of the forecast and escalated thereafter at 3% per annum. Unit operating costs are expected to remain relatively constant over the life of the operation at $14.15 per sold ton.
- Taxes are based on combined Federal and State Tax rates totaling 26%
- Buildup of net working capital is equal to 25% of positive cash (operating) margins.
- Depreciation and amortization expenses are estimated as the average of the proceeding three years.
- Asset recovery/salvage values were not included in the valuation.

19.3 Financial Model Results

Estimated LOM pre-tax and after-tax cash flows for proppant sand production from the Crane Operation are presented in Table 19.1, on the following page.

Table 19.1

ANNUAL PRODUCTION AND CASH FLOW FORECAST
CRANE OPERATION
Prepared For
U.S. SILICA COMPANY
By
John T. Boyd Company
Mining and Geological Consultants
February 2023

Description	Units	2023	2024	2025	2026	2027	2028 to 2032	2033 to 2042	2043 to 2052	2053	Total
Production:											
ROM Production	000 tons	4,230	4,315	4,401	4,489	4,579	23,980	48,485	48,485	4,822	147,788
Product Sales	000 tons	3,490	3,560	3,631	3,704	3,778	19,784	40,000	40,000	3,978	121,925
Total Revenues	$ 000	83,484	85,154	86,857	88,594	90,366	473,230	956,800	956,800	95,165	2,916,448
Average Selling Price	$/ton sold	23.92	23.92	23.92	23.92	23.92	23.92	23.92	23.92	23.92	23.92
Total Cash Costs of Sales	$ 000	49,385	50,373	51,381	52,408	53,456	279,941	566,000	566,000	56,295	1,725,240
Average Cash Cost of Sales	$/ton sold	14.15	14.15	14.15	14.15	14.15	14.15	14.15	14.15	14.15	14.15
EBITDA	$ 000	34,099	34,781	35,476	36,186	36,909	193,288	390,800	390,800	38,870	1,191,208
Depreciation & Amortization	$ 000	15,038	15,440	15,410	15,296	15,382	76,787	153,581	153,580	15,358	475,873
EBIT	$ 000	19,060	19,341	20,066	20,890	21,527	116,501	237,219	237,220	23,512	715,336
Taxes	$ 000	4,956	5,029	5,217	5,431	5,597	30,290	61,677	61,677	6,113	185,987
Operating Income	$ 000	14,105	14,312	14,849	15,458	15,930	86,211	175,542	175,543	17,399	529,348
Capital Expenditures	$ 000	708	729	751	773	796	4,355	10,902	14,651	1,718	35,382
Net Working Capital Contribution	$ 000	-	170	174	177	181	543	-	-	-	1,245
Net Income	$ 000	13,397	13,413	13,924	14,508	14,953	81,313	164,640	160,892	15,681	492,721
Pre-tax Cash Flow	$ 000	33,391	33,881	34,552	35,235	35,932	188,390	379,898	376,149	37,152	1,154,580
Discounted at 12.5%	$ 000	31,481	28,394	25,739	23,331	21,149	78,768	68,754	20,969	1,023	299,609
After-tax Cash Flow	$ 000	28,435	28,853	29,334	29,804	30,335	158,100	318,221	314,472	31,039	968,593
Discounted at 12.5%	$ 000	26,809	24,180	21,852	19,735	17,855	66,119	57,600	17,535	855	252,540

Table 19.2, below, provides a summary of the estimated remaining life of mine financial results for the Crane Operation.

Table 19.2: Financial Results

	Units	Remaining Life of Mine Total
Remaining Life	years	31
Production:		
ROM Production	000 tons	147,788
Product Sales	000 tons	121,925
Total Revenues	$ millions	2,916.4
Total Cash Costs of Sales	$ millions	1,725.2
Capital Expenditures	$ millions	35.4
Pre-Tax:		
Cash Flow	$ millions	1,154.6
$NPV_{12.5}$	$ millions	299.6
After-tax:		
Cash Flow	$ millions	968.6
$NPV_{12.5}$	$ millions	252.5

DCF-NPV on a pre-tax and after-tax basis, using discount rates of 10%, 12.5% (the base case), and 15%, were calculated utilizing the projected cash flows. Table 19.3 summarizes the results of the pre-tax and after-tax DCF-NPV analyses:

Table 19.3: DCF-NPV Analysis

	NPV ($ millions)		
	10%	12.5%	15%
Pre-Tax	362.4	299.6	254.4
After-Tax	305.2	252.5	214.6

As shown, the pre-tax DCF-NPV ranges from approximately $254.4 million to $362.4 million. The after-tax DCF-NPV ranges from approximately $214.6 million to $305.2 million.

The economic analysis confirms that the Crane Operation generates positive pre- and after-tax financial results and a real $NPV_{12.5}$ of $252.5 million. As such, it is BOYD's

opinion that the Crane Operation's proppant sand reserves have demonstrated economic viability.

19.4 Sensitivity Analysis

Table 19.4, below, shows the sensitivity of the project after-tax for a cash flow discounted at 12.5% ($NPV_{12.5}$) to a variation over a range of 20% above and below the base case in: (1) average selling prices and (2) operating costs.

Table 19.4: After-Tax $NPV_{12.5}$ Sensitivity Analysis ($ millions)

Cash Costs of Sale:	Revenues								
	-20%	-15%	-10%	-5%	0%	5%	10%	15%	20%
-20%	207.1	234.9	262.7	290.5	318.3	346.1	373.9	401.6	428.5
-15%	190.7	218.5	246.3	274.1	301.9	329.6	357.4	385.2	412.7
-10%	174.3	202.1	229.8	257.6	285.4	313.2	341.0	368.8	396.6
-5%	157.8	185.6	213.4	241.2	269.0	296.8	324.5	352.3	380.1
0%	141.4	169.2	197.0	224.8	**252.5**	280.3	308.1	335.9	363.7
5%	125.0	152.7	180.5	208.3	236.1	263.9	291.7	319.5	347.2
10%	108.5	136.3	164.1	191.9	219.7	247.5	275.2	303.0	330.8
15%	92.1	119.9	147.7	175.4	203.2	231.0	258.8	286.6	314.4
20%	75.6	103.4	131.2	159.0	186.8	214.6	242.4	270.2	297.9

As might be expected, the project is most sensitive to changes in product pricing and operating costs. The project is less sensitive to capital costs. There is little to no impact varying the capital costs from 70% to 130% of the base case.

This analysis demonstrates the project value to be relatively robust, with positive NPVs reported across the range of values assessed.

20.0 ADJACENT PROPERTIES

There is no information used in this report that has been sourced from adjacent properties. BOYD is unaware of any mining or exploration activities having occurred on the adjacent properties.

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21.0 OTHER RELEVANT DATA AND INFORMATION

BOYD is not aware of any additional information which would materially impact the proppant sand resource and reserve estimates reported herein.

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22.0 INTERPRETATION AND CONCLUSIONS

22.1 Audit Findings

BOYD's independent technical assessment was conducted in accordance with S-K 1300 and concludes:

- Sufficient data have been obtained through site exploration and sampling programs and mining operations to support the geological interpretations of the sand deposit within the controlled property of the Crane Operation. The data are of sufficient quantity and reliability to reasonably support the proppant sand resource and reserve estimates presented in this report.
- BOYD is of the opinion that our data verification efforts: (1) adequately confirm the reasonableness of the geologic interpretations, resource estimation criteria, and economic assumptions; and (2) support the use of the data in proppant sand resource/reserve estimation.
- The 121.9 million saleable product tons of proppant sand reserves (as of December 31, 2022) identified on the property are reasonably and appropriately supported by technical studies, which consider expected geologic conditions, planned mining and processing operations, forecasted product revenues, and operating and capital cost estimates. As such, BOYD is of the opinion that there are reasonable expectations that the stated proppant sand reserves for the Crane Operation are technically, economically, and legally extractable as of December 31, 2022.
- In addition to the reported reserves, U.S. Silica controls approximately 2.2 million in-place tons of measured and indicated proppant sand resources and 16.4 million in-place tons of inferred proppant sand resources at the Crane Operation. It is BOYD's opinion that the stated proppant sand resources have been reported using economic and mining assumptions which support the reasonable potential for eventual economic extraction.
- There is no other relevant information material to the Crane Operation that is necessary to make this technical report summary not misleading.

22.2 Significant Risks and Uncertainties

As a mining operation with an established operating history, the purpose of U.S. Silica's periodic mine planning exercises is to: (1) collect and analyze sufficient data to reduce or to eliminate risk in the technical components of the project, and (2) to refine economic projections based on current data. There is a high degree of certainty for this project under the current and foreseeable operating environment. A general assessment of risk is presented in the relevant sections of this report.

23.0 RECOMMENDATIONS

Based on the scope of our assignment, BOYD has no recommendations regarding the Crane Operation. It is our understanding that U.S. Silica continuously reviews and improves operating practices as a matter of course.

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24.0 REFERENCES

A list of supporting information is provided in Section 2.4. Additional references are cited as footnotes in the report as required.

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25.0 RELIANCE ON INFORMATION PROVIDED BY REGISTRANT

In the preparation of this report, BOYD has relied, exclusively and without independent verification, upon information furnished by U.S. Silica as presented in Table 25.1, below.

Table 25.1: Information Relied Upon from Registrant

Subject Matter	Information	Report Chapter(s)
Environmental	Permits, bond, and reclamation liability	3, 17
	Sustainability initiatives	17
	Surface tailings management	15
	Mine closure requirements and plans	17
	Monitoring/compliance requirements for protected areas/species	3, 17
Governmental	Income tax rates	19
Legal	Property title and status	3
	Encumbrances, easements, and right-of-ways	3
Macroeconomics	Inflation, interest, and discount rates	19
Markets	Market overview and strategy	16
	Long-term product price projections	11, 12, 16, 19
	Product specifications	16
	Marketing and sales contracts	16
Social	Community relations	17

BOYD exercised due care in reviewing the information provided by U.S. Silica within the scope of our expertise and experience (which is in technical and financial mining issues) and concluded the data are reasonable and appropriate considering the status of the subject properties and the purpose for which this report was prepared. We have no reason to believe that any material facts have been withheld or misstated, or that further analysis may reveal additional material information. However, the accuracy of the results and conclusions of this report are reliant on the accuracy of the information provided by U.S. Silica.