

SOLITARIO ZINC CORP.
Form 10-K
March 01, 2019
UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

(Mark One)

Annual report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 for the fiscal year ended December 31, 2018

or

Transition report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934

For the transition period from _____ to _____

Commission file number **001-32978**

SOLITARIO ZINC CORP.

(Exact name of registrant as specified in charter)

Colorado

(State or other jurisdiction of incorporation or organization)

4251 Kipling St. Suite 390, Wheat Ridge, CO

(Address of principal executive offices)

Registrant's telephone number, including area code

84-1285791

(I.R.S. Employer Identification No.)

80033

(Zip Code)

(303) 534-1030

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

Title of each class	Name of exchange on which registered
Common Stock, \$0.01 par value	NYSE American

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

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

YES [] NO [X]

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 [X] 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 if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained to the best of registrant's knowledge in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

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

Large accelerated filer	Accelerated filer	Non-accelerated filer	Smaller reporting company	Emerging growth company
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act).

YES NO

The aggregate market value of the voting and non-voting common stock held by non-affiliates of the registrant as of the last business day of the registrant's most recently completed second fiscal quarter, based upon the closing sale price of the registrant's common stock on June 30, 2018 as reported on NYSE American, was approximately \$22,719,000.

There were 58,160,718 shares of common stock, \$0.01 par value, outstanding on February 28, 2019.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the definitive Proxy Statement for the Registrant's Annual Meeting of Shareholders, which is expected to be filed by April 30, 2019, have been incorporated by reference into Part III of this Annual Report on Form 10-K.

TABLE OF CONTENTS

	Page
PART I	
Item 1 Business	3
Item 1A Risk Factors	6
Item 1B Unresolved Staff Comments	11
Item 2 Properties	11
Item 3 Legal Proceedings	25
Item 4 Mine Safety Disclosures	25
PART II	
Item 5 Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities	26
Item 6 Selected Financial Data	28
Item 7 Management's Discussion and Analysis of Financial Condition and Results of Operations	29
Item 7A Quantitative and Qualitative Disclosures about Market Risk	37
Item 8 Financial Statements and Supplementary Data	38
Item 9 Changes in and Disagreements with Accountants on Accounting and Financial Disclosure	59
Item 9A Controls and Procedures	59
Item 9B Other Information	59
PART III	
Item 10 Directors, Executive Officers and Corporate Governance	60
Item 11 Executive Compensation	60
Item 12 Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters	60
Item 13 Certain Relationships and Related Transactions, and Director Independence	60
Item 14 Principal Accounting Fees and Services	60
PART IV	
Item 15 Exhibits, Financial Statement Schedules	61
Item 16 Form 10-K Summary	61
SIGNATURES	62

PART I

This Annual Report on Form 10-K contains statements that constitute "forward-looking statements" within the meaning of section 27A of the Securities Act of 1933 and section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). These statements can be identified by the fact that they do not relate strictly to historical information and include the words "expects", "believes", "anticipates", "plans", "may", "will", "intend", "estimate", "continue" or other similar expressions. These forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from those currently anticipated. These risks and uncertainties include, but are not limited to, items discussed below in Item 1A "Risk Factors" in this Form 10-K. Forward-looking statements speak only as of the date made. We undertake no obligation to publicly release or update forward-looking statements, whether as a result of new information, future events or otherwise. You are, however, advised to consult any further disclosures we make on related subjects in our quarterly reports on Form 10-Q and any reports made on Form 8-K to the United States Securities and Exchange Commission (the "SEC").

Item 1. Business

Business and Company Formation

Solitario Zinc Corp. ("Solitario" or the "Company") is an exploration stage company as defined in Industry Guide 7, as issued by the United States Securities and Exchange Commission ("SEC"). Solitario was incorporated in the state of Colorado on November 15, 1984 as a wholly-owned subsidiary of Crown Resources Corporation ("Crown"). In July 1994, Solitario became a publicly traded company on the Toronto Stock Exchange (the "TSX") through its initial public offering. Solitario has been actively involved in mineral exploration since 1993. Solitario's primary business is to acquire exploration mineral properties and/or discover economic deposits on its mineral properties and advance these deposits, either on its own or through joint ventures, up to the development stage. At that point, or sometime prior to that point, Solitario would likely attempt to sell its mineral properties, pursue their development either on its own, or through a joint venture with a partner that has expertise in mining operations, or create a royalty with a third party that continues to advance the property. Solitario has never developed a property. Although Solitario has owned exploration projects in both precious and base metals in the past, Solitario's current focus is on the acquisition and exploration of zinc-related exploration mineral properties. However, Solitario may still evaluate and/or acquire other precious metal projects as part of its overall mineral property activity. In addition to focusing on its mineral exploration properties and the evaluation of mineral properties for acquisition, Solitario also evaluates potential strategic transactions for the acquisition of new precious and base metal properties and assets with exploration potential or business combinations that Solitario determines to be favorable to Solitario.

In July 2017 Solitario completed the acquisition of Zazu Metals Corp. ("Zazu") whereby Solitario issued 19,788,177 shares of its common stock for all the issued and outstanding common shares of Zazu (the "Acquisition"). Zazu had one primary asset, its interest in the Lik project, and the Acquisition was treated as an asset purchase.

Solitario has recorded revenue from the sale of mineral properties, including the sale on April 26, 2018 of its interest in the royalty on the Yanacocha property (discussed below), the sale in 2015 of its former interest in Mount Hamilton LLC the owner of Solitario's former Mt. Hamilton project (the "Mt. Hamilton Transaction"), joint venture property payments and the sale of a royalty on the former Mt. Hamilton project. Revenues from the sale or joint venture of properties or assets, although significant when they occur, have not been a consistent annual source of revenue and would only occur in the future, if at all, on an infrequent basis.

Solitario currently considers its carried interest in the Florida Canyon project in Peru and its interest in the Lik project in Alaska to be its core mineral property assets. Nexa Resources, Ltd. ("Nexa"), Solitario's joint venture partner, initiated a 17,000-meter drilling program at Florida Canyon during the fourth quarter of 2018 (discussed below), which is expected to be completed during 2019. Solitario is working with its 50% joint venture partner, Teck American Inc., a wholly-owned subsidiary of Teck Resources Limited (both companies are referred to in this Annual Report as "Teck") and completed a limited exploration program at the Lik project during 2018 consisting of mapping, geophysical work, relogging of prior drilling core and environmental evaluation.

As of December 31, 2018, Solitario has significant balances of cash and short-term investments that Solitario anticipates using, in part, to further the development of the Florida Canyon and Lik projects and to potentially acquire additional mineral property assets. The fluctuations in precious metal and other commodity prices contribute to a challenging environment for mineral exploration and development, which has created opportunities as well as challenges for the potential acquisition of early-stage and advanced mineral exploration projects or other related assets at potentially attractive terms.

Recent Developments

On April 26, 2018 Solitario sold its royalty interest in the non-producing Yanacocha property (the “Yanacocha Royalty”) to a wholly owned subsidiary of Newmont Mining Corporation (“Newmont”) for approximately \$502,000 in cash. The Yanacocha Royalty covered 43 concessions totaling 36,052 hectares. Newmont owns the underlying mineral concessions covered by the Yanacocha Royalty. None of the concessions covered by the Yanacocha Royalty have any reported reserves or resources. Solitario had no mineral property capitalized cost in the Yanacocha Royalty and recorded Mineral Property Revenue of \$502,000 during 2018.

Corporate Structure

Solitario Zinc Corp. [Colorado]

- Zazu Metals Corp. [Canada] (100%)
- Zazu Metals (AK) Corp [Alaska] (100%)
- Lik Project (50%)
- Minera Chambara, S.A. [Peru] (85%)
- Chambara Project
- Minera Solitario Peru, S.A. [Peru] (100%)
- Minera Bongará, S.A. [Peru] (39%)
- Florida Canyon Project
- Minera Soloco, S.A. [Peru] (100%)

Mineral Exploration Properties

We hold a 50% operating interest in the Lik zinc-lead-silver property in Northwest Alaska, which is estimated to contain a large tonnage, high-grade deposit potentially mineable by open-pit methods. Teck is a 50% partner with Solitario in the Lik deposit, with Solitario acting as the project manager. A Preliminary Economic Assessment (“PEA”) was completed on the Lik deposit in 2014.

Solitario's other core asset is a 39% interest in the advanced, high-grade, Florida Canyon zinc project located in northern Peru. The project has a significant mineral resource and Solitario is fully carried to production by its joint venture partner Nexa, formerly Votorantim Metais Holdings, SA ("Votorantim") and Compañía Minera Milpo S.A.A. ("Milpo"). Solitario and Nexa completed a PEA on the Florida Canyon deposit in August 2017. Nexa is one of the largest zinc producers in Peru. Since inception of the Florida Canyon joint venture in 2006, Nexa has funded 100% of project expenditures. Nexa will earn a 70% interest in the project by continuing to solely fund all project expenditures, excluding a portion of the 2018-2019 drilling program, discussed below, and committing to place the project into production based upon a positive feasibility study. After earning 70%, and at the request of Solitario, Nexa has further agreed to finance Solitario's 30% participating interest for construction. Solitario will repay the loan facility through 50% of its net cash flow distributions.

In August of 2018, Solitario agreed to fund a portion of a 2018 – 2019 drilling program at the Florida Canyon project. Per the agreement, Solitario will fund up to \$1,580,000 of a planned 41-hole 17,000-meter drilling program to be conducted through December 31, 2019 (the "Drilling Program"). Upon Nexa completing the first 1,700 meters of the Drilling Program, Solitario will pay Nexa \$527,000, upon completion of the next 1,700 meters (3,400 meters total) of the Drilling Program, Solitario will pay Nexa \$527,000, and upon completion of the third 1,700 meters (5,100 meters total) of the Drilling Program, Solitario will pay Nexa the balance remaining on its \$1,580,000 funding commitment, or \$526,000. Solitario has no obligation to pay Nexa prior to the attainment of the separate 1,700-meter thresholds. The funding commitments are in the form of an advance on Solitario's commitment to fund 30% of any future construction development costs of Florida Canyon under the original joint venture agreement discussed above. Accordingly, in the event the Florida Canyon project is developed, which cannot be assured at this time, any funds paid to Nexa under this agreement will reduce the amount of Solitario's obligation to fund 30% of future development costs, and / or repay loans from Nexa for future development costs at the Florida Canyon project. As of December 31, 2018, Nexa had completed four holes and a total of 2,203 meters under the Drilling Program, and Solitario has recorded an account payable to Nexa of \$527,000 and recorded a charge to exploration expense of \$527,000.

At December 31, 2018, Solitario also owns the La Promesa gold exploration project. Solitario also holds an 85% interest in the Chambara exploration project in Peru (Nexa holds the remaining 15%), and a 9.9% equity interest in Vendetta Mining Corp. ("Vendetta").

Subsequent to December 31, 2018, on January 22, 2019, we announced the sale of our interests in a retained royalty on the Pedra Branca project in Brazil, a retained royalty on non-producing exploration properties in Mexico, and an option to purchase a royalty on certain non-producing mineral claims in Montana to SilverStream SEZC (“SilverStream”), a private Cayman Island royalty and streaming company for Cdn\$250,000 in cash and a one-year promissory note from SilverStream for Cdn\$350,000.

We are conducting exploration and property evaluation activities in Peru either on our own using contract geologists, or through joint ventures operated by our partners.

Our exploration activities and those of our joint venture partners are carried out on a property-by-property basis. These activities may include prospecting, geologic mapping, sampling, geophysics and drilling. When we determine that this work indicates a project may not be economic or contain sufficient geologic or economic potential, we may impair or completely write-off the property. A significant factor in the success or failure of our activities is the price of commodities. For example, when the price of zinc or other commodities is down, we may determine that the value of our mineral exploration properties decreases; however, during such down markets it may also become easier and less expensive to locate and acquire new mineral exploration properties.

We have recorded revenue in the past from the sale of mineral properties, joint venture property payments and the sale of a royalty on our formerly-held Mt. Hamilton property. Proceeds from the sale or joint venture of properties, although potentially significant when they occur, have not been a consistent source of cash and may only occur in the future, if at all, on an infrequent basis. Accordingly, while we conduct exploration activities on our projects, we need to maintain and replenish our capital resources. Historically, we have met our need for capital through (i) sale of our Yanacocha royalty to Newmont for \$502,000 during 2018; (ii) proceeds received from the Mt. Hamilton Transaction; (iii) sales of our shares of common stock of Vendetta and Kinross Gold Corporation (“Kinross”); (iv) borrowing in the form of short-term margin debt secured by our investment in Kinross; (v) borrowing under long-term debt secured by our former Mt. Hamilton project (vi) joint venture delay rental payments, including payments on our Florida Canyon project; (vii) a royalty sale for \$10,000,000 in 2012; (viii) issuances of common stock; (ix) sales of covered call options on our Kinross common stock; and (x) interest on short term Treasury Notes and Bank CDs. In the past, we have reduced our exposure to the costs of our exploration activities through the use of joint ventures.

We operate in one segment: mineral exploration. We currently conduct exploration activities in Peru and Alaska and evaluate properties for potential acquisition and evaluation of strategic corporate opportunities throughout North and South America. As of February 28, 2019, we had four full-time employees located in the United States and no full-time employees outside of the United States. We utilize contract managers, geologists, administrators and laborers to execute our Latin American and North American project work and acquisition evaluations.

A large number of companies are engaged in the acquisition, exploration and development of mineral properties, many of which have substantially greater technical and financial resources than we have and, accordingly, we may be at a disadvantage in being able to compete effectively for the acquisition, exploration and development of mineral

properties. We are not aware of any single competitor or group of competitors that dominate the exploration and development of mineral properties. In acquiring mineral properties for exploration and development, we rely on the experience, technical expertise and knowledge of our employees and advisors, which is limited by the size of our company compared to many of our competitors who may have either more employees or employees with more specialized knowledge and experience.

Governmental Regulations

Mineral development and exploration activities are subject to various national, state/provincial, and local laws and regulations, which govern prospecting, development, mining, production, exports, taxes, labor standards, occupational health, waste disposal, protection of the environment, mine safety, hazardous substances and other matters. Similarly, if any of our properties are developed and/or mined those activities are also subject to significant governmental regulation and oversight. We are required to obtain the licenses, permits and other authorizations in order to conduct our exploration programs.

Environmental Regulations

Our current and planned activities are subject to various national and local laws and regulations governing protection of the environment. These laws are continually changing and, in general, are becoming more restrictive. We are required to conduct our operations in compliance with applicable laws and regulations. Changes to current local, state or federal laws and regulations in each jurisdiction in which we conduct our exploration activities could, in the future, require additional capital expenditures and increased operating and/or reclamation costs. Although we are unable to predict what additional legislation, if any, might be proposed or enacted, additional regulatory requirements could impact the economics of our projects. During 2018, we had no material environmental incidents or non-compliance with any applicable environmental regulations.

Financial Information about Geographic Areas

Included in the consolidated balance sheets at December 31, 2018 and 2017, are total assets of \$416,000 and \$73,000, respectively, related to Solitario's operations located outside of the United States.

Available Information

We file our Annual Report on Form 10-K, our quarterly reports on Form 10-Q, current reports on Form 8-K, and any amendments to those reports electronically with the SEC. The SEC maintains a website (<http://www.sec.gov>) that contains reports, proxy and information statements and other information regarding registrants, including the Company, that file electronically with the SEC.

Paper copies of our Annual Report to Shareholders, our Annual Report on Form 10-K, our quarterly reports on Form 10-Q, current reports on Form 8-K, and any amendments to those reports are available free of charge by writing to Solitario at its address on the front of this Form 10-K. In addition, electronic versions of the reports we file with the SEC are available on our website, www.solitarioxr.com as soon as practicable, after filing with the SEC.

Item 1A. Risk Factors

In addition to considering the other information in this Form 10-K, you should consider carefully the following factors. The risks described below are the significant risks we face and include all material risks of which we are aware. Additional risks not presently known to us or risks that we currently consider immaterial may also adversely affect our business.

Our mineral exploration activities involve a high degree of risk, and a significant portion of our business model envisions the sale or joint venture of mineral properties. If we are unable to sell or joint venture these properties, the money spent on exploration may never be recovered and we could incur an impairment of our investments in our projects.

The exploration for mineral deposits involves significant financial and other risks over an extended period of time. Few properties that are explored are ultimately developed into producing mines. Major expenditures are required to

determine if any of our mineral properties may have the potential to be commercially viable and be salable or joint ventured. Prior to completion of the feasibility study on our former Mt. Hamilton project, we had never established reserves on any of our properties. Significant additional expense and risks, including drilling and determining the feasibility of a project, are required prior to the establishment of reserves. It is impossible to ensure that the current or proposed exploration programs on properties in which we have an interest will be commercially viable or that we will be able to sell, joint venture or develop our properties. Whether a mineral deposit will be commercially viable depends on a number of factors, some of which are the particular attributes of the deposit, such as its size and grade, costs and efficiency of the recovery methods that can be employed, proximity to infrastructure, commodity prices, financing costs and governmental regulations, including regulations relating to prices, taxes, royalties, infrastructure, land use, importing and exporting of mineral products and environmental protection.

We believe the data obtained from our own exploration activities or our partners' activities to be reliable; however, the nature of exploration of mineral properties and analysis of geological information is often subjective, and data and conclusions are subject to uncertainty. Even if exploration activities determine that a project is commercially viable, it is impossible to ensure that such determination will result in a profitable sale of the project or development either on our own or by a joint venture in the future and that such project will result in profitable commercial mining operations. If we determine that capitalized costs associated with any of our mineral interests are not likely to be recovered, we would incur an impairment of our investment in such property interest. All of these factors may result in losses in relation to amounts spent, which are not recoverable. We have experienced losses of this type from time to time and may record mineral property impairments in the future.

We have no reported proven and probable mineral reserves and none of our current projects are likely to be monetized in the near future and any projects we may acquire are not likely to offer the opportunity for near term revenues or sale proceeds, and if we are unsuccessful in identifying mineral reserves in the future, we may not be able to realize any profit from these property interests.

None of our current projects have reported proven and probable mineral reserves as those terms are used in SEC Guide 7. Any mineral reserves on these projects will only come from extensive additional exploration, engineering and evaluation of existing or future mineral properties. The lack of reserves on these mineral properties could prohibit us from any near-term sale or joint venture of our mineral properties and we would not be able to realize any proceeds and or profit from our interests in such mineral properties, which could materially adversely affect our financial position or results of operations.

Mineral exploration activities are inherently dangerous and could cause us to incur significant unexpected costs, including legal liability for loss of life, damage to property and environmental damage, any of which could materially adversely affect our financial position or results of operations.

Mining exploration operations are subject to the hazards and risks normally related to exploration of a mineral deposit, including, but not limited to mapping and sampling, drilling, road building, trenching, assaying and analyzing rock samples, transportation over primitive roads or via small contract aircraft or helicopters and severe weather conditions. Any of the hazards of mining exploration could result in damage to life or property, environmental damage and possible legal liability for such damage. Any of these risks could cause us to incur significant unexpected costs that could have a material adverse effect on our financial condition and ability to finance our exploration and development activities.

We have a history of losses and if we do not operate profitably in the future it could have a material adverse effect on our financial position or results of operations and the trading price of our common stock would likely decline.

We have reported losses in 22 of our 25 years of operations. We can provide no assurance that we will be able to operate profitably in the future or begin to generate significant and consistent sources of revenues or cash flows from operations. We have had net income in only three years in our history; during 2015, as a result of the Mt. Hamilton Transaction, during 2003, as a result of a \$5,438,000 gain on a derivative instrument related to our investment in certain Crown warrants and during 2000, when we sold our former Yanacocha property. We cannot predict when, if ever, we will be profitable again or able to begin generating consistent revenues or cash flows from our operations or assets. If we do not operate profitably or identify and execute on outside sources of funding, we may be unable to fund our current or contemplated exploration activities, acquire new assets, or otherwise further our business plan.

Our operations outside of the United States of America may be adversely affected by factors outside of our control, such as changing political, local and economic conditions, any of which could materially adversely affect our financial position or results of operations.

Our mineral properties located in Latin America consist primarily of mineral concessions granted by national governmental agencies and are held 100% by us or in conjunction with our joint venture partners, or under lease, option or purchase agreements. Certain of our mineral properties are located in Peru and we have held royalties on non-producing exploration properties in Mexico, Brazil and Montana (U.S.) through January 22, 2019 when they were sold. We act as operator on all of our mineral properties or assets that are not held in joint ventures or are royalty interests. The success of projects held under joint ventures or royalty interests that are not operated by us are substantially dependent on the joint venture partner, over which we have limited or no control.

Our exploration activities, mineral properties and royalties located outside of the United States are subject to the laws of Peru, Mexico and Brazil and any other countries in which we conduct business. Exploration and potential development activities in these countries are potentially subject to political and economic risks, including:

- cancellation or renegotiation of contracts;
- disadvantages of competing against companies from countries that are not subject to US laws and regulations, including the U.S. Foreign Corrupt Practices Act (“FCPA”);
- changes in foreign laws or regulations;
- changes in tax laws;
- royalty and tax increases or claims by governmental entities, including retroactive claims;
- expropriation or nationalization of property;
- currency fluctuations (particularly related to declines in the U.S. dollar compared to local currencies);
- foreign exchange controls;
- restrictions on the ability for us to hold U.S. dollars or other foreign currencies in offshore bank accounts;
- import and export regulations;
- environmental controls;
- risks of loss due to community opposition to our activities, civil strife, acts of war, guerrilla activities, insurrection and terrorism; and
- other risks arising out of foreign sovereignty over the areas in which our exploration activities are conducted.

Accordingly, our current exploration activities outside of the United States may be substantially affected by factors beyond our control, any of which could materially adversely affect the value of certain of our assets or results of operations. Furthermore, in the event of a dispute arising from such activities, we would likely be subject to the exclusive jurisdiction of courts outside of the United States or may not be successful in subjecting persons to the jurisdictions of the courts in the United States, which could adversely affect the outcome of a dispute.

We may not have sufficient funding for exploration and development, which may impair our profitability and growth.

The capital required for exploration and development of mineral properties is substantial. In the past we have financed operations through the sale of interests in mineral properties, including the Mt. Hamilton Transaction in 2015, the utilization of joint venture arrangements with third parties (generally providing that the third party will obtain a specified percentage of our interest in a certain property or a subsidiary owning a property in exchange for the expenditure of a specified amount), the sale of other assets, the sale of marketable equity securities we hold, short-term margin loans, funds from the long-term debt, and the issuance of common stock. We may need to raise additional capital, or enter into joint venture arrangements, in order to fund the exploration activities required to determine whether mineral deposits on our projects are commercially viable. New financing or acceptable joint venture partners may or may not be available on a basis that is acceptable to us. The inability to obtain new financing or joint venture partners on acceptable terms may prohibit us from continued development or exploration of our mineral properties. Without the successful sale or future development of our mineral properties through joint ventures, or on our own, we will not be able to realize any profit from our interests in such properties, which could have a material adverse effect on our financial position and results of operations.

A large number of companies are engaged in the exploration and development or sale of mineral properties, many of which have substantially greater technical and financial resources than us and, accordingly, we may be unable to compete effectively in this sector of the mining industry which could have a material adverse effect on our financial position or results of operations.

We are at a disadvantage with respect to many of our competitors in the acquisition, exploration and development or sale of mining projects. Our competitors with greater financial resources than us will be better able to withstand the uncertainties and fluctuations associated with sustained downturns in the market and to acquire high quality exploration and mining properties when market conditions are favorable. In addition, we compete with other companies in the mineral properties sector to attract and retain key executives and other employees with technical skills and experience in the mineral exploration business. There can be no assurance that we will continue to attract and retain skilled and experienced employees or to acquire additional exploration projects. The realization of any of these risks from competitors could have a material adverse effect on our financial position or results of operations.

The title to our mineral properties may be defective or challenged which could have a material adverse effect on our financial position or results of operations.

In connection with the acquisition of our mineral properties, we conduct limited reviews of title and related matters, and obtain certain representations regarding ownership. These limited reviews and representations do not necessarily preclude third parties from challenging our title and, furthermore, our title may be defective. Consequently, there can be no assurance that we hold good and marketable title to all of our mineral interests. Additionally, we have to make annual filings to various government agencies on all of our mineral properties. If we fail to make such filings, or improperly document such filings, the validity of our title to a mineral property could be lost or challenged. If any of our mineral interests were challenged, we could incur significant costs in defending such a challenge. These costs or an adverse ruling with regards to any challenge of our titles could have a material adverse effect on our financial position or results of operations.

Our operations could be negatively affected by existing laws as well as potential changes in laws and regulatory requirements to which we are subject, including regulation of mineral exploration and ownership, environmental regulations and taxation.

The exploration and development of mineral properties is subject to federal, state, provincial and local laws and regulations in the countries in which they are located in a variety of ways, including regulation of mineral exploration and land ownership, environmental regulation and taxation. These laws and regulations, as well as future interpretation of or changes to existing laws and regulations, may require substantial increases in capital and operating costs to us and delays, interruptions, or a termination of operations.

In the United States and the other countries in which we operate, in order to obtain permits for exploration or potential future development of mineral properties, environmental regulations generally require a description of the existing environment, including but not limited to natural, archeological and socio-economic environments, at the project site and in the region; an interpretation of the nature and magnitude of potential environmental impacts that might result from such activities; and a description and evaluation of the effectiveness of the operational measures planned to mitigate the environmental impacts. Currently, the expenditures to obtain exploration permits to conduct our exploration activities are not material to our total exploration cost.

The laws and regulations in all the countries in which we operate are continually changing and are generally becoming more restrictive, especially environmental laws and regulations. As part of our ongoing exploration activities, we have made expenditures to comply with such laws and regulations, but such expenditures could substantially increase our costs to achieve compliance in the future. Delays in obtaining or failure to obtain government permits and approvals or significant changes in regulation could have a material adverse effect on our exploration activities, our ability to locate economic mineral deposits, and our potential to sell, joint venture or eventually develop our properties, which could have a material adverse effect on our financial position or results of operations.

Occurrence of events for which we are not insured may materially adversely affect our business.

Mineral exploration is subject to risks of human injury, environmental liability and loss of assets. We maintain limited insurance coverage to protect ourselves against certain risks related to loss of assets for equipment in our operations and limited corporate liability coverage; however, we have elected not to have insurance for other risks because of the high premiums associated with insuring those risks or for various other reasons including those risks where insurance may not be available. There are additional risks in connection with investments in parts of the world where civil unrest, war, nationalist movements, political violence or economic crisis are possible. These countries may also pose heightened risks of expropriation of assets, business interruption, increased taxation and a unilateral modification of concessions and contracts. We do not maintain insurance against political risk. Occurrence of events for which we are not insured could have a material adverse effect on our financial position or results of operations.

Severe weather or violent storms could materially affect our operations due to damage or delays caused by such weather.

Our exploration activities are subject to normal seasonal weather conditions that often hamper and may temporarily prevent exploration or development activities. There is a risk that unexpectedly harsh weather or violent storms could affect areas where we conduct these activities. Delays or damage caused by severe weather could materially affect our operations or our financial position.

Our business is dependent on the market price of certain commodities, particularly zinc, and currency exchange rates over which we have no control.

Our operations are significantly affected by changes in the market price of commodities since the evaluation of whether a mineral deposit is commercially viable is heavily dependent upon the market price of the commodities related to any specific project, such as gold or zinc. Because our core assets are currently in zinc related projects, the spot price of zinc is particularly important to the value of our assets and future prospects. The price of commodities also affects the value of exploration projects we own or may wish to acquire or joint venture. These commodity prices fluctuate on a daily basis and are affected by numerous factors beyond our control. The supply and demand for commodities, the level of interest rates, the rate of inflation, investment decisions by large holders of these commodities, including governmental reserves, and stability of exchange rates can all cause significant fluctuations in prices. Currency exchange rates relative to the United States dollar can affect the cost of doing business in a foreign country in United States dollar terms, which is our functional currency. Consequently, the cost of conducting exploration in the countries where we operate, accounted for in United States dollars, can fluctuate based upon changes in currency exchange rates and may be higher than we anticipate in terms of United States dollars because of a decrease in the relative strength of the United States dollar to currencies of the countries where we operate. We currently do not hedge against currency or commodity fluctuations. The prices of commodities as well as currency exchange rates have fluctuated widely and future significant price declines in commodities or changes in currency exchange rates could have a material adverse effect on our financial position or results of operations.

Our business is dependent on key executives and the loss of any of our key executives could adversely affect our business, future operations and financial condition.

We are dependent on the services of key executives, including our Chief Executive Officer, Christopher E. Herald, our Chief Operating Officer, Walter H. Hunt, and our Chief Financial Officer, James R. Maronick. All of those officers have many years of experience and an extensive background with Solitario and in the mining industry in general. We may not be able to replace that experience and knowledge with other individuals. We do not have "Key-Man" life insurance policies on any of our key executives. The loss of these persons or our inability to attract and retain additional highly skilled employees may adversely affect our business, future operations and financial condition.

Our business model relies significantly on other companies to joint venture our projects and we anticipate continuing this practice in the future. Therefore, our results are subject to the additional risks associated with the financial condition, operational expertise and corporate priorities of our joint venture partners.

Our Florida Canyon project is joint-ventured with another mining company that manages the exploration and development activities on the project and we are the minority-interest party. Although our joint venture agreement provides certain voting rights and other minority-interest safeguards, the majority partner not only manages operations, but controls most decisions, including budgets and scope and pace of exploration and development activities. Consequently, we are highly dependent on the operational expertise and financial condition of our joint venture partner, as well as its own corporate priorities. For instance, even though our joint venture property may be highly prospective for exploration success, or economically viable based on feasibility studies, our partner may decide to not fund the further exploration or development of our project based on their respective financial condition or other corporate priorities. Therefore, our results are subject to the additional risks associated with the financial condition, operational expertise and corporate priorities of our joint venture partners, which could have a material adverse effect on our financial position or results of operations. Our Lik project is equally owned with another mining company and unanimous consent by the joint venture partners is required for annual budgets in excess of \$1.0 million. Consequently, development of the project could be delayed without the unanimous consent of both parties to certain proposed actions or transactions.

We may look to joint venture with another mining company in the future to develop and/or operate one of our foreign projects; therefore, in the future, our results may become subject to additional risks associated with development and production of our foreign mining projects.

We are not currently involved in mining development or operation at any of our properties. In order to realize a profit from our mineral interests we have to: (1) sell such properties outright at a profit; (2) form a joint venture for the project with a larger mining company with greater resources, both technical and financial, to further develop and/or operate a project at a profit; (3) develop and operate such projects at a profit on our own; or (4) create and retain a royalty interest in a property with a third party that agrees to advance the property toward development and mining. In the future, if our exploration results show sufficient promise in one of our foreign projects, we may either look to form a joint venture with another mining company to develop and/or operate our projects or sell the property outright and retain partial ownership or a retained royalty based on the success of such project. Therefore, in the future, our results may become subject to the additional risks associated with development and production of mining projects in general.

In the future, we may attempt to acquire a new property or another company and the acquisition may require a substantial amount of capital or the issuance of Solitario equity to complete. Acquisition costs may never be recovered due to changing market conditions, or our own miscalculation concerning the recoverability of our acquisition investment. Such an occurrence could adversely affect our business, future operations and financial condition.

We have evaluated a wide variety of acquisition opportunities involving mineral properties and companies for acquisition and we anticipate evaluating potential acquisition opportunities in the future. Some of these opportunities may involve a substantial amount of capital or the issuance of Solitario equity to successfully acquire. As many of these opportunities do not have reliable feasibility-level studies, we may have to rely on our own estimates for investment analysis. Such estimates, by their very nature, contain substantial uncertainty. In addition, economic assumptions, such as future costs and commodity prices, also contain significant uncertainty. Consequently, if we are successful in acquiring any new opportunities and our estimates prove to be in error, either through miscalculations or changing market conditions, this could have a material adverse effect on our financial position or results of operations.

The market for shares of our common stock has limited liquidity and the market price of our common stock has fluctuated and may decline.

An investment in our common stock involves a high degree of risk. The liquidity of our shares, or the ability of a shareholder to buy or sell our common stock, may be significantly limited for various unforeseeable periods. The average combined daily volume of our shares traded on the NYSE American and the TSX during 2018 was approximately 104,000

shares. The market price of our shares of common stock has historically fluctuated within a wide range. The price of our common stock may be affected by many factors, including an adverse change in our business, a decline in the price of zinc or other commodity prices, negative news on our projects, negative investment sentiment for mining and commodity equities and general economic trends.

A significant portion of our liquid assets consist of U.S. Treasuries and bank certificates of deposit. The failure of the financial institutions that issued or hold these financial instruments could have a material adverse impact on the market price of our common stock and our liquidity and capital resources.

At December 31, 2018, we have invested approximately \$500,000 in separate, FDIC insured certificates of deposit with the maximum individual bank exposure of \$250,000. Further, as of December 31, 2018 we have invested \$9,345,000 in United States Treasury securities, with maturities of between 15 days and 22 months and we have approximately \$495,000 of our cash in uninsured deposit accounts and brokerage accounts including \$378,000 in a US dollar bank savings account in Peru, none of which are covered by FDIC insurance. The failure of either Charles Schwab or the financial institutions holding these funds and assets could have a material impact on the market price of our common stock and our liquidity and capital resources.

We are dependent upon information technology systems, which are subject to disruption, damage, failure and risks associated with implementation and integration.

We are dependent upon information technology systems in the conduct of our operations. Our information technology systems are subject to disruption, damage or failure from a variety of sources, including, without limitation, computer viruses, security breaches, cyber-attacks, natural disasters and defects in design. Cybersecurity incidents, in particular, are evolving and include, but are not limited to, malicious software, attempts to gain unauthorized access to data and other electronic security breaches that could lead to disruptions in systems, unauthorized release of confidential or otherwise protected information and the corruption of data. Various measures have been implemented to manage our risks related to information technology systems and network disruptions. However, given the unpredictability of the timing, nature and scope of information technology disruptions, we could potentially be subject to operational delays, the compromising of confidential or otherwise protected information, destruction or corruption of data, security breaches, other manipulation or improper use of our systems and networks or financial losses from remedial actions, any of which could have a material adverse effect on our cash flows, competitive position, financial condition or results of operations.

Failure to comply with the FCPA could subject us to penalties and other adverse consequences.

As a Colorado corporation, we are subject to the FCPA and similar worldwide anti-bribery laws, which generally prohibit United States companies and their intermediaries from engaging in bribery or other improper payments to foreign officials for the purpose of obtaining or retaining business. Foreign companies, including some that may compete with our company, are not subject to U.S. laws and regulations, including the FCPA, and therefore our exploration, development, production and mine closure activities are subject to the disadvantage of competing against companies from countries that are not subject to these prohibitions.

In addition, we could be adversely affected by violations of the FCPA and similar anti-bribery laws in other jurisdictions. Corruption, extortion, bribery, pay-offs, theft and other fraudulent practices may occur from time-to-time in the countries outside of the United States in which we operate. Our mineral properties are located in countries that may have experienced governmental corruption to some degree and, in certain circumstances, strict compliance with anti-bribery laws may conflict with local customs and practices. Our policies mandate compliance with these anti-bribery laws; however, we cannot assure you that our internal controls and procedures always will protect us from the reckless or criminal acts committed by our employees or agents. We can make no assurance that our employees or other agents will not engage in such conduct for which we might be held responsible. If our employees or other agents are found to have engaged in such practices or we are found to be liable for FCPA violations, we could suffer severe criminal or civil penalties or other sanctions and other consequences that may have a material adverse effect on our business, financial condition and results of operations.

Item 1B. Unresolved Staff Comments

None

Item 2. Properties

Florida Canyon Zinc Project (Peru)

1. Property Description and Location

(Map of Florida Canyon Property, formerly Bongara)

On August 15, 2006, Solitario signed a Letter Agreement with Votorantim Metais Cajamarquilla, S.A., a wholly-owned subsidiary of Votorantim (now known as Nexa) both companies are referred to in this Item 2 as "Nexa") on Solitario's 100%-owned Florida Canyon zinc project (formerly called the Bongará project), On March 24, 2007, Solitario signed the Framework Agreement with Votorantim for the Exploration and Potential Development of Mining Properties, pursuant to, and replacing, the Florida Canyon Letter Agreement. In 2015 Votorantim transferred its interest in the Florida Canyon project to Compañía Minera Milpo S.A.A. ("Milpo"), an 80%-owned affiliate of Votorantim. In October of 2017, Milpo and Votorantim merged to form Nexa. Nexa completed an IPO raising \$570 million and listed on the NYSE under the trading symbol NEXA and the TSX under the trading symbol NEXA. For the remainder of this Florida Canyon property section, all references to Votorantim, Milpo or Nexa will be collectively referred to as Nexa.

The Florida Canyon project consists of 16 concessions comprising 12,600 hectares of mineral rights originally granted to Minera Bongará S.A., our subsidiary incorporated in Peru. The property is located in the Department of Amazonas, northern Peru. Solitario's and Nexa's property interests are held through the ownership of shares in Minera Bongará S.A., a joint operating company that holds a 100% interest in the mineral rights and other project assets. Solitario currently owns 39% of the Florida Canyon project.

During 2015 Nexa completed the steps required to earn a 61% interest in the Florida Canyon project, with Solitario retaining a 39% interest. Nexa may earn an additional 9% interest (up to a 70% shareholding interest) in Minera Bongará S.A., by sole-funding future annual exploration and development expenditures until a production decision is made. The option to earn the 70% interest can be exercised by Nexa at any time by committing to place the project into production based upon a completed feasibility study. Nexa is the project manager. Once Nexa has committed to place the project into production based upon a feasibility study, it has further agreed to finance Solitario's 30% participating interest until production with a loan facility from Nexa to Solitario. Solitario will repay this loan facility through 50% of Solitario's cash flow distributions from the joint operating company, however, as described above, funds provided by Solitario in the Drilling Program may serve to fund Solitario's obligation to finance a portion of its 30% participating interest.

According to Peruvian law, concessions may be held indefinitely, subject only to payment of annual fees to the government. In June 2019, payments of approximately \$289,000 to the Peruvian government will be due in order to maintain the Florida Canyon mineral rights of Minera Bongará. Nexa is responsible for paying these costs as part of its earn-in expenditures. Peru imposes a sliding scale royalty varying from 1% to 12% of the operating profit of a mining operation. The percentage royalty is determined by rule based on the operating margin; however, the minimum royalty is 1% of the revenues.

From time to time Nexa may enter into surface rights agreements with individual landowners or communities to provide access for exploration work at the Florida Canyon project. Generally, these are short-term agreements.

Environmental permits are required for exploration and development projects in Peru that involve drilling, road building or underground mining. The requisite environmental and archeological studies were completed for all past work, but new studies are required for expanded activities planned for future years at the Florida Canyon project. Although we believe that these permits will be obtained in a timely fashion, the timing of government approval of permits remains beyond our control.

2. Accessibility, Climate, Local Resources, Infrastructure and Physiology

The Florida Canyon property is accessed from the coastal city of Chiclayo by the paved Carretera Marginal road, which is a heavily travelled paved national highway that passes approximately eight kilometers south of the deposit. The nearest town to the project is Pedro Ruiz located 15 kilometers southeast of the property. The area of the majority of past drilling and the most prospective mineralization, Florida Canyon, was previously inaccessible by road, the work to date having been done by either foot or helicopter access. Nexa has now completed approximately 30 kilometers of access road and Nexa is planning to complete the road access to the mineralized area of the project in 2019. Nexa maintains project field offices in Pedro Ruiz and a drill core processing facility and operations office in the nearby community of Shipasbamba.

The project area elevation ranges between 1,800 and 3,200 meters above sea level. The climate is tropical with an average annual temperature of approximately 25°C. Mean annual rainfall exceeds one meter with up to two meters in the cloud forest at higher elevations. Most precipitation occurs during the rainy season, between November and April. Field work is considerably more difficult in the rainy season. Topography is steep, consisting of prominent escarpments and deep valleys.

Dense jungle or forest vegetation covers the project area. With the exception of the partially completed access road and approximately 700 meters of tunneling, no infrastructure facilities have been constructed within the project area.

3. History

We discovered the Florida Canyon mineralized zone of the Florida Canyon Project in 1996. Subsequently, we joint ventured the property in December 1996 to Cominco (now Teck). Cominco drilled 80 core holes from 1997-2000. Cominco withdrew from the joint venture in February 2001, and Solitario retained its 100% interest in the project. We maintained the claims from 2001 to 2006, until the Florida Canyon Letter Agreement was signed. Nexa conducted surface drilling on an annual basis from 2006 to 2013 and underground tunneling and drilling from 2010 to 2013. All significant work on the property has been conducted by our joint venture partners, Cominco and Nexa and is described below in Section 5, "Prior Exploration."

4. Geological Setting

The project is located within an extensive belt of Mesozoic carbonate rocks belonging to the Upper Triassic to Lower Jurassic Pucará Group and equivalents. This belt extends through the central and eastern extent of the Peruvian Andes for nearly 1000 km and is the host for many polymetallic and base metal vein and replacement deposits in the Peruvian Mineral Belt. Among these is the San Vicente Mississippi Valley Type ("MVT") zinc-lead deposit that has many similarities to the Florida Canyon deposit and other MVT occurrences in the Project area.

The geology of the Florida Canyon area is relatively simple consisting of a sequence of Jurassic and Triassic clastic and carbonate rocks which are gently deformed into a broad northwesterly trending domal anticline. The MVT zinc-lead mineralization occurs in the carbonate facies of the Chambara (rock) Formation. This domal anticline is cut on the west by the Sam Fault and to the east by the Tesoro-Florida Fault.

5. Prior Exploration

We conducted a regional stream sediment survey and reconnaissance geological surveys leading to the discovery of the Florida Canyon area in 1996. The discovered outcropping mineralization is located in two deeply incised canyons within the limestone stratigraphy.

Subsequent to our initial work, Cominco conducted extensive mapping, soil and rock sampling, stream sediment surveys and drilling. This work was designed to determine the extent and grade of the zinc-lead mineralization, the controls of mineral deposition and to identify areas of potential new mineralization. Nexa began work in the fall of 2006 and drilled annually from 2006 through 2013. Underground exploration operations were conducted from

2011-2013. Since 2013 the most important work conducted consisted of continued access road construction and metallurgical testing. All work performed by us, Cominco, and Nexa was done by direct employees of the respective companies with the exception of the drilling, underground tunneling, helicopter services and road building, all of which were performed by third-party contractors under the direction of Cominco and Nexa.

6. Mineralization

Mineralization occurs as massive to semi-massive replacements of sphalerite and galena localized by specific sedimentary facies (rock strata) within the limestone stratigraphy and by structural feeders and karst breccias. More than three-quarters of mineralization is sulfide-dominant with the remainder being oxide-dominant. A total of 11 preferred beds for replacement mineralization have been located within the middle unit of the Chambara Formation. Mineralization is associated with the conversion of limestone to dolomite, which creates porosity and permeability within the rock formations, promoting the passage of mineralizing fluids through the rock formations forming stratigraphically controlled near-horizontal manto deposits. Drilling of stratigraphic targets has shown that certain coarser-grained facies of the stratigraphy are the best hosts for manto mineralization. Stratigraphically controlled mineralization is typically one to several meters in thickness, but often attains thicknesses of five to ten meters.

The laterally extensive manto deposits are strongly related to, and potentially originate from, structurally controlled near-vertical conduits for mineralizing solutions. Replacement deposits occur along these high-angle structures as well as in the stratigraphic mantos at Florida Canyon.

Karst features are localized along the feeder faults and locally produce "breakout zones" where mineralization may extend vertically across thick stratigraphic intervals where collapse breccias have been replaced by ore minerals. Mineralized karst structures are up to 50 meters in width (horizontal), up to 100 meters vertically, and up to hundreds of meters along strike.

Evidence for these breakout zones is provided by the following drill holes from various locations on the property:

Breakout Zone Name	Drill Hole Number	Intercepts (meters)	Zinc %	Lead %	Zinc+Lead %
Sam	GC-17	58.8	12.0	2.8	14.8
	FC-23	81.5	4.8	0.8	5.6
Karen	A-1	36.2	12.8	2.7	15.5
North Zone	V-21	92.0	5.5	1.7	7.2
South Zone	V-44	28.3	15.2	0.8	16.0
	V-169	51.6	7.1	0.7	7.8
San Jorge	V-297	56.6	22.69	1.15	23.84

Dolomitization reaches stratigraphic thicknesses in excess of 100 meters locally. This alteration is thought to be related to the mineralizing event and is an important exploration tool. Continuity of the mineralization is demonstrable in areas of highest drilling density by correlation of mineralization within characteristic sedimentary facies, typical of specific stratigraphic intervals or within through-going observable structural zones in drill core. At Florida Canyon the high-angle mineralization occurs along well-defined northwest and northeast fracture systems. These structures occur in conjugate fractures, with N10°-50°E trends present at a number of mineralized surface outcrops while trends of N50°-80°W are identified at other showings.

7. Drilling

From 1997 through 2001, Cominco drilled 80 surface core holes totaling 24,696 meters. From 2006-2013, Nexa completed 309 surface core holes totaling 77,193 meters. The majority of Nexa's surface drilling was infill drilling designed to demonstrate the continuity and geometry of mineralization, and to a lesser extent, test for extensions of known mineralization. From 2011-2013, Nexa completed 95 underground core holes totaling 15,144 meters. The underground drilling was conducted from 10 drill stations at generally 40-meter centers (two drill stations at 20-meter centers) and entirely within the San Jorge mineralized zone. Anywhere from three to 14 holes were drilled from each of the ten drill stations. The underground drilling was tightly spaced and designed to allow for feasibility-level reserve estimation.

In November 2018, Nexa re-initiated drilling with two core rigs at Florida Canyon, as part of a 2018/2019 41-hole, 17,000-meter drilling program. The first phase of this drilling campaign ended in late-December 2018 upon the onset of the rainy season when helicopter supported drilling became operationally inefficient. Four holes were completed to planned target depth and a fifth hole was abandoned due to technical drilling problems. Total meterage completed was 2,203 meters. All holes were located at the northern and northeastern margin of the previous drilling footprint in the Karen-Milagros zone.

All past drilling conducted is within a footprint measuring approximately 2.5 kilometers long in a north-south direction and a little over a kilometer in an east-west direction. The entire drill pattern is within what we have informally labeled the Florida Canyon district. Within this district, several zones of strong zinc mineralization have been defined. The two zones with the largest amount of drilling are the San Jorge and the Karen-Milagros zones. Drilling indicates that, for the most part, the entire Florida Canyon district remains open to expansion and the identified zones are interconnected. Better 2013 drill-hole intercepts are provided in the table below:

Typical Mineralized Intersections

Drill Hole Number	Surface or Underground	Intercept Meters	Zinc (%)	Lead (%)	Zinc + Lead (%)	Lead Silver (grams/t)
V-378	Surface	7.7	14.62	2.11	16.73	15.69
V-386	Surface	16.2	16.20	10.70	12.41	11.13
V-427	Surface	15.1	12.06	2.75	14.81	17.59
V-436	Surface	17.0	11.74	1.08	12.81	18.48
V-451	Surface	30.7	13.06	4.97	18.03	32.64
V-407	Underground	3.6	26.31	1.59	27.90	74.87
V-432	Underground	21.1	8.31	1.71	10.02	12.11
V-433	Underground	5.0	38.22	3.89	42.12	60.76
V-458	Underground	25.5	7.22	0.55	7.77	6.21
V-465	Underground	10.7	45.60	5.25	50.84	106.71

8. Sampling, Analysis and Security of Samples

Core samples were transported from the drill by helicopter in sealed boxes to the processing facility in Shipasbamba where they were cut with a diamond saw. Half of the core was taken of intervals selected according to geologic criteria under the supervision of the geologist in charge and shipped in sealed bags by land. Cominco used SGS Laboratories and Nexa used ALS-Chemex, both in Lima, Peru, where all samples were analyzed by ICP. Any samples that contained greater than 1% zinc were then analyzed by wet chemistry assay for zinc and lead to provide a more accurate analysis of grade.

Since 2006, Nexa has been in control of all field activities on the project and is responsible for the security of samples. Nexa has indicated that there have been no breaches in the security of the samples. We have reviewed and engaged SRK Consulting (USA) Inc. (“SRK”) (a large independent international mining engineering firm) to review Nexa’s sampling procedures and believe that adequate procedures are in place to ensure the future security and integrity of samples. No breaches of security of samples are known to have occurred prior to Nexa’s work on the project.

9. Prefeasibility Studies

Nexa, either through its engineering staff or contracted independent mining engineering firms, has conducted prefeasibility-level studies to provide estimates of deposit size and grade, mining and processing recoveries, sizing of appropriate scale of operations, infrastructure design, and capital and operating cost estimates at a level of detail varying from preliminary economic assessment to feasibility levels. These studies were generally performed between 2007 and 2014.

Solitario and Nexa jointly completed a PEA for the entire project in 2017 that incorporated a variety of Nexa-generated studies into the analysis. The PEA evaluation included resource estimation, mining and processing recovery estimates, a preliminary mining and processing plan, infrastructure layout, environmental considerations and an economic analysis based on certain base case parameters. The PEA envisioned an underground mining operation with a 2,500 tonne per day floatation mill for processing, resulting in a 12.5-year mine life. It was assumed that concentrates would be trucked to Nexa’s Cajamarquilla zinc smelter facility in Lima Peru.

Metallurgical testing to evaluate metal recoveries and various processing options for mineralized material at Florida Canyon was conducted in 2010, 2011 and 2014. Tests to date on composited samples indicate zinc recoveries of 91.8% and lead recoveries of 81.9% in the San Jorge zone and zinc recoveries of 80.3% and lead recoveries of 71.7% in the Karen-Milagros zone. These recoveries represent averages for each zone based on sulfide dominant mineralization, but oxide material was present in the tested samples. Nexa also conducted a comprehensive geochemical testing program that demonstrated that zinc (and lead) recoveries were significantly affected by the Zn-sulfide/Zn-oxide ratio of mineralization. In general, mineralized material with greater than an 80% ratio of

Zn-sulfide/Zn-oxide, recoveries are greater than 90% for Zn. Conversely, for mineralized material, with less than a 20% ratio of Zn-sulfide/Zn-oxide, recoveries are approximately 40% for Zn. Although sulfide recoveries achieved to date are very good, SRK suggests that optimization of processing and metallurgical parameters may result in improved recoveries and concentrate grade.

Other prefeasibility work completed by Nexa included drilling 16 diamond core holes in 2013 to evaluate geotechnical and hydrological parameters of the mineralized areas for both engineering and environmental purposes. In 2016, Nexa completed a geochemical/metallurgical study that more accurately defined the distribution of sulfide/oxide mineralization based on re-assaying of nearly all past drill-hole samples. This information was critical in resource estimation and accurately estimating metal recoveries.

The 2017 Florida Canyon Project PEA was completed by SRK on behalf of Nexa and Solitario in August of 2017. The NI 43-101 compliant study entitled: “*Technical Report, Preliminary Economic Assessment, Florida Canyon Zinc Project,*

Amazonas Department, Peru; Effective Date: July 13, 2017, Report Date: August 3, 2017;” can be found in the Company’s Canadian Sedar filings and is furnished in the Company’s U.S. Edgar filings.

10. Reserves and Resources

There are no reported mineral reserves.

11. Mining Operations

No commercial mining operations to recover metals have occurred on the project. However, in September 2010 Nexa initiated an underground tunneling program to access mineralization and completed its underground work in 2013. As of December 31, 2018, 700 meters of tunneling were completed.

12. Planned Exploration and Development

Nexa is planning to resume its 41-hole, 17,000-meter drilling program at the end of the rainy season, expected sometime in April 2019. At that time, Nexa plans to accelerate drilling operations utilizing up to four core rigs operating simultaneously to complete the remaining 37 drill holes. In addition, Nexa plans to conduct additional road construction work in 2019 that includes completion of the access road into the mineralized area of Florida Canyon and also an access road to a local community as part of their social commitment to the local communities.

Lik Project (Alaska)

1. Property Description and Location

(Map of Lik Property)

The Lik property consists of 47 contiguous Alaska state mining claims. The contiguous claims have been grouped together for the purpose of working and operating under a common plan of development for the benefit of all of the claims. The claims cover an area of approximately 6,075 acres (2,460 ha). The claims are located in the southwestern DeLong Mountains in the Wulik River drainage.

To retain the state claims, the Company is required to make annual rental payments to the State of Alaska. The estimated rental payments for 2019 are \$7,000. Property holders are also required to perform assessment work with the amount dependent on the area of the State claims. Excess assessment expenditure credits may be carried forward for a maximum of

four years. If required, payments may be made in lieu of work to allow retention of the property for a period of five consecutive years. The geographical coordinates of the Lik deposit are approximately 163° 12' W and 68° 10' N. The figure above illustrates the location of the Lik property.

2. Acquisition History and Joint Venture Arrangement

Solitario acquired its 50% interest in the Lik property from the acquisition of Zazu on July 12, 2017. As a result of the Acquisition, Zazu became a wholly-owned subsidiary of Solitario. Prior to that, Zazu acquired its 50% interest in the Lik property from GCO Minerals Company a wholly-owned subsidiary of the International Paper Company (“GCO”), on June 28, 2007 by making a cash payment to GCO of \$20,000,000 and granting GCO a 2% net proceeds interest. GCO also owns an additional 1% net profits interest in the Lik property from a 1997 agreement.

The Company is participating in the exploration and possible development of the Lik property through a joint venture with Teck. The terms of the joint venture were governed by the Lik Block Agreement, made as of January 27, 1983, between Houston Oil & Minerals Exploration Company (“HOMEX”) and GCO. HOMEX assigned its interest in the Lik Block Agreement to Echo Bay Mines Ltd., which, in turn, assigned such interest to Teck.

Under the terms of the Lik Block Agreement, GCO held a 50% interest, and the right to increase its interest to up to 80% provided that GCO met an inflation-adjusted work commitment. The required expenditure amount was originally \$25 million when defined in 1983 and increased with inflation indexing and escalations to approximately \$43 million at the time Solitario closed the Acquisition. As of January 27, 2018, we estimate approximately \$22 million had been incurred towards the inflation adjusted \$43 million expenditure required to earn an additional 30% interest in the property.

As the Company did not spend the full inflation-adjusted expenditure amount by January 27, 2018, the Lik Block Agreement terminated. Consequently, as of December 31, 2018, Teck retains its 50% participating interest in the Lik property, and Teck and Solitario are negotiating a new a joint operating agreement that will governing all further operations relating to the Lik property. We anticipate that under such joint operating agreement, Solitario, as successor to GCO, may be the operator and may have full and exclusive control of the Lik property, its facilities and production as well as the exploration, development and mining undertaken pursuant to the Lik Block Agreement. The current agreement requires unanimous approval by the parties for annual expenditures in excess of \$1 million. In July 2018, the Company and Teck signed a Joint Exploration Agreement whereby both parties agreed to fund a surface

exploration program on a 50%-50% basis for 2018. However, pending the completion of a new joint operating agreement, an extension to the Joint Exploration Agreement is expected to be signed in 2019 to provide for the planned 2019 exploration program on the project. Teck was designated the operator for the 2018 program and is expected to be the designated operator under the planned extension of the 2018 Joint Exploration Agreement for the upcoming 2019 program.

3. Accessibility, Climate, Local Resources, Infrastructure and Physiology

Access to the Lik property is by air to a gravel surfaced airstrip located on the property. The airstrip is capable of handling multi-engine cargo planes. Charter flights may be arranged from a number of sites in northwestern Alaska. The town of Kotzebue, which is located about 90 miles from the deposit, is a seaport with commercial air service from Anchorage. Kotzebue is the center for access to the nearby Red Dog mine operated by Teck.

The nearest location for which climatic data is available is the town of Kotzebue. The average annual temperature at Kotzebue is 21.6°F, with seasonal extremes ranging between 77°F in summer to -58°F in winter. There is an average of nine inches of rain and 47 inches of snowfall per year. Snow falls are not extreme but blowing snow may form significant drifts. Strong winds are common in most parts of Alaska. Diamond drilling is possible at the Lik property between June and October.

The exposures of mineralization at the Lik property are located at about 800 feet above sea level. West of the deposit, the land rises steeply to peaks about 2,300 feet above sea level. To the southeast, the land slopes down to the Wulik River where the bottom of the valley is about 700 feet above sea level. There is sufficient space for tailings and waste rock disposal, and sufficient water is expected to be available for any proposed processing. Locally, there is vegetation on the property consisting of tundra grasses and low brush made up of willow, dwarf birch, and alder.

There is a camp located on the Lik property. The camp has been used periodically over the last twelve years and was substantially refurbished as a part the 2007 and 2008 field programs. The supply of electric power and workforce accommodation will have to be developed. There are no local resources adjacent to the Lik property. The Red Dog mine, operated by Teck, is located about 13.6 miles southeast of the deposit. Potentially, concentrates could be moved along the access road from the Red Dog mine to the port on the Chukchi Sea. The port has a shipping season in excess of 100 days.

Zazu entered into an agreement with Alaska Industrial Development and Export Agency (“AIDEA”) to enable AIDEA to begin due diligence on the proposed expansion of the port and the Red Dog road, the DeLong Mountain Transportation System (“DMTS”), to potentially handle Lik concentrates. AIDEA, as owners of the DMTS, evaluated their possible role in the two parts of the proposed expansion project: the financing of a spur road connecting the Lik project to the DMTS, and the financing of any required modifications at the port. The DMTS is open to multiple users such as the Company. The studied expansion would facilitate both the development of the Lik project and handle future concentrate production from the project. The DMTS road and port system currently handles all concentrate produced by the Red Dog zinc mine of Teck. Prior to the AIDEA agreement, Zazu received a letter of Non-Objection from the Northwest Arctic Borough (“NWAB”). In this letter, the NWAB formally acknowledged its awareness of the Lik project, and that NWAB had no objection to the project.

In January 2015, AIDEA announced the completion of its study into capacity availability in its DMTS. The report concluded that there is sufficient excess capacity for the Company’s concentrate shipping needs, confirming the assumptions made in Zazu’s 2014 PEA. This study aimed to closely identify the outputs of both Lik and Red Dog, if any modifications are required to the DMTS to support them, and if so, their potential cost. The study concluded that sufficient handling capacity will exist with only minor modifications required to accommodate future planned production from Lik under the analyzed PEA scenario.

4. History

The Red Dog ore deposit was originally discovered in 1970 by a geologist undertaking mapping in the De Long Mountains area on behalf of the United States Geological Survey. GCO, in joint venture with New Jersey Zinc Company and WGM Inc., carried out stream geochemical sampling and reconnaissance for color anomalies. Claims were staked in July 1976 to cover a stream geochemical anomaly on Lik Creek. HOMEX replaced New Jersey Zinc Company in the joint venture in 1976/1977.

Diamond drilling on the Lik property commenced in 1977 and targeted a gossan with a coincident soil and electromagnetic anomaly. The first hole encountered massive lead-zinc-silver-bearing sulfides. By the end of 1977, the joint venture had completed 25 line-miles of ground geophysics, a soil sampling program, and ten diamond drill holes with an aggregate depth of 5,260 feet. In 1978 and 1979, further geological, geochemical and geophysical surveys were carried out, together with the drilling of another 93 diamond drill holes aggregating 51,200 feet. A mineral resource was estimated. The joint venture continued to work in the district in the period 1980 to 1983. However, only limited diamond drilling activity continued on the Lik property. The Lik Block Agreement was signed in 1984.

In 1984, Noranda optioned the GCO holding of the Lik property. Much of Noranda’s activity was concentrated in the Lik North Area where ten diamond drill holes with an aggregate depth of 13,710 feet were completed on four sections.

Noranda also drilled holes in the Lik South deposit to better define the deposit. Noranda released its interest in the Lik property after a re-organization of its holdings in the United States. From 1985 through June of 2007, when Zazu acquired its interest in the Lik property, only a limited amount of work was conducted at Lik.

Zazu completed diamond drilling programs during the 2007, 2008 and 2011 summer field seasons. From 2009 through 2014, Zazu conducted a suite of economic, engineering, environmental and metallurgical studies on the Lik property, culminating with the completion of a Preliminary Economic Assessment in 2014.

5. Geological Setting

The regional geology of the Western Brooks Range area is structurally complex. The sedimentary rocks of the area have been significantly disrupted by thrust sheets. The Lik property and the other zinc-lead deposits of the Brooks Range, including Red Dog, are hosted in the Kuna Formation of the Lisburne Group. In the Western Brooks Range, the Lisburne Group includes both deep and shallow water sedimentary facies and local volcanic rocks. The rocks have been extensively disrupted by thrusting. The deep-water facies of the Lisburne Group, the Kuna Formation, are exposed chiefly in the Endicott Mountains.

On a district scale, the Lik property is hosted in the Red Dog plate of the Endicott Mountains thrust sheet. The stratigraphically lowest rocks within the Red Dog plate belong to the Kayak Shale. The top of the Kayak Shale is interbedded with rocks of the Kuna Formation. The Ikalukrok Unit has been divided into a lower laminated black shale sub-unit and an upper medium- to thick-bedded black chert sub-unit. The Ikalukrok Unit hosts all of the massive sulfide deposits in the area.

Locally, the Lik property is hosted in the upper part of the Ikalukrok Unit of the Kuna Formation. The host rocks are carbonaceous and siliceous black shale, with subordinate black chert and fine-grained limestone. These rocks strike broadly north-south and dip at about 25° to 40° to the west. The massive sulfides are overlain conformably by rocks of the Siksikpuk Formation. The sequence is overridden by allochthonous rocks that form high hills north and west of the deposits.

The mineralized sequence is cut by a number of faults. The most significant disruption is the Main Break Fault, which drops the northern end of the Lik deposit down about 500 feet. It is unclear whether there is a change in strike north of the fault, or whether the change is more apparent due to topography. The Main Break Fault strikes east-west and dips north at about 60°. There is another group of steeper faults that tend to strike northerly or northwesterly and which are interpreted as being both normal and reverse with throws of up to 330 feet.

6. Prior Exploration and the Results of the 2018 Exploration Program

The Red Dog ore deposit was originally discovered in 1970 by a geologist undertaking mapping in the De Long Mountains area on behalf of the United States Geological Survey. The Lik deposit was discovered by GCO in the mid-1970's by following up on soil color and stream geochemical anomalies. From the late 1970's to 2011, various geochemical, geophysical and geologic activities were intermittently conducted to define drill targets. The Lik property was sporadically drill tested from the late-1970's to 2011 by seven different companies. Details of these historical drilling campaigns are discussed above under the heading "History" and below under the heading "Drilling."

The 2018 exploration program consisted of geologic mapping, geochemical sampling, re-logging of old core and ground gravity geophysical surveying. The geologic mapping program resulted in a better understanding of the stratigraphic and structural control of mineralization at Lik, and the potential trend of mineralization to the north. Geochemical sampling indicates an area of elevated geochemistry to the north that requires further investigation. The gravity survey results are somewhat uncertain, but may point to an area of interest, also to the north. Re-logging of old core is expected to be completed in the second quarter of 2019.

7. Mineralization

The Lik deposit is a black shale-hosted stratiform zinc-lead-silver sedimentary-exhalative (SEDEX) deposit. Mineralization is syngenetic with respect to sediment deposition. Silicification occurs within and peripheral to the main mass of sulfides. Major sulfides in decreasing order of abundance are pyrite-marcasite, sphalerite and galena. The ore textures are massive, fragmental, chaotic, and veined; they rarely show typical sedimentary layering. The portion of the ore body near the surface is oxidized. The deposit is continuous outside the Lik property onto the adjacent 100%-owned Teck property to the south. The southern continuation of the Lik deposit is referred to as the Su deposit, lying on Teck's Su property.

Within the Lik property, the deposit is divided into two parts by the Main Break Fault. The main part of the deposit within the existing claims is referred to as the Lik South deposit. As presently tested, the Lik South deposit has a surface footprint of about 3,600 feet long and about 2,000 feet wide. It has been tested down dip to a depth of about 650 feet. The Lik South deposit remains open down dip. North of the Main Break Fault, the Lik North deposit has a surface footprint of about 2,300 feet long and about 1,150 feet wide. It has been tested down dip to a depth of about 1,000 feet. The Lik North deposit remains strongly open down dip and to the north.

The deposits strike northerly and dip westerly at about 25° to 40°. The mineralization comprises irregular, stratiform lenses. The mineralogy of the sulfides is simple and comprises pyrite, marcasite, sphalerite, and galena. Gangue minerals include quartz (as chert), clay minerals, carbonate and barite. Noranda recognized six different ore types in its logging of drill core. Typical grades of mineralized intersections within the Lik deposit are listed in the table below:

Typical Mineralized Intersections

Hole No.	From (m)	To (m)	Length (m)	Zn (%)	Pb (%)	Ag (g/t)
5	54.56	78.79	24.23	19.72	6.27	126.5
16	80.16	94.49	14.33	21.67	0.01	230.4
21	129.54	135.33	5.79	7.07	1.88	8.6
24	40.87	50.14	9.27	11.09	1.44	51.1
38	45.90	63.76	17.86	8.13	1.80	48.0
38	70.53	87.75	17.22	8.92	1.08	28.8
43	35.66	40.69	5.03	17.66	0.62	8.6
43	60.96	80.28	19.32	9.07	1.49	47.7
43	84.73	91.04	6.31	21.07	0.95	111.4
68	32.31	53.43	21.12	13.34	1.85	56.9

Previous work by GCO determined that sulfides were deposited in four distinct cycles. Individual cycles may be quite thin near the margins of the deposit and the thickest accumulation in a single cycle noted to date is about 45 feet thick. The base of a sulfide cycle begins abruptly with the deposition of sphalerite, galena and pyrite. Typically, the highest grades are found at or within 5-10 feet of the base of a sulfide cycle. In the central portion of the deposit several cycles are stacked and comprise a cumulative thickness of up to 100 feet of mineralization.

8. Drilling

All diamond drill programs are summarized in the following table.

Historical Diamond Drilling Campaigns

Year	Number of Holes	Aggregate Depth (m)	Company
1977	I0	1,603.3	Managed by WGM
1978	O9	10,680.2	Managed by WGM
1979	I4	1,931.1	Managed by GCO
1980	K	102.1	Managed by GCO
1983	I	835.2	Managed by GCO
1984	N	1,643.5	Managed by GCO
1985	I6	1,883.1	Managed by Noranda
1987	I	196.5	Managed by GCO
1990	K	163.4	Managed by Moneta

Edgar Filing: SOLITARIO ZINC CORP. - Form 10-K

1992 J	J83.5	Managed by GCO
2007 11	1,393.5	Managed by Zazu
2008 58	6,827.5	Managed by Zazu
2011 25	3,871.0	Managed by Zazu
TotalsJ29	38,328.6	

Zazu completed two diamond drilling programs during the 2007 and 2008 to further test the Lik South deposit and to obtain samples for metallurgical testing. At the end of 2008, most of the Lik South deposit had been tested on lines spaced at 200 ft. with holes spaced at about 100 ft.

The 2011 drilling program at Lik combined exploration and development drilling. The exploration drilling focused on improving resource definition, in particular near the transition zone between Lik South and Lik North and also Lik North. The development drilling focused on obtaining additional metallurgical samples and geotechnical drilling for the open pit design and foundation information to assist in infrastructure design. By the end of 2011, a total of approximately 38,328 meters (125,700 feet) of drilling in 229 holes had been completed on the Lik property by the Company (Zazu) and the previous owners. No drilling has been completed on the Lik project since 2011.

9. Sampling, Analysis and Security of Samples

Pre-Zazu Drilling

Core recoveries were typically high within the massive sulfides, but lower, more variable recoveries were obtained in the unmineralized and weakly mineralized sections. The entire core obtained from the Lik deposit, usually NQ-size, was logged on site. All of the core containing sulfide mineralization was cut using diamond saws and half of the core was sent for assay. Reference samples were not included in the sample stream. Sample lengths in massive sulfides were typically from two to three feet, but occasionally up to nine feet. Sample lengths were probably controlled by geology and the location of depth markers in the core boxes.

Most of the samples were assayed by Bondar Clegg Laboratory Group (“Bondar Clegg”) of Vancouver. At various times, the laboratory-maintained preparation facilities in Anchorage and Fairbanks Alaska. In the initial years, when the bulk of the drilling was completed, it is believed that sample preparation and analysis were carried out in Vancouver. Bondar Clegg was not a registered laboratory at that time. However, Bondar Clegg was a recognized, reputable laboratory and was experienced in the use of atomic absorption spectrophotometry.

As the entire core was logged and sampled in an isolated field camp, security was not a major concern because access to the camp was closely controlled. It is noted that four different companies (WGM, GCO, Noranda and Moneta) have completed drilling programs at the Lik property and all of them have obtained consistent results. The work was considered completed to industry standards in use at the time of the work. Sample preparation was completed in the assay laboratory.

Zazu Drilling

Drill core obtained during the 2007, 2008 and 2011 drilling campaigns was logged on site. The entire core containing sulfide mineralization was sawn using diamond saws and half of the core was sent for assay. All massive and high-sulfide cores were sampled. Visual methods were used to select sample boundaries and lengths. The mineralization at Lik is considered to be appropriately logged and sampled. It is not evident that logging or sampling is leading to any bias in the sample results. An examination of logging showed that core recovery in sulfide areas was generally very high.

Core drilled in 2007 was placed in the sample bags, the air was evacuated and replaced with nitrogen. The samples were sent to Kotzebue by charter and then by licensed carrier to Anchorage. The samples were stored under refrigeration in Anchorage. The samples were dispatched to G & T Metallurgical Services Ltd. (“G & T”) of Kamloops, British Columbia, an ISO 9001:2000 certified laboratory for precious metals and base metals. As well as completing metallurgical testing, G & T crushed and analyzed the samples. The 2008 diamond drill core was not required for metallurgical testing and core was handled normally. Sawn samples were securely bagged and boxed on site and dispatched to a facility of ALS Laboratory Group (“ALS Chemex”) located in Fairbanks, Alaska, for sample preparation. Transportation of the samples was through third-party companies that provided secure transportation services. The pulps were analyzed at ALS Chemex located in Fairbanks or Elko, Nevada. Zazu did not participate in any part of the sample preparation or analysis except for cutting core.

Check samples from the 2007 drilling program and all samples from the 2008 drilling campaign were sent to the preparation and assaying facilities of ALS Chemex (ISO 17025 accreditation). Other QA/QC procedures employed by Zazu included the use of blanks (unmineralized core from outside of the mineralized zone) and quartered core duplicates. Zazu was unable to obtain acceptable reference samples for the 2007 field season and reference samples were not included as part of the 2007 ongoing QA/QC program. Reproducibility between G & T and ALS Chemex was found to be good. A detailed description of QA/QC procedures can be found in the Solitario’s Canadian SEDAR filings and in the Company’s US Edgar

filings: Technical Report; Zazu Metals Corporation, Lik Deposit, Alaska, USA; Report Date: April 23, 2014; Effective Date: March 3, 2014; prepared by JDS Energy and Mining Inc (“JDS”).

10. Prefeasibility Studies

Zazu completed a Preliminary Economic Assessment in 2014 that incorporated a variety of prefeasibility level studies into the analysis. These studies included resource estimation, mining and processing recovery estimates, a preliminary mining and processing plan, infrastructure layout, environmental considerations and an economic analysis based on the base case parameters. The PEA envisioned an open pit mining operation with a 5,500 ton per day floatation mill for processing resulting in a nine-year mine life. Concentrates would be handled through the DMTS road and port system that currently handles all concentrate produced by the nearby Red Dog zinc mine of Teck. A summary of metallurgical testing and mineral processing is provided below. The PEA analyzed the Lik project as a stand-alone operation building its own independent processing, tailings and port facilities.

Zazu engaged JDS to complete the PEA on the Lik deposit in 2013. The NI 43-101 compliant study entitled: *“Technical Report; Zazu Metals Corporation, Lik Deposit, Alaska, USA; Report Date: April 23, 2014; Effective Date: March 3, 2014;”* can be found in the Company’s Canadian Sedar filings and is furnished in the Company’s U.S. Edgar filings. JDS is a Canadian independent and internationally recognized mining engineering firm providing engineering services internationally.

Metallurgical Testing and Mineral Processing

There have been five metallurgical test work reports issued to date on the Lik ores. The most recent and comprehensive processing and metallurgical testing programs include work performed by G&T and by SGS. Samples collected during drilling in 2007 and 2008 were composited into one Master Composite for testing at G&T in 2008, and later testing by SGS was carried out in 2010 on the remainder of the Master Composite. These key testing results have formed the basis for this economic evaluation of the Lik deposit. Results are summarized in the table below:

Summary of SGS 2010 and G&T 2008 Metallurgical Test Results

Test	Element	Lead		Zinc		
		Feed Grade	Concentrate Grade	Recovery	Concentrate Grade	Recovery
SGS 2010	Pb%	2.83	52.00	69.10	1.88	9.70
	Zn%	9.56	7.39	2.91	54.60	83.10
	Ag gpt	37	55	5.5	68	26.6
G&T 2008	Pb%	2.36	70.30	70.3	1.57	9.4
	Zn%	8.47	4.17	1.20	52.20	86.9
	Ag gpt	34	68	4.8	64	26.9
	Pb%	2.60	61.15	69.7	1.73	9.6

Average Used for Mass Balance and NSR Estimates

Edgar Filing: SOLITARIO ZINC CORP. - Form 10-K

Zn%	9.02	5.78	2.06	53.40	85.0
Ag gpt	36	62	5.2	66	26.8

The metallurgical flowsheet for this PEA includes conventional crushing, grinding, and flotation processing methods. Run-of-Mine (ROM) ore will be delivered to a primary crushing plant and stored in a coarse ore stockpile awaiting reclaim into the grinding circuit. Crusher ore will be reclaimed and delivered to a two-stage grinding circuit equipped with a Semi-Autogenous Grinding (SAG) mill and a ball mill in closed circuit with cyclones.

Recoveries from these modeled methods and metallurgical testing conducted to date are anticipated to be 85% of zinc to the zinc concentrate and 69.7% of the lead to the lead concentrate. Silver is also recovered and payable at times in the zinc concentrate and more significantly in the lead concentrate.

11. Reserves

There are no reported mineral reserves.

12. Mining Operations

No commercial mining operations to recover metals have occurred on the project.

13. Planned Exploration and Development

Solitario and Teck are planning to negotiate to jointly fund a 2019 exploration program with Teck acting as project operator. The budgeted program will have four components: 1) re-logging of previous drill core; 2) XRF (x-ray fluorescence) – Tuscan TruScan continuous scanning analysis of previous drill core to analyze for geochemical trends within the Lik mineralized system; 3) continued geologic and geochemical investigations of an area north of the Lik deposit; and, 4) Remodeling of the Lik geology. These activities are scheduled to begin in April and be completed by the end of September.

Chambara Zinc Property (Peru)

In April 2008, we signed the Minera Chambara shareholders' agreement with Votorantim on Solitario's 100%-owned Chambara zinc project. In 2015 Votorantim transferred its interest in the Chambara project to Milpo, now Nexa. In October of 2017, Milpo and Votorantim merged to form Nexa. For the remainder of this Chambara property section, all references to Votorantim, Milpo or Nexa are collectively referred to as "Nexa."

The original purpose of the Chambara joint venture was to collectively pool independently owned Solitario

and Nexa properties into a jointly-held joint venture. These properties were located within a large area of interest in northern Peru measuring approximately 200 by 85 kilometers, but outside of the Florida Canyon property position. Nexa originally contributed 52 mineral concessions within the area of interest totaling 52,000 hectares to Minera Chambara for a 15% interest in Minera Chambara. We contributed 9,600 hectares of mineral claims and an extensive exploration data base in our possession for an 85% interest in Minera Chambara. Existing and future acquired properties subject to the terms of the shareholders' agreement will be controlled by Minera Chambara. Minera Chambara dropped selected concessions in 2013 and 2016 and acquired the rights to 13 new concessions totaling 11,600 hectares in 2017. This resulted in Minera Chambara holding 36,400 hectares of valid concessions that completely surround the Florida Canyon project area held by Minera Bongará. As of December 31, 2016, Minera Chambara's only assets are the properties and Minera Chambara has no debt. Nexa may increase its shareholding interest to 49% through cumulative spending of \$6,250,000 and may further increase its interest to 70% by funding a feasibility study and providing for construction financing for Solitario's interest. If Nexa provides such construction financing, we would repay that financing, including interest, from 80% of Solitario's portion of the project cash flow.

The project has been on care and maintenance in recent years. Significant geochemical anomalies and outcropping mineralization have been identified at several locations on the Chambara property. Nexa is responsible for maintaining the property in good standing and making all concession payments to the Peruvian government. Concession costs in 2019 to be paid by Nexa are estimated to be \$423,000.

La Promesa Project (Peru)

The La Promesa property, acquired in 2008, consists of three concessions totaling 2,600 hectares. Currently, our only holding costs for the mineral rights are annual payments of nine dollars per hectare to the Peruvian government. Total holding costs in 2018 will be approximately \$8,000. A subsidiary of Newmont holds a 2% net smelter return (“NSR”) on the property.

During the past several years Solitario has conducted an active social engagement program with the community located near the La Promesa project area with the objective of obtaining a community agreement to support exploration activities, including drilling. To date, no agreement has been signed. In Peru, a community agreement is required in order to obtain drilling permits. During 2019 our objectives are to complete an agreement with the local community, to conduct surface exploration, and if warranted, conduct a drilling program.

At least five high-grade polymetallic veins have been identified and sampled at surface. Two of the veins, about 300 meters apart, have been traced for at least 400 meters along strike. There appears to be a systematic trend towards greater vein thickness with depth, as the widest observed vein in outcrop occurs at the lowest elevation sampled to date. Channel sampling along 300 meters of strike length from the best exposed vein yielded the following high-grade results:

Chip Channel #	True Width	Silver gpt	% Zinc	% Lead	Indium gpt
A	2.8	758	19.4	7.2	153
B	1.1	181	21.0	2.4	190
C	0.5	433	10.5	6.3	23
D	0.4	458	10.2	10.8	15
E	1.0	346	5.9	3.4	27
F	1.2	1975	33.1	5.6	430

Royalty Properties

Yanacocha Royalty Property (Peru)

The Yanacocha royalty property covered 43 concessions totaling 36,052 hectares. Solitario, through its wholly owned subsidiary Minera Solitario Perú S.A.C., sold the non-producing Yanacocha royalty to Minera Los Tapados S.A., a wholly owned subsidiary of Newmont for approximately \$502,000 in cash. Prior to the sale, Solitario received a term sheet from a third-party to purchase the Yanacocha Royalty as part of discussions concerning the potential sale of Solitario's entire portfolio of royalty properties. Newmont had a 30-day right of first refusal ("ROFR") to match any third-party offer to purchase the Yanacocha Royalty from Solitario. Newmont exercised its ROFR and the transaction with Newmont closed on April 26, 2018.

No resources or reserves have been reported by Newmont on the Yanacocha royalty property in Peru, nor has any mining been conducted on the property.

Other Royalty Properties (Brazil, Mexico and USA)

Subsequent to December 31, 2018, in January 2019, Solitario sold two royalties and an option to purchase a third royalty to SilverStream. Solitario received CDN \$250,000 in cash and CDN \$350,000 in a convertible note as payment for the royalties and option. The royalties cover the 125,000-acre polymetallic Pedra Branca palladium, platinum, gold, nickel, cobalt and chrome project in Brazil (1.0% NSR royalty) and the 3,880-acre Mexico royalty portfolio (1.0% NSR royalty). The purchase option covers 11 separate properties covering 16,500 acres in Montana (1.5% NSR royalty).

The CDN \$350,000 convertible note has a one-year term with a 5% per annum simple interest rate. The note is convertible into SilverStream stock should SilverStream complete an initial public offering before the end of the

one-year term.

Discontinued Projects

We did not abandon any mineral properties during 2018.

GLOSSARY OF MINING TERMS

“Allochthonous” means originating in a place other than a place where it was formed.

“Assay” means to test minerals by chemical or other methods for the purpose of determining the amount of valuable metals contained.

“Anticline” means folds in which each half of the fold dips away from the crest.

“Breccia” means rock consisting of fragments, more or less angular, in a matrix of finer-grained material or of cementing material.

“Claim” or “Concession” means a mining interest giving its holder the right to prospect, explore for and exploit minerals within a defined area.

“Clastic” means pertaining to rock or rocks composed of fragments or particles of older rocks or previously existing solid matter; fragmental.

“Deposit” means an informal term for an accumulation of mineral ores.

“Development” means work carried out for the purpose of opening up a mineral deposit and making the actual ore extraction possible.

“Domal” means of a dome shape.

“Dolomite” means calcium magnesium carbonate, $\text{CaMg}(\text{CO}_3)_2$, occurring in crystals and in masses.

“Facies” means the appearance and characteristics of a sedimentary deposit, especially as they reflect the conditions and environment of deposition and serve to distinguish the deposit from contiguous deposits.

“**Fault**” means a fracture in rock along which there has been displacement of the two sides parallel to the fracture.

“**gpt**” means grams per tonne.

“**Karst**” means a landscape that is characterized by the features of solution weathering and erosion in the subsurface. These features include caves, sinkholes, disappearing streams, subsurface drainage and deeply incised narrow canyons.

“**Manto deposits**” means replacement ore bodies that are strata bound, irregular to rod shaped ore occurrences usually horizontal or near horizontal in attitude.

“**Mineralization**” means the concentration of metals within a body of rock.

“**NSR**” means net smelter return royalty.

“**opt**” or “**oz/ton**” means ounces per ton.

“**Ore**” means material containing minerals that can be economically extracted.

“**Ounce**” means a troy ounce.

“**Reserves**” or “**Ore Reserves**” means that part of a mineral deposit, which could be economically and legally extracted or produced at the time of the reserve determination.

“**Sampling**” means selecting a fractional, but representative, part of a mineral deposit for analysis.

“**Sediment**” means solid material settled from suspension in a liquid.

“**Sedimentary Exhalative Deposits (SEDEX)**” means ore deposits which have been formed by the release of ore-bearing hydrothermal fluids into a water reservoir.

“**Silicification**” means the process in which organic matter becomes saturated with silica (silicon dioxide).

“**Sphalerite**” means a very common mineral, zinc sulfide, usually containing some iron and a little cadmium, occurring in yellow, brown, or black crystals or cleavable masses with resinous luster and it is the principal ore of zinc.

“**Spectrophotometry**” means the quantitative measurement of the reflection properties of a material as a function of its wavelength.

“**Stratiform**” means formed parallel to the bedding planes of surrounding rock.

“**Stratigraphy**” means the arrangement of rock strata, especially as to the geographic, chronologic order of sequence (age), classification, characteristics and formation.

“**Strike**” when used as a noun, means the direction, course or bearing of a vein or rock formation measured on a level surface and, when used as a verb, means to take such direction, course or bearing.

“**Sulfide**” means a compound of sulfur and some other element.

“**Syngenetic**” means a mineral deposit that forms at the same time as the surrounding rock.

“**Ton**” means a short ton (2,000 pounds).

“**Tonne**” means a metric ton that contains 2,204.6 pounds or 1,000 kilograms.

“**Vein**” means a fissure, fault or crack in a rock filled by minerals that have traveled upwards from some deep source.

Item 3. Legal Proceedings

None

Item 4. Mine Safety Disclosures

Not applicable

25

PART II**Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities**

Our common stock trades on the NYSE American exchange under the symbol "XPL" and on the TSX under the symbol "SLR." Since 2008 trading volume of our common stock on NYSE American exchange has exceeded the trading volume of our stock on the TSX by a substantial margin.

The following table sets forth the high and low sales prices on NYSE American exchange for our common stock for the quarterly periods from January 1, 2017 to December 31, 2018:

Period	All prices are in US\$			
	2018		2017	
	High	Low	High	Low
First quarter	\$0.71	\$0.46	\$0.88	\$0.64
Second quarter	0.49	0.40	0.85	0.65
Third quarter	0.44	0.36	0.79	0.65
Fourth quarter	0.36	0.21	0.73	0.55

The following table sets forth the high and low sales prices on the TSX for our common stock for the quarterly periods from January 1, 2017 to December 31, 2018:

Period	All prices are in CDN\$			
	2018		2017	
	High	Low	High	Low
First quarter	\$0.88	\$0.59	\$1.18	\$0.87
Second quarter	0.64	0.50	1.15	0.81
Third quarter	0.60	0.46	1.03	0.81
Fourth quarter	0.46	0.32	0.88	0.70

Shares authorized for issuance under equity compensation plans

On June 18, 2013 Solitario's shareholders approved the 2013 Solitario Exploration & Royalty Corp. Omnibus Stock and Incentive Plan (the "2013 Plan"). On June 29, 2017, Solitario shareholders approved an amendment to the 2013 Plan, which increased the number of shares available of common stock for issuance under the 2013 Plan from

1,750,000 to 5,750,000. Under the terms of the 2013 Plan, the Board of Directors may grant awards to directors, officers, employees and consultants. Such awards may take the form of stock options, stock appreciation rights, restricted stock, and restricted stock units. The terms and conditions of the awards are pursuant to the 2013 Plan and options are granted by the Board of Directors or a committee appointed by the Board of Directors.

In connection with the Acquisition, Solitario granted 1,782,428 replacement options to former officers and directors of Zazu (the "Replacement Options"). The exercise prices of the Replacement Options are between \$2.24 per share and \$0.70 per share with terms between 10 months and 18 months. In accordance with the terms of the Acquisition, the Replacement Options were fully vested upon grant. The Replacement Options had a grant date fair value of \$164,000, based upon Black-Scholes models with an expected volatility of 67% and a risk-free interest rate of 1.00%. The grant date fair value was capitalized as part of the purchase price of the Zazu assets acquired. During 2018, 782,268 of the Replacement Options, expired unexercised, in accordance with their terms and as of December 31, 2018, 1,000,160 Replacement Options remain outstanding, all of which expired unexercised subsequent to December 31, 2018 on January 19, 2019.

On September 1, 2017, the Board of Directors granted 200,000 stock options under the 2013 Plan. The options have a five-year life, vested 25% on the date of grant and vest 25% on each of the next three anniversary dates of the date of grant, and have an exercise price of \$0.77 per share, and a grant date fair value of \$84,000, based upon a Black-Scholes model with an expected volatility of 64%, and a risk free interest rate of 1.70%.

On September 1, 2017, the Board of Directors granted, subject to shareholder approval at the next meeting of shareholders, 2,300,000 stock options under the 2013 Plan to officers and members of the Board of Directors (the "Conditional Options"). The Conditional Options were approved by Solitario's shareholders at Solitario's annual meeting on June 19, 2018. The Conditional Options have a five-year life, an exercise price of \$0.77 per share, and a grant date fair value of \$970,000, based upon a Black-Scholes model with a volatility of 64%, and a risk-free interest rate of 1.70%. The Conditional Options

vest on the schedule of 25% on date of approval of the grant (June 19, 2018) and 25% on each of the next three anniversary dates of the date of grant (September 1, 2018, 2019 and 2020).

On November 1, 2018, the Board of Directors granted 1,623,000 stock options under the 2013 Plan. These options have a five-year life, vested 25% on the date of grant and vest 25% on each of the next three anniversary dates of the date of grant, and have an exercise price of \$0.31 per share, and a grant date fair value of \$282,000, based upon a Black-Scholes model with an expected volatility of 64%, and a risk free interest rate of 2.98%.

Equity Compensation Plan Information as of December 31, 2018:

Plan category	Number of securities to be issued upon exercise of outstanding options, warrants and rights	Weighted-average exercise price of outstanding options, warrants and rights (2013 Plan – US\$)	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a))
	(a)	(b)	(c)
2013 Plan			
Equity compensation plans approved by security holders	5,223,160	0.76	476,278
Equity compensation plans not approved by security holders	—	N/A	—
Total 2013 Plan	5,223,160	0.76	476,278

Holders of our common stock

As of February 28, 2019, we have approximately 3,392 holders of our common stock.

Dividend policy

We have not paid a dividend in our history and do not anticipate paying a dividend in the foreseeable future.

Issuer purchases of equity securities

The following table provides information about our purchase of our common shares during the three months ended December 31, 2018.

Period	Total Number of Shares Purchased	Average Price Paid Per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs⁽¹⁾	Maximum number of Shares that May Yet Be Purchased Under the Plans or Programs⁽¹⁾
October 1, 2017 – October 31, 2018	28,500	\$0.31	28,500	1,130,500
November 1, 2017—November 30, 2018	18,000	\$0.30	18,000	1,112,500
December 1, 2017—December 31, 2018	43,400	\$0.26	43,400	1,069,100

(1) On October 28, 2015, the Board of Directors authorized a share repurchase program pursuant to which Solitario may acquire up to 2 million of its common shares. All purchases listed were made in open-market transactions through a broker dealer. During 2018 the Board of Directors extended the termination date of the repurchase program to December 31, 2019; however, the repurchase program may be suspended or discontinued at any time and does not obligate Solitario to acquire any particular amount of our shares. During the years ended December 31, 2018 and 2017, we purchased 263,100 and 47,200 shares of Solitario common stock, respectively, for an aggregate purchase price of \$101,000 and \$32,000, respectively. As of December 31, 2018, we have purchased a total of 930,900 shares of Solitario common stock for an aggregate purchase price of \$449,000 under the share repurchase program since its inception.

Item 6. Selected Financial Data

The following table summarizes the consolidated statements of operations and balance sheet data for our business since January 1, 2014. This data has been derived from our audited consolidated statements of operations for each of the five years ended December 31, 2018 and our audited consolidated balance sheets as of December 31, 2018, 2017, 2016, 2015 and 2014. You should read this information in conjunction with Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations" and Solitario's historical consolidated financial statements and notes included in Item 8, "Financial Statements and Supplementary Data." The information set forth below is not necessarily indicative of future results.

Balance sheet data: (in thousands)	As of December 31,				
	2018	2017	2016	2015	2014
Total current assets	\$12,136	\$14,613	\$16,797	\$17,990	\$3,217
Total assets	\$27,903	\$30,395	\$17,614	\$18,054	\$19,040
Working capital (deficit) (1)	\$11,448	\$14,472	\$16,671	\$17,811	\$(1,987)
Long-term debt	\$—	\$—	\$—	\$—	\$—
Shareholders' equity	\$27,090	\$30,129	\$17,488	\$17,875	\$6,781

Statement of operations data: (in thousands, except per share amounts)	Year ended December 31,				
	2018	2017	2016	2015	2014
Property and joint venture revenue	\$—	\$—	\$—	\$—	\$200
Net (loss) income	\$(3,598)	\$(942)	\$(1,710)	\$8,872	\$(1,833)

Per share information:					
Basic and diluted					
Net (loss) income	2018	2017	2016	2015	2014
	\$(0.06)	\$(0.02)	\$(0.04)	\$0.23	\$(0.05)

(1) Working capital consists of current assets less current liabilities.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

The following discussion should be read in conjunction with the information contained in the consolidated financial statements and notes thereto included in Item 8, "Financial Statements and Supplementary Data." Our financial condition and results of operations are not necessarily indicative of what may be expected in future years.

(a). Recent Developments

On April 26, 2018, we sold the Yanacocha Royalty to a wholly owned subsidiary of Newmont for approximately \$502,000 in cash. The Yanacocha Royalty covered 43 concessions totaling 36,052 hectares. Newmont owns the underlying mineral concessions covered by the Yanacocha Royalty. None of the concessions covered by the Yanacocha Royalty have any reported reserves or resources. Solitario had no mineral property capitalized cost in the Yanacocha Royalty and recorded Mineral Property Revenue of \$502,000 during 2018.

In August of 2018, Solitario agreed to fund a portion of a 2018 – 2019 drilling program at the Florida Canyon project. Per the agreement, Solitario will fund up to \$1,580,000 of a planned 41-hole 17,000-meter drilling program to be conducted through December 31, 2019 (the "Drilling Program"). Upon Nexa completing the first 1,700 meters of the Drilling Program, Solitario will pay Nexa \$527,000, upon completion of the next 1,700 meters (3,400 meters total) of the Drilling Program, Solitario will pay Nexa \$527,000, and upon completion of the next 1,700 meters (5,100 meters total) of the Drilling Program, Solitario will pay Nexa the balance remaining on its \$1,580,000 funding commitment, or \$526,000. Solitario has no obligation to pay Nexa prior to the attainment of the separate 1,700-meter thresholds. The funding commitments are in the form of an advance on Solitario's commitment to fund 30% of any future development of Florida Canyon under the existing joint venture agreement with Nexa. Accordingly, in the event Florida Canyon is developed, which cannot be assured at this time, any funds paid to Nexa under this agreement, will reduce the amount of Solitario's obligation to fund 30% of future development costs, and / or repay loans from Nexa for future development costs at the Florida Canyon project. As of December 31, 2018, Nexa had completed four holes and a total of 2,203 meters under the Drilling Program, and Solitario has recorded an account payable to Nexa of \$527,000 and recorded a charge to exploration expense of \$527,000.

(b). Business Overview and Summary

We are an exploration stage company at December 31, 2018 under Industry Guide 7, as issued by the SEC. We were incorporated in the state of Colorado on November 15, 1984 as a wholly-owned subsidiary of Crown Resources Corporation ("Crown"). In July 1994, we became a publicly traded company on the Toronto Stock Exchange (the "TSX") through our initial public offering. We have been actively involved in mineral exploration since 1993. Our primary business is to acquire exploration mineral properties and/or discover economic deposits on our mineral properties and advance these deposits, either on our own or through joint ventures, up to the development stage

(development activities include, among other things, completion of a feasibility study for the identification of proven and probable reserves, as well as permitting and preparing a deposit for mining). At that point, or sometime prior to that point, we would likely attempt to sell a given mineral property, pursue its development either on our own, or through a joint venture with a partner that has expertise in mining operations, or obtain a royalty from a third party that continues to advance the property. Upon the completion of the Acquisition, we shifted our primary focus to the acquisition and exploration of zinc-related exploration mineral properties. In addition to focusing on our current assets and the evaluation of mineral properties for acquisition, we also evaluate potential strategic corporate transactions for the acquisition of new precious and base metal properties and assets with exploration potential or business combinations we determine to be favorable to Solitario.

In July 2017 we completed the acquisition of Zazu Metals Corp. (“Zazu”) whereby we issued 19,788,177 shares of our common stock for all the issued and outstanding common shares of Zazu (the “Acquisition”). Zazu had one primary asset, its interest in the Lik project, and the Acquisition was treated as an asset purchase. The total purchase price of \$16,110,000 was recorded during 2017.

Our geographic focus for the evaluation of potential mineral property assets is in North and South America; however, we have conducted property evaluations for potential acquisition in other parts of the world. Our exploration properties may be developed in the future by us or through a joint venture, although we have never developed a mineral property. At December 31, 2018, we consider our carried interest in our Florida Canyon project in Peru and our interest in the Lik project in Alaska to be our core mineral property assets. In addition, at December 31, 2018, we have one exploration property in Peru, and one royalty property in each of Peru, Brazil, United States and Mexico. Subsequent to December 31, 2018, we sold our royalty property interests in Brazil, the United States and Mexico. We are conducting independent exploration activities in Peru and through joint ventures operated by our partners in Peru and the United States. We conduct potential acquisition evaluations in other countries of both South and North America.

As of December 31, 2018, we have significant balances of cash and short-term investments that we anticipate using, in part, to fund planned 2019 exploration, including our portion of the Drilling Program, discussed above, , to further the exploration of the Lik project, conduct initial exploration on the La Promesa project in Peru, and to potentially acquire additional mineral property assets. The fluctuations in commodity prices of base and precious metals has contributed to a challenging environment for mineral exploration and development, which has created opportunities as well as challenges for the potential acquisition of advanced mineral exploration projects or other related assets at potentially attractive terms.

In analyzing our activities, the most significant aspect relates to results of our exploration and potential development activities and those of our joint venture partners on a property-by-property basis. When our exploration or potential development activities, including drilling, sampling and geologic testing, indicate a project may not be economic or contain sufficient geologic or economic potential we may impair or completely write-off the property. Another significant factor in the success or failure of our activities is the price of commodities. For example, when the price of zinc is down, the value of zinc-bearing mineral properties decreases; however, when the price of zinc is up it may become more difficult and expensive to locate and acquire new zinc-bearing mineral properties with potential to have economic deposits.

The potential sale, joint venture or development of our mineral properties will occur, if at all, on an infrequent basis. Historically, we have recorded revenues and met our need for capital in the past through (i) the sale of properties; (ii) joint venture payments, including delay rental payments; (iii) a royalty sale on our former Mt. Hamilton property; (iv) the sale of our shares of Vendetta and Kinross common stock; (v) long-term debt secured by our mineral property; (vi) short-term margin borrowing; and (vii) issuances of common stock. During 2018 we recorded mineral property income from the sale of our Yanacocha royalty of \$502,000. In 2015 we recorded a gain on the sale of our interest in Mount Hamilton LLC of \$12,309,000. During June 2012, we sold a royalty interest in our Mt. Hamilton project to Sandstorm Gold Ltd. for \$10,000,000. Previous to the Mt. Hamilton Transaction, our last significant cash proceeds were recorded in 2000 upon the sale of our former Yanacocha property for \$6,000,000. Proceeds from the sale or joint venture of properties, although significant when they occur, have not been a consistent annual source of cash and would occur in the future, if at all, on an infrequent basis. We have reduced our exposure to the costs of our exploration activities in the past through the use of joint ventures. Although we anticipate the use of joint venture funding for some of our exploration activities will continue for the foreseeable future, we can provide no assurance that these or other sources of capital will be available in sufficient amounts to meet our needs, if at all.

(c). Results of Operations

Comparison of the year ended December 31, 2018 to the year ended December 31, 2017

We had a net loss of \$3,528,000 or \$0.06 per share for the year ended December 31, 2018 compared to a loss of \$942,000 or \$0.02 per basic and diluted share for the year ended December 31, 2017. As explained in more detail below, the primary reasons for the increase in net loss during 2018 compared to 2017 was an increase in (i) exploration expense to \$1,254,000 during 2018 compared to exploration expense of \$699,000 during 2017; (ii) an increased in general and administrative expense to \$1,884,000 during 2018 compared to general and administrative expense of \$1,202,000 during 2017, which was significantly related to an increase in non-cash stock option expense of \$660,000 during 2018 compared to \$50,000 during 2017; (iii) the recording of an unrealized loss on marketable equity securities of \$1,058,000 during 2018 compared to a realized gain on the sale of marketable equity securities of \$578,000 during 2017; and (iv) a gain on derivative instruments of \$271,000 during 2017 with no similar item during 2018. Partially offsetting these factors that served to increase our net loss were (i) mineral property sale revenue of \$502,000 from the sale of our Yanacocha Royalty during 2018 with no similar item during 2017; and (ii) an increase in interest income (net) to \$192,000 during 2018 compared to interest income of \$123,000 during 2017. Each of these items is discussed in greater detail below.

Our primary exploration activities during 2018 and 2017 were related to exploration and evaluation of our mineral properties and as well as the evaluation of mineral properties held by other mining companies for possible acquisition and or corporate merger, with an increase in related reconnaissance exploration activities and expense. At the Florida Canyon project we recorded a total of \$550,000 of exploration expense of which the largest single expense related to our agreement with Nexa, discussed above, whereby Solitario recorded \$527,000 in exploration expense for the drilling completed at the Florida Canyon project during 2018, this compared to the completion of a preliminary economic analysis (“PEA”) at Florida Canyon during 2017. The total cost of the 2017 PEA was approximately \$243,000 of which our joint venture partner, Nexa paid one-half. We recorded a total of \$125,000 of exploration expense at our Lik project of which the largest expense was related to approximately \$234,000 of joint exploration expenses during 2018 at the Lik project, of which we paid half and our joint venture partner, Teck paid the other half. During 2018 and 2017, we evaluated several projects for acquisition, in addition to the Lik project acquired in the Acquisition and we performed limited exploration activities, primarily related to permitting at our La Promesa project in Peru. We did no drilling on any of our exploration projects in North or South America during 2017. Our 2019 exploration and development budget is approximately \$2,345,000, of which approximately \$1,053,000 is related to the Florida Canyon project Drilling Program and approximately \$210,000 is planned for our Lik project in Alaska, the remainder of the 2019 budget is primarily related to our planned 2019 reconnaissance efforts as well as additional work planned for our La Promesa project. We also will be evaluating potential acquisition of new mineral exploration properties. This expenditure amount could increase significantly if we decide to conduct exploration drilling on any of our other existing projects, which is not currently included in the 2019 budget. We cannot predict with certainty that we will acquire new mineral exploration properties during 2019; however, we expect to continue our early-stage exploration activities. Our exploration activities may be modified, as necessary for any drilling programs we may undertake, changes related to potential acquisition of new properties, joint venture funding, commodity prices and deployment of our capital.

Exploration expense (in thousands) by property consisted of the following:

Property Name	2018	2017
Florida Canyon	\$550	\$124
Lik project	125	54
La Promesa	86	41
Reconnaissance exploration activity	493	480
Total exploration expense	\$1,254	\$699

We believe a discussion of our general and administrative costs should be viewed without the non-cash stock option compensation expense which is discussed below. Excluding these costs, general and administrative costs were \$1,294,000 during 2018 compared to \$1,152,000 during 2017. We reduced salary and benefits expense to \$619,000 during 2018 compared to \$639,000 during 2017 as a result of bonus reductions. In addition, (i) legal and accounting costs increased to \$208,000 during 2018 compared to \$134,000 during 2017, primarily due to additional tax work related to the Acquisition; (ii) travel and investor relation costs increased to \$308,000 during 2018 compared to \$224,000 during 2017 as a result of expenses related to increased post-Acquisition disclosures and market activities; (iii) we recorded directors and officer insurance expense of \$60,000 during 2018 compared to \$55,000 during 2017; and (iv) other costs related to office, insurance and miscellaneous costs remained essentially flat at \$99,000 during 2018 compared to \$98,000 during 2017. We anticipate general and administrative costs for 2019 will be lower than the costs incurred during 2018 due to several management initiatives to reduce costs; however this amount may vary significantly during 2019 depending on the outcome of our property evaluations and any strategic transactions we may attempt to execute upon. We have forecast 2019 general and administrative costs to be approximately \$1,122,000, excluding non-cash stock option compensation expense.

We account for our employee stock options under the provisions of Accounting Standards Codification No. 718 (“ASC No. 718”). We recognize stock option compensation expense on the date of grant for 25% of the grant date fair value, and subsequently, based upon a straight-line amortization of the grant date fair value of each of its outstanding options. During the year ended December 31, 2018, we recorded \$660,000 of non-cash stock option expense for the amortization of our outstanding options grant date fair value with a credit to additional paid-in-capital compared to \$50,000 of non-cash stock option compensation expense during 2017. On June 19, 2018 our shareholders approved 2,300,000 Conditional Options, and we recorded \$422,000 of stock option compensation related to those options during 2018 for the vested portion of the grant date fair value of those options as of the date of approval. In addition, during 2018 we granted an additional 1,723,000 options and recorded \$96,000 of stock option compensation expense related to the vested portion of the grant date fair value for those options. We recorded an additional \$142,000 of stock option compensation expense related to the vested portion of other outstanding options during 2018. See Note 10, “Employee Stock Compensation Plans,” to our consolidated financial statements in Item 8, “Financial Statements and Supplementary Data to this Form 10-K” for an analysis of the changes in the fair value of our outstanding stock options and the components that are used to determine the fair value.

We recorded an unrealized loss on marketable equity securities of \$1,058,000 during 2018 in the statement of operations compared to an unrealized loss on marketable equity securities of \$136,000 recorded as other comprehensive income in the statements of shareholders' equity during 2017. The loss during 2018 was primarily related to a decrease in the value of our holdings of 11,000,000 shares of Vendetta common stock, which decreased from a fair value of \$2,192,000 at December 31, 2017 to a fair value of \$1,249,000 at December 31, 2018 based on quoted market prices. In addition, we recorded an unrealized loss on marketable equity securities of \$108,000 during 2018 on our holdings of Kinross. We adopted ASU 2016-01 in the first quarter of 2018. We recorded a cumulative-effect adjustment for the change in accounting principle to accumulated deficit of \$576,000 related to the adoption of ASU 2016-01. See Note 10, "Shareholders' Equity" to the consolidated financial statements.

During 2017 we received proceeds of \$666,000 and recorded a realized gain on the sale of marketable equity securities of \$578,000 from the sale of 3,480,000 Vendetta common shares. We used the bulk of the proceeds of \$666,000 to exercise 7,240,000 warrants to acquire Vendetta common shares for \$578,000. See Note 3, “Marketable Equity Securities,” to the consolidated financial statements in Item 8, “Financial Statements and Supplementary Data” of this Form 10-K for a discussion of the sale of Vendetta shares and the exercise of the Vendetta Warrants (defined below). As of December 31, 2018, we have 11,000,000 shares of Vendetta common stock and no remaining Vendetta Warrants. There were no similar sales of shares during 2018. We may sell some of our marketable equity securities from time to time during 2019 for working capital needs; however, we do not expect to sell all of our holdings of marketable equity securities during 2019. Any proceeds we may receive from sales of marketable equity securities during 2019 will be dependent on the quoted market price of the securities sold on the date of sale and may be at prices below the fair value at December 31, 2018. See “Liquidity and Capital Resources” below.

During 2017 we recorded a gain on derivative instruments of \$271,000 with no similar item during the year ended December 31, 2018. The gains during 2017 were primarily related to our investment in Vendetta Warrants, which were purchased on May 2, 2016, as part of our strategic investment in Vendetta, where we acquired 7,240,000 units for Cdn\$0.05 per unit, with each unit consisting of one share of Vendetta common stock and one Vendetta Warrant. Each Vendetta Warrant entitled Solitario the right to acquire one share of Vendetta common stock at a price of Cdn\$0.10 per share for a period of two years (“Vendetta Warrant”). We recorded a gain on derivative instruments of \$216,000 during 2017 related to the Vendetta Warrants. These gains were primarily as a result of an increase in the price of the underlying Vendetta common shares during 2017. The remaining increase in the gain on derivative instruments was related to the sale of Kinross calls during 2017 of \$55,000. We have sold covered calls on a limited portion of our Kinross common stock that we intend to sell within one year, to enhance our return on Kinross common stock in exchange for potential upside in those covered Kinross shares. We may continue to sell covered Kinross call options during 2019. See Note 7, “Derivative Instruments,” to our consolidated financial statements in Item 8, “Financial Statements and Supplementary Data,” of this Form 10-K for an analysis of the changes in our derivative instruments, and the components that are used to determine the fair value of our derivative instruments.

We recorded \$25,000 of depreciation and amortization during 2018 compared to \$13,000 of depreciation and amortization during 2017. The increase is primarily as a result of a full year of depreciation on the equipment acquired in the Acquisition at the Lik project during 2018. We amortize these assets over a five-year period. We anticipate our 2019 depreciation and amortization expense will be similar to our 2018 depreciation expense.

We recorded interest income of \$192,000 during 2018 compared to interest income of \$123,000 during 2017. The increase during 2018 was primarily related to an increase in the average interest rate earned on our investment in United States Treasury securities during 2018 compared to 2017, which was partially offset by a lower average investment during 2018 compared to 2017. We anticipate our interest income will decrease in 2019 compared to 2018 as a result of the use of our short-term investments and our cash balances for ordinary overhead, operational costs, and the exploration, evaluation and or acquisition of mineral properties discussed above. See “Liquidity and Capital Resources,” below, for further discussion of our cash and cash equivalent balances.

We recorded no deferred tax expense or benefit in either 2018 or 2017 as we provide a valuation allowance for the tax benefit arising out of our net operating losses for all periods presented. See Note 3, “Marketable Equity Securities” and Note 6, “Income Taxes” to our consolidated financial statements in Item 8, “Financial Statements and Supplementary Data of this Form 10-K for additional discussion of our income tax valuation allowance, deferred tax assets and our net operating losses for 2018 and 2017. We anticipate we will continue to provide a valuation allowance for these net operating losses until we are in a net tax liability position with regards to those countries where we operate or until it is more likely than not that we will be able to realize those net operating losses in the future.

We regularly perform evaluations of our mineral property assets to assess the recoverability of our investments in these assets. All long-lived assets are reviewed for impairment whenever events or circumstances change which indicate the carrying amount of an asset may not be recoverable utilizing guidelines based upon future net cash flows from the asset as well as our estimates of the geologic potential of early stage mineral property and its related value for future sale, joint venture or development by us or others. We had no mineral property impairments during 2018 or 2017.

(d). Liquidity and Capital Resources

Cash

As of December 31, 2018, we have \$117,000 in cash. We intend to utilize a portion of this cash and a portion of our short-term investments, discussed below, to fund our ordinary overhead, operational costs, exploration activities and the

potential acquisition of mineral properties and other assets over the next several years. We may also use a portion of these assets to repurchase shares of our common stock, pursuant to the terms of a stock buy-back program discussed below.

Short-term Investments

As of December 31, 2018, we have \$9,345,000 of our current assets in United States Treasury securities (“USTS”) with maturities of 15 days to 22 months. The USTS are recorded at their fair value, based upon quoted market prices. The USTS are highly liquid and may be sold in their entirety at any time at their quoted market price and are classified as a current asset. We anticipate we will roll over that portion of our USTS not used for operating costs or mineral property acquisitions as they mature during 2019.

As of December 31, 2018, we have two bank certificates of deposit (“CDs”) each with a maximum value of \$250,000, maturities of three months, and each of which are covered by Federal Deposit Insurance Corporation insurance to the full-face value of the CDs. In addition, we have a US Dollar bank savings account in Peru with a fair value of \$378,000. The CDs are recorded at their fair value, based upon quoted market prices. The CDs are highly liquid and may be sold in their entirety at any time at their quoted market price and are classified as a current asset. We anticipate we will roll over that portion of our CDs not used for operating costs or mineral property acquisitions as they mature during 2019.

Marketable Equity Securities

Our marketable equity securities are classified as available-for-sale and are carried at fair value, which is based upon market quotes of the underlying securities. We owned 100,000 shares of Kinross common stock at December 31, 2018. The Kinross shares are recorded at their fair value of \$324,000 at December 31, 2018. As of December 31, 2018, we own 11,000,000 shares of Vendetta common stock recorded at their fair market value of \$1,248,000 based upon quoted market prices. In addition, we own other marketable equity securities with a fair value of \$13,000 as of

December 31, 2018 based upon quoted market prices. Changes in the fair value of marketable equity securities are recorded as gains and losses in the statements of operations.

Working Capital

We had working capital of \$11,448,000 at December 31, 2018 compared to working capital of \$14,472,000 as of December 31, 2017. Our working capital at December 31, 2018 consists primarily of our cash and cash equivalents, our investment in USTS and CDs, discussed above, and our marketable equity securities of \$1,585,000, less our accounts payable of \$688,000. As of December 31, 2018, our cash balances along with our short-term investments and marketable equity securities are adequate to fund our expected expenditures over the next year.

The nature of the mineral exploration business requires significant sources of capital to fund exploration, development and operation of mining projects. We expect we will need additional capital if we decide to develop or operate any of our current exploration projects or any projects or assets we may acquire. We anticipate we would finance any such development through the use of our cash reserves, short-term investments, joint ventures, issuance of debt or equity, or the sale of other exploration projects or assets.

Stock-Based Compensation Plans

At December 31, 2018, options to acquire 5,223,160 shares of our common stock were outstanding, of which 785,840 options were Replacement Options granted in connection with the Acquisition. There are 2,770,910 options that are vested and exercisable at December 31, 2018. None of our outstanding options are in the money with an exercise price below the market price of a share of Solitario common stock at December 31, 2018 as quoted on the NYSE American exchange. See Note 10, "Employee Stock Compensation Plans" to our consolidated financial statements in Item 8, "Financial Statements and Supplementary Data of this Form 10-K for a discussion of the activity in our 2013 Plan during 2018 and 2017. We do not anticipate that stock option exercises will be a significant source of cash during 2019.

Share Repurchase Program

On October 28, 2015, our Board of Directors approved a share repurchase program that authorized us to purchase up to two million shares of our outstanding common stock. During 2018, our Board of Directors extended the term of the share repurchase program until December 31, 2019. All shares purchased to date have reduced the number of shares of outstanding common stock. The amount and timing of any shares purchased has been and will be determined by our management and the purchases will be effected in the open market or in privately negotiated transactions based upon market conditions and other

factors, including price, regulatory requirements and capital availability and in compliance with applicable state and federal securities laws. Purchases may also be made in accordance with Rule 10b-18 of the Exchange Act. The repurchase program does not require the purchase of any minimum number of shares of common stock by the Company, and may be suspended, modified or discontinued at any time without prior notice. No purchases will be made outside of the United States, including on the TSX. Payments for shares of common stock repurchased under the program will be funded using the Company's working capital. As of December 31, 2018, since the inception of the share repurchase program, we have purchased a total of 930,900 shares for an aggregate purchase price of \$449,000 and these shares are no longer included in our issued and outstanding shares. We anticipate we will continue to purchase shares under the share repurchase plan during 2019 as determined by management.

Off-balance sheet arrangements

As of December 31, 2018, and 2017, we have no off-balance sheet arrangements.

(e). Cash Flows

Net cash used in operations during the year ended December 31, 2018 decreased to \$1,357,000 compared to \$1,658,000 for 2017 primarily as a result of (i) the sale of our Yanacocha Royalty for \$502,000 during 2018 with no similar sale during 2017; (ii) additional interest income of \$192,000 during 2018 compared to \$123,000 during 2017 and (iii) an increase in our account payable balance of \$547,000 from December 31, 2017 to December 31, 2018, which is primarily related to the accrual of our required payment to Nexa of \$527,000 at December 31, 2018 related to the portion of the drilling completed, but not yet paid, at our Florida Canyon project, discussed above under "Results of Operations. Partially offsetting this decreased use of cash in operations was an increase in other exploration activities, including reconnaissance exploration to \$727,000 during 2018 compared to \$699,000 during 2017; and (ii) an increase in general and administrative expense, excluding non-cash stock option compensation to \$1,294,000 during 2018 compared to \$1,102,000 during 2017 as discussed in further detail above under "Results of Operations."

Net cash provided by investing activities decreased to \$1,361,000 during 2018 compared to net cash provided of \$1,785,000 during 2017. The primary source of cash was the sale of short-term investments of \$1,371,000 during 2018 compared to \$3,563,000 during 2017. There were no other significant provisions or uses of cash during 2018. However, during 2017, Solitario loaned Zazu \$1,500,000, prior to the Acquisition, to assist Zazu with its cash needs in anticipation of the completion of the Acquisition. The remaining uses of cash during 2017 included the net costs to acquire Zazu of \$417,000 and the purchase of the marketable equity securities through the exercise of Vendetta Warrants of \$578,000. During 2017 we received proceeds of \$666,000 from the sale of Vendetta common shares. Both the exercise of the Vendetta Warrants and the sale of Vendetta shares are discussed above under “Results of Operations.” We also received proceeds of \$53,000 from the sale of derivative instruments, also discussed above under “Results of Operations.” We anticipate we will continue to utilize proceeds from the sale of our short-term investments to fund our operations during 2019.

The net cash used in financing activities of \$101,000 during 2018 and \$32,000 during 2017 were for the repurchase of common stock for cancellation, discussed above. We anticipate we will use a similar amount of cash as we spent during 2018 for the repurchase of shares during 2019.

(f). Development Activities, Exploration Activities, Environmental Compliance and Contractual Obligations

Development Activities

We do not have any ongoing mineral development activities, which are activities for the development of mineral properties with reserves for potential mining.

Exploration Activities

A historically significant part of our business involves the review of potential property acquisitions and continuing review and analysis of properties in which we have an interest, to determine the exploration and development potential of the properties. In analyzing expected levels of expenditures for work commitments and property payments, our obligations to make such payments fluctuate greatly depending on whether, among other things, we make a decision to sell a property interest, convey a property interest to a joint venture, or allow our interest in a property to lapse by not making the work commitment or payment required. In acquiring many of our interests in mining claims and leases, we have entered into agreements, which generally may be canceled at our option. We are often required to make minimum rental and option payments in order to maintain our interest in certain claims and leases. Our net 2018 mineral and surface property rental and

option payments, included in exploration expense, were \$10,000. Our 2019 total exploration property rentals and option payments for properties we own or operate are estimated to be approximately \$729,000. Assuming that our joint ventures continue in their current status and that we do not appreciably change our property positions on existing properties, we estimate that our joint venture partners will pay on our behalf or reimburse us approximately \$712,000

of these annual payments. These obligations are detailed below under “Contractual Obligations.” In addition, we may be required to make further payments in the future if we elect to exercise our options under those agreements or if we enter into new agreements.

Environmental Compliance

We are subject to various federal, state and local environmental laws and regulations in the countries where we operate. We are required to obtain permits in advance of initiating certain of our exploration activities, to monitor and report on certain activities to appropriate authorities, and to perform remediation of environmental disturbance as a result of certain of our activities. Historically, the nature of our activities of review, acquisition and exploration of properties prior to the establishment of reserves, which may include mapping, sampling, geochemistry and geophysical studies, as well as some limited exploration drilling, has not resulted in significant environmental impacts in the past. We have historically carried on our required environmental remediation expenditures and activities, if any, concurrently with our exploration activities and expenditures. The expenditures to comply with our environmental obligations are included in our exploration expenditures in the statement of operations and have not been material to our capital or exploration expenditures and have not had a material effect on our financial position. For the years ended December 31, 2018 and 2017, we have not capitalized any costs related to environmental control facilities. We do not anticipate our exploration activities will result in any material new or additional environmental expenditures or liabilities in the near future.

Contractual Obligations

The following table provides an analysis of our contractual obligations:

(in thousands)	As of December 31, 2018				
	Payments due by period				
	Total	Less than 1 year	1–3 years	4–5 years	More than 5 years
Operating Lease Obligations (1)	\$ 85	\$ 43	\$ 42	\$ -	\$ -
Mineral property option and lease payments (2)	\$ 17	\$ 17	\$ -	\$ -	\$ -
	(1)	<i>Lease obligation on our Wheat Ridge Colorado office.</i>			
	(2)	<i>Mineral property payments under lease and property claim and concession payments for the next year, net of joint venture payments.</i>			

(g). Exploration Joint Ventures, Royalty and Other Properties

The following discussion relates to an analysis of our anticipated property exploration plans as of December 31, 2018. Please also see Note 2, “Mineral Properties,” to the consolidated financial statements in Item 8, “Financial Statements and Supplementary Data,” and our discussion of our properties under Item 2, “Properties” of this Annual Report on Form 10-K for a more complete discussion of all of our mineral properties.

Florida Canyon

The Florida Canyon project is an advanced-stage high-grade zinc project in Peru. Based on extensive exploration and development work conducted to date, we believe the property has excellent potential to be developed into a mine over the next several years. The project is held in a joint venture between Nexa (61%) and Solitario (39%).

Solitario and Nexa jointly completed a PEA in 2017 that incorporated a variety of Nexa-generated prefeasibility studies into the analysis. The PEA evaluation included resource estimation, mining and processing recovery estimates, a preliminary mining and processing plan, infrastructure layout, environmental considerations and an economic analysis based on the certain base case parameters. The PEA envisioned an underground mining operation with a 2,500 tonne per day floatation mill for processing, resulting in a 12.5-year mine life. Concentrates would be trucked to Nexa's Cajamarquilla zinc smelter facility in Lima, Peru.

The terrain at Florida Canyon is steep and previous project access supporting surface and underground work programs was conducted by helicopter. The lack of road access restricted the scope of field activities to further advance the project. During 2018 certain work was undertaken on road access to the project, and Nexa expects to continue to work on completing the road access during 2019. Upon the completion of the road, heavy equipment will be able to enter the project area and allow feasibility related activities to proceed more efficiently. Important future activities that will be facilitated by the completion of the road are the construction of an underground tunnel into the Karen-Milagros high-grade zinc zone, detailed underground resource/reserve definition drilling, surface drilling designed to increase the project resources and additional feasibility-related studies. Continuing road work is scheduled to begin in May 2019 after the rainy season ends and continue until the road is completed.

In August of 2018, Solitario agreed to fund a portion of a 2018 – 2019 drilling program at Florida Canyon. Per the agreement, Solitario will fund up to \$1,580,000 of a planned 41-hole 17,000-meter drilling program to be conducted through December 31, 2019. Upon Nexa completing the first 1,700 meters of the Drilling Program, Solitario will pay Nexa \$527,000, upon completion of the next 1,700 meters (3,400 meters total) of the Drilling Program, Solitario will pay Nexa \$527,000, and upon completion of the next 1,700 meters (5,100 meters total) of the Drilling Program, Solitario will pay Nexa the balance remaining on its \$1,580,000 funding commitment, or \$526,000. Solitario has no obligation to pay Nexa prior to the attainment of the separate 1,700-meter thresholds. The funding commitments are in the form of an advance on Solitario's commitment to fund 30% of any future development of Florida Canyon under the original joint venture agreement between Solitario and Nexa. Accordingly, in the event Florida Canyon is developed, which cannot be assured at this time, any funds paid to Nexa under this agreement, will reduce the amount of Solitario's obligation to fund 30% of future development costs, and / or repay any loans from Nexa for future development costs at Florida Canyon. As of December 31, 2018, Nexa had completed four holes and a total of 2,203 meters under the Drilling Program, and Solitario has recorded an account payable to Nexa of \$527,000 and recorded a charge to exploration expense of \$527,000. Our exploration budget at Florida Canyon for 2019 includes the remaining drilling of approximately \$1,053,000.

Lik project

The Lik project is an advanced-staged high-grade zinc project. The project is held in a joint venture between Teck (50%) and Solitario (50%).

Zazu completed a PEA in 2014 that incorporated a variety of prefeasibility studies into the analysis. These studies included resource estimation, mining and processing recovery estimates, a preliminary mining and processing plan, infrastructure layout, environmental considerations and an economic analysis based on the base case parameters. The PEA envisioned an open pit mining operation with a 5,500 ton per day floatation mill for processing resulting in a nine-year mine life. Concentrates would be handled through the DMTS road and port system that currently handles all concentrate produced by the nearby Red Dog zinc mine of Teck. A summary of metallurgical testing and mineral processing is provided below. The PEA analyzed the Lik project as a stand-alone operation building its own independent processing, tailings and port facilities.

During 2018 Solitario and Teck jointly funded a gravity geophysical program, geologic mapping, geochemical sampling, an evaluation of past baseline environmental work for mine permitting previously initiated by Zazu, and rehabilitation work the Lik camp. Based on this work, Teck and Solitario have agreed to a 2019 joint exploration budget of \$420,000 at Lik (Solitario's portion \$210,000) and anticipate exploration activities to be similar to the exploration activities during 2018. Teck will manage the 2019 exploration program, although Solitario will remain the manager of the joint venture.

Royalty Properties

On April 26, 2018, Solitario, through its wholly owned subsidiary Minera Solitario Perú S.A.C., sold the non-producing Yanacocha royalty to Minera Los Tapados S.A., a wholly owned subsidiary of Newmont for approximately \$502,000 in cash.

Subsequent to December 31, 2018, on January 22, 2019, we announced the sale of our interests in a retained royalty on the Pedra Branca project in Brazil, a retained royalty on non-producing exploration properties in Mexico, and an option to purchase our royalty on certain non-producing mineral claims in Montana to SilverStream for Cdn\$250,000 in cash and a one-year promissory note from SilverStream for Cdn\$350,000.

Other Properties

We have budgeted 2019 exploration expenditures of \$667,000 for exploration and evaluation of existing and potential new acquisitions of properties primarily in Peru, and to a lesser extent in other regions of North and South America. We expect to carry out limited exploration activities during 2019 utilizing our own employees and contract geologists.

(h). Discontinued Projects

We had no mineral property impairments during 2018 or 2017.

(i). Significant Accounting Policies

See Note 1, “Business and Summary of Significant Accounting Policies,” in Item 8, “Financial Statements and Supplementary Data” of this Form 10-K for a discussion of our significant accounting policies.

(j). Related Party Transactions

None

(k). Recent Accounting Pronouncements

See Note 1, “Business and Summary of Significant Accounting Policies,” in Item 8 “Financial Statements and Supplementary Data” of this Form 10-K for a discussion of recent accounting pronouncements.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk

Smaller reporting companies are not required to provide the information required by this item.

Item 8. Financial Statements and Supplementary Data

	Page
Consolidated Financial Statements	
Reports of Independent Registered Public Accounting Firm	39
Consolidated Balance Sheets as of December 31, 2018 and 2017	41
Consolidated Statements of Operations for the years ended December 31, 2018 and 2017	42
Consolidated Statements of Other Comprehensive Income for the years ended	
December 31, 2018 and 2017	43
Consolidated Statements of Shareholders' Equity for the years ended December 31, 2018 and 2017	44
Consolidated Statements of Cash Flows for the years ended December 31, 2018 and 2017	45
Notes to Consolidated Financial Statements	46

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Shareholders and Board of Directors

Solitario Zinc Corp.

Wheat Ridge, Colorado

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheet of Solitario Zinc Corp. (the “Company”) as of December 31, 2018, the related consolidated statements of operations, stockholders’ equity, and cash flows for the year ended December 31, 2018, and the related notes (collectively referred to as the “financial statements”). In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018, and the results of its operations and its cash flows for the year ended December 31, 2018 in conformity with accounting principles generally accepted in the United States of America.

Basis for Opinion

The Company's management is responsible for these financial statements. Our responsibility is to express an opinion on the Company's financial statements based on our audit. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (“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 the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audit we are required to obtain an understanding

of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audit 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 audit 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 audit provides a reasonable basis for our opinion.

Plante & Moran, PLLC

We have served as the Company's auditor since 2005.

Denver, Colorado

February 28, 2019

39

Report of Independent Public Accounting Firm

To the Shareholders and Board of Directors of

Solitario Zinc Corp.

Wheat Ridge, Colorado

OPINIONS ON THE CONSOLIDATED FINANCIAL STATEMENTS

We have audited the accompanying consolidated balance sheets of Solitario Zinc Corp. (the “Company”) as of December 31, 2017, and the related consolidated statements of income, comprehensive income, stockholders’ equity, and cash flows, for each year in the two-year period ended December 31, 2017, and the related notes (collectively referred to as the “financial statements”).

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2017, and the results of its operations and its cash flows for each year in the two-year period ended December 31, 2017, in conformity with accounting principles generally accepted in the United States of America.

BASIS FOR OPINIONS

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud.

EKS&H LLLP

March 14, 2018

Denver, Colorado

40

SOLITARIO ZINC CORP.

CONSOLIDATED BALANCE SHEETS

(in thousands of U.S. dollars, except share and per share amounts)	December 31, 2018	December 31, 2017
Assets		
Current assets:		
Cash and cash equivalents	\$ 117	\$ 214
Short-term investments, at fair value	10,223	11,642
Investments in marketable equity securities, at fair value	1,585	2,643
Prepaid expenses and other	211	114
Total current assets	12,136	14,613
Mineral properties	15,657	15,657
Other assets	110	125
Total assets	\$27,903	\$30,395
Liabilities and Shareholders' Equity		
Current liabilities:		
Accounts payable	\$ 688	\$ 141
Long-term liabilities		
Asset retirement obligation - Lik	125	125
Commitments and contingencies (Note 9)		
Shareholders' equity:		
Solitario shareholders' equity		
Preferred stock, \$0.01 par value, authorized 10,000,000 shares (none issued and outstanding at December 31, 2018 and 2017)	—	—
Common stock, \$0.01 par value, authorized, 100,000,000 shares (58,171,466 and 58,434,566, respectively, shares issued and outstanding at December 31, 2018 and 2017)	582	584
Additional paid-in capital	69,873	69,312
Accumulated deficit	(43,365)	(40,343)
Accumulated Other Comprehensive Income		576
Total shareholders' equity	27,090	30,129
Total liabilities and shareholders' equity	\$27,903	\$30,395

See Notes to Consolidated Financial Statements.

SOLITARIO ZINC CORP.

CONSOLIDATED STATEMENTS OF OPERATIONS

(in thousands, except share and per share amounts)	For the years ended	
	December 31,	
	2018	2017
Revenue – mineral property sale	\$502	\$—
Costs, expenses and other		
Exploration expense	1,254	699
Depreciation and amortization	25	13
General and administrative	1,954	1,202
Total costs, expenses and other	3,233	1,914
Other (expense) income		
Interest and dividend income (net)	192	123
Gain on sale of marketable equity securities	—	578
Unrealized loss on marketable equity securities	(1,058)	—
Gain on derivative instruments	—	271
Loss on sale of assets	(1)	—
Total other income (expense)	(867)	972
Net loss	\$(3,598)	\$(942)
Loss per common share		
basic and diluted	\$(0.06)	\$(0.02)
Weighted average shares outstanding		
Basic and diluted	58,360	47,990

See Notes to Consolidated Financial Statements.

SOLITARIO ZINC CORP.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS

FOR THE YEARS ENDED DECEMBER 31, 2018 AND 2017

(in thousands of U.S. Dollars)

	For the year ended December 31,	
	2018	2017
Net loss for the period, before other comprehensive loss	\$(3,598)	\$(942)
Other comprehensive loss:		
Unrealized gain (loss) on marketable equity securities, net of deferred taxes	—	(136)
Comprehensive loss	\$(3,598)	\$(1,078)

See Notes to Consolidated Financial Statements.

43

SOLITARIO ZINC CORP.

CONSOLIDATED STATEMENTS OF SHAREHOLDERS' EQUITY

FOR THE YEARS ENDED DECEMBER 31, 2018 AND 2017

(in thousands, of U.S. Dollars except share amounts)	Common Stock		Additional	Accumulated	Accumulated	Total
	Shares	Amount	Paid-in	Deficit	Other	Shareholders'
			Capital		Comprehensive	Equity
					Income	
Balance at December 31, 2016	38,693,589	\$ 387	\$ 55,790	\$ (39,401)	\$ 712	\$ 17,488
Issuance of shares - Acquisition	19,788,177	198	13,456			13,654
Stock issuance costs - Acquisition			(117)			(117)
Replacement options	—	—	164	—	—	164
Stock option expense	—	—	50	—	—	50
Repurchase of shares for cancellation	(47,200)	(1)	(31)			(32)
Net loss	—	—	—	(942)	—	(942)
Net unrealized loss on marketable equity securities (net of deferred taxes)	—	—	—	—	(136)	(136)
Balance at December 31, 2017	58,434,566	584	69,312	(40,343)	576	30,129
Cumulative-effect adjustment change in accounting principle	—	—	—	576	(576)	—
Adjusted balance – January 1, 2018	58,434,566	584	\$ 69,312	\$ (39,767)	—	\$ 30,129
Stock option expense	—	—	660	—	—	660
Repurchase of shares for cancellation	(263,100)	(2)	(99)			(101)
Net loss	—	—	—	(3,598)	—	(3,598)
Balance at December 31, 2018	58,171,466	582	\$ 69,873	\$ (43,365)	\$ —	\$ 27,090

See Notes to Consolidated Financial Statements.

SOLITARIO ZINC CORP.

CONSOLIDATED STATEMENTS OF CASH FLOWS

FOR THE YEARS ENDED DECEMBER 31, 2018 AND 2017

(in thousands of U.S. Dollars)	For the year ended December 31,	
	2018	2017
Operating activities:		
Net loss	\$(3,598)	\$(942)
Adjustments to reconcile net loss to net cash used in operating activities:		
Unrealized loss on marketable equity securities	1,058	—
Gain on sale of marketable equity securities	—	(578)
Gain on derivative instruments	—	(271)
Employee stock option expense	660	50
Depreciation and amortization	25	13
Loss on sale of assets	1	—
Changes in operating assets and liabilities:		
Prepaid expenses and other current assets	(50)	52
Accounts payable and other current liabilities	547	18
Net cash (used in) operating activities	(1,357)	(1,658)
Investing activities:		
Sale of short-term investments - net	1,371	3,563
Loan to Zazu	—	(1,500)
Purchase of Zazu, net of cash acquired	—	(417)
Purchase of marketable equity securities	—	(578)
Proceeds from sale of marketable equity securities	—	666
Sale of derivative instrument, net	—	53
Additions to other assets	(10)	(2)
Net cash provided by investing activities	1,361	1,785
Financing activities:		
Repurchase of Solitario common stock for cancellation	(101)	(32)
Net cash used in financing activities	(101)	(32)
Net (decrease) increase in cash and cash equivalents	(97)	95
Cash and cash equivalents, beginning of year	214	119
Cash and cash equivalents, end of year	\$117	\$214
Supplemental disclosure of non-cash activities:		
Additions to mining equipment –Zazu, through issuance of stock in Acquisition	—	\$(100)
Additions to mineral property- Zazu, through issuance of stock in Acquisition	—	\$(15,611)
Additions to current assets, net – Zazu, through issuance of stock in Acquisition	—	\$(42)

Edgar Filing: SOLITARIO ZINC CORP. - Form 10-K

Issuance of common stock – Zazu acquisition	—	\$13,654
Convertible debenture – due from Zazu cancelled	—	\$1,510
Asset retirement obligation - Lik	—	\$125
Issuance of replacement options – Zazu	—	\$164
Transfer of warrant value to marketable equity securities on exercise of Vendetta Warrants	—	\$949

See Notes to Consolidated Financial Statements.

45

SOLITARIO ZINC CORP.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

For the years ended December 31, 2018 and 2017

1. Business and Summary of Significant Accounting Policies

Business and company formation

Solitario Zinc Corp. (“Solitario,” “Company”) is an exploration stage company as defined in Industry Guide 7, as issued by the United States Securities and Exchange Commission (“SEC”). Solitario was incorporated in the state of Colorado on November 15, 1984 as a wholly-owned subsidiary of Crown Resources Corporation (“Crown”). In July 1994, Solitario became a publicly traded company on the Toronto Stock Exchange (the “TSX”) through its initial public offering. Solitario has been actively involved in mineral exploration since 1993. Solitario’s primary business is to acquire exploration mineral properties and/or discover economic deposits on its mineral properties and advance these deposits, either on its own or through joint ventures, up to the development stage. At that point, or sometime prior to that point, Solitario would likely attempt to sell its mineral properties, pursue their development either on its own, or through a joint venture with a partner that has expertise in mining operations, or create a royalty with a third party that continues to advance the property. As a result of the Acquisition (defined below), Solitario is now primarily focused on the acquisition and exploration of zinc-related exploration mineral properties. In addition to focusing on its mineral exploration properties and the evaluation of mineral properties, Solitario also evaluates potential strategic corporate transactions for the potential acquisition of new precious and base metal properties and assets with exploration potential or business combinations that Solitario determines to be favorable to Solitario.

Purchase of Zazu

On July 12, 2017, Solitario completed the acquisition of Zazu Metals Corp. (“Zazu”) pursuant to a definitive arrangement agreement between Solitario and Zazu (the “Arrangement Agreement”) whereby Solitario agreed to acquire all of the issued and outstanding common shares of Zazu (the “Zazu Shares”) by way of a statutory plan of arrangement (the “Arrangement”) under the *Canada Business Corporations Act* (the “Acquisition”). The Arrangement was approved by the Ontario (Canada) Superior Court of Justice on July 7, 2017. Per the Arrangement, Solitario issued 19,788,177 shares of its common stock on July 12, 2017 in exchange for all of the issued and outstanding Zazu Shares, which represented 0.3572 shares of Solitario common stock for each outstanding Zazu Share. Solitario granted stock options to acquire an aggregate of 1,782,428 shares of Solitario common stock to Zazu option holders the (“Replacement Options”) in connection with the Acquisition. The total purchase price of \$16,110,000, recorded during the year ended December 31, 2017, is detailed below. Results of operations for Zazu are included in Solitario’s consolidated financial statements from the date of the Acquisition.

(in thousands)	July 12, 2017
Issuance of 19,788,177 shares of Solitario common stock	\$13,654
Replacement options	164
Investment banking and transaction costs	782
Convertible debenture due Solitario, cancelled	1,510
Total purchase price	\$16,110

The Acquisition was treated as an asset purchase. Accordingly, as the purchase of an asset (essentially the interest in the Lik project in Alaska) Solitario capitalized related transaction costs associated with the Acquisition, including the following costs:

(in thousands)	July 12, 2017
Investment banking fees	\$552
Legal and accounting costs	196
Other costs and fees	34
Total capitalized transaction costs	\$782

The purchase price was allocated to the assets and liabilities acquired from Zazu on the date of the Acquisition as follows:

(in thousands)	July 12, 2017
Cash	\$974
Other current assets	42
Equipment	100
Mineral property	15,611
Accounts payable	(492)
Asset retirement obligation – Lik	(125)
Total purchase price	\$16,110

The cash transaction costs less the cash acquired are shown as the cash transaction costs for the year ended December 31, 2017 on the consolidated statement of cash flows. Solitario also incurred stock issuance costs of \$117,000, related to the Acquisition, which were charged to equity.

Solitario has recorded revenue in the past from the sale of mineral property, including the sale on April 26, 2018 of its interest in the royalty on the Yanacocha property (discussed below) and the sale in 2015 of its former interest in Mount Hamilton LLC the owner of its former Mt. Hamilton project (the “Mt. Hamilton Transaction”), and joint venture property payments and the sale of a royalty on its former Mt. Hamilton project. Revenues from the sale or joint venture of properties, although significant when they occur, have not been a consistent annual source of revenue and would only occur in the future, if at all, on an infrequent basis.

Solitario currently considers its carried interest in the Florida Canyon project and its interest in the Lik project to be its core mineral property assets. Nexa Resources, Ltd. (“Nexa”), Solitario’s joint venture partner, is expected to continue the development and furtherance of the Florida Canyon project and Solitario is monitoring progress at Florida Canyon. Solitario is working with its 50% joint venture partner, Teck American Incorporated, a wholly-owned subsidiary of Teck Resources Limited (both companies are referred to as “Teck”), in the Lik deposit to further the exploration and evaluate potential development plans for the Lik project.

As of December 31, 2018, Solitario has significant balances of cash and short-term investments that Solitario anticipates using, in part, to further the development of the Florida Canyon project and the Lik project and to potentially acquire additional mineral property assets. The fluctuations in precious metal and other commodity prices has contributed to a challenging environment for mineral exploration and development, which has created opportunities as well as challenges for the potential acquisition of early-stage and advanced mineral exploration projects or other related assets at potentially attractive terms.

Financial reporting

The consolidated financial statements include the accounts of Solitario and its wholly-owned subsidiaries. All significant intercompany accounts and transactions have been eliminated in consolidation. The consolidated financial statements are prepared in accordance with accounting principles generally accepted in the United States of America ("generally accepted accounting principles") and are expressed in US dollars.

Revenue recognition

Solitario adopted ASU 2014-09 (defined below under "Recent accounting pronouncements") on January 1, 2018. ASU 2014-09 primarily impacts revenue recognition based upon the timing of transfer of control of goods and services sold. Historically Solitario has recorded revenue from the sale of exploration mineral properties and joint venture property payments. Solitario's policy is to recognize revenue from the sale of its exploration mineral properties (those without reserves) on a property by property basis, computed as the cash received and / or collectable receivables less any capitalized cost. Payments received for the sale of exploration property interests that are less than the properties cost are recorded as a reduction of the related property's capitalized cost. In addition, Solitario's policy is to recognize revenue on any receipts of joint venture property payments in excess of its capitalized costs on a property that Solitario may lease to another mining company.

Solitario has recognized revenue during 2018 for the first time in more than five years from the sale of an exploration mineral property, and expects, any property sales in the future to also be on an infrequent basis. The last proceeds from joint venture property payments was in 2015 and Solitario does not expect to record joint venture property payments on any of its currently held properties for the foreseeable future. Historically, Solitario's revenues have been infrequent and significant individual transactions and have only been from sales to well known or vetted mining companies. Solitario has never had a

return on any of its sales recorded as revenue in its history and does not anticipate it will recognize any estimated returns on its current or future recorded revenues. The adoption of ASU 2014-09 had no impact on Solitario's recorded revenues for the year ended December 31, 2018 or 2017. Solitario recorded the revenue of \$502,000 from the sale of the Yanacocha Royalty in accordance with ASU 2014-09.

Use of estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates. Some of the more significant estimates included in the preparation of Solitario's financial statements pertain to: (i) Solitario's carrying value of short-term investments; (ii) the recoverability of mineral properties related to its mineral exploration properties and their future exploration potential; (iii) the fair value of stock option grants to employees; (iv) the ability of Solitario to realize its deferred tax assets; and (v) Solitario's investment in marketable equity securities.

In performing its activities, Solitario has incurred certain costs for mineral properties. The recovery of these costs is ultimately dependent upon the sale of mineral property interests or the development of economically recoverable ore reserves and the ability of Solitario to obtain the necessary permits and financing to successfully place the properties into production, and upon future profitable operations, none of which is assured.

Cash and cash equivalents

Cash equivalents include investments in highly liquid money-market securities with original maturities of three months or less when purchased. At December 31, 2018, approximately \$113,000 of Solitario's cash and cash equivalents are held in brokerage accounts and foreign banks, which are not covered under the Federal Deposit Insurance Corporation ("FDIC") rules for the United States.

Short-term investments

At December 31, 2018, Solitario has United States Treasury securities ("USTS") with maturities of 15 days to 22 months recorded at their fair value of \$9,345,000. At December 31, 2018, Solitario has \$500,000 in separate bank certificates of deposit ("CDs") each with a maximum value of \$250,000, and each of which are covered by Federal Deposit Insurance Corporation insurance to the full-face value of the CDs. At December 31, 2018, the CDs have maturities of three months. In addition, Solitario has a US dollar bank savings account in Peru with a fair value of \$378,000. Solitario's short-term investments are recorded at their fair value, based upon quoted market prices. The short-term investments are highly liquid and may be sold in their entirety at any time at their quoted market price and are classified as a current asset.

Mineral properties

Solitario expenses all exploration costs incurred on its mineral properties prior to the establishment of proven and probable reserves through the completion of a feasibility study. Initial acquisition costs of its mineral properties are capitalized. Solitario regularly performs evaluations of its investment in mineral properties to assess the recoverability and/or the residual value of its investments in these assets. All long-lived assets are reviewed for impairment whenever events or circumstances change which indicate the carrying amount of an asset may not be recoverable, utilizing established guidelines based upon undiscounted future net cash flows from the asset or upon the determination that certain exploration properties do not have sufficient potential for economic mineralization.

Derivative instruments

Solitario accounts for its derivative instruments in accordance with ASC 815, "Accounting for Derivative Instruments and Hedging Activities" ("ASC 815"). Solitario acquired its investment in Vendetta Mining Corp. ("Vendetta") units, including the Vendetta Warrants (defined below) during 2016. During 2017, Solitario exercised all of its Vendetta Warrants and at December 31, 2018 and 2017 has no Vendetta Warrants. Changes in fair value of the Vendetta Warrants are recognized in the statements of operations in the period of change as gain or loss on derivative instruments. Solitario has entered into covered calls from time to time on its investment in Kinross marketable equity securities. Solitario has not designated its covered calls as hedging instruments and any changes in the fair value of the covered calls and its warrants are recognized in the statements of operations in the period of the change as gain or loss on derivative instruments.

Fair value

Financial Accounting Standards Board ASC 820, "Fair Value Measurements and Disclosures" ("ASC 820") establishes a framework for measuring fair value and requires enhanced disclosures about fair value measurements. ASC 820 clarifies that fair value is an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. For certain of Solitario's financial instruments, including cash and cash equivalents and accounts payable, the carrying amounts approximate fair value due to their short-term maturities. Solitario's short-term investments in USTS and CDs, its marketable equity securities and any covered call options against those marketable equity securities are carried at their estimated fair value based on quoted market prices. See Note 8, "Fair Value of Financial Instruments," below.

Marketable equity securities

Solitario's investments in marketable equity securities are classified as available-for-sale and are carried at fair value, which is based upon quoted prices of the securities owned. Solitario records investments in marketable equity securities as available-for-sale for investments in publicly traded marketable equity securities for which it does not exercise significant control and where Solitario has no representation on the board of directors of those companies and exercises no control over the management of those companies. The cost of marketable equity securities sold is determined by the specific identification method. Changes in fair value are recorded as unrealized gain or loss in the statement of operations. A decline in fair value that is considered other than temporary is recognized as a loss in the consolidated statements of operations.

Foreign exchange

The United States dollar is the functional currency for all of Solitario's foreign subsidiaries. Although Solitario's South American exploration activities during 2018 and 2017 were conducted primarily in Peru, a portion of the payments for the land, leasehold and exploration agreements as well as certain exploration activities are denominated in United States dollars. Foreign currency gains and losses are included in the results of operations in the period in which they occur.

Income taxes

Solitario accounts for income taxes in accordance with ASC 740, "Accounting for Income Taxes" ("ASC 740"). Under ASC 740, income taxes are provided for the tax effects of transactions reported in the financial statements and consist of taxes currently due plus deferred taxes related to certain income and expenses recognized in different periods for financial and income tax reporting purposes. Deferred tax assets and liabilities represent the future tax return consequences of those differences, which will either be taxable or deductible when the assets and liabilities are recovered or settled. Deferred taxes are also recognized for operating losses and tax credits that are available to offset future taxable income and income taxes, respectively. A valuation allowance is provided if it is more likely than not that some portion or all of the deferred tax assets will not be realized.

Accounting for uncertainty in income taxes

ASC 740 clarifies the accounting for uncertainty in income taxes recognized in a company's financial statements. ASC 740 prescribes a recognition threshold and measurement attribute for the financial statement recognition and measurement of a tax position taken or expected to be taken in a tax return. ASC 740 also provides guidance on derecognition, classification, interest and penalties, accounting in interim periods, disclosure, and transition. ASC 740 provides that a company's tax position will be considered settled if the taxing authority has completed its examination, the company does not plan to appeal, and it is remote that the taxing authority would reexamine the tax position in the future. These provisions of ASC 740 had no effect on Solitario's financial position or results of operations. See Note 6, "Income Taxes," below.

Earnings per share

The calculation of basic and diluted earnings (loss) per share is based on the weighted average number of shares of common stock outstanding during the years ended December 31, 2018 and 2017. Potentially dilutive shares, consisting of outstanding common stock options for 5,223,160 and 1,982,428, respectively, Solitario common shares were excluded from the calculation of diluted earnings (loss) per share for the year ended December 31, 2018 and 2017 because the effects were anti-dilutive.

Employee stock compensation and incentive plans

Solitario classifies all of its stock options as equity options in accordance with the provisions of ASC 718, “Compensation – Stock Compensation.” See Note 10, “Employee Stock Compensation Plans,” below.

Recently adopted accounting pronouncements

In January 2016 the FASB issued ASU 2016-01, “Financial Instruments – Overall (subtopic 825-10) Recognition and Measurement of Financial Assets and Liabilities,” (“ASU 2016-01”). ASU 2016-01 revises the classification and measurement of investment in certain equity investments and the presentation of certain fair value changes for certain financial liabilities measured at fair value. ASU 2016-01 requires the change in fair value of many equity investments to be recognized in net income. ASU 2016-01 is effective for interim and annual periods beginning after December 15, 2017, with early adoption permitted. Solitario adopted ASU 2016-01 in the first quarter of 2018. Solitario recorded a cumulative-effect adjustment for the change in accounting principle to accumulated deficit of \$576,000 related to the adoption of ASU 2016-01. See also Note 9, “Shareholders’ Equity and Accumulated Other Comprehensive Income,” below.

In May 2014, the FASB issued ASU No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*: Under ASU No. 2014-09, an entity should recognize revenue when it transfers promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. ASU No. 2014-09 also requires additional disclosure about the nature, amount, timing, and uncertainty of revenue and cash flows arising from customer contracts. This includes significant judgments and changes in judgments and assets recognized from costs incurred to obtain or fulfill a contract. Solitario adopted ASU No. 2014-09 in 2018 and it had no impact on Solitario’s financial position or results of operations.

Recently issued accounting pronouncements

In February 2016, the FASB issued Accounting Standards Updated (“ASU”) 2016-02, “Leases” (“ASU 2016-02”). The new standard establishes a right-of-use (ROU) model that requires a lessee to record a ROU asset and a lease liability on the balance sheet for all leases with terms longer than 12 months. Leases will be classified as either finance or operating, with classification affecting the pattern of expense recognition in the income statement. The new standard is effective for interim and annual periods beginning after December 15, 2018. The new rules will be effective for Solitario in the first quarter of 2019. Solitario expect the adoption of ASU 2016-02 to materially change net income or total expense in the statement of operations from its current accounting methods and has estimated it will record an asset and offsetting liability of approximately \$80,000 in the consolidated balance sheet upon adoption of ASU 2016-02 in January 2019.

The FASB issued ASU No. 2016-13, *Financial Instruments – Credit Losses (Topic 326): Measurements of Credit Losses on Financial Statements* (“ASU No. 2016-13”). Among other things, these amendments require the measurement of all expected credit losses for financial assets held at the reporting date based on historical experience, current conditions, and reasonable and supportable forecasts. Financial institutions and other organizations will now use forward-looking information to better inform their credit loss estimates. ASU No. 2016-13 is effective for Solitario for fiscal year, and interim periods within those fiscal years, beginning after December 15, 2019. Solitario does not expect the adoption of ASU No. 2016-13 to have a material impact, its consolidated financial position or results of operations.

In February 2018, the FASB issued ASU 2018-02, “Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income” (ASU 2018-02”), which allows for a reclassification from accumulated other comprehensive income or loss to retained earnings or accumulated deficit for stranded tax effects resulting from the Tax Cuts and Jobs Act of 2017 (“TCJA”). ASU 2018-02 also requires certain related disclosures. ASU 2018-02 is effective for annual periods, and interim periods within those annual periods, beginning after December 15, 2018 and should be applied either in the period of adoption or retrospectively to each period in which the effect of the change in the U.S. federal corporate income tax rate in the TCJA is recognized. Early adoption is permitted. Solitario does not expect the adoption of ASU 2018-02 will have a material effect on Solitario’s financial position or results of operations.

2. Mineral Properties:

The following table details Solitario’s capitalized investment in exploration mineral property:

(in thousands)	December 31,	
	2018	2017
Exploration		
Lik project (Alaska – US)	\$15,611	\$15,611
La Promesa (Peru)	6	6
Montana Royalty property (US)	40	40
Total exploration mineral property	\$15,657	\$15,657

Exploration property

Solitario's exploration mineral properties at December 31, 2018 and 2017 consist of use rights related to its exploration properties, and the value of such assets is primarily driven by the nature and amount of economic mineral ore believed to be contained, or potentially contained, in such properties. The amounts capitalized as mineral properties include concession and lease or option acquisition costs. Capitalized costs related to a mineral property represent its fair value at the time it was acquired. At December 31, 2018, none of Solitario's exploration properties have production (are operating) or contain proven or probable reserves. Solitario's exploration mineral properties represent interests in properties that Solitario believes have exploration and development potential. Solitario's mineral use rights generally are enforceable regardless of whether proven and probable reserves have been established. Solitario acquired the Lik project during 2017 in the Acquisition; see Note 1 above.

In addition to its capitalized exploration properties, Solitario has an interest in its Florida Canyon exploration concessions, which are currently subject to a joint venture agreement where joint venture partners made stand-by joint venture payments to Solitario prior to January 1, 2015. Solitario recorded joint venture property payment revenue received in excess of capitalized costs. Per the joint venture agreement, as of December 31, 2018, no further standby joint-venture payments are due to Solitario on the Florida Canyon project. At December 31, 2018 and 2017, Solitario has no remaining capitalized costs related to its Florida Canyon joint venture.

On April 26, 2018, Solitario sold the Yanacocha Royalty to a Newmont for \$502,000 in cash. Newmont owns the underlying mineral concessions covered by the Yanacocha Royalty. None of the concessions covered by the Yanacocha Royalty have any reported reserves or resources. Solitario had no mineral property capitalized cost in the Yanacocha Royalty and recorded Mineral Property Revenue of \$502,000 during 2018.

Discontinued projects

During 2017, Solitario abandoned its interests in the Aconchi and Norcan exploration properties in Mexico and Solitario no longer holds any interest in those properties. However, there were no capitalized mineral property costs related to these properties and Solitario did not record any mineral property write-downs during the year ended December 31, 2017.

Exploration Expense

The following items comprised exploration expense:

	For the year ended December 31,	
(in thousands)	2018	2017
Geologic and field expenses	\$1,165	\$447
Administrative	89	252
Total exploration expense	\$1,254	\$699

Asset Retirement Obligation

In connection with the Acquisition, Solitario recorded an asset retirement obligation of \$125,000 for Solitario's estimated reclamation cost of the existing disturbance at the Lik project. This disturbance consists of an exploration camp including certain drill sites and access roads at the camp. The estimate was based upon estimated cash costs for reclamation as determined by the permitting bond required by the State of Alaska, for which Solitario has retained a reclamation bond insurance policy in the event Solitario or its 50% partner, Teck, do not complete required reclamation.

Solitario has not applied a discount rate to the recorded asset retirement obligation as the estimated time frame for reclamation is not currently known, as reclamation is not expected to occur until the end of the Lik project life, which would follow future development and operations, the start of which cannot be estimated or assured at this time. Additionally, no

depreciation will be recorded on the related asset for the asset retirement obligation until the Lik project goes into operation, which cannot be assured.

3. Marketable Equity Securities

On May 2, 2016, Solitario purchased 7,240,000 units of Vendetta for aggregate consideration of \$289,000. Each unit included one common share of Vendetta and one warrant which allow the holder to purchase one share of Vendetta common stock at a price of Cdn\$0.10 per share for a period of two years (the “Vendetta Warrants”). The purchase price of the units of \$289,000 was allocated between the Vendetta common shares and the Vendetta Warrants based upon total fair values on the date of purchase. The Vendetta common stock was allocated a purchase cost of \$186,000 and the Vendetta Warrants were allocated a purchase cost of \$103,000. As discussed below, during 2017 Solitario exercised all of its Vendetta Warrants, and sold 3,480,000 shares of Vendetta common stock. As of December 31, 2018, Solitario owns 11,000,000 shares of Vendetta common stock which are carried at their fair value based upon the quoted market price of Vendetta, a publicly traded company on the TSX venture exchange, and included in marketable equity securities.

The following tables summarize Solitario’s marketable equity securities and adjustments to fair value:

(in thousands)	Year ended	
	December 31,	
	2018	2017
Marketable equity securities at cost	\$1,714	\$1,714
Cumulative unrealized (loss) gain on marketable equity securities	(129)	929
Marketable equity securities at fair value	\$1,585	\$2,643

The following table represents changes in marketable equity securities:

(in thousands)	Year ended	
	December 31,	
	2018	2017
Cost of marketable equity securities sold	\$—	\$88
Realized gain on marketable equity securities sold	—	578
Proceeds from the sale of marketable equity securities sold	—	(666)
Purchase of marketable equity securities	—	1,528
Gross (loss) gain on marketable equity securities	(1,058)	442
Change in marketable equity securities at fair value	\$(1,058)	\$1,304

The following table represents the realized and unrealized gain (loss) on marketable equity securities:

(in thousands)	Year ended	
	December 31,	
	2018	2017
Gross (loss) gain on marketable securities	\$(1,058)	\$442
Realized gain on marketable equity securities sold	—	(578)

Unrealized (loss) on marketable equity securities \$(1,058) \$(136)

During 2017, Solitario sold 3,480,000 Vendetta common shares, for cash proceeds of \$666,000. In addition, during 2017, Solitario exercised its Vendetta Warrants, also discussed below in Note 4, "Other Assets" and received 7,240,000 common shares of Vendetta. Solitario transferred the fair value of the Vendetta Warrants on the date of exercise of \$950,000, along with the cash paid to exercise the Vendetta Warrants of \$578,000 to marketable equity securities as the cost of the 7,240,000 common shares of Vendetta acquired.

4. Other Assets:

The following items comprised other assets:

(in thousands)	December	
	2018	2017
Furniture and fixtures, net of accumulated depreciation	\$36	\$31
Lik project equipment, net of accumulated depreciation	70	90
Exploration bonds and other assets	4	4
Total other assets	\$110	\$125

During 2017, Solitario acquired \$100,000 of exploration-related equipment at the Lik project as part of the Acquisition. The equipment is being depreciated over a five-year life on a straight-line basis and Solitario recorded depreciation expense of \$20,000 and \$10,000, respectively, during 2018 and 2017 related to this equipment.

During 2017, Solitario exercised 7,240,000 of its Vendetta Warrants and received 7,240,000 Vendetta common shares, by paying \$578,000 in cash to Vendetta. As a result, as of December 31, 2017, Solitario no longer owns any Vendetta Warrants. Upon the exercise of the Vendetta Warrants, Solitario transferred the fair value of the Vendetta Warrants on the date of exercise of \$950,000 along with the cash paid to exercise the Vendetta Warrants of \$578,000 to marketable equity securities as the cost of the 7,240,000 common shares of Vendetta acquired. During the year ended December 31, 2017, Solitario recorded a gain on derivative instruments of \$216,000 related to the Vendetta Warrants, with no similar item during 2018; see Note 7, “Derivative Instruments,” below.

5. Revenue mineral property sale

On April 26, 2018, Solitario sold its royalty interest in the non-producing Yanacocha property (the “Yanacocha Royalty”) to a wholly owned subsidiary of Newmont Mining Corporation (“Newmont”) for approximately \$502,000 in cash. The Yanacocha Royalty covered 43 concessions totaling 36,052 hectares. Newmont owns the underlying mineral concessions covered by the Yanacocha Royalty. None of the concessions covered by the Yanacocha Royalty had any reported reserves or resources. Solitario had no mineral property capitalized cost in the Yanacocha Royalty and recorded Mineral Property Revenue of \$502,000 during 2018.

6. Income Taxes:

Consolidated loss before income taxes includes losses from foreign operations of \$260,000 and \$322,000 in 2018 and 2017, respectively.

The net deferred tax assets/liabilities in the December 31, 2018 and 2017 consolidated balance sheets include the following components:

(in thousands)	2018	2017
Deferred tax assets:		
Loss carryovers	\$12,432	\$12,178
Investment in Mineral Property	1,669	1,952
Capitalized Exploration Costs	877	1,205
Stock option compensation expense	150	13
Royalty	—	989
Unrealized loss on derivative securities	60	28
Other	135	135
Valuation allowance	(15,099)	(16,249)
Total deferred tax assets	224	251
Deferred tax liabilities:		
Unrealized gain on derivative securities	—	—
Unrealized gains on marketable equity securities	209	230
Other	15	21
Total deferred tax liabilities	224	251
Net deferred tax liabilities	\$—	\$—

A reconciliation of expected federal income taxes on income (loss) from continuing operations at statutory rates, with the expense for income taxes is as follows:

(in thousands)	2018	2017
Expected income tax benefit	\$(756)	\$(355)
Equity based compensation	—	—
Foreign tax rate differences	(27)	17
State income tax	(143)	(27)
Impact of Tax Legislation	—	4,494
Adjustment to Deferred Taxes	2,058	—
Change in Tax Rate	53	—
Change in valuation allowance	(1,164)	(4,120)
Permanent differences and other	(21)	(9)
Income tax (benefit) expense	\$—	\$—

On December 22, 2017, the Tax Cuts and Jobs Act of 2017 (the “Tax Act”) was signed into law making significant changes to the Internal Revenue Code. Changes include, but are not limited to, a federal corporate tax rate decrease from 35% to 21% for tax years beginning after December 31, 2017, the transition of U.S international taxation from a worldwide tax system to a territorial system, and a one-time transition tax on the mandatory deemed repatriation of foreign earnings. In accordance with ASC 740, Income Taxes, the impact of a change in tax law is recorded in the period of enactment. Consequently, Solitario recorded a decrease to its net deferred tax assets of \$4,494,000 with a corresponding net adjustment to the valuation allowance for the year ended December 31, 2017.

While the Tax Act provides for a territorial tax system, beginning in 2018, it includes two new U.S. tax base erosion provisions, the global intangible low-taxed income (“GILTI”) provisions and the base-erosion and anti-abuse tax (“BEAT”) provisions.

The GILTI provisions require the Company to include in its U.S. income tax return foreign subsidiary earnings in excess of an allowable return on the foreign subsidiary’s tangible assets. The Company currently has no profitable foreign subsidiaries. Therefore, this provision currently has no impact on the Company.

The BEAT provisions in the Tax Act eliminates the deduction of certain base-erosion payments made to related foreign corporations and impose a minimum tax if greater than regular tax. The Company does not expect it will be subject to this tax and therefore has not included any tax impacts of BEAT in its consolidated financial statements for the years ended December 31, 2018 and 2017.

As a result of the acquisition of Zazu during the year ended December 31, 2017, Solitario acquired deferred tax assets totaling \$10,366,000 primarily related to US federal and state net operating losses, mineral properties and exploration

costs, and Canadian net operating losses. These deferred tax assets were fully offset by a valuation allowance. Solitario does not believe it is more likely than not that the assets will be utilized in the future. As a result of the ownership change of Zazu Metals (Alaska) Corp, utilization of its United States Federal and State of Alaska net operating losses will be limited due to the annual limitation provided by Section 382 of the Internal Revenue Code.

During 2018, the valuation allowance decreased primarily due to the adjustments to deferred taxes that were part of the Zazu acquisition and the disposition of royalties that were part of the Yanacocha sale. During 2017, the valuation allowance was increased primarily due to the acquisition of Zazu and the impact of the Tax Act.

At December 31, 2018, Solitario has unused US NOL carryovers of \$15,404,000 and unused US State NOL carryovers of \$15,980,000 which begin expiring in 2027. Solitario has unused Capital Loss carryovers of \$11,132,000 for US Federal and US State purposes which begin expiring in 2019. Solitario has Canadian loss carryforwards of \$9,205,000 which begin expiring in 2027. Other foreign loss carryforwards for which Solitario has provided a full valuation allowance related to Solitario's exploration activities in Peru. The Peru losses do not expire.

Solitario adopted ASC 740, which prescribes a recognition threshold and measurement attribute for the financial statement recognition and measurement of a tax position taken or expected to be taken in a tax return. ASC 740 requires that Solitario recognize in its consolidated financial statements, only those tax positions that are “more-likely-than-not” of being

sustained as of the adoption date, based on the technical merits of the position. As a result of the implementation of ASC 740, Solitario performed a comprehensive review of its material tax positions in accordance with recognition and measurement standards established by ASC 740. The provisions of ASC 740 had no effect on Solitario’s financial position, cash flows or results of operations at December 31, 2018 or December 31, 2017, or for the years then ended as Solitario had no unrecognized tax benefits.

Solitario and its subsidiaries are subject to the following material taxing jurisdictions: United States Federal, State of Colorado, State of Alaska, Canada and Peru. Solitario’s United States federal, Canada and State of Alaska returns for years 2016 and forward and Solitario’s Peru and State of Colorado returns for tax years 2014 and forward are subject to examination. Solitario’s policy is to recognize interest and penalties related to uncertain tax benefits in income tax expense. Solitario has no accrued interest or penalties related to uncertain tax positions as of December 31, 2018, or December 31, 2017 or for the years then ended.

7. Derivative Instruments:

Covered call options

From time to time Solitario has sold covered call options against its holdings of Kinross. The business purpose of selling covered calls is to provide additional income on a limited portion of shares of Kinross that Solitario may sell in the near term, which is generally defined as less than one year. Solitario has not designated its covered calls as hedging instruments as described in ASC 815, “Derivatives and Hedging,” and any changes in the fair value of its covered calls are recognized in the statement of operations in the period of the change. As of December 31, 2018, all of the covered calls had expired unexercised and there were no liabilities related to those calls entered during the year.

Vendetta Warrants

The Vendetta Warrants were exercised during 2017 and there are none remaining at December 31, 2018; see Note 4, “Other Assets” above.

Solitario recorded the following gain on derivative instruments:

(in thousands)	Year ended December
----------------	---------------------------

	31,
	20182017
Gain on Kinross calls	\$— \$55
Gain on Vendetta Warrants	— 216
	\$— \$271

8. Fair Value of Financial Instruments:

For certain of Solitario's financial instruments, including cash and cash equivalents, payables and short-term debt, the carrying amounts approximate fair value due to their short maturities. Solitario's marketable equity securities, including its investment in shares of Kinross common stock, Vendetta common stock and TNR Gold Corp (“TNR”) common stock, are carried at their estimated fair value primarily based on publicly available quoted market prices.

Solitario applies ASC 820 that establishes a framework for measuring fair value and requires enhanced disclosures about fair value measurements. ASC 820 clarifies that fair value is an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. ASC 820 also requires disclosure about how fair value is determined for assets and liabilities and establishes a hierarchy for which these assets and liabilities must be grouped, based on significant levels of inputs as follows:

Level 1: Quoted prices in active markets for identical assets or liabilities;

Level 2: Quoted prices in active markets for similar assets and liabilities and inputs that are observable for the asset or liability; or

Level 3: Unobservable inputs in which there is little or no market data, which require the reporting entity to develop its own assumptions.

The determination of where assets and liabilities fall within this hierarchy is based upon the lowest level of input that is significant to the fair value measurement. During the years ended December 31, 2018 and 2017, there were no reclassifications in financial assets or liabilities between Level 1, 2 or 3 categories.

The following is a listing of Solitario’s financial assets and liabilities required to be measured at fair value on a recurring basis and where they are classified within the hierarchy as of December 31, 2018:

(in thousands)	Level 1	Level 2	Level 3	Total
Assets				
Short-term investments	\$10,223	\$ —	\$ —	\$10,223
Marketable equity securities	\$1,585	\$ —	\$ —	\$1,585

The following is a listing of Solitario’s financial assets and liabilities required to be measured at fair value on a recurring basis and where they are classified within the hierarchy as of December 31, 2017:

(in thousands)	Level 1	Level 2	Level 3	Total
Assets				
Short-term investments	\$11,642	\$ —	\$ —	\$11,642
Marketable equity securities	\$2,643	\$ —	\$ —	\$2,643

Items measured at fair value on a recurring basis:

Short-term investments: At December 31, 2018 and 2017, Solitario’s holdings of short-term investments consist of USTS and CD’s and are recorded at their fair value based upon quoted market prices.

Marketable equity securities: At December 31, 2018 and 2017, the fair value of Solitario’s holdings in shares of Vendetta, Kinross, and TNR marketable equity securities and the Kinross calls are based upon quoted market prices.

During the year ended December 31, 2018, Solitario did not change any of the valuation techniques used to measure its financial assets and liabilities at fair value.

9. **Commitments and Contingencies:**

In acquiring its interests in mineral claims and leases, Solitario has entered into lease agreements, which may be canceled at its option without penalty. Solitario is required to make minimum rental and option payments in order to maintain its interests in certain claims and leases. See Note 2, “Mineral Properties,” above. Solitario estimates its 2019 property rentals and option payments for properties Solitario owns or operate to be approximately \$729,000.

Assuming that Solitario's joint ventures continue in their current status and that Solitario does not appreciably change its property positions on existing properties, approximately \$712,000 of these annual payments are paid or are reimbursable to us by Solitario's joint venture partners. In addition, Solitario may be required to make further payments in the future enters into new agreements.

Solitario has recorded an asset retirement obligation of \$125,000 related to its Lik project in Alaska. See Note 2, "Mineral Properties," above.

Solitario leases office space under a non-cancelable operating lease for the Wheat Ridge, Colorado office which provides for total minimum annual rent payments of \$43,000 through March of 2021.

In August of 2018, Solitario agreed to fund a portion of a 2018 – 2019 drilling program at the Florida Canyon project. Per the agreement, Solitario will fund up to \$1,580,000 of a planned 41-hole 17,000-meter drilling program to be conducted through December 31, 2019 (the "Drilling Program"). Upon Nexa completing the first 1,700 meters of the Drilling Program, Solitario will pay Nexa \$527,000, upon completion of the next 1,700 meters (3,400 meters total) of the Drilling Program, Solitario will pay Nexa \$527,000, and upon completion of the next 1,700 meters (5,100 meters total) of the Drilling Program, Solitario will pay Nexa the balance remaining on its \$1,580,000 funding commitment, or \$526,000. Solitario has no obligation to pay Nexa prior to the attainment of the separate 1,700-meter thresholds. The funding commitments are in the form of an advance on Solitario's commitment to fund 30% of any future development of Florida Canyon under the existing joint venture agreement with Nexa. Accordingly, in the event Florida Canyon is developed, which cannot be assured at this time, any funds paid to Nexa under this agreement, will reduce the amount of Solitario's obligation to fund 30% of future development costs, and / or repay loans from Nexa for future development costs at the Florida Canyon project. As of December 31, 2018, Nexa had completed four holes and a total of 2,203 meters under the Drilling Program, and Solitario has recorded an account payable to Nexa of \$527,000 and recorded a charge to exploration expense of \$527,000, should Nexa complete the remaining 2,897 meters (5,100 meters less the completed 2,203 meters) during 2019, Solitario will be obligated to pay Nexa \$1,053,000 in addition to its currently recorded account payable of \$527,000 during 2019.

10. Employee Stock Compensation Plans:

On June 18, 2013, Solitario's shareholders approved the Solitario Resources Corporation Omnibus Stock Incentive Plan (the "2013 Plan"). Under the terms of the 2013 Plan, as amended, a total of 5,750,000 shares of Solitario common stock are reserved for awards to directors, officers, employees and consultants. Awards granted under the 2013 Plan may take the form of stock options, stock appreciation rights, restricted stock, and restricted stock units. The terms and conditions of the awards are pursuant to the 2013 Plan and are granted by the Board of Directors or a committee appointed by the Board of Directors.

a.) 2013 Plan stock option grants

The following table shows the grant date fair value of Solitario's awards during 2018 pursuant to the 2013 Plan:

Grant Date	1	/02/18(1)	11	/01/18(2)
Option – grant date price	\$0.62		\$0.31	
Options granted	100,000		1,623,000	
Expected life years	0.80		5.00	
Expected volatility	66	%	64	%
Risk free interest rate	1.0	%	3.0	%
Weighted average fair value	\$0.12		\$0.17	
Grant date fair value	\$12,000		\$282,000	

(1) Option granted to a consultant had an expected life of 0.8 years on grant date and was fully vested during 2018.

(1) Option remains vested for a maximum of five years from date of grant or termination of the consulting contract.

(2) Option grants have a five-year term, and vest 25% on date of grant and 25% on each of the next three anniversary dates.

The following table shows the grant date fair value of Solitario's awards during 2017 pursuant to the 2013 Plan:

Grant Date	7	/12/17(1)	7	/12/17(1)	7	/12/17(1)	7	/12/17(1)	9	/01/17(2)	9	/01/17(2)
Option – grant date price	\$1.74		\$1.52		\$1.30		\$0.54		\$0.77		\$0.77	
Options granted	357,200		425,068		785,840		214,320		200,000		2,300,000	
Expected life years	0.84		1.35		1.50		1.50		5.0		5.0	
	67	%	67	%	67	%	67	%	64	%	64	%

Expected volatility												
Risk free interest rate	1.0	%	1.0	%	1.0	%	1.0	%	1.7	%	1.7	%
Weighted average fair value	\$0.02		\$0.08		\$0.12		\$0.36		\$0.42		\$0.42	
Grant date fair value	\$7,000		\$26,000		\$72,000		\$59,000		\$126,000		\$970,000	

Replacement Options had terms of May 15, 2018, November 15, 2018, January 12, 2019 and January 12, 2019.

- (1) The Replacement Options were fully vested on the date of grant. Replacement Options were priced in Canadian Dollars, the grant day prices reflect the US Dollar price exchange rate of .07749 Cdn\$/US\$ on the date of grant.
- (2) Options grants have a five-year term, and vest 25% on date of grant and 25% on each of the next three anniversary dates.
- (3) Conditional Options, (defined below) approved by Solitario shareholders on June 19, 2018.

b.) Stock option activity

During 2018 and 2017 no options granted from the 2013 Plan were exercised. The following table summarizes the activity for stock options outstanding under the 2013 Plan for the years ended December 31, 2018 and 2017:

	2018			2017		
	RSUs/ Options	Weighted Average Exercise Price	Aggregate Intrinsic Value (1)	RSUs/ Options	Weighted Average Exercise Price	Aggregate Intrinsic Value (2)
Outstanding, beginning of year	1,982,428	\$ 1.29	—	—	—	—
Granted (3)	4,023,000	\$ 0.58	—	1,982,428	\$ 1.29	—
Exercised	—	—	—	—	—	—
Expired	(782,268)	\$ 2.09	—	—	—	—
Forfeited	—	—	—	—	—	—
Outstanding, end of year	5,223,160	\$ 0.76	\$ —	1,982,428	\$ 1.29	\$ 9,000
Exercisable, end of year	2,770,910	\$ 0.95	\$ —	1,832,428	\$ 1.33	\$ 9,000

(1) Intrinsic value based upon December 31, 2018 price of a share of Solitario common stock as quoted on the NYSE American exchange of \$0.23 per share.

(2) Intrinsic value based upon December 31, 2017 price of a share of Solitario common stock as quoted on the NYSE American exchange of \$0.60 per share.

(3) Options granted during 2018, include 2,300,000 Conditional Options, approved by Solitario shareholders on June 19, 2018.

During the years ended December 31, 2018 and 2017, Solitario recorded \$660,000 and \$50,000, respectively, of stock option expense under the 2013 Plan for the amortization of the grant date fair value of each of its outstanding options with a credit to additional paid-in-capital. At December 31, 2018, the total unrecognized stock option compensation cost related to non-vested options is \$639,000 and is expected to be recognized over a weighted average period of 24 months.

On September 1, 2017, the Board of Directors granted, subject to shareholder approval at the next meeting of shareholders, 2,300,000 stock options under the 2013 Plan to officers and members of the Board of Directors (the "Conditional Options"). The Conditional Options were approved by Solitario's shareholders at Solitario's annual meeting on June 19, 2018. The Conditional Options vest on the schedule of 25% on date of approval of the grant (June 19, 2018) and 25% on each of the next three anniversary dates of the date of grant (September 1, 2018, 2019 and 2020).

11. Shareholders' equity and accumulated other comprehensive income

We adopted ASU 2016-01 in the first quarter of 2018. We recorded a cumulative-effect adjustment for the change in accounting principle to from other comprehensive income in the equity section of the consolidated balance sheet to accumulated deficit of \$576,000 related to the adoption of ASU 2016-01. During 2017 we recorded an unrealized loss on marketable equity securities of \$136,000 as other comprehensive income in the statement of shareholders equity for the year ended December 31, 2017.

12. Share Repurchase Program

On October 28, 2015, Solitario's Board of Directors approved a share repurchase program that authorized Solitario to purchase up to two million shares of its outstanding common stock. During 2018 Solitario's Board of Directors extended the expiration date of the share repurchase program through December 31, 2019. During the years ended December 31, 2018 and 2017, Solitario purchased 263,100 and 47,200 shares of Solitario common stock, respectively, for an aggregate purchase price of \$101,000 and \$32,000, respectively. As of December 31, 2018, Solitario has purchased a total of 930,900 shares for an aggregate purchase price of \$449,000 under the share repurchase program since its inception.

13. Subsequent Event

The financial statements and related disclosures include an evaluation of events leading up through and including February 28, 2019, which is the date the financial statements were issued. On January 22, 2019, Solitario announced the sale of its interests in a retained royalty on the Pedra Branca project in Brazil, a retained royalty on non-producing exploration properties in Mexico, and a royalty on certain non-producing mineral claims in Montana to SilverStream for Cdn\$250,000 in cash and a one-year note from SilverStream for Cdn\$350,000.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None

Item 9A. Controls and Procedures

The management of Solitario is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rule 13a-15(e) of the Exchange Act). During the fiscal period covered by this report, Solitario's management, with the participation of the Chief Executive Officer and Chief Financial Officer, carried out an evaluation of the effectiveness of Solitario's internal control over financial reporting and the design and operation of Solitario's disclosure controls and procedures (as defined in Rule 13a-15(e) of the Exchange Act). This evaluation of the effectiveness of our internal control over financial reporting was based on the framework and criteria established in *Internal Control – Integrated Framework (2013)*, issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on such evaluations, Solitario's Chief Executive Officer and Chief Financial Officer have concluded that, as of December 31, 2018, Solitario's internal control over financial reporting is effective and that its disclosure controls and procedures are effective to ensure that information required to be disclosed by Solitario in reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the required time periods and are designed to ensure that information required to be disclosed in its reports is accumulated and communicated to Solitario's management, including the Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure. There were no changes in internal control over financial reporting during the three months ended December 31, 2018.

This Annual Report does not include an attestation report of our independent registered public accounting firm regarding internal control over financial reporting. As a smaller reporting company, Solitario's management's report was not subject to attestation by our independent registered public accounting firm pursuant to rules of the SEC that permit us to provide only management's report in this annual report.

Item 9B. Other Information

None

PART

III

Item 10. Directors, Executive Officers and Corporate Governance

The information required under Item 10 is incorporated herein by reference to the information set forth in our definitive proxy statement in connection with the annual meeting of shareholders to be filed with the SEC within 120 days after the end of our fiscal year ended December 31, 2018 pursuant to Section 14(a) of the Exchange Act (the "2019 Proxy").

Item 11. Executive Compensation

The information required under Item 11 is incorporated herein by reference to the information set forth in the 2019 Proxy.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The information with respect to Item 12 is incorporated herein by reference to the information set forth in the 2019 Proxy.

Item 13. Certain Relationships and Related Transactions, and Director Independence

The information with respect to Item 13 is incorporated herein by reference to the information set forth in the 2019 Proxy.

Item 14. Principal Accounting Fees and Services

The information required under Item 14 is incorporated herein by reference to the information set forth in the 2019 Proxy.

PART IV

Item 15. Exhibits, Financial Statement Schedules

The following documents are filed as a part of this Annual Report on Form 10-K:

1. Financial Statements

The following financial statements contained in Part II, Item 8 are filed as part of this Annual Report on Form 10-K:

Consolidated Financial Statements
Report of Independent Registered Public Accounting Firm
Consolidated Balance Sheets as of December 31, 2018 and 2017
Consolidated Statements of Operations for the years ended December 31, 2018 and 2017
Consolidated Statements of Comprehensive Income (Loss) for the years ended December 31, 2018 and 2017
Consolidated Statements of Shareholders' Equity for the years ended December 31, 2018 and 2017
Consolidated Statements of Cash Flows for the years ended December 31, 2018 and 2017
Notes to Consolidated Financial Statements

2. Financial Statement Schedules

Financial statement schedules are omitted because they are not required or are not applicable, or the required information is provided in the consolidated financial statements or notes thereto described in Item 15(1) above.

3. Exhibits

The Exhibits listed in the Index to Exhibits, which appears immediately following the signature page and is incorporated herein by reference, are filed as part of this Annual Report on Form 10-K.

Item 16. Form 10-K Summary

None.

61

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.

SOLITARIO ZINC CORP.

By: /s/ James R. Maronick
Chief Financial Officer

Date: February 28, 2019

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.

Signature	Title	Date
<u>/s/</u> Christopher E. Herald, Chief Executive Officer	Principal Executive Officer and Director	February 28, 2019
<u>/s/</u> James R. Maronick, Chief Financial Officer	Principal Financial and Accounting Officer	February 28, 2019
<u>/s/</u> John Labate		
<u>/s/</u> Brian Labadie	A majority of the Board of Directors	February 28, 2019
<u>/s/</u> James Hesketh		
<u>/s/</u>		

Gil Atzmon

|
|
|
|

/s/

Joshua D. Crumb

By: /s/

James R. Maronick,
Attorney-in-fact

62

INDEX TO EXHIBITS

Description

- 2.1 Arrangement Agreement and Plan of Arrangement dated April 26, 2017, among Solitario Exploration & Royalty Corp. and Zazu Metals Corporation (incorporated by reference to Exhibit 2.1 to Solitario's Current Report on Form 8-K filed on July 14, 2017)
- 3.1 Amended and Restated Articles of Incorporation of Solitario Exploration & Royalty Corp., as Amended (incorporated by reference to Exhibit 3.1 to Solitario's Form 10-Q filed on August 10, 2010)
- 3.1.1 Articles of Amendment to Restated Articles of Incorporation of Solitario Zinc Corp. (incorporated by reference to Exhibit 3.1 to Solitario's Current Report on Form 8-K filed on July 14, 2017)
- 3.2 Amended and Restated By-laws of Solitario Exploration & Royalty Corp. (incorporated by reference to Exhibit 99.1 to Solitario's Form 8-K filed on March 22, 2013)
- 4.1 Form of Common Stock Certificate of Solitario Zinc (incorporated by reference to Exhibit 4.1 to Solitario's Form 10-Q filed on November 8, 2017)
- 10.1# 2013 Solitario Exploration & Royalty Corp. Omnibus Stock and Incentive Plan (incorporated by reference to Exhibit 10.2 to Solitario's Form 8-K filed on June 20, 2013)
- 10.2 Alliance Agreement, dated January 18, 2005, between Solitario Resources Corporation and Newmont Overseas Exploration Limited (incorporated by reference to Exhibit 99.1 to Solitario's Form 8-K filed on January 20, 2005)
- 10.3# Change in Control Severance Benefits Agreement between Solitario Resources Corporation and Christopher E. Herald, dated as of March 14, 2007 (incorporated by reference to Exhibit 99.1 to Solitario's Form 8-K filed on March 14, 2007)
- 10.4# Change in Control Severance Benefits Agreement between Solitario Resources Corporation and James R. Maronick, dated as of March 14, 2007 (incorporated by reference to Exhibit 99.2 to Solitario's Form 8-K filed on March 14, 2007)
- 10.5# Change in Control Severance Benefits Agreement between Solitario Resources Corporation and Walter W. Hunt, dated as of March 14, 2007 (incorporated by reference to Exhibit 99.3 to Solitario's Form 8-K filed on March 14, 2007)
- 10.6 Framework Agreement for the Exploration and Development of Potential Mining Properties, related to Solitario's 100% owned Florida Canyon project in Peru between Minera Florida Canyon S.A., Minera Solitario Peru S.A.C., Solitario Resources Corporation, and Votorantim Metais – Cajamarquilla S.A., dated March 24, 2007 (incorporated by reference to Exhibit 10.2 to Solitario's Form 8-K filed on October 4, 2007)
- 10.7# First Amendment to the 2013 Solitario Exploration & Royalty Corp. Omnibus Stock and Incentive Plan (incorporated by reference to Exhibit 10.1 to Solitario's Form 8-K filed on June 29, 2017)

- 14.1 Code of Ethics for the Chief Executive Officer and Senior Financial Officer (incorporated by reference to Exhibit 99.1 to Solitario's Form 8-K filed on July 18, 2006)
- 21.1 * Subsidiaries of Solitario Zinc Corp.
- 23.1 * Consent of EKS&H LLLP
- 23.2 * Consent of Plante Moran PLLC

24.1 * Power of Attorney

31.1 * Certification of Chief Executive Officer pursuant to SEC Rule 13a-14(a)/15d-14(a) as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002

31.2 * Certification of Chief Financial Officer pursuant to SEC Rule 13a-14(a)/15d-14(a) as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002

32.1 * Certification of Chief Executive Officer and Chief Financial Officer pursuant to 18 U.S.C Section 1350 as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002

101 * The following financial statements, formatted in XBRL: (i) Consolidated Balance Sheets as of December 31, 2018 and 2017; (ii) Consolidated Statements of Operations for the years ended December 31, 2018 and 2017; (iii) Consolidated Statements of Comprehensive Income (Loss) for the years ended December 31, 2018 and 2017; (iv) Consolidated Statements of Shareholders' Equity for the years ended December 31, 2018 and 2017; (v) Consolidated Statements of Cash Flows for the years ended December 31, 2018 and 2017; and (vi) Notes to the Consolidated Financial Statements.

* Filed herewith

Designates a management contract, or a compensatory plan or arrangement.