Search Minerals Provides Pilot Plant Optimization Update

written by Raj Shah | October 23, 2019

October 23, 2019 (Source) – **Search Minerals Inc. ("Search" or the "Company") (TSXV: SMY)** is pleased to provide an update of the current pilot plant optimization being carried out by SGS Canada in Lakefield, Ontario. The SGS Minerals test program designed to optimize the Search Minerals Direct Extraction Process for Rare Earth Element Recovery is nearing successful completion.

HIGHLIGHTS:

- **The absence of acid during material heating is favourable for equipment selection and maintenance as acid corrosivity was significantly reduced**
- **Gains in rare earth recovery can be obtained by fine crushing of the primary material**
- **Process flowsheet simplification by placing uranium removal in the much smaller re-leach circuit**
- **Re-leaching of the rare earth carbonate was optimized to permit high rare earth recovery and minimum co-extraction of impurities**
- **Removal of thorium from the re-leach solution by selective solvent extraction**

Greg Andrews, President and CEO stated; "We are receiving significant improvements and efficiencies to our proprietary direct extract process flowsheet during this optimization program. The data and information gathered during the program will be used to prepare a preliminary economic assessment for capital and operating costs along with engineering plans to build a demonstration plant in St. Lewis, Labrador. These

processing advancements along with our recent DEEPFOX resource estimate announcement well positions Search to become a crucial player in the creation of a secure North American rare earth element supply chain."

The Direct Extraction Process involves the following unit operations.

1. Material Crushing
2. Sulfuric Acid Treatment of the Crushed Material at ~190 °C for 4 hours
3. Water Leaching of the Acid/Material Mixture at 90 °C for 24-36 hours
4. Iron and Impurity Removal by Magnesium Carbonate Addition to pH 3-3.5
5. Filtration and Washing of the Leach Residue and Iron Precipitate
6. Uranium Removal by Ion Exchange
7. Precipitation of a Mixed Rare Earth Carbonate by Addition of Sodium Carbonate
8. Re-Leaching of the Mixed Rare Earth Carbonate with Sulfuric Acid and Filtration of Un-Leached Residue
9. Thorium Removal by Precipitation
10. Zinc Removal by Precipitation as Zinc Sulfide
11. Rare Earth Oxalate Precipitation and Calcination to Produce a Mixed Rare Earth Oxide of High Purity (+99% REO) for Refining

The SGS Program funded by Search Minerals with significant support from the Newfoundland and Labrador Department of Tourism, Culture, Industry and Innovation ("**TCII**") and from the Atlantic Canada Opportunities Agency ("**ACOA**") was designed to optimize the process in the areas of hot sulfuric acid treatment, water leaching, uranium removal, re-leaching of the mixed rare earth carbonate and thorium removal. A composite

sample of material from the Foxtrot deposit was used for all testing. The analysis of the rare earth oxide content was 1.10% TREO consistent with prior work.

Rare Earth Oxide	Analysis (%)
La_2O_3	0.188
Ce_2O_3	0.399
Pr_6O_{11}	0.049
Nd_2O_3	0.175
Sm_2O_3	0.031
Eu_2O_3	0.002
Gd_2O_3	0.032
Tb_4O_7	0.0048
Dy_2O_3	0.027
Ho_2O_3	0.0054
Y_2O_3	0.150
Er_2O_3	0.015
Tm_2O_3	0.002
Yb_2O_3	0.013
Lu_2O_3	0.0018
Total	1.10

The significant results achieved to date include the following:

1. A pilot plant test of material heating followed by hot acid mixing was completed. The use of material heating ahead of acid treatment did not impact rare earth extraction in the subsequent water leaching. The absence

of acid during material heating is favourable for equipment selection and maintenance as acid corrosivity was significantly reduced.

2. A study of material crush size on rare earth extraction showed that a significant increase in REE extraction could be achieved by crushing the material to 0.5 mm prior to acid treatment and water leach at 90 °C and 10% solids for 24 hours. The water leach extractions for the key elements were 89% Pr, 89% Nd, 78% Tb and 77% Dy. These results indicate further gains in rare earth recovery can be obtained by fine crushing of the primary material.
3. Uranium removal was demonstrated on the primary leachate after iron removal or from the re-leach solution (formed by acid leaching of the rare earth carbonate). The uranium can be removed by conventional ion exchange in either location in the process to below detection limit. These results allow process flowsheet simplification by placing uranium removal in the much smaller re-leach circuit.
4. The re-leaching of the rare earth carbonate was optimized to permit high rare earth recovery and minimum co-extraction of impurities.
5. A pilot plant test was performed on removal of thorium from the re-leach solution by selective solvent extraction. The pilot plant test treated rare earth leachate in two stages of extraction with a primary amine solvent, followed by two scrub stages with dilute sulfuric acid and finally two strip stages with dilute hydrochloric acid. The thorium content of the solution was reduced from 4.83 mg Th/L to 0.03-0.07 mg Th/L representing approximately 99% removal efficiency with negligible extraction of rare earth elements. The low level of thorium in solution will result in < 5 g Th/t in the mixed rare earth oxide from the process to meet all rare earth

refinery specifications. The small amount of thorium and minor amounts of rare earths in the strip solution will be directed to the main water leach circuit for precipitation of thorium into the final leach residue and recovery of the rare earths. The demonstration of this thorium control process was a major achievement of the SGS program.

The SGS group will complete the program by treating the thorium – free solution containing rare earths with (1) sulfide ion to precipitate zinc and (2) oxalate to precipitate a mixed rare earth oxalate. The rare earth oxalate will then be calcined to form a mixed rare earth oxide. The mixed rare earth oxide is anticipated to have a purity of +99% rare earth oxide content, consistent with previous work.

The SGS Minerals program has resulted in significant optimization of the Search Direct Extraction Process with respect to process simplification, increased operating flexibility, reduced chemical consumption and more robust management of minor element impurities.

Qualified Person:

Dr. David Dreisinger, Ph.D., P.Eng., is the Company's Vice President, Metallurgy and Qualified Person for the purposes of NI 43-101. Dr. Dreisinger has reviewed and approved the technical disclosure contained in this news release as applicable. The company will endeavour to meet high standards of integrity, transparency, and consistency in reporting technical content, including geological and assay (e.g., REE) data.

About Search Minerals Inc.

Led by a proven management team and board of directors, Search is focused on finding and developing resources within the

emerging Port Hope Simpson Critical Rare Earth Element ("**CREE**") District of South East Labrador (the "**District**"). The Company controls a belt 70 km long and 8 km wide including its 100% interest in the FOXTROT and DEEP FOX Projects, which are road accessible and at tidewater. Exploration efforts have advanced "Fox Meadow" as a significant new CREE prospect very similar to and in close proximity to FOXTROT and DEEP FOX. The FOXTROT Project has a low capital cost to bring the initial project into production ($152 M), a short payback period and is scalable due to Search's proprietary processing technology.

The FOXTROT preliminary economic assessment is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realized. The preliminary economic assessment includes the results of an economic analysis of mineral resources. Mineral resources are not mineral reserves and do not have demonstrated economic viability.

All material information on the Company may be found on its website at www.searchminerals.ca and on SEDAR at www.sedar.com

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