

NioCorp's niobium, scandium, and titanium make the U.S. critical minerals list

NioCorp Developments Ltd. (TSX: NB | OTCQX: NIOBF) owns the Elk Creek niobium-scandium-titanium project in Southeast Nebraska, USA. NioCorp is focused on the three superalloy materials niobium, scandium, and titanium. All three of which were last week included in the "critical minerals" list of just 35 critical minerals, by the US Government.

Niobium is mostly used for steel alloys as it makes steel lighter and stronger. Niobium is used in bridges and other large infrastructure projects, in high pressure oil and gas pipelines, in virtually all steel-chassis vehicles, and in many other applications. NioCorp states – "\$9 of Niobium added to a mid-sized automobile reduces its weight by 100kg, increasing fuel efficiency by 5%."

Scandium is also used for light weighting. It is used in aluminum-scandium alloys for aerospace industry components and for sports equipment such as bicycle frames, fishing rods, golf iron shafts and baseball bats. NioCorp states – "Scandium expert says airline industry stands to reap hundreds of millions of dollars in annual savings by integrating scandium alloys into commercial jetliners."

Titanium is as strong as steel but much less dense. It is therefore important as an alloying agent with many metals including aluminum, molybdenum and iron. These alloys are mainly used in aircraft, spacecraft and missiles because of their low density and ability to withstand extremes of temperature.



Niobium, Scandium and Titanium

NioCorp's Elk Creek has the highest-grade primary niobium resource in North America, and the only such resource under development in the US. Elk Creek has Probable Reserves of 31.7 million tonnes of ore at 0.79% niobium (Nb₂O₅), 71.6 grams per tonne (g/t) scandium (Sc), and 2.81% TiO₂. Indicated Mineral Resources are 90.9 million tonnes at 0.66% Nb₂O₅, 70 g/t Sc, and 2.59% TiO₂. The Elk Creek deposit is open in three directions: to the northwest, southeast, and at depth.

Infrastructure is good with the deposit located next to a highway and rail line.

Figure 4.1 Project Location Map



NioCorp Elk Creek Nebraska location map

The December 2017 Definitive Revised Feasibility Study resulted in a post-tax NPV 8% of \$1.7 billion, with post-tax IRR of 21.7%, a 32-year mine life with a 3.4 year pre-tax payback period from onset of production. The project is expected to produce an average of 7,055 tonnes per annum (tpa) of ferroniobium, 103 tpa of scandium trioxide, and 11,445 tpa of titanium dioxide. CapEx was estimated to be US\$1b. Forecast production costs (net of TiO₂ byproduct credit) are \$12.14/kg of niobium (on a niobium equivalent basis) and \$1,127/kg of Sc₂O₃ (on a Sc₂O₃ equivalent basis).

NioCorp has 75% of their primary product ferroniobium already under contract for the first 10 years of production – 50% to ThyssenKrupp Metallurgical Products GmbH and 25% to CMC Cometals.

NioCorp is still very well valued with a market cap of just CAD \$152m, compared to a NPV of \$1.7b.

NioCorp's challenges lie around funding their large CapEx. However, given their very impressive Feasibility Study result, their 75% ferroniobium off-take commitments, and their

eligibility for the German Government loan guarantee program the company is well positioned to progress to the final stages.

Of key significance is the fact that the US relies on China and Russia for these three critical metals. With last week's change to include niobium, scandium and titanium in the US critical minerals list, and with NioCorp's 2021 timeline to production, that could soon change.

Feasibility Study results position NioCorp “shares to head skyward”

NioCorp Developments Ltd. (TSX: NB | OTCQX: NIOBF) (“NioCorp”) released a positive feasibility study for its Elk Creek project in Southeast Nebraska. The results show that the deposit contains valuable niobium, scandium and titanium metals. The primary focus of the group is to produce ferroniobium and to this end, the company has already secured an offtake for 75% of its production, which de-risks the project considerably.

According to the feasibility study, this massive ore body has a potential value of \$17.6bn over a life of 32 years and has the capacity to produce 143,824 tonnes of niobium, 3,237 tonnes of scandium and 359,128 tonnes of titanium oxides. Capital raising is already in full swing, with \$2m already secured in a private placement so that construction on the mine can begin. The company must now execute a graceful run-up to completing the \$1bn facility that could turn Nebraska, which is not a major mining destination by local or global

standards, into the state's major mining destination.

Taking a total of only 36 months, the feasibility study was completed remarkably efficiently, which is largely attributable to the experience of the management team allowing them to move more confidently through the formalities of the exploration stage. Now that the project is de-risked, the company can follow-up on an in-principal agreement with a loan guarantee scheme from the German government to serve as debt financing. This loan agreement will be sufficient to kickstart decent equity financing and propel NioCorp to the ranks of major producer.

The study's results show that the potential returns are indeed substantial and demonstrates a positive net present value (NPV) and internal rate of return (IRR) of \$2.3billion and 24.3% respectively, at a discount rate of 8% and an after-tax NPV of \$1.7bn. The payback period following production is expected to be 3.4 years. With three quarters of the company's ferroniobium production already committed, recouping the cost outlay should be a smooth run.

Over the last six years, more than \$6bn was invested into the niobium market and the landscape of this niche metal has gone through considerable changes in a very short time frame. For years, ferroniobium demand was met by almost entirely by the Salles family in Brazil (CMBB), with Anglo American's Brazilian operations providing the balance. IAMGOLD in Canada was arguably the only other significant producer. Since this time, 30% of CMBB has been sold to two Asian consortia for \$3.9bn, while IAMGOLD sold its deposit to Magris Resources, a private equity firm, backed by Singapore and Hong Kong investors and not to be left behind, Anglo American sold its Brazilian based niobium business to China Molybdenum (CMOC). Today, Asian investors are said to own more than one third of the globe's ferroniobium production capacity.

Ferroniobium is used to increase steel strength, and with the

US's emphasis on domestic infrastructure development, high-strength steel is going to be important in the medium term. Moreover, as the largest players are now in Asian hands, the regional diversification, that Niocorp offers, cannot be underestimated.

With a key federal permit in-hand, NioCorp's advance should be fairly swift, especially considering that management have completed the feasibility stage in such a short time frame. Once the funding is secured, construction could be complete within a couple of years, and with numbers like these, the value of the company's shares are set to head skyward. NioCorp is currently trading at C\$0.68 with a market cap of C\$129.74m, and investors hopeful about making money from the junior mining world should be looking for the most feasible, de-risked, and therefore potentially profitable outfits.

Two key breakthroughs prove the magic of niobium

There is no name for the specific emotion one feels when a silver bullet downs eight problems at once, but no doubt there definitely should be. It is similar to that relief you feel when you're watching an episode of *The Walking Dead*, and twenty-thousand decaying corpses are but a millimeter from the carotid you happen to be most fond of, which also just happens to be in a collapsing building and, oh yea, everything is on fire; until a surprise twist results in everyone you care about surveying the scene from a safe distance within 0.8 seconds. Suggestions in the comments, please.

NioCorp Developments Ltd. (TSX: NB | OTCQX:NI0BF) ("NioCorp")

have had a January to shout about. Back in 2015, they received the results of their Preliminary Economic Assessment (PEA), and aside from the incredibly favourable outcomes, it called for the construction of a seven-kilometer railroad spur line with considerable supporting infrastructure; the function of the railroad was to permit delivery of approximately 7,000 tonnes of reagents every single week that were required for the separation and purification of the three valuable superalloy metals (niobium, scandium, and titanium) that NioCorp is going for in Nebraska. Whomever said the cornhusker state was known only for football and cows was clearly rather shortsighted.

The railroad would have required NioCorp to casually throw up several bridges over the Nemaha River, Elk Creek, and various tributaries, as well as impacting an estimated 2.6 acres of wetlands and open water, and more than 1,700 feet of various water channels. Not to mention the additional land purchases, permits and, oh yea, and everything is on fire.

Terrible, right? Nope. NioCorp has utilised the admittedly oxymoronic magic of science to achieve a great deal this month. In a single announcement, they told us of two key breakthroughs that not only render the rail construction project entirely redundant, but dramatically reduce the environmental impact of the whole extraction going forward.

The first of these breakthroughs permits a large reduction in the size of a range of equipment since NioCorp discovered that it can still attain high Niobium recovery rates even while using up to an order of magnitude less water than previously planned. This breakthrough removes a zero from the costs!

The second breakthrough came when NioCorp realised they could source the essential reagents from their own waste products. The company found that it can convert significant fractions of its neutralization solids and acid regeneration solids into supplies of neutralizing agents and process reagents that are

used to help produce the commercial products. The solid material is comprised mostly of calcium compounds similar to those found in household wallboard, and were originally planned either for disposal on-site or the backfilling of the mine.

With the dissipation of the anticipated impacts, the project's permitting should be vastly smoother, and the associated environmental review process able to be conducted more efficiently. If all of these benefits are achieved, and there is no reason they shouldn't be, NioCorp could reduce both their OPEX and CAPEX for specific portions of the project.

To top it all off, NioCorp announced a \$2m private placement deal on January 27th. Not really surprising given the recent developments, and we're sure there'll be many more eyes cast their way before the snow melts. The PEA, without the rail demands, shows that the Elk Creek Project will deliver exceptional economic results. With anticipated production of 7,490 tonnes per annum of ferroniobium, 97 tpa of scandium trioxide, and 23,960 tpa of titanium dioxide over its 32-year life, Elk Creek is estimated to have pre-tax NPV of US\$3.07 billion. Goodbye railway; hello feasibility study.