



Cheetah Resources' Clarence Pyke, Mathew Edler and Chris Pedersen at a Nechalacho ore pile.

A rare first in Canada

Cheetah Resources starts small at Nechalacho, Canada's first rare earth producer

By Herb Mathisen

The first thing you see as the single Otter touches down on Thor Lake is a dozen or so humble, wooden cabins poking out from a spruce tree backdrop above the rocky shore. If you didn't know better, you might think you have landed at a fishing lodge, roughly 110 kilometres southeast of Yellowknife, Northwest Territories.

But no, this is the site of Canada's first producing rare earth elements mine – and only the second in all of North America. Although Cheetah Resources' Nechalacho project is not going to break China's dominance of the market any time soon, the company – and its majority local, Indigenous workforce – is dedicated to proving that rare earths can be sustainably mined, sorted and extracted in Canada.

Still, everyone involved with Nechalacho is careful to temper expectations, even if this three-year demonstration-scale project has some larger ambitions. This initial phase of the project will focus on earning the social licence to operate from Indigenous stakeholders and mining the high-grade North T Zone, with a

measured and indicated resource of 9,102 tonnes of light rare earth oxides from 120,000 tonnes of ore grading at 9.01 per cent. Thousands of tonnes of rare earth concentrate – crushed and sorted bastnaesite rock that looks very much like pink gravel – will be barged across Great Slave Lake to Hay River, Northwest Territories. It will be stored there before travelling south by rail and truck to Cheetah's extraction – or "cracking" – plant, currently under construction in Saskatoon. Cheetah will then sell its final output, a rare earth carbonate, that customers will use to produce separated rare earth products, which are found in the very strong permanent magnets vital to electric vehicles and wind turbines.

Cheetah Resources is taking these three years to demonstrate that rare earth products from the Northwest Territories are acceptable to the global market and to earn the social licence to operate from Indigenous stakeholders. If it does, the company can scale up to mine the larger Tardiff zone to the south, which has the potential to keep the company in business in the North for generations.



Courtesy of Cheetah Resources/billbradenphoto

The 130-kilometre ice road helped to ensure Nechalacho was commercially viable.

Starting small

This summer, Cheetah Resources drilled, blasted, hauled, crushed and sorted ore from the North T Zone around the clock. The plan is to complete all the mining there before the winter freeze-up. Then, it will spend the next two summers sorting the rest of the bastnaesite ore, which hosts the rare earths, from quartz gangue. The work makes for an oddly pretty site. “We made our own roads with waste rock,” said mine manager Clarence Pyke, while driving along the bumpy, two-kilometre stretch from the main camp to the pit, which leads you over a pathway of glittering pink and white crushed quartz.

At the pit, four HD400 Komatsu haul trucks move ore to a mobile crushing circuit, where high-grade ore is crushed to between 10-millimetre and 20-millimetre widths, and low-grade ore down to eight millimetres. Gord Peckford, site superintendent, explained why the high-grade ore is not crushed too finely: “When you create dust, it means you’re losing the ore, right?”

Most of Nechalacho’s equipment – from its fleet of leased vehicles to its diesel generators and crushing circuit – was brought in over an ice road. Counterintuitively, Geoff Atkins, CEO of Australia-based Vital Metals, which owns Cheetah Resources, said the region’s cold climate helped instead of hindered the development of the project. “Coming from Australia, one of the things I admit I never truly appreciated was the beauty of an ice road because, from a capital side of things, it has a very low level of intensity. We can put an ice road in, for not a lot of money, across 130 kilometres. That makes a huge difference on what you can and can’t do for a project,” he said. Cheetah Resources has spent roughly \$20 million on construction and operating costs at Nechalacho. “If, on top of that, you added spending \$40 or \$50 million on a road, then that completely changes what that project has to look like.”

One of the most important pieces of equipment to travel over the frozen Great Slave Lake from Yellowknife was a TOMRA COM

Tertiary XRT sensor-based ore sorter. Roughly 80 per cent of mining applications for TOMRA’s sorters comes from the diamond sector, said Russ Tjossem, applications engineer with the company, who was on site in late July for commissioning and training Indigenous operators. “This is the first I’m aware of for rare earths,” he said. “This is one of the easiest sorts I’ve ever seen. This material was made for sorting.”

The sorter gives Cheetah the ability to separate even more waste rock from its ore, allowing it to ship a higher-grade, 35 to 40 per cent total rare earth oxide concentrate to its extraction plant.

Jeremy Catholique, a sorting operator from Lútsël K’é, N.W.T., now living in Yellowknife, fired up the sorter and explained the process. Crushed ore is fed onto a conveyor that leads into the sorter. There, an X-ray scans the feed and, before it has travelled two feet, a valve hits each rock with a puff of air, knocking it onto one of two conveyors. One leads to the rare earth concentrates pile; the other to a waste rock pile. “There are 192 valves,” said Catholique. “They’re really tiny.”

Cruze Jerome, a sorting operator from Inuvik, N.W.T., also living in Yellowknife, provided a quick tour of the control room. He can take a snapshot of the material inside the sorter at any time, while receiving constant updates on the total volume of ore, and ore and waste percentages. At this stage of commissioning, Cheetah is putting low-grade ore through the sorter. Jerome said it was roughly 10 per cent concentrate.

Cheetah received a \$1.26 million interest-free loan from CanNor – the Canadian Northern Economic Development Agency – to help pay for the sorter and its installation, based on its innovative use of the technology. Cheetah will pay it off in monthly installments over ten years.

To date, Cheetah Resources has spent roughly \$15 million at Nechalacho and in Saskatoon, said Mathew Edler, executive vice-president with Cheetah, with additional operating and consum-



The COM Tertiary XRT sensor-based ore sorter provides the background to Yellowknives Dene First Nations drummers during the commissioning ceremony.

able costs to come at the Saskatchewan plant. When all the construction is completed, the total cost is expected to be \$40 million.

Cracking the code

At the Saskatoon extraction facility, the rare earth concentrate is crushed down to a sand, put through a rotary furnace and heated up to 400°C. Edler explained that the heat allows Cheetah to dissolve the rare earths, which will eventually take the form of a rare earth carbonate – which he described as “a pale blue powder” – that is sold to separation plants.

Cheetah has signed a 10-year lease for a bastnaesite extraction facility located right next door to the Saskatchewan Research Council’s new \$31 million rare earths processing facility, which will include both a monazite rare earth extraction, as well as a separation plant, once construction is finished. Cheetah hopes to begin commissioning its facility this winter, and provide a shipment to its first customer within the first six months of 2022 to begin generating revenue.

Cheetah has a five-year agreement to sell 1,000 tonnes of rare earth carbonate ex-cerium annually to REEtec, a Norwegian company that specializes in separating rare earths. With so many technological, logistical and supply chain details to iron out, it is understandable why Cheetah is taking a gradual approach to ramping up Nechalacho. “The reason we did this was to get everybody comfortable with what we’re doing,” said Edler. “Rare earths in general have a very long customer acceptance period.” In other words, customers like REEtec need to know the company can deliver the exact rare earth carbonate product it has promised. “They will actually take small quantities of the material – potentially for 12 months, 24 months, 36 months – until they are confident that we can produce a quality and a consistency.”

Cheetah will also continue to optimize its plant to provide its customers with the most attractive product possible. Cerium, for instance, can comprise up to 50 per cent of the rare earth carbonate product, but in recent years, Edler explained, the element has become a nuisance to separation facilities because there is little market for it. “Every gram of cerium we get out is a gram less that they have to get out and our process is cheaper to get it out than theirs,” he said. REEtec would rather have 1,000 tonnes of rare earth carbonate ex-cerium (without cerium) than 2,000 tonnes with cerium. “There’s a cost sharing there,” Edler



Flying into the remote camp, wooden cabins greet visitors and employees alike.

said, adding that the companies can work together to find the best arrangement because Cheetah is not in competition with REEtec. “There’s all these little things we’re learning.”

Going local

In late July, Cheetah celebrated the commissioning of the ore sorter by flying members of the Yellowknives Dene First Nation (YKDFN), as well as Yellowknife’s mayor, to the site for a visit and a Dene drum ceremony. There, David Connelly, Cheetah’s vice-president of strategy and corporate affairs, listed the project’s benefits to the territorial economy. He said more than 100 local vendors have been involved in the project thus far, with over 85 per cent of the procurement contracts having gone to Indigenous suppliers. Barge shipments south to Hay River would also nearly double the amount of non-fuel-related freight going through the port over the next three years. This freight would be heading out of the territory, reversing the trend for a region that depends mightily on importing goods, food and fuel from the south.

For its main mining contractor, Cheetah hired Det’on Cho Nahanni Construction Corp., a joint venture 51 per cent owned by the YKDFN. Paul Gruner, president and CEO of the Det’on Cho Corporation – the YKDFN’s business entity – said he believed this marks the first time a First Nation in Canada was the contract miner on its traditional lands. Gruner said there have also been discussions between the First Nation and Cheetah Resources about the possibility of the YKDFN taking an equity stake in the project.

Over 70 per cent of Nechalacho’s employees and managers are Indigenous and, when mining, drilling, blasting and sorting are occurring, there are nearly 40 workers on site. (Operations will slow down considerably in winter; if drill crews are not around, there will be just two care and maintenance staff on site.) For now, Cheetah Resources has 67 workers on the rotation schedule. But there is potential to double this if the Tardiff scale-up proceeds in 2024.

As Cheetah fine-tunes its North T Zone operation, it continues to drill out the much larger Tardiff deposit to the south of its main camp. Cheetah’s brass understands that if it wants to continue mining at Nechalacho, it needs to start the permitting process for Tardiff soon, with Edler and Connelly both noting it can take roughly two-and-a-half years in the Northwest Territories to get its permits in place. To assure a continued supply of

concentrate for Cheetah's cracking facility in Saskatoon, the company purchased the Kipawa and Zeus rare earth projects near Temiscaming, Quebec, in August 2021.

Cheetah expects to use the ore sorter at Tardiff, although there may be a need to use flotation to separate the ore further. (For now, Gruner likens mining at Nechalacho's North T Zone to an "aggregate quarry," due to a lack of any secondary processing or chemicals used.)

Connelly said most of the exploration work at Tardiff right now is focused on mine planning. The resource, he said, is fairly well understood and explored, as more than \$120 million had been spent by previous owners to develop Nechalacho.

In fact, Thor Lake has been explored since the 1970s, when geologists came looking for tantalum, beryllium and uranium. (Edler said he visited the site in the 1980s, back when miners were not even interested in rare earths. Cheetah geologist, Chris Pedersen, was part of a team exploring the site for beryllium in the 1980s.)

In the mid-2000s, Avalon Rare Earth Metals acquired the property and spent more than a decade developing the project. In June 2019, Cheetah Resources purchased the near-surface Upper Zone of the North T Zone and Tardiff deposits (basically, everything at Nechalacho above 150 metres above sea level) for \$5 million. Tardiff's Upper Zone has a measured, indicated and inferred resource of 94.7 million tonnes grading at 1.46 per cent

total rare earth oxides. Avalon still owns the rich, but more complex Basal Zone – everything below the Upper Zone.

Cheetah's next phase of Nechalacho from Tardiff could possibly produce five times more rare earth carbonates than the North T Zone's annual output, but the project will still be small by traditional mining standards. "Separated rare earth products: the world production and consumption are 130,000 to 140,000 tonnes a year," said Edler. At most, Cheetah Resources might sell 10,000 tonnes of rare earth carbonates a year from its Saskatoon facility – with some of that feed possibly coming from other rare earth projects it is developing, like Wigu Hill in Tanzania as well as Zeus and Kipawa.

Still, if the Tardiff expansion goes ahead, it could provide stable jobs to a couple generations of miners in the Northwest Territories, at a time when the future of the sector in the territory looks grim. It would also help loosen China's stranglehold on the rare earths market, which would give end-users added certainty, as the country has been known to influence prices through tariffs and by rationing or flooding production.

And it would add to the global supply of metals that continue to find new applications in high-end technology. "A tiny little pinch of rare earths could make a massive difference to magnets, fibre optics, LCD screens – all these little weird and wonderful things, and they're constantly discovering some really cool new ones," said Edler. 



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