



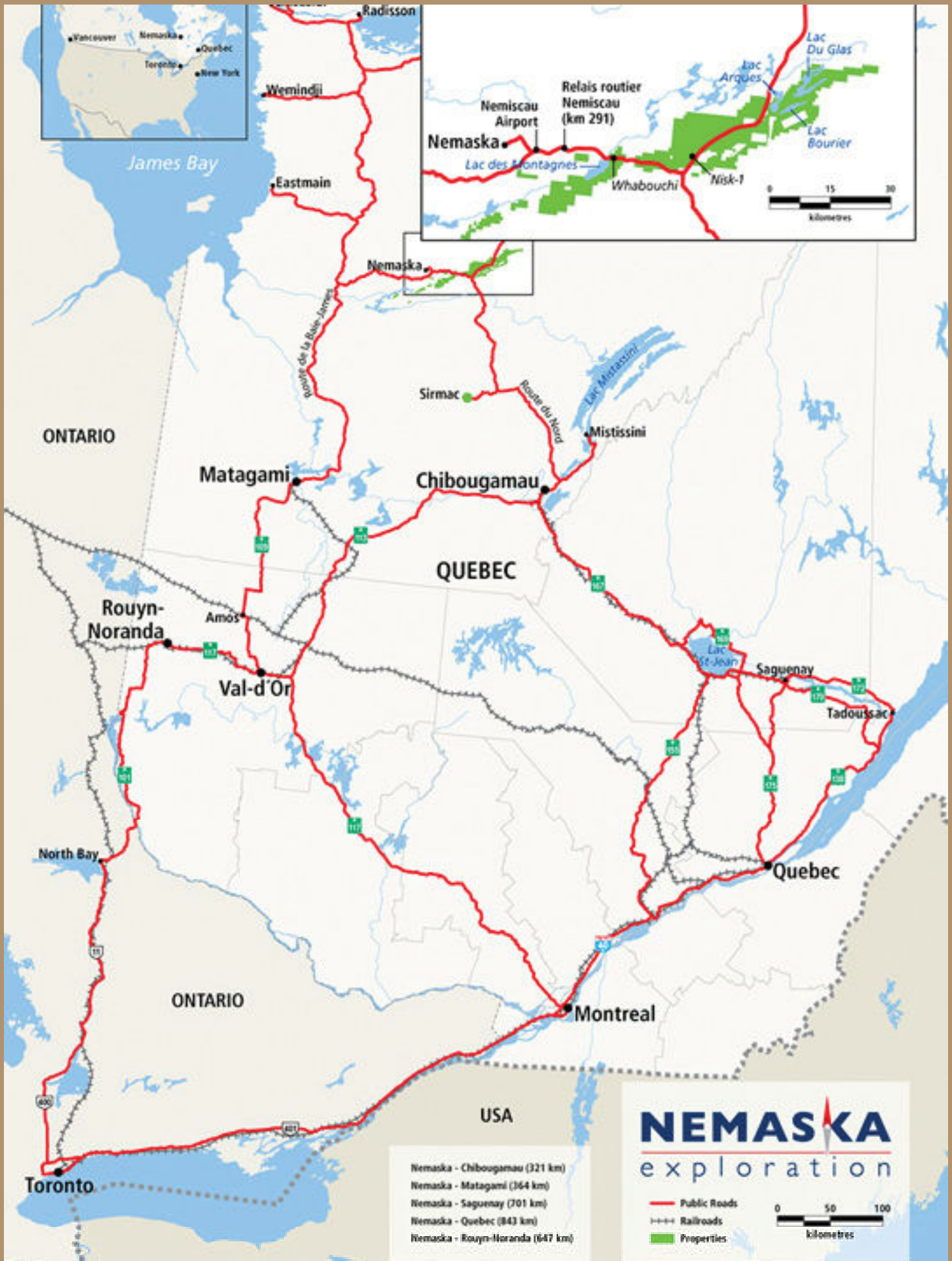
Washing away the overburden from a section of the Whabouchi deposit in preparation for core drilling. Snags in background the result of a previous forest fire.

The Lithium Mining Game

Eons ago, a little understood process formed pale green crystals of what geologists call spodumene. It formed in slivered tendrils among coarse-grained aggregations of glittering white pegmatite. According to Guy Bourassa, the president of Nemaska Lithium, headquartered in Quebec, such deposits typically formed in narrow, short “dike-like” geologic structures that occasionally become exposed when the overburden of soil erodes away, revealing the

marbled bone-white rock below. A sharp, trained eye might catch the green glint of spodumene that hints at the presence of a valuable mineral on which the modern world of mobile communications, computing, and now transportation is becoming evermore dependent: lithium.

Most of the lithium used in the world now comes from the Altiplano deserts high in the Andes on the borders of Argentina, Bolivia



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and Chile; with the later currently the dominate producer, largely because it has been exploiting the resource the longest. Here and in China the lithium is found in the brine of vast salt pans, leached over the millennia by runoff from surrounding mountains, and concentrated by a merciless sun that evaporated away the water, literally leaving behind dry lakes of salt. Companies like SQM, one of the world leaders, collects the salt into vast evaporation ponds, eventually concentrating it to the point where it can be refined into lithium carbonate, the stuff that makes lithium batteries possible. It's been so comparatively inexpensive to produce over the last decade or so, that brine operators have pretty much driven the original hard rock lithium companies out of business.

But that situation is beginning to change

as I learned this week while in the company of Nemaska's president during a two city tour at which he and his new business partner, Vivian Wu with the Chengdu Tianqi Group of China pitched mining industry analysts and investment bankers on the prospects of their extraordinary find in northern Quebec province, in Canada. I was asked to talk about the future of electric mobility, a similar presentation I had given earlier in the year on behalf of Canada Lithium, another "junior" mining venture looking to develop its own deposit in Quebec's Val-d'Or. It was that talk, accompanied by a colorful Keynote slide show, that led to the invitation to accompany Bourassa and Wu to meetings in downtown Toronto and Montreal. It would be a very instructive two days.

Guy Bourassa is a non-practicing attorney who got his start in Canada's mining industry

Whabouchi project centers along the exposed spin of pegmatite running vertical down the center of this aerial photo. All weather road runs long top of photograph and power line just north of it.



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while clerking after law school in northern Quebec. Most of his clients were mining companies and eventually he found himself being hired as their chief counsel. From chief counsel, opportunities opened up to run companies, and to acquire promising properties like the Whabouchi site near the Cree community of Nemaska.

Bourassa explained that prospectors first discovered the vein in the early 1960s when they spotted a large greenish crystal embedded in the exposed rock atop a ridge that had been burned off by a forest fire some years earlier. But the resource wasn't developed, because just after it was discovered the price of lithium collapsed when the United States government de-listed it as a "strategic mineral." It simply wasn't worth investing in at that point.

This changed with the advent of lithium battery technology and its resultant boost to both mobile communications and computing, as well as the promising growth of electric vehicles powered all or in part by lithium battery chemistry. Suddenly, lithium was a hot topic in the mining industry and the scramble is now on to find and exploit it from both brine pans and hard rock deposits like the Whabouchi.

I learned there are hundreds of 'junior' mining companies across Quebec and the rest of Canada hunting for both minerals like gold, copper, and now lithium, as well as investors to fund them. Nemaska Lithium is just one of them, but according to Bourassa, and a few of the analysts and bankers I spoke with, what the company owns, in partnership with the local Cree tribe and Tianqi, is one of the better prospects. It has virtually all of the elements

you want in a mining venture: all-weather road access, nearby power lines, a trained work force with nearby housing, technical support in the way of heavy equipment rental and repair, a good airport and experienced management. Most importantly, it appears to be a very rich source of lithium as the 3D animation video on Nemaska's web site illustrates.

For at least one of the investment bankers with whom I spoke, the big unknown in the project, as with any business, is the state of the market: how much demand will there be for their lithium? This is where Miss Wu comes into the picture. Tianqi is China's largest processor of lithium for the battery industry. They see demand for their product growing, especially for batteries used to power the tens of millions of electric bicycles and mopeds produced in China each year. Besides having more than a decade of experience in processing lithium from spodumene concentrate, she explained in her part of the presentation, Tianqi also has positions in two of China's largest lithium battery manufacturers, one that builds batteries for the military, the other for the e-bike market. With demand growing, the industry needs a steady supply of lithium and they see Nemaska Lithium supplying a good share of that new demand, which is why they plan to take a 19 % stake in the company.

Bourassa's plan is to spend the first five years mining the resource much like a quarry by first cutting into the 45 meter-high rocky spine of the resource, which is some 1.5 km in length and more than half a kilometer in width. Once this has been leveled, the next 10 years will be devoted to open pit mining, initially to a depth of some 125 m. The overburden will be stock-piled on a nearby section of the property for later reclamation. The rock waste will be piled

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into an artificial man-made hill, over which the stockpiled soil will be excavated. The open pit will gradually become just another lake much like the natural ones around it.

Processing of the ore into spodumene concentrate will occur on site, the final product being over 6% lithium and the consistency of beach sand. This will then be trucked some 300 km south to a railhead in Chibouhamau. There it can be sent by rail to either Montreal or the inland port of Saquenay, where it can be loaded on oceangoing freighters headed to China.

Since the mine will have at least a 25 year life span, and possibly longer given the newly realized depth of the deposit, Bourassa envisions phase two of the project being the construction of a lithium hydroxide processing plant in Quebec somewhere. It would be the first of its kind in North America. The reason he's considering lithium hydroxide instead of lithium carbonate is because it gives him greater flexibility in responding to market demands. The hydroxide form of lithium is ideal for use in lubricants, already a significant market for lithium. As demand for the carbonate form of lithium ebbs and flows, he can process the hydroxide into lithium carbonate more cheaply than going the other way, if I understand it correctly. This gives him an economic edge over his larger competitors. SignumBOX, based in Santiago, Chile forecasts the market for hydroxide will reach 183,303 MT in 2025, up from the current 25,824 MT. According to one of the analysts from China with whom I spoke, battery manufacturers are taking a greater interest in using the hydroxide instead of the carbonate form of lithium. But just looking at the lubri-



cation greases market, 10,630 metric tons of lithium hydroxide will be used in 2011, based again on signumBOX projections. This is estimated to grow to 27,840 MT by 2025.

Meanwhile, the lithium market for mobile batteries, excluding those used in electric-drive vehicles will grow from the 27,420 MT today to 105,240 MT by 2025.

But it's the electric vehicle side that really has the industry salivating. It's expected to mushroom from just 6,970 tons this year to a whopping 204,910 metric tons, again by 2025. Total global demand for refined lithium could reach 472,300 MT from the current 118,840 metric tons.

Of course, the question has been raised, isn't brine evaporation a less costly way to get lithium, and to this Ms. Wu responds, not necessarily. Open evaporation ponds are subject to environmental factors that hard rock sources are not. Unexpected rains can dilute the brine and set back production schedules. Addition-

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ally, brine-based producers can only increase production by building more evaporative ponds, etc.

Further, other's point out that promising brine deposits like the fabled Salar de Uyuni in Bolivia are quite remote, have little in the way of supporting infrastructure from good roads to rails to power lines to trained workers. Additionally, in the case of Bolivia's vast brine deposits, they tend to contain heavy concentrations of magnesium, which will require additional processing. Spodumene deposits like Nemaska, in contrast, are not subject to similar production variations; and the concentration of lithium in Whabouchi deposit is high enough to make it globally competitive, even being able to

compete with similar resources in Australia.

Nemaska plans to begin developing the project this year, constructing the necessary support facilities, with mining slated to commence in 2013. Bourassa made the point during his presentation that not only does the project sit on the second richest known deposit of lithium-bearing spodumene, estimated at 386,000 tons of lithium oxide, the company itself is highly undervalued. He estimates that if you compare it with comparable lithium juniors like Canada Lithium or majors like Talison, it should be worth between \$300-400 per tonne of lithium contained. Today, it's valued at \$73CAD.

Disclaimer: I don't own any shares of Nemaska Lithium (TSX-V:NMX) ... yet.

Nemaska Lithium president Guy Bourassa (left), Vivian Wu (center), Bill Moore (right)

