



**Inset: Typical deep penetrating EM layout.
Main image: The two 'bull's eyes' identified in the Chisel Basin in 2005.**

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Billions images \$



By Frank Fieber

The two men on our cover have mastered the art of Electromagnetic imaging. Alan Vowles, Geophysicist at Hudson Bay Exploration and Development (HBED), and Dave Koop, Geophysical Technician and private contractor with HBED, have perfected a geophysical technique that can extract an image from 1000 metres (1km) underground. Lalor Lake was discovered using targets discovered by Vowles' and Koop's methods. According to HudBay Minerals, Lalor is the largest base metal deposit discovered in Canada in decades. Snow Lake began in 1947 as a gold mining town, but since the 1950's, Hudson Bay Mining and Smelting Co. (HBM&S) has operated nine copper/zinc mines in the area. Last spring, metal prices dipped and the last operating (Chisel North) mine was put on care and maintenance and the Snow Lake concentrator was moth-balled. When the ore runs out in a mining town, property values dive along with the population. Not everyone knew the details but an incredible mining story was taking shape in the Chisel Lake Basin.

Back in 2002, Anglo American, the parent company of HBM&S, was thinking of getting out of the base metals business in Northern Manitoba and they gave explorationists at HBED an ultimatum, either come up with something big or HBM&S will be sold. The pressure was on for HBED, the exploration arm of HBM&S. In the 1980s the Geological Survey of Canada's Don Sangster declared that "the largest mineral deposit in the Snow Lake area was as yet undiscovered". All the geologists at HBED, particularly Gerry Kitzler and Ted Baumgartner, agreed the best shot for a few more holes would be in the Chisel Basin, near Snow Lake. Vowles had worked with Bob Fraser, a geologist/geophysicist and Chief Geophysicist at HBED. Fraser was one of the first to begin using computer models to analyze mineral deposits. Modern Electromagnetic (EM) systems send a pulse of current into the earth, through a carefully arranged grid of wires on surface. The electricity flows through the earth and depending on the composition of the rock formation and various signals collected by receivers, the computer can interpret the data to form an image of conductive bodies to a depth of 300 meters. These images of conductive bodies at depth are known as targets. While zinc deposits at Lalor Lake are not conductive, the zinc is found associated with metals that are, like iron

Continued on page 28

Continued from page 27

sulphide, copper and gold.

HBED had to come up with a way of seeing the deeper ore bodies they were convinced existed in the basin. Project Geophysicist Alan Vowles along with Dave Koop then applied what Fraser had taught them in order to conduct a test on a known ore body.

Vowles and Koop had worked together at HBED for five years before Koop started his own company, Koop Geotechnical Services, the only independent operator in North America with a Crone EM system. The Crone EM system is only sold to large mining companies for their in-house use, but Koop and Vowles have such a long history of working with the gear that Crone sold the unit to Koop. “They’ve taken the system and pushed it to the point where detection levels are beyond what anyone imagined,” says Kevin Ralph of Crone Geophysics, manufacturer and worldwide distributor of the EM system. “Lalor is the deepest [target] ever discovered with Crone’s EM system.”

Vowles plotted a grid for laying out wires on a two-kilometer square over the Chisel North Mine. Where an image of a conductive body at 300 meters would take a 30 second pulse; this was going to take more. Vowles and Koop threw the power switch and went for lunch. The electricity flowed through the ten kilometers of wire grid and down through the rock and minerals far below and the EM receivers recorded thousands of readings. The pair returned to find the image had locked in and they had a perfect view of the Chisel Mine workings at 600 meters deep. This is a simplified explanation but it meant HBED finally had a tool to give the basin a fresh survey. Calibrating, filtering, and tweaking the system, they found them-

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selves on the leading edge of electromagnetic imaging. Vowles and Koop set out to beat the Anglo American ultimatum. They started working a grid, focusing on a 20-square kilometre piece of the Chisel Basin. “We were doing surface EM on two-kilometer squares,” says Koop. “We kept picking up a build up signal along the edge of each square. We

began leapfrogging squares and it still took us six months to zero in on two targets that sat about 800 metres deep.” “The targets looked like two bull’s eyes” says Vowles. “We drilled the first target and it was right where we said, but it was sub-ore grade and didn’t warrant further expense.” The #1 hole cost \$250 thousand to drill, and it sat two kilometres from Lalor Lake. Based on the poor results in the last best area to explore, Anglo abandoned support for additional exploration in Manitoba and sold HBM&S to Hudbay Minerals. Koop and Vowles were disappointed but they believed their instruments and their instinct. Finally in March, 2007, an HBED drill was spinning over Target #2.

“We had modeled the deposit at 800 metres,” says Vowles, “and the drill intersected at 795 meters ... after 24 metres of high grade zinc, we knew we had two out of two targets and the model was 100% accurate.”

Additional drills were soon at Lalor Lake, drilling off at 200 meter stepouts with almost all of the first ten holes showing ore. Drillers only had to see the ore to recognize the distinctive weight and colour of the Blackjack Zinc ore, and there was gold. The gold alone is worth \$3-4 billion. The find was recognized in March of 2009 when HudBay received the Prospector and Developers of Canada’s Bill Dennis Award for the best discovery in Canada.

After the billion dollar zinc/gold deposit was almost drilled off, a hole was drilled outside the known ore body, and a bore-hole EM survey (where the EM receiver is placed down the hole) recorded the image of a separate ore body – gold, with high grade copper – below and



Snow Lake cairn honouring those who discovered the numerous mines in the area. Opposite: Mural at the Snow Lake Mining Museum.

PHOTOS BY FRANK FIEBER



to one side of the huge zinc deposit. Enough gold and zinc to make the Town of Snow Lake hum for the next 20 years and to keep the Zinc Plant in Flin Flon operating at full capacity.

This is not the first discovery for Vowles and Koop. With each new discovery, the HBED legend grows. "It's not just EM," says Vowles, "we've always had good geologists to show us the best ground to conduct our surveys."

"I have been lucky to work with Alan," says Koop, "he could be working anywhere but he is here with HBED." The HBED teams have discovered almost 30 mines in Canada, mostly in the greenstone belt between Snow Lake and Flin Flon.

The Town of Snow Lake is preparing for a boom. With more new ore than all previous Hudbay Mines in Snow Lake area confirmed, Lalor Lake is just the tip of one new iceberg, floating in the sea of northern Manitoba rock. ■

On October 30, 2009, Hudbay Minerals' CEO Peter Jones announced the re-opening of Chisel North Mine and the Snow Lake Concentrator. Zinc prices are up and the Lalor deposit is on the front burner. A production ramp will be built from Chisel North to the Lalor deposit. The ramp will take 30 months to build, providing access to Lalor's high-grade zinc and to a drilling platform from which to expand knowledge of the gold deposit as yet unnamed. The ramp will cost \$85 million. Phases 2 and 3 will see the Lalor site developed. Production shaft and refurbishing the concentrator will bring the total commitment to about \$450 million.



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