



Canada Silver Cobalt Works reopened a facility known as Temiskaming Testing Labs, which includes an assay lab, a bulk-sample processing plant and a bullion furnace.

# Pieces of the puzzle

Canada Silver Cobalt Works is taking steps to build a mining and processing operation for high-grade silver and critical battery minerals

By Alexandra Lopez-Pacheco

In September, Canada Silver Cobalt Works (CSCW) filled in what it calls the “missing link” in the company’s two-pronged strategy of becoming both a precious-metal producer and a supplier of critical minerals.

The link in question is the newly re-opened Temiskaming Testing Labs (TTL), a historic processing facility located in Cobalt, Ontario, that CSCW purchased and refurbished in advance of handling what the company describes as high-grade silver (originating from both historical mining sites and ones currently under exploration) and cobalt recovered from tailings deposited at the old mines.

Beyond the goal of sending its own ore to TTL (a facility which could also eventually house a newly developed recovery process called Re-20x for battery metals and rare earths), the CSCW executive team envisions the facility and the Cobalt area – which was once at the centre of the silver-mining industry – becoming a critical metals hub and a mining hotbed once again.

“Cobalt could compete on a global level,” said Frank Basa, chair and CEO of CSCW. “It has the infrastructure, the skillset and the high grades.”

## Bringing new life to an old plant

In September, CSCW officially commissioned TTL, two years after the junior exploration company purchased the 20,000-square-foot facility.

The plant was originally built by the Ontario Department of Mines (now the Ministry of Mines) in 1941 to provide an assay lab and bulk testing and processing facility for mining operations in the Cobalt area.

While the area around Cobalt is rich in its namesake mineral, the town made its reputation in the mining world as a prime location of silver, thanks to a rush that began in 1903 and peaked in 1911 when 34 mines produced a total of 30 million ounces that year. At the time, cobalt was a difficult-to-sell byproduct, and often discarded as waste. Although the rush eventually waned, mining continued, but only to the degree that the industry could support a single, local processing facility – a facility that burned down in a fire – and that was replaced by TTL and its bullion furnace.

While an 80-year-old facility may not be at the top of every mining company’s wish list, TTL offered one especially attractive aspect: it could handle the processing of the extremely high grades of silver that lured early 20th century miners from around the world to Cobalt – silver grades that could reach thousands of ounces per tonne. The Lawson vein, which is better known as the “Silver Sidewalk,” for example, averaged 18 inches in width along a length of 350 feet at the surface and reaching a depth of nearly 200 feet.

Given the hope and expectation of discovering high-grade deposits in the area (based, in part, because of Cobalt’s mining

history), CSCW wanted to ensure it had the ability to process any future output. The TTL facility is serving as a pilot plant said Basa. “It can do quite a bit of tonnage, but eventually we will build a bigger plant.”

It is a decision that seems to be prescient based on the company’s subsequent exploration results, including one particular intercept at its Castle East property that was recorded as 89,853 grams of silver per tonne over 0.3 metres.

CSCW purchased TTL from Polymet Resources, which had run the lab since 2000, in a cash-and-shares deal valued at \$650,000. It contracted out the assay lab part of TTL to ONSite Labs, which retained Polymet’s team, as an independent third-party operator. CSCW became the operator of the facility’s bulk-sample processing plant and bullion furnace – a furnace that, in its heyday, produced two million ounces of silver in doré bars annually for companies like Teck and Agnico Eagle. It was Agnico, a few years before it left the area in 1989, that hired metallurgical engineer Basa and first brought him to Cobalt.

Now, Basa’s company has rebuilt TTL’s processing plant, replacing old wear parts to revive its screening and secondary crushing circuit. The circuit has a 20-tonne-per-hour capacity and produces three different product sizes: greater than 0.25 inch (coarse), between 0.25 inch and 20-mesh (medium), and less than 20-mesh (fine).

“It’s a dry mill that only recovers high-grade silver that’s very fine,” said Basa.

To upgrade lower grade minerals, the TTL also installed a new a two-stage gravity plant with a water recycle step that is closed loop and produces zero discharge. It can handle 24 tonnes per day, and includes a spiral concentrator feeding material to a conventional gravity table as well as a supplement-

tary Falcon high-grade gravity concentrator. “With that, we recover everything else – the cobalt, nickel, copper and anything else in there,” said Basa.

Interestingly, said Basa, the environmentally advantageous design of the zero-discharge circuit dates back to the original 1941 Ontario government installation.

Refurbishing TTL will provide the company with the capacity on hand to process the company’s own mined and recovered output.

“In the event we need bulk sampling,” said Basa, “we’ll do what the old timers did: send all our ore samples to this facility that will crush and grind and separate the high-grade silver and pour doré bars.”

Those bulk samples would come not only from CSCW’s exploration work but also from the silver sulfides left in the historical stamp-mill tailings on its Castle mine and Beaver mine properties. In 2019, even before purchasing the facility, the company conducted a test of its waste-silver recovery plant at TTL and using tailings from the old Castle mine.

“We were able to pour a 1,000-ounce bar,” said Basa. “The TTL has that ability to actually take rock from any mine in the Cobalt camp, as it has done historically, and then produce a metal bar.”

Furthering the proof of concept that there is still silver to be recovered from old waste, in 2021, after sonic drilling of 354 metres over 127 holes, CSCW reported grades from Beaver tailings ranging between 14 and 314 grams of silver per tonne.

### Processing for battery minerals

CSCW is hoping to recover not just silver from what was left at its Beaver and Violet mine sites; the company also views the sites as potential sources of critical minerals.

## Canada Silver Cobalt Works Properties

<b>Castle Mine</b>	<ul style="list-style-type: none"> <li>• Past-producing, permitted, three-shaft, underground mine</li> <li>• 85km northwest of Cobalt, Ont., near the town of Gowganda</li> <li>• 7,800 hectares</li> </ul>	<ul style="list-style-type: none"> <li>• Historical grades of 25 ounces/ton silver and one pound/ton cobalt between 1923 and 1930 and 26 ounces/ton of silver between 1979 and 1989</li> </ul>
<b>Castle East Silver</b>	<ul style="list-style-type: none"> <li>• 2km east of Castle Mine</li> <li>• 546 hectares</li> <li>• Environmental study and ramp-permitting process begun</li> </ul>	<ul style="list-style-type: none"> <li>• 43-101 (from May 2021) reports total inferred mineral resources of 7,149 g/t silver, 2,537 g/t cobalt, 628 g/t copper, 467 g/t nickel, 41 g/t lead, 52 g/t zinc out of 32,900 tonnes totalling 7.753 million ounces of silver equivalent</li> </ul>
<b>Beaver Mine</b>	<ul style="list-style-type: none"> <li>• Past-producing, 20-acre, two-shaft (the deepest at 1,600 ft.) mine in the Cobalt camp, with 8.5 miles of drifts and crosscuts</li> </ul>	<ul style="list-style-type: none"> <li>• Historical producer of 221.7 tonnes silver and 140,000 pounds of cobalt averaging 1.4 lbs/ton between 1907 and 1940</li> </ul>
<b>Violet Mine</b>	<ul style="list-style-type: none"> <li>• Past-producing mine in the Cobalt camp</li> <li>• Five known veins on the property</li> </ul>	<ul style="list-style-type: none"> <li>• Historical production of 897,000 ounces of silver between 1905 and 1966</li> </ul>
<b>Eby-Otto gold project</b>	<ul style="list-style-type: none"> <li>• 1,000 hectares of exploration target in the Kirkland Lake Gold camp</li> </ul>	<ul style="list-style-type: none"> <li>• Field mapping, channel sampling and drilling underway</li> </ul>
<b>Graal nickel and copper project</b>	<ul style="list-style-type: none"> <li>• 31,201 hectares in northern Quebec with 110 designated claims</li> <li>• CSCW reports sulfide deposits and six-kilometre strike length on the property</li> </ul>	<ul style="list-style-type: none"> <li>• 43-101 Technical Report released in August 2022</li> </ul>

“When I joined Agnico, we actually threw the cobalt away,” said Basa. “There’s still a lot in the bush. The way they mined in the old days was they blasted and if it looked like silver, they brought it out and if it looked like cobalt, they left it in the stope. So, we have a fair amount of broken cobalt.”

In 2019, CSCW hired SGS Canada’s laboratory facility in Lakefield, Ontario, to test a gravity concentrate from a sample of Castle mine’s tailings. The concentrate graded 389 grams of silver per tonne, 0.63 grams of gold per tonne and 0.20 per cent cobalt.

The metals in those tailings also confirmed that earlier hydrometallurgical work Basa had done with National Research Council Canada was not in vain. The process they had developed, now known as Re-20x, was designed to recover an assortment of metals and elements from a variety of sources – concentrates and also recycled battery materials.

CSCW hired SGS to evaluate the process by performing advance-stage testing and designing and building a Re-20x pilot plant and, in 2018, SGS succeeded in producing cobalt sulfate hexahydrate at 22.6 per cent purity from the Castle mine tailings using Re-20x. According to Basa, this grade surpasses the battery-manufacturing industry’s benchmark requirement of 20.5 per cent.

The process can also extract other battery metals, including rubidium. Adding rubidium carbonate salt to the electrolyte found in both lithium-ion and sodium-ion EV batteries can improve charging rates and cyclability.

In a 2022 benchmark test using Re-20x, SGS achieved 99 per cent extraction of the element from drill core sourced from a low-grade alkali and rare-earth-mineralized zone situated on the Granada Gold Mine deposit in northwestern Quebec’s Abitibi Greenstone Belt. Granada Gold Mine drilled two holes:

Courtesy of Canada Silver Cobalt Works



Clockwise from top: TTL’s cone crusher; the TTL was built in the 1940s by the provincial government to serve the needs of miners in Cobalt, Ont.; scoop tram at the Castle mine adit entrance; TTL’s ball mill.

the deepest, at 1,626 metres, intersected 21 distinct mineralized zones varying in width from 2.8 to 177 metres. According to the company, the best grade, over a wide width, for rubidium was 340 grams per tonne over 53 metres.

(In addition to being a junior explorer trying to revive a historical asset, in this case, a shuttered mine originally staked in 1922, and conduct original exploration, Granada Gold Mine and CSCW share something else in common: Basa is also chair and CEO of Granada Gold Mine.)

Basa's Re-20x's flow sheet is designed to be able to process two feeds – the primary one is gravity-recovered concentrates, with battery metals and rare earth elements. The secondary feed is what is known as black mass, which is physically crushed and shredded spent batteries, in order to extract products to the specifications required by potential battery and storage customers.

The process puts both feeds through a two-reactor leaching process. The first reactor removes the arsenic as a byproduct. Arsenic is a critical element used in semiconductors. The second reactor separates the battery metals (copper, cobalt and nickel) and the rare earths (cesium, scandium and rubidium).

"We have this in-house process," said Matthew Halliday, a resource geologist and CSCW's president and chief operating officer. "Now, we need to meet with people who need to buy the cobalt sulfate and produce it to their specifications and we need to find sufficient bulk samples that we can start providing that cobalt sulfate to the market in advance of going into full production."

### High grades and unusual deposits

From a mining perspective, CSCW's long-term plan is to build a hub-and-spoke operation in the Cobalt mining district. The company is optimistic its flagship project, the silver-cobalt Castle mine located 85 kilometres northwest of Cobalt and its most advanced exploration project, Castle East, hold the resources needed to build its first mining operation.

Historically, the Castle mine produced more than nine million ounces of silver and 376,053 pounds of cobalt. The company's Violet mine and Beaver mine projects, right at the Cobalt camp, were prolific in the 1900s yet, according to CSCW, underdeveloped. CSCW is also actively exploring the Eby-Otto gold project near Kirkland Lake, Ontario, and the nickel-copper-cobalt Graal-Nourricier-Lac Suzanne property in northern Quebec, where it has completed a 15,000-metre drill program.

This year, the company also completed a 60,000-metre drilling program at Castle East, where it intercepted seven high-grade structures. The two highest intersections so far have been 53,739 grams of silver per tonne over 0.48 metres and the earlier mentioned 89,853 grams of silver per tonne. Additionally, CSCW reported other high-grade intersections at Castle East including 3,680 grams per tonne of silver over 1.01 metres and 1.34 per cent cobalt over 0.47 metres. In November, the company released the results of two more intersections: 4,710 grams per tonne of silver over 0.53 metres and 3,020 grams per tonne of silver over 0.67 metres.

**"Cobalt could compete on a global level. It has the infrastructure, the skillset and the high grades."**

– F. Basa



Courtesy of Canada Silver Cobalt Works

Frank Basa, chair and CEO of CSCW, in the field.

"We're the first in 50 years to actually find such high grades in Cobalt," said Basa.

The veins are narrow – anywhere between 2.5 centimetres and 30 centimetres – but that is typical of the Cobalt mining district's rare form of mineralization, known as a five-element system, which contains silver, cobalt, nickel, bismuth and arsenic. Mined for thousands of years and coveted for what can be very high-grades, there are now very few such systems left in the world that are being mined.

"Cobalt normally comes with copper and nickel in massive sulfide deposits, but here we have cobalt and silver together in a five-element system," said Halliday. "The cobalt mining camp seems to be the largest of this deposit style in the world that I know of and it seems to be the richest in silver and cobalt compared to some of the other five-element systems that exist. It's a very niche deposit model. We're very fortunate that it happens to be here."

Despite being so narrow, because their grades can also be so high, the veins can produce a large amount of product without having to process massive amounts of tonnage. The Little Silver vein discovered in Cobalt in 1903, for example, averaged only 20 centimetres in width but produced 700,000 ounces of silver.

### Next steps

The company plans to keep exploring and looking deeper beneath the surface than the old mining operations. It is currently in the process of conducting environmental tests to obtain permits to build a ramp down to 400 metres at Castle East.

"There's an opportunity to find additional high-grade material," said Halliday. "The Cobalt mining camp produced about 640 million ounces of silver and 30 million pounds of cobalt. It's a large camp with a lot of untapped potential so I don't see why this camp doesn't have another 640 million ounces of silver to discover." **CNN**