



INTERNATIONAL
MINING

Technology HALL OF FAME



Allan Cramm / ENVIRONMENTAL MANAGEMENT and STEWARDSHIP



Allan Cramm is the Vice President, Innovation and Development focusing on key strategic projects to maximize the company's assets. He also is part of the development team for new mines and operations. Prior to his promotion, Allan was the General Manager of Anaconda's Point Rouse Project in Baie Verte, Newfoundland and Labrador. He was responsible for the overall operation of the project including permitting, construction, production and special projects.

Cramm has been involved in various management and supervisory roles associated with mining for the past 25 years (both open pit and underground) including Project Coordinator/General Manager of two underground mines in Newfoundland, Nugget Pond and Hammerdown, that used a central-processing facility. He has a high regard for environmental protection with some associated projects having been recognised provincially and nationally for their attention to environmental stewardship.

Cramm was recently recognised with Honorary Membership in the organization of Professional Engineers and Geoscientists Newfoundland & Labrador (PEGNL). The PEGNL Board of Directors may confer Honorary Membership in PEGNL upon any person who, through his/her own initiative and leadership, has rendered eminent service allied with the profession resulting in the betterment of society through the development of new material, equipment, techniques, philosophy or management related to engineering or geoscience.

"Cramm embodies the ideals represented in an Honorary Membership in PEGNL. He is an innovative leader and an 'out-of-the-box' thinker who has been at the forefront of the growth and development of our Point Rouse Project. His leadership has taken pioneering ideas, such as selling the waste rock from our gold mining operation as a construction aggregate product, and made them a reality. I'm pleased to be able to witness how one person's ingenuity can effect such positive change, not just for our company but for the mining industry. On behalf of the board of directors and the management team of Anaconda, I want to congratulate Allan on this well-deserved recognition." ~

Dustin Angelo, President & CEO, Anaconda Mining Inc.
"Cramm is recognized as a purveyor of innovation within the mining industry, from his early days at the Baie Verte asbestos mine to his current role with Anaconda Mining. Through his leadership he has seen many young workers move back to the Baie Verte region and has found ways of challenging them to grow the local economy. Mentors like Allan Cramm are critical to advancing the mining industry in Newfoundland and Labrador." ~ Geoff Emberley, CEO & Registrar, PEGNL.

PEGNL is mandated to regulate the practice of engineering and geoscience in the public interest, as outlined in the Engineers and Geoscientists Act (2008) of Newfoundland and Labrador. PEGNL exists so that there will be competent and ethical practice of engineering and geoscience in Newfoundland and Labrador, and to ensure public confidence in, sustainability of, and stewardship of the professions.

In 2015 and 2016 Cramm turned a big idea into a very unique project that was a revenue generator while significantly advancing Anaconda's goal of Environmental Sustainability.

Anaconda worked with Shore Line Aggregates, a subsidiary of its contract miner, Guy J. Bailey Ltd., and Phoenix Bulk Carriers, to supply approximately 3.5 Mt of construction aggregate, using Anaconda's waste rock from its gold mining operation, for a construction project on the eastern seaboard of the US. Using the Baie Verte harbour, one of the deepest in Atlantic Canada, it is suitable for the type of ships required to move such a large quantity of material. Ships on this route measure 199 m and can carry up to 60,000 t of aggregate per trip. The transportation of waste rock from Baie Verte is now a competitive product in the aggregates market, resulting in an additional revenue stream for Anaconda, while also reducing mining costs. The shipment of aggregates for this venture reduces the need for waste rock disposal on site and decreases the overall environmental footprint of the Point Rouse Project.



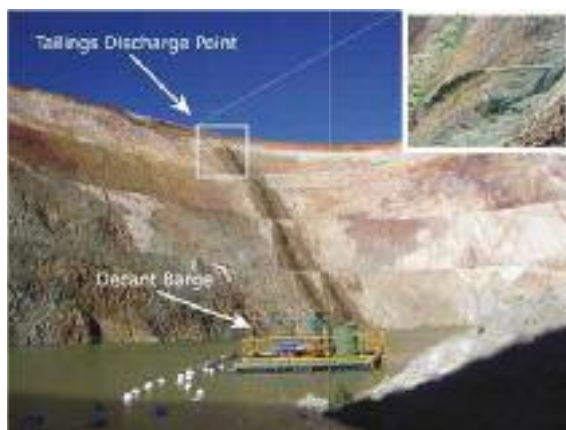
The aggregate shipped under this project would otherwise require approximately 100,000 tri-axle tractor trailer loads if transported over land. The marine shipping option makes it a safe, green and competitive means to move vast amounts of product. The companies involved continue to explore other market opportunities. The company generated other income of C\$938,089 from this agreement during fiscal year 2017.

Over half of these people are under 35 years of age. Businesses throughout the Baie Verte Peninsula region are also feeling the benefits of this work. Anaconda takes pride in innovation. It took an obstacle and turned it into an opportunity both for the Company and the broader community. Over 70 direct jobs were been created, with 60 people hired by Shore Line for onshore operations, and an additional 12 employees by Sealand Shipping Services, as tug operators, harbour pilots, and hand-lining services.



The addition to the aggregates venture, the approval of an in-pit tailings facility by the Department of Natural Resources, strengthens Anaconda's infrastructure at the Point Rousse Project and fortifies its platform to support growth initiatives in Atlantic Canada. Anaconda has generated over C\$140 million in revenue from its Pine Cove deposit, and now the potential tailings capacity will continue to generate significant financial and strategic value. Given the high cost of permitting hurdles of constructed tailings facilities, the Pine Cove Pit is a tremendous, low-cost asset, providing storage capacity of approximately 15 years. A long life, in-pit storage facility is the perfect complement to Anaconda's 1,300 t/d mill and deep-water port.

Unlike tailing facilities with engineered walls, with the in-pit tailings facility, there are less technical and environmental risks than in conventional constructed facilities. The company estimates this facility is saving approximately C\$35 million to C\$70 million in capital expenditure related to tailings storage based on 7 Mt of capacity.



This is just one of the many innovative projects that have been spearheaded by Cramm. Others include Anaconda University repurposing of tailings as a potential agricultural fertilizer, Fragmentation-In-Place a new method for narrow vein mining, and research on ore management to name a few.

One of his principles is 'Olive' "the colour you get mixing gold and green." His "Triple Crown of Environmental Sustainability" involves repurposing coarse mine waste, processing tailings and converting open pit to tailings storage.

For example, the surplus waste produced at Point Rousse gold mine consumed 2.5 million litres of fuel; generated 6.7 Mkg of Co₂; required the detonation of 3,600 t of explosive; and required 250 person years of employment. He asked, "Why replicate"

That waste had favourable chemistry, was suitable as a bulk fill and there was deep water available for shipping. So, an innovative load-out was designed and built.

Repurposing tailings sand involved its chemistry being similar to commercial rock dust. Cramm notes that production of conventional (NPK) fertilizer requires 51 -68 MJ/kg nitrogen; 6.82 MJ/kg phosphorous; and 2.88 MJ/kg potassium. Packaging and transport of conventional fertilizer is about 6-8 MJ/kg. Application of fertilizer (conventional and rock dust) equals 51.62 MJ/kg.

By contrast, the Anaconda Mining material is a byproduct of the gold extraction and does not consume energy for its production.

Cramm explains: "Many people are familiar with using diatomaceous earth (DE) for pest control, but comparatively few are aware that finely ground rock dust can be similar in efficacy and preferable in other respects."

In repurposing the pit, he notes that in-pit tailings disposal offers a number of advantages over conventional surface impoundments:

- The long-term risks associated with in-pit tailings pit tailings disposal are reduced compared to on-land tailings disposal confined by conventional engineered embankments
- Maintenance of a water cover over the tailings to manage acid rock drainage (ARD) potential is more easily achieved in the Pine Cove pit, compared to an on-land tailings facility. It increases the long term stability of the pit.