

CASE STUDY

INTRODUCTION OF INDUSTRY BEST PRACTICES & TECHNICAL SOLUTIONS TO REDUCE NITRATES IN GROUNDWATER.

DE BEERS GAHCHO KUÉ MINE, CANADA

SITE PROFILE

Located in the sub-Arctic region of northern Canada, the Gahcho Kué diamond mine is a joint venture between De Beers Canada Inc. (51%) and Mountain Province Diamonds Inc. (49%). De Beers, as the operator, is committed to operating the mine to high safety and sustainability standards, with a deep respect for the land. The mine is surrounded by pristine natural waterbodies.

THE SITUATION

Blasting is an essential activity to fragment rock for excavation. Orica and De Beers have been working closely together since the beginning of the Gahcho Kué mine to minimize the effect of blasting on the environment.

The environmental monitoring team at Gahcho Kué detected increasing levels of nitrates in mine water. Bulk mining explosives are a known source of nitrates. Even though the nitrate and ammonium levels in the discharge water did not exceed regulatory limits, De Beers decided to act to reduce the nitrate generation under the *Building Forever – Protecting the Natural World Initiative*. The team sought a solution to reduce the contribution of blasting to nitrates.

In 2020 De Beers engaged Orica to complete a full review of the drill and blast process to deliver recommendations in line with industry best practices to make drilling and blasting safer and more efficient. As part of this, Orica applied the Nitrate Risk Reduction (NRR) framework. NRR is a three-tiered approach to systematically reduce the contribution of blasting to nitrates in mine water.

TECHNICAL SOLUTIONS

The NRR process begins by identifying the sources of nitrates from blasting and implements managed changes to reduce them. These changes typically include minimizing bulk explosive waste, maximizing the reliability and efficiency of detonation, and selecting the right product to match the mine's groundwater conditions and sleep time requirements.

The site team reinforced industry best practices on-bench as part of a Nitrate Risk Reduction strategy. The site introduced i-kon™ III electronic detonators as the mine's sole initiation system, to reduce the rate of misfires.



Figure 1 - The Gahcho Kué diamond mine in June 2022.
Photo: De Beers Canada



Figure 2 - The Nitrate Risk Reduction framework takes a holistic approach to reducing nitrates from blasting.

TECHNICAL SOLUTIONS

After embedding best-practices on the bench and in blast design, the site launched a pilot program in early 2022 to evaluate the potential of Fortis™ Protect as part of the third stage of the Nitrate Risk Reduction program.

Fortis™ Protect is a bulk system designed to reduce nitrates even further, after best on-bench and design practices are implemented. It includes a specially formulated emulsion blend and a modified delivery system on an Orica Mobile Manufacturing Unit (MMU™).

Upon successful completion of the pilot program and a rigorous eight-month evaluation, the site seamlessly transitioned to using Fortis™ Protect 70 as the primary bulk explosive at the end of 2022.

THE ORICA PRODUCT RANGE

The table below summarises the range of Orica products and services used on the De Beers Gahcho Kué Mine throughout this project.

Product or service	Category
Nitrate Risk Reduction	Bulk Service
Fortis™ Protect	Bulk explosive
i-kon™ III	Initiating - electronic blasting system
Mobile Manufacturing Unit (MMU™)	Bulk delivery vehicle

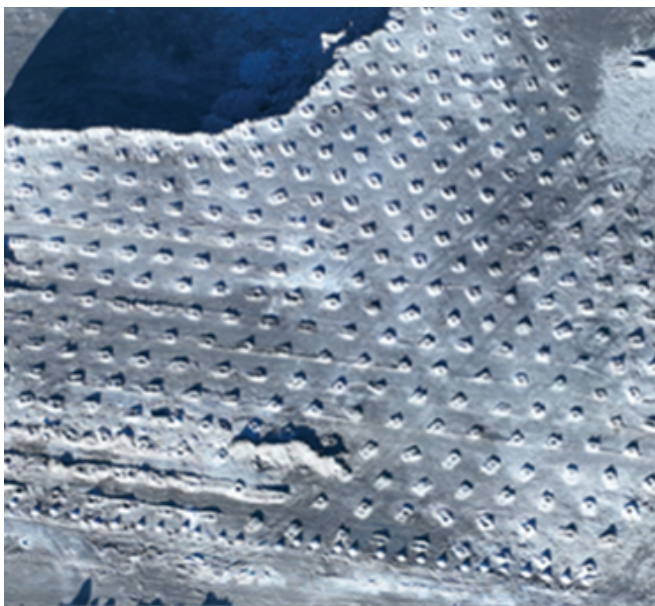


Figure 3 - Gahcho Kué Bench Preparation



Figure 4 - Fortis™ Protect delivers a special emulsion blend from a modified MMU™.



Figure 5 - Fortis™ Protect is formulated to reduce nitrates from blasting in groundwater.

THE RESULT

The environmental team at Gahcho Kué regularly monitors nitrate concentrations in mine water. The year-to-year results show nitrate (presented as nitrogen) in 2023 at a 78.85% decrease (shown in Figure 6) which is significantly less than the measurements in 2017.

Switching to Fortis™ Protect reduced the nitrate loading in the surrounding water bodies which drain into Great Slave Lake. One full year of data has been captured and a multi-year monitoring program is required to verify the effect of using Fortis™ Protect compared to the previous explosive on site.

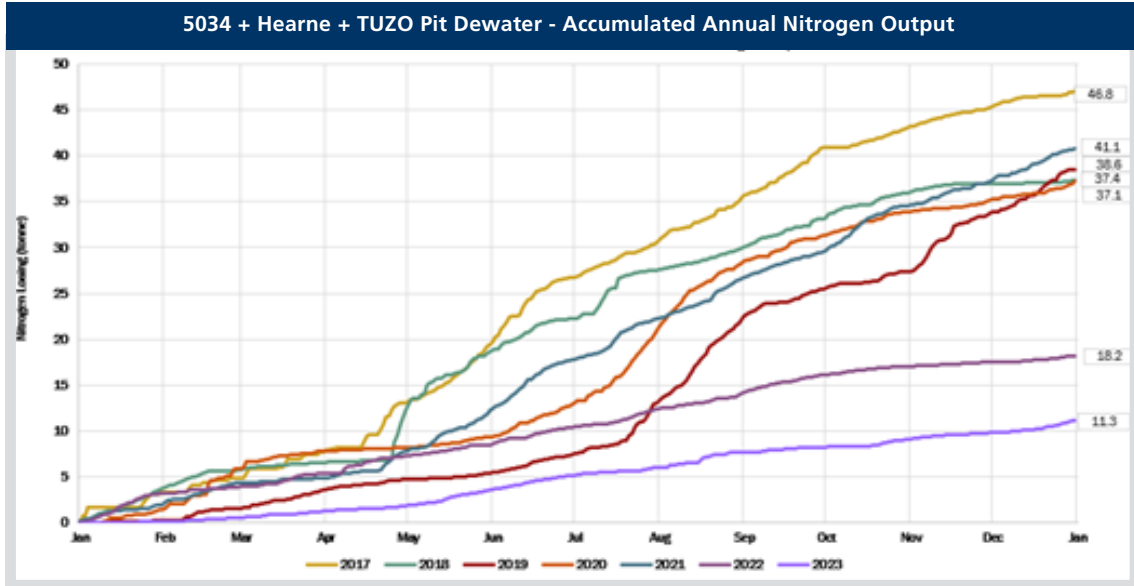


Figure 6 - Annual Accumulative Nitrogen Output from Pit Dewatering (tonne). The purple line shows the 2023 levels were lower than the six (6) prior years.

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For more information on how Orica can support your nitrate risk reduction, please contact your local Orica Representative or visit: orica.com/markets-and-solutions/Surface-Coal/nitrate-risk-reduction



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