

Minnow Environmental Delivers Reliable EEM Compliance Under Challenging Conditions

CHALLENGE

A Canadian mining operation needed a reliable sampling method to meet EEM requirements in a deep, fast-flowing river where rapid effluent dilution and challenging conditions prevented the use of conventional sampling techniques.

SOLUTION

Minnow Environmental developed an effective, artificial substrate system featuring durable conical cages and precise deployment and retrieval to ensure accurate sampling within the challenging conditions and narrow effluent plume.

RESULT

Eliminated manual sampling and compliance activities for improved accuracy, safety, and cost savings, with a proven, ongoing solution that can be repurposed in future construction projects.

A Canadian mining operation faced a significant obstacle in fulfilling its Environmental Effects Monitoring (EEM) obligations under the Metal and Diamond Mining Effluent Regulations (MDMER). Effluent discharged into a large, fast-flowing river results in conditions where standard sampling methods could not be used to obtain the data required to assess for potential environmental effects. The river's depth and swift current made conventional techniques unusable, while the rapid dilution of the effluent confined the sampling area to a small, hard-to-access zone. When a previous consultant's design proved inadequate for these conditions, the mining operation turned to Minnow Environmental, a Trinity Consultants Canada team, for a custom solution.



CHALLENGE

The mining operation discharged effluent into the middle of a large river characterized by high water velocities and deep conditions. Effluent is diluted rapidly within the river, resulting in a small area with effluent concentrations of at least 1%. These conditions resulted in a short, narrow zone for conducting monitoring, which was not conducive to the use of conventional sampling techniques. Sampling outside this area would fail to capture effluent-exposed conditions, as required under EEM, rendering the data meaningless for assessing potential environmental effects associated with the discharge. Conducting sampling within this mid-river area also presented logistical challenges requiring skilled navigation of potentially dangerous conditions.

SOLUTION

The Minnow team evaluated the site-specific challenges and developed an effective artificial substrate system that would ensure accurate sampling could be conducted within the narrow effluent plume. The system used 75 conical cage substrates filled with smoothed rocks that would remain stable within the fast-flowing conditions. The methods incorporated techniques to ensure the substrates remained in place during deployment and that organisms would not be washed out when the substrates were retrieved at the end of the deployment period.

In addition to these environmental challenges affecting the sampling design, conditions on the river made it difficult to deploy and retrieve equipment. Conducting sampling mid-river under fast-flowing conditions required skilled operators using a jet boat to navigate the conditions. Precise placement of sampling devices within the effluent plume was completed using real-time conductivity measurements, while retrieval methods had to prevent entanglement and sample loss, ensuring sample integrity was preserved.

The design drew on published scientific literature but was adapted specifically for the unique conditions of this river, combining research with practical innovation to deliver a robust solution.

RESULT

The effective artificial substrate system designed for this program allowed the mining operation to collect high-quality, reliable data that could effectively meet the objective of evaluating for potential effects associated with the effluent discharge. To date, Minnow has conducted five studies for the site, and the method has demonstrated consistent results year after year, validating its efficacy and providing confidence in its reliability.

The data collected consistently showed no evidence of adverse effects on benthic invertebrates from the effluent discharge. Minnow's approach highlights the importance of tailoring EEM methods to specific site conditions. Through careful evaluation and precise implementation, the team delivered a scalable solution that not only met the EEM objectives for this site but also established a field-tested, reliable method that has been employed for studies with other similarly challenging environments.

ABOUT TRINITY CONSULTANTS

Trinity Consultants, a leading global environmental consulting firm, provides services and solutions in the EHS Regulatory Compliance, Built Environment, Life Sciences, and Water & Ecology markets. Founded in 1974, Trinity has the technical expertise, industry depth, and capabilities to help clients achieve their goals across the natural and built environments.