



## MBBR Nitrification System for Seabee Gold Mine

### Introduction

Headworks BIO was awarded a contract with Claude Resources to supply an MBBR nitrification system in frac tanks. Claude Resources, a fully integrated Canadian gold exploration and mining company, required a wastewater treatment process that could lower the ammonia content of the mine's effluent. The system is designed to greatly reduce the ammonia in wastewater removed from their Seabee Gold Mine operation in northern Saskatchewan, Canada.

### Challenges

The mine is situated in a remote location in Northern Canada where direct access is severely restricted. Equipment and heavy supplies can only be trucked to the site via a 60 kilometer winter ice road only available for use from January through March when the ice is thick enough to sustain heavy traffic. Given this remoteness and logistical challenge, the Headworks BIO system was installed into readily available Frac Tanks, successfully using two such tanks as bioreactors.

Frac tanks are common in many resource sector applications, especially the oil and gas industry. They are a mobile storage tank that is the approximate size of a commercial trailer, and are easily moved as such. They were originally designed for

Customer: Claude Resources Inc.  
Industry: Mining

the gas industry but their prevalence in recent years has resulted in them being now used in a wide range of applications. Providing up to 21,000 gallons of capacity, these tanks are ideal for conversion to MBBR bioreactors, especially when portability and rapid deployment is a priority.

### KEY FACTS

- **Wastewater Flow:** 300 m<sup>3</sup>/day (0.079 MGD)
- **BOD<sub>5</sub>:** Design influent 20 mg/L
- **TSS:** Influent 30 mg/L  
Effluent limit 60 mg/L
- **TDS:** Influent 300 mg/L
- **Ammoniacal Nitrogen:** 120 mg/L
- **pH:** Influent 6.8 – 7.2
- **Alkalinity:** 120 mg/L
- **Temperature:** 10 – 12 °C (50 – 53.6 °F)

“*This project demonstrates the flexibility of our technology to be used for such a diverse and not so obvious application. We are eager to meet the logistical challenges associate with this project.*”

- Michele LaNoue

CEO of Headworks International Inc.



Typical FRAC Tank with a capacity of up to 21,000 Gallons (79,000 L)

Headworks BIO can provide other key equipment such as blowers, dosing and control systems on a pre-assembled skid, along with the required MBBR internals to be added to a locally procured Frac Tank. This provides for rapidly deployed MBBR treatment systems to remote and/or transient locations, and can be used for a wide variety of biological treatment applications such as temporary work camp wastewater, industrial treatment, etc.

## Solution

MBBR is a highly effective fixed film wastewater treatment process that employs thousands of polyethylene biofilm carriers to support the growth of biofilm. The carriers move freely in the reactor housing the bacteria which oxidize ammonia and nitrogen in the wastewater. Oxygen is delivered to the bacteria which need it to survive through coarse bubble aeration, which also keeps the carriers mixed and in suspension.

The process employs Headworks' proprietary mobile biofilm carriers (ActiveCell AC<sub>920</sub>) to support a very high concentration of attached biomass and maintain excellent mass transfer conditions. The neutrally buoyant HDPE ActiveCell biofilm carriers within the bioreactor tank provide a stable base for growth of a diverse community of microorganisms. Every biofilm carrier has a very high surface-to-volume ratio, allowing for a high concentration of biological growth to thrive within the internally protected areas.

## Outcome

The system is a two-stage MBBR system to nitrify the influent which can have as much as 45 mg/L of Ammonia (NH<sub>3</sub>-N). Operating under aerobic conditions, this is reduced to less than 5 mg/L – well below the requirement of 15 mg/L. Despite the seasons variations the plant copes extremely well with the fluctuating incoming loads.



Seabee FRAC tanks being loaded with ActiveCell® AC<sub>920</sub> media

Since becoming operational in the spring of 2014, the system has consistently exceeded the performance targets. The versatility of Headworks BIO's process engineering experience in a wide range of industrial and municipal applications as well as its team's commitment to solving our customers' most challenging conundrums sets us apart from the competition.