

## **ORP Controlled Facultative Anaerobic Nitrate Reduction in a Groundwater Mesocosm**

NED MURPHY, FRGS<sup>1\*</sup>

<sup>1</sup>Central Planet Repair, LLC, Wahiawa, HI 96786, USA,  
(\*correspondence: ned@geochemist.net)

Nitrate functions as a nutrient and as a terminal electron acceptor compound for facultative anaerobic bacteria. Nitrate is also a contaminant of surface water and groundwater. This study was conducted to identify the conditions that initiate Nitrate Reduction by Facultative Anaerobic Bacteria in groundwater without a significant organic carbon loading from either natural or anthropogenic sources. Inhibition of Nitrate Reduction by very low concentrations of Dissolved Oxygen under these conditions has been observed on groundwater remediation sites.

The facultative anaerobic use of nitrate as the primary electron acceptor is dependent upon the dissolved oxygen and dissolved organic carbon concentrations in the aqueous system. Oxidation-Reduction Potential is used as a measurement for the dissolved organic carbon in the system.

The specific conditions where nitrate reduction initiates is the "Nitrate Gate" which is a relationship of Dissolved Oxygen vs Oxidation Reduction Potential. The location of the "Nitrate Gate" in various geochemical conditions has been investigated using a purpose built groundwater mesocosm that is a closed system allowing for control of the Dissolved Oxygen and Oxidation Reduction Potential in synthetic groundwater. Valves for water sample collection are spaced at 1 Meter intervals along the length of the mesocosm.

The initial results from the mesocosm testing showed that nitrate reduction initiated under very low Dissolved Oxygen concentrations in the near zero negative ORP region between 0 and -200 mV. The results of additional testing under varying controlled conditions will be presented.