

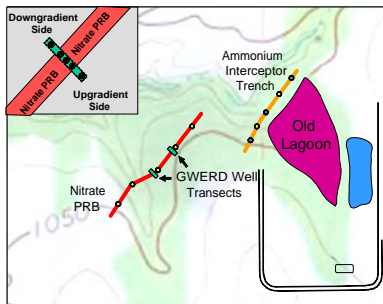
Project Title: Evaluation of Reactive Barrier Technology for Remediation of Nutrient-Contaminated Ground Water from a Swine CAFO (GWERD Task 18540)

Principal Investigators: R. Wilkin, S. Hutchins

Project Period: 10/01/2003 - 09/30/2006

Long-Term Goal/APM: WQ MYP LTG3/APG 58, HW MYP LTG2/APG 136. Specific APMs will be developed for this project.

Abstract: The overall goals of research tasks described here are to better understand the chemical and microbiological processes that result in nitrate removal in carbon-based permeable reactive barriers (PRBs) and to evaluate the effect of the PRB on downgradient aquifer/ground-water chemistry. This work will be conducted at a now-closed facility in Oklahoma. This facility had originally been a swine CAFO, and led to extensive on-site ground water contamination by both nitrate and ammonium through approximately seven years of operation. The selected remediation strategy has been to install an interception trench barrier for recovery and subsequent above-ground treatment of ammonium, and a permeable reactive barrier (PRB) with commercial hay as the reactive matrix for in-situ treatment of nitrate. GWERD personnel have been invited to help evaluate the current remediation strategy. Additional site characterization will be required to



better assess PRB performance, and GWERD personnel will use this information to better assess system performance and address problems which arise. The objectives of proposed research activities are to develop a hydrogeological conceptual model for the site and also to develop monitoring approaches that can be used to better predict the performance and longevity of carbon-based reactive barriers for nitrate removal. The proposed research is organized into three principal topical areas: (1) Development of a site hydrogeological model, (2) Detailed ground water characterization in regions of the site upgradient, downgradient, and within the reactive treatment zone, and (3) Microbiological and geochemical characterization of the carbon-based PRB.

Status: This task will be funded with both Water Quality and Hazardous Waste funds. Ground water characterization has been completed for all existing wells currently on the site as part of a separate project (GWERD Task 5823). Fully-screened wells, cluster wells, and/or multilevel sampling cells have been established within and on each side of the PRB at two transect locations, and a quarterly ground water monitoring program is in place. Results show that denitrification is taking place and that ammonium release, at first observed to be very high and problematic, has dissipated and that the PRB chemistry is working as anticipated. Questions remain regarding ground water flow within and across the barrier and long-term performance across the vertical profile.



Products: (1) Paper on general site characterization and initial PRB performance (*planned*); (2) paper on ground water modeling and PRB performance (*planned*), (3) paper on development of geomicrobiological reaction transport model for assessing PRB performance (*planned*).