

## REMOVAL OF ORGANIC POLLUTIONS BY CETCO REACTIVE CORE MAT® AND ORGANOCLOY® PERMEABLE REACTIVE BARRIER (PRB)

### Introduction

A permeable reactive barrier PRB is an in-situ treatment zone for remediation of contaminated groundwater plumes. These vertical walls are designed to intercept the contaminant plume flow below ground (Figure 1). There has been about 80 PRBs installed in the last 10 years. Many of these have been constructed with zero-valent iron (ZVI) for treatment of organic pollutants (ITRC, 2005).

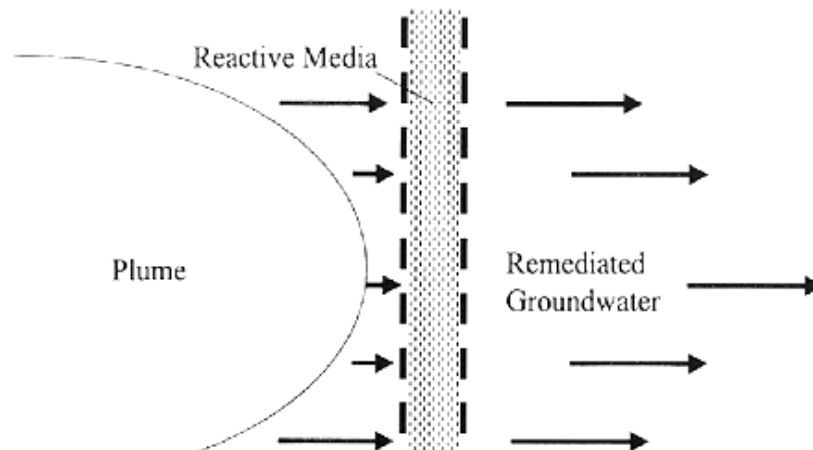


Figure 1. Permeable Reactive Barrier

Recently ZVI has been in short supply and the cost of zero-valent iron has increased dramatically. CETCO's proprietary PM199 organoclay media has become an attractive alternative for this application due to its high adsorption capacity, high removal efficiency on a variety of organic species, and its cost effectiveness. The case study described below illustrates the use CETCO organoclay Reactive Core Mat® (RCM) as well as PM 199 organoclay media in construction of a PRB to treat contaminated groundwater.

### Case Study

The groundwater at a former creosote wood treating site was contaminated by non-aqueous phase liquid (NAPL). The contaminated groundwater was a threat to the nearby fresh water bay when NAPL and soluble organics were showing on the surface of the bay. To stop this pollution from spreading through the bay and into Lake Michigan an interim measure was taken which consisted of installing organoclay RCM along the affected stretch of beach and a permeable reactive wall behind the RCM.

Rolls of Organoclay RCM were laid along a 15 ft (5 m) x 240 ft (80 m) stretch of beach (Figure 2). The RCM was covered with 6 inches (15 cm) of  $\frac{3}{4}$  inch (18 mm) stone and then 2 ft (60 cm) of riprap. The use of gravel below the riprap helped cushion the RCM and prevent the RCM from being blinded off by the angular riprap. As soon as the RCM was placed the sheen that had been seeping into the bay dissipated.



**Figure 2. RCM deployment with front end load equipped with spreader bar system.**

Approximately 15 ft (5 m) up gradient of the RCM a permeable reactive barrier wall was installed. One part organoclay was mixed with 3 parts of ¼ inch (6 mm) pea gravel by volume in a stockpile. The design that was used to size the backfill mix with the native soils considered the following factors:

- The gradation of the backfill should be at least as permeable as the native soil so that the groundwater and NAPL will flow through the PRB rather than around it. In general, this means that the mixed backfill particles should be coarser than the native soils and the fines content should be less.
- The backfill mix should be fine enough that the native soils will not intrude into and clog the backfill mix. A standard “filter design” formula is used to fulfill this criterion.

$$D_{15F} \leq 5 \times D_{85S}$$

where

$D_{15F}$  = grain size that 15% of the filter material is finer than

$D_{85S}$  = grain size that 85% of the native soil is finer than

A continuous trenching machine placed the organoclay-gravel mix in an 18 inch (45 cm) wide by 10 ft (3 m) deep by 240 ft (80 m) long trench (Figure 3). The organoclay PRB was completed in one day. The installed cost for mobilization/demobilization, RCM installation, PRB installation, site restoration, and waste disposal was approximately \$220,000.



Figure 3. Continuous trenching of organoclay PRB.



Figure 4. Alignment of organoclay RCM and PRB

The organoclay RCM and PRB have worked successfully for three years. Piezometers were installed upstream and downstream of the PRB. The piezometers indicate that there is no mounding of the upstream groundwater. There is DNAPL present the central upstream piezometer, but no DNAPL in the respective downstream piezometer. Also, no sheen has been observed emanating from the RCM.

**Engineer:** CH2M Hill      **Contractor:** CH2M Hill Construction      **Subcontractor:** DeWind Dewatering

**Reference**

ITRC (Interstate Technology & Regulatory Council), 2005. *Permeable Reactive Barriers: Lessons Learned/New Directions*, PRB-4, Washington, D.C.: Interstate Technology & Regulatory Council, Permeable Reactive Barriers Team. [www.itrcweb.org](http://www.itrcweb.org).