

PROJECT DESCRIPTION – PASSIVE GROUNDWATER TREATMENT FOR NITROGEN, PHOSPHORUS & PERCHLORATE REMOVAL

Nitrate Nitrogen < 0.1 -0.6 mg/l
Total Phosphorus < 0.1 mg/l
Total Perchlorate < 0.2 ug/l

Project: Permeable Reactive Barrier (PRB)
Passive Groundwater Treatment
Nitrogen Removal

Wastewater Engineer: Pio Lombardo, P.E.
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Site 1 – Nitrogen Removal – Cape Cod, Massachusetts

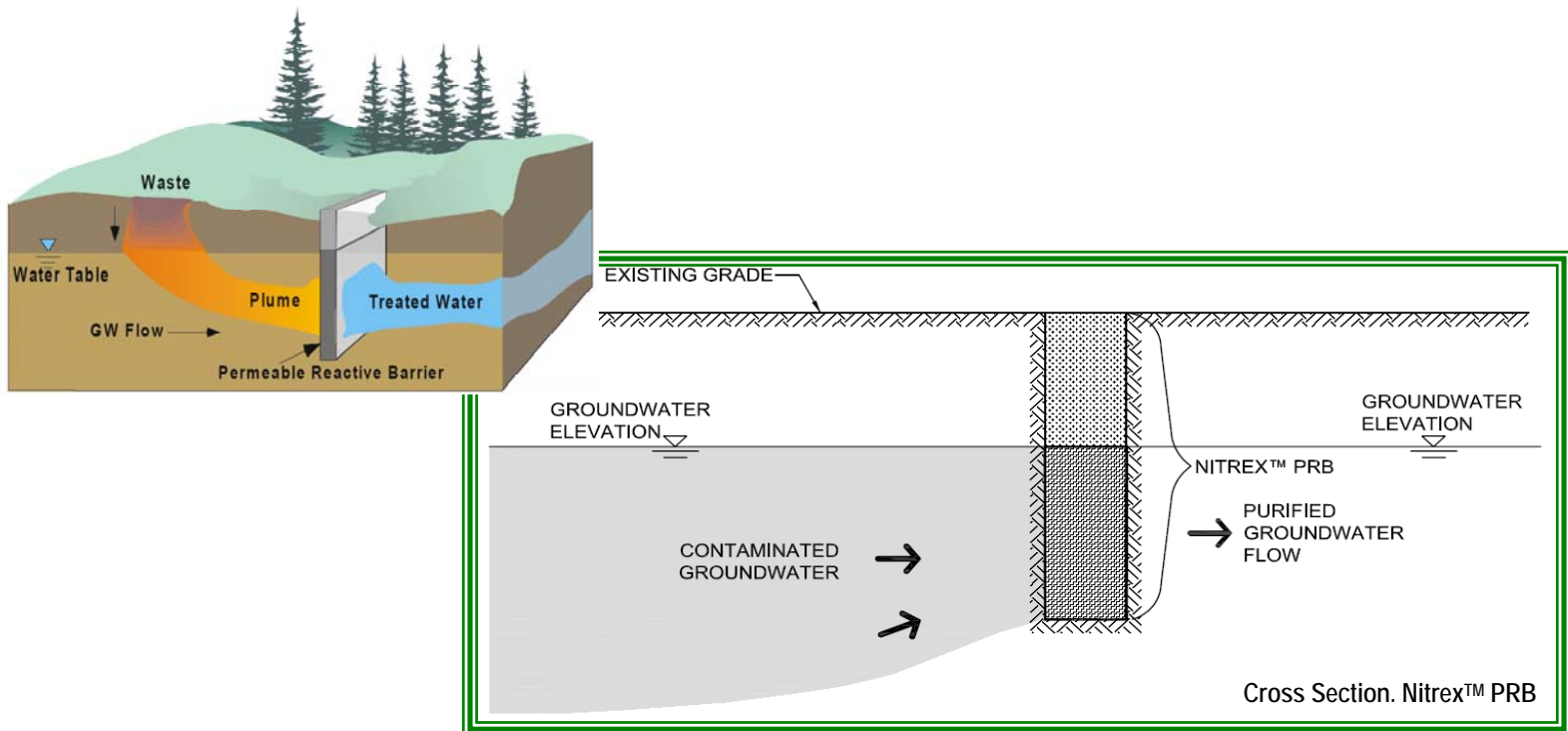


As part of a Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET) funded demonstrated project, the Woods Hole Marine Biological Lab (MBL) retained Lombardo Associates, Inc. (LAI) for installation of the patented Nitrex™ groundwater nitrogen removal technology at two locations on Cape Cod, MA in the Waquoit Bay watershed.

Performance.

Site	Influent Nitrate – N (mg/l)	Effluent Nitrate – N (mg/l)
Waquoit Bay, MA	1.74	0.007
Childs River, MA	7.19	0.568





Site 2 – Nitrogen Removal – Southern New England

Two Nitrex™ PRBs were installed in a Rhode Island coastal watershed. Upstream and downstream concentrations of nitrate, ammonia, and dissolved organic nitrogen in the groundwater were monitored over two annual cycles. The dissolved inorganic nitrogen (DIN) levels are presented below.

	Influent DIN (mg/l)	Effluent DIN (mg/l)
Coastal Site #1	3.9	0.2
Coastal Site #2	3.7	0.1

DIN = Dissolved Inorganic Nitrogen = Ammonium + Nitrate + Nitrite

Site 3 – Perchlorate and Nitrogen Removal – Ontario, Canada

Ontario, Canada Site	Nitrate - N (mg/l)	Perchlorate (ug/l)
Influent	50	50
Effluent	<0.1	<0.2

Site 4 – Phosphorus Removal –Massachusetts Site

Massachusetts Site	Influent Phosphorus (mg/l)	Effluent Phosphorus (mg/l)
Site #1	1.7	0.1

Environmental Engineers/Consultants
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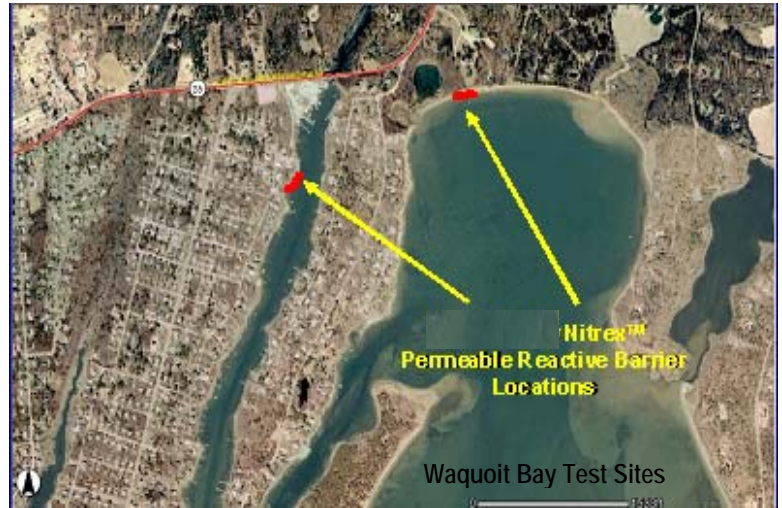


PROJECT DESCRIPTION – WAQUOIT BAY, MA – PASSIVE GROUNDWATER TREATMENT FOR NITROGEN REMOVAL

Treating Groundwater for Nitrate – N < 0.1 mg/l

Project: Waquoit Bay, MA
Permeable Reactive Barrier (PRB)
Passive Groundwater Treatment
Nitrogen Removal

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Waquoit Bay is located in the towns of Falmouth and Mashpee on the south side of Cape Cod. It is part of the Waquoit Bay National Estuarine Research Reserve (WBNERR), which has about 3,000 acres of bays, ponds and uplands. As part of a Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET) funded demonstrated project, the Woods Hole Marine Biological Lab (MBL) retained Lombardo Associates, Inc. (LAI) for installation of the patented Nitrex™ groundwater nitrogen removal technology at two locations in the Waquoit Bay watershed.

The two installations constructed in summer 2005 are:

- Childs River
- Waquoit Bay Reserve Property –
149 Waquoit Highway, East Falmouth, MA

Performance.

Site	Influent Nitrate – N (mg/l)	Effluent Nitrate – N (mg/l)
Waquoit Bay	1.74	0.007
Childs River	7.19	0.568

