

## Lagoon Barrier (Permaliner®)

**1 mm Flexible Polypropylene**  
**Maraetai, Auckland, New Zealand**

**Client: Manukau Water**

**M**anukau City Council operates the Beachlands Maraetai Water Treatment Plant (WTP) in Whitford. The upgrading of the plant was undertaken in August through September 2000, which included the installation of the Lagoon Barrier Curtain. The purpose of the curtain is to separate the existing lagoon, which is approximately 60 m x 15 m, into two different biological process sections.

The lead section which receives the normal inflow and re-circulated, is intended to maintain anoxic conditions. The subsequent section will be aerated as at present. The intent is to allow for the curtain separating the two zones to be movable up and down the lagoon over a distance of approximately 8 m.

The curtain was fabricated from Permaliner FPP (Flexible Polypropylene) 1 mm membrane, which is suitable for effluent containment facilities. Permaliner is a co-extruded (triple-layered), virgin polymer based, polypropylene and has excellent tensile strength and flexibility to withstand ground settlement and loading stresses, high tear and puncture resistance, and is free from additives such as plasticisers, adhesives and lubricants. It is manufactured to food hygiene grade standards for suitability to potable water (BS 6920) and is highly UV resistant.

Permaliner FPP is resistant to a wide range of chemical agents, including the surfactants that often exacerbate environmental stress cracking in other polymer materials. The mechanical properties are virtually unaffected by prolonged exposure to a wide range of organic and inorganic agents. It is very resistant to leachate from Municipal Solid Waste (MSW) facilities.

Permaliner has exceptional resistance to puncture and it exceeds the specifications of GRI test method GM-3.

Note: As at August 2008 the curtain had recently been decommissioned. Upon examination absolutely no deterioration had occurred to the material.



## Silt Curtain

### Floating silt barrier

**Marine construction, Waiheke Island**  
**Client: Auckland City**

**K**ennedy's point Waiheke Island is a bay used by ferry's carrying people and vehicle's from Bucklands Beach and Auckland central to the Island. Due to the exposed nature of the bay the ferry's dock at, Auckland city planned for a new breakwater to be constructed in the bay to provide shelter to the vessel's docking at Kennedy's point, for smooth loading and unloading of people and vehicles.

The plans called for the creation of a breakwater to extend 180 m from the shore to a depth of almost 4m. The method adopted was for large armor rock to built up to a sufficient level, in this case about 2 m above high tide mark, thus providing shelter from incoming waves.

Due to the sensitive environment of Auckland's Hauraki Gulf, a popular destination for tourists, pleasure boaters and fishermen, Auckland City council was very conscious about protecting the sensitive marine ecosystem which Waiheke Island plays a major part in.

This large breakwater was made from rock placed on the sea floor to build up the structure and it was clear that this would create a lot of silt which is a potential killer for marine organisms.

It was determined that before any works could begin the entire site had to be screened by a dedicated floating silt screen, which would hang vertically stopping any silt from leaving the construction zone.

As this is one of the first projects in New Zealand that a dedicated floating silt screen had actually been specified, Permathene was approached as a leading Civil and environmental engineering supplier to offer solutions for this problem.

Permathene supplied a dedicated floating silt screen made from the highest quality products. This screen consisted of a 300mm floatation device sealed in a PVC sleeve, the silt screen itself is made from a mono-filament woven geotextile, with openings small enough to trap silt, but also allowing water to pass through the screen. The whole fence was held in place with anchor ropes tied to weights sitting on the sea floor. The screen its self extended over 3m from the surface of the water.

Monofilament is a superiour fabric because typical woven fabrics that are slightly cheaper in general have a far lower flow rate, or sacrifices filtration. The monofilament traps any silt (in this case any particles larger than .4mm) and additionally allows normal flow of tides and current.

This type of screen can be manufactured in almost any lengths and floatation devices also can be modified for varying waters, ie. Lakes, rivers and open seas.



## Floating Baffle Curtains / Storage Pond Liner

### Waste Water Treatment Plant Upgrade Ngaruawahia, New Zealand

**Client: Spartan Construction / Waikato District Council**

**Date: March 2009**

The Ngaruawahia Waste Water Treatment Plant receives domestic wastewater from several towns for treatment. Upgrading of the plant required that the flow of wastewater into the plant was never disrupted and that the quality of the water leaving the plant had received as much treatment as possible. The latest stage of the plant upgrade included the removal of sludge and other deposits from the sewage treatment pond. This sludge had to be dewatered and the dried residue permanently deposited in designated areas of the treatment plant's wetlands. A temporary de-watering pond was commissioned for this part of the project and Permathene supplied 3,250 m<sup>2</sup> of Permaliner 0.5mm Flexible Polypropylene for the lining of the excavation. This liner was factory fabricated in three separate panels which were welded together on-site at the time of installation. Dewatered sludge was placed in this area at the primary stage of the dewatering process.



Six new floating baffle curtain walls were fabricated by Permathene and installed in the recently de-sludged treatment pond. Installation of these baffle curtains allowed for the creation of an extended flow path through the pond thus separating the area into one facultative and four maturation zones. Baffles 1, 2, 5, and 6 were fabricated with a range of square openings which allowed for a controlled water flow throughout the four maturation zones. This work significantly improved the performance of the treatment pond and prepared the pond for future upgrades. The six baffles with a total length 730m were fabricated in standard 30m long units. The baffles had secondary skirts installed on the slope units, allowing for complete contact with the concrete wave band and therefore reducing any short circuiting of the water.

Construction of maturation zones inside the existing pond required that the baffles be connected at the correct angles. This included 3 "T" connections and one complex Cross-Connection. The baffles were connected to each other and to the shore anchors via SS high tension cable. At this stage the required shape of the maturation cells was formed. The task of creating a water tight seal of the baffles at the cross and T connections was achieved by bringing together additional flaps previously installed to the end of each unit. The cross-connections were later secured by the installation of cross-anchors (short mooring lines 4m long connected to heavy concrete weights on the pond's floor). The positions of the baffles in the pond are determined by fixed anchor points, cross anchors and wooden poles left in the ponds from previous installations and designed to accommodate the pond's water level variation. Permathene engineers provided support during the design and installation process.

The total length of the baffle curtain system is 787 meters and currently is probably the longest floating geosynthetic baffle curtain system used in wastewater applications in New Zealand. To date, Permathene Ltd have manufactured and supplied over 5 kilometres of baffle curtains to various sites in New Zealand, Australia, and the Pacific Islands.

## Floating Baffle Curtains

### Waste Water Treatment Plant Upgrade Te Kuiti, New Zealand

**Client: Waitomo District Council**

**Date: May 2013**

In October 2011 the Waitomo District Council issued tender documents for the \$7.59m upgrade of the Te Kuiti Waste Water Treatment Plant. As the central part of the Activated Sludge Reactor, the Anaerobic Zone was to be separated from the AS Reactor by the installation of a circular scrim reinforced Polypropylene curtain. Spartan Construction was awarded the Civil Works section of the upgrade and Permathene Ltd was subcontracted to fabricate and install the floating curtain.

The curtain requirements as set out by Opus International Consultants called for a fabrication made from 1mm (minimum) thick membrane and installed as one continuous length around the anaerobic zone perimeter which was defined by the installation of seven 200 SED piles. The curtain would follow the water level in the pond by floating up and down these piles by means of HDPE rings attached to the ends of seven PVC 150mm floatation pipes welded into hems at the top of the unit.

The hems were fabricated with a double layer of membrane in order to give extra protection against the effects of UV for this exposed portion of the curtain. Ballast was achieved by the incorporation of 150mm diameter sand filled socks in welded hems at the base of the curtain. Total length of the curtain was 32m with an overall depth of 3.5m and the membrane supplied was 1.2mm in thickness. Five transfer openings with reinforced edges were situated vertically in one section of the curtain.

The factory fabricated unit was shipped to site along with the floatation pipes and ballast socks which were fitted after the membrane was placed in position. Once the floatation pipes and HDPE rings were attached the curtain was temporarily hoisted to the top of the posts by means of pulleys and the ends overlapped and welded together. Installation was completed in two days.



# BAFFLE CURTAINS



## BAFFLE CURTAIN PROJECTS LGL Gold Silt Barrier Lihir Island, Papua New Guinea

Project Scope: 600 Im of Floating  
Silt Curtains

Completed: 2010

Project Type:  
Mining Operations Silt Barrier

Customer:  
Lihir Services Australia Pty /  
LGL Gold

Contractor:  
Lihir Services Australia Pty Ltd



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LGL Gold are the operators of a gold mine on Lihir Island, New Ireland Province in Papua New Guinea.

The company made a request to Permathene to fabricate 600m of floating silt barrier to protect the marine environment from the silt created by their on-shore operations.

The curtain's depth varied from 1.5m in the shallow areas to 3m in places.

Buoyancy elements were made from 300mm round polystyrene logs enclosed in low-density polyethylene tube weld-sealed inside 1mm Permaliner Flexible Polypropylene sleeves.

A double-ballast system was utilized for tidal self-adjustment of the silt barrier. A 10mm galvanized chain was sewn in the seams along the bottom of the each of the curtain's two skirts.

Syntex GNP non-woven geotextile skirts were welded to the Flexible Polypropylene floatation tube making for a durable and efficient silt curtain

Permathene Baffle Curtains

- Turbidity Barriers
- Potable Water Reservoirs
- Silt Control Baffles
- Debris Collection / Control
- Sediment Control
- Stormwater ponds
- Oil / pollution booms



# BAFFLE CURTAINS



## BAFFLE CURTAIN PROJECTS Porangahau WWTP Hawkes Bay, New Zealand

Project Size: 3 baffle curtains up to 1.8 m deep with combined length 45 m

Completed: 2010

Project Type:

Waste Water Treatment Plant  
Turbidity Barriers

Customer:

Hawkes Bay DC

Contractor:

Infracon Ltd

Consultant:

Opus International  
Consultants Ltd



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Porangahau WWTP installed three baffle curtains—one turbidity barrier to lengthen the water passage through the oxidation pond, one cut-off (shore to shore) baffle curtain with an opening to create a small maturation area around the pond's outlet, and one 4m long inlet screen

The curtains were installed in two stages, the objective being the increase of the plant's productivity for the small coastal community of Porangahau and Te Paerahi.

The pond is located in a strong wind zone, so even for these small curtains heavy M8 316 stainless steel flexible cable was used for the tensioning and mooring lines.

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# BAFFLE CURTAINS



## BAFFLE CURTAIN PROJECTS Wallan WWTP Victoria, Australia

Project Scope: 3 × 90m × 3.6m  
Turbidity Barriers

Completed: 2008

Project Type:

Waste Water Treatment Plant  
Turbidity Barriers

Customer:

Yarra Valley Water

Contractor:

Yarra Valley Sewerage & Drainage

Consultant:

GHD, Melbourne



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The upgrade program for the Wallan STP in Victoria, Australia, called for 3 baffle curtain to be installed in the plant's oxidation pond.

Engineer's from GHD in Melbourne specified the 90m long and 3.6m deep units to be installed in alternate positions.

The curtains floatation tubes and skirts were made from Permaliner 1000, a 1mm thick geomembrane of increased durability and extended UV resistance.

200mmØ marine grade polystyrene logs were welded inside the floatation tubes to create the buoyancy elements and stop any water from passing over the top of the units.

16mm medium link galvanized chain was enclosed in a welded seam along the base of the curtain's skirt in order to create the ballast.

The mooring lines and tension cables utilized 8mm 7/17 flexible marine grade stainless steel wire rope.

Project completed late 2008.

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