

Auckland marina development protects pristine national conservation site

Project profile

Objective

Stringent stormwater treatment requirements threatened to quash a marina development project in Auckland, New Zealand. A shallow drainage profile exposed to tidal conditions further complicated the design challenges.

Solution

Three Up-Flo® Filters were used to remove >75% of Total Suspended Solids (TSS) and other pollutants from stormwater runoff prior to discharge into the bay.

The Hauraki Gulf is an object of national pride in New Zealand. Held up as a national treasure, it is one of the country's most precious conservation icons due to its diversity natural life. Concern about the Gulf has been mounting since the 1990s due to increasing pressures from population growth, an expanding port and international events such as the America's Cup, which brought thousands of people to New Zealand.

Many companies had sought and failed to receive approval for development projects at Okahu Landing overlooking the Hauraki Gulf. Orakei Marina Development proposed the upgrade of 172 new berths and more than two acres of development consisting of a car park and gardens. To receive approval of the project, the firm needed to comply with strict environment requirements and overcome the challenges of working in tidal conditions.

The conversion of open space to impervious surfaces such as the car park proposed by Orakei Marina Development, would increase the volume of runoff and the risk of downstream flooding. Additionally, runoff from car park areas may contain high levels of pollutants, including trash and other debris, coarse and fine sediment, hydrocarbons, toxic trace metals, nutrients, pathogens and other contaminants.

Runoff from critical areas such as large car parks has been shown to have above average pollutant load, so multiple treatment processes are typically needed to address the composition and loading of the runoff.

Product profile

- The Up-Flo® Filter met and exceeded treatment requirements, with removal efficiencies at >90% for particles with a d_{50} of 20 micron
- The low headloss Up-Flo® Filter required substantially less hydraulic drop than a conventional sand filter
- High rate up-flow filtration translates to a smaller footprint, lower capital cost and lower maintenance cost than traditional downward flow sand filters



Stormwater filtration is effective for controlling fine particulates and associated pollutants. However, a common challenge with traditional systems is a slow filtration rate (hence large footprint) and tendency to clog. With conventional down-flow filters, water flows down through a porous media filter that traps particles. If the particles are too large, they will block the filter and reduce the surface area available. Often, developers try to overcome this by increasing the footprint of the filter, but this takes up expensive real estate and involves considerably higher maintenance costs.

Conventional surface filtration devices are generally not cost-effective for managing stormwater runoff due to the relatively high flow rates that occur during storm events. The average one-acre parking lot, for example, can generate approximately 450 GPM of water with average rainfall, yet typical down-flow filters can only handle between 2 and 5 GPM. This is a particular concern in a region such as Auckland, which experiences an average of 4 ft of rain per year.

To tackle these challenges, Orakei Marina Development hired Hynds Environmental Systems Ltd., a New Zealand firm that helps companies meet environmental requirements through stormwater treatment, sewage treatment, flood protection, combined sewer overflow systems and other solutions. Hynds Environmental supplied three Hydro International Up-Flo® Filter units to treat stormwater runoff from the marina's three acres of parking lots totaling 3.1 million gallons.

The low headloss of the Up-Flo® Filter suited this shallow drainage system. Unlike traditional sand filters that can require up to 4 ft or more of headloss to operate efficiently, the Up-Flo® Filter's combination of porous media, high flow-through rate and high treatment capacity allows for much lower headloss. At peak operational capacity, it only has approximately 29.5 in of required headloss.

The three Up-Flo® Filters employ multiple methods to treat runoff from critical source areas such as car parks. The sump captures coarse grit and gross debris, the chamber eliminates floatables and trash, the angled screen handles neutrally buoyant material, and the filter media screens out fine sediment, hydrocarbons, metals, organics such as pesticides and herbicides, and nutrients such as nitrogen and phosphorus.

How it works

During a stormwater event, water enters the chamber within the device via an inlet pipe or overhead grate. Gross debris and sediment settle out in the sump.

As water fills the chamber, flow is directed up through an angled screen and flow distribution media into the filter module. Particles fall away from the filter media to prevent it from clogging, and flow is evenly distributed across the media for maximum treatment.

Treated flow exits the filter module via a conveyance channel to an outlet module.

A space allowance is provided for the filter media to swell and circulate through the device. This additional room ensures a higher flow through capacity.

In addition, a drain-down system keeps the media from staying submerged between storms.



This alternative approach has been fully vetted by the Auckland Regional Council, which approved the Up-Flo® Filter for treatment of stormwater runoff.

As a result of using this advanced filtration system, Orakei Marina Development was able to exceed the Council's requirements for stormwater treatment of 75% of total suspended solids. The system removes more than 90% of particles with a mean particle distribution of 20 microns.

Based on the success of the Orakei Marina project, other areas of the country now look to Auckland for guidance on the best treatment technologies for a particular job.

Learn more

To learn more about how Up-Flo® Filter can help you to manage water more effectively, visit hydro-int.com, search **Up-Flo Filter** online or contact us:

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