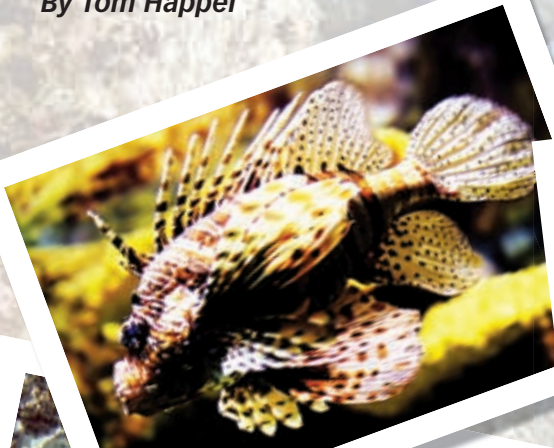


[COASTAL WATERS]

Injection Well island

By Tom Happel



Key West is home to more than 80 percent of U.S. fish species.

Eliminating and treating storm water outfalls to protect water quality, fish and coral reefs in Key West, Fla.

Key West is a historical city where the real estate titles often date back to the kings of Spain. Today's municipal leadership is making storm water management history.

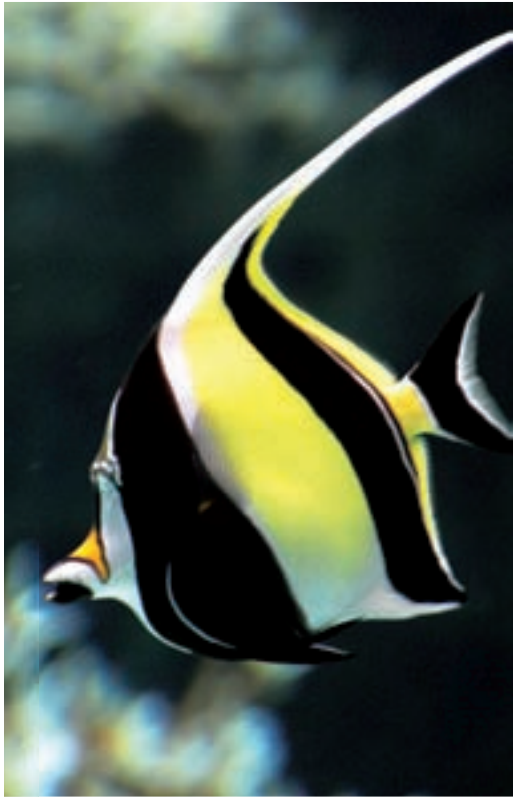
The city has taken the initiative to completely eliminate 63 of its 78 near-shore outfalls and provide treatment to the remaining 15 outfalls. Located at the end of the Florida Keys and the southernmost point in the U.S., Key West is an island city 4.5 miles long and 1.5 miles wide.

How does an island city eliminate almost all its storm water outfalls

without causing flooding? The answer is to provide treatment for the storm water and then inject the water underground by means of gravity injection wells.

The near-shore waters around Key West provide a habitat for 80 percent of the fish species in the U.S., including its largest living coral reef system. Because of the special nature of the aquatic habitat surrounding Key West, the near-shore waters have been designated as "Outstanding Florida Waters," and no water quality degradation is permitted.

All of the Keys have also been identified as critical areas of concern



by the state. At the federal level, the Florida Keys National Marine Sanctuary and Protection Act of 1990 directs the U.S. Environmental Protection Agency (EPA) and the state to develop a water quality protection plan for the sanctuary.

Project Overview

With the assistance and oversight of the EPA, Florida Department of Environmental Protection and South Florida Water Management District, the city of Key West began the implementation of its injection well project in 2005. The scope of the work around each injection well includes removal of the old drainage system, the placement of new catch basins and pipes, the installation of nutrient-separating baffle boxes (NSBBs) and the drilling of the injection well.

The engineering firm that has been tasked with designing each site and overseeing the work to ensure quality control is Perez Engineering & Development Inc. With offices in Tampa and Key West, Fla., Perez is able to put field engineers on site while support from the main office designs work and solves problems. This type of civil engineering

expertise and teamwork is what keeps the project moving smoothly.

The injection wells are drilled using a bucket auger method to a depth of 90 ft. The well pipe is 24-in. PVC and is cased to a depth of 60 ft, leaving the lower 30 ft pervious to act as the conveyance into the substrates. To maintain the design flow specification of each well, it is imperative to prevent the well from filling with debris.

The NSBBs, manufactured by

Suntree Technologies Inc., proved to be the pretreatment structure of choice because of their ability to treat the entire flow with almost no head loss, a more than 90 percent removal efficiency, their ability to treat multiple inflows and an inexpensive price.

Third-party studies have shown high removal efficiencies for solids down to 12 microns with no detectable resuspension. By keeping debris out of the injection well, the entire system

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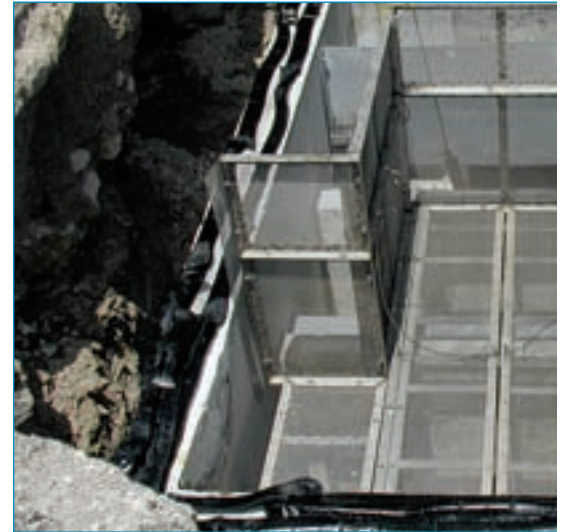
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will flow more water and require less service.

Special features of the NSBB include a primary screen system and a secondary screen system to prevent the passage of floatables, a large skimmer complete with hydrocarbon absorption booms and three settling chambers with strategically placed turbulence deflectors to allow for the settling of sediment without the potential for resuspension.

As the water flows into the treatment structure, it enters the primary screen system, which is relatively large in volume and surface area and spans the first and second sediment chambers. The linear velocity of the water flow is reduced as it spreads wide in the structure and eventually passes through the screen system.

Sediment, most of which will not make it past the first settling chamber,



Nutrient-separating baffle box installations help keep debris out of injection wells.

You did it.
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*Source: EPA Performance and Accountability Report for Fiscal Year 2007



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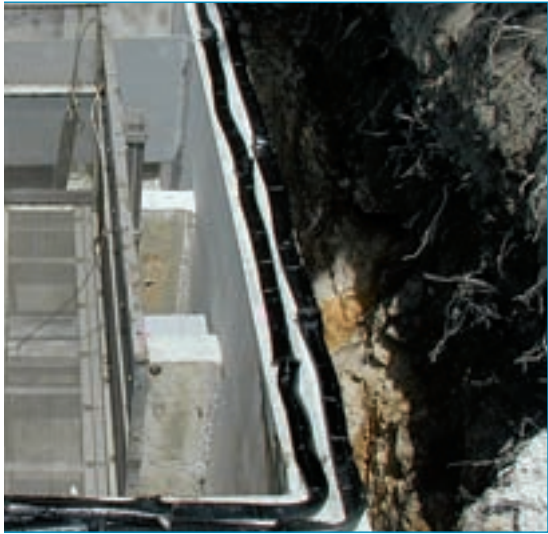
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settles as the water is calmed. After the primary screen system and above the third chamber, the skimmer prevents the passage of petroleum products such as motor oil leaked by automobiles. Along the face of the skimmer, hydrocarbon absorption booms absorb the petroleum sheen on contact.

The injection well casing enters the treatment structure through the floor in the third chamber, which eliminates the need for a separate concrete structure for the well. On top of the well casing, a secondary screen system with a finer sieve size filters the water again as it enters the well. The secondary screen system is also a skimmer with approximately 1.2 sq ft of conveyance between the screen and well casing. This ensures that the water will always flow, even if the screen becomes obstructed.

Streamlined Solutions

The primary installation contractor has been Charlie Toppino & Sons Inc., and because the group is based in Key West, it has the advantage of having local resources and equipment to carry out the project. Tourism is a primary source of income for many in Key West, and having the installation work performed quickly is of great concern. To accomplish this, three separate crews with specialized skills and equipment work in concert for greater installation efficiency.



The first crew is tasked with drilling the well, which takes a few days on site. After the well is drilled, it is capped and the hole stabilized to await the arrival of the second crew. The visual impact of the project is minimal at this point. The second crew removes the old drain system, installs new catch basins and pipes and sets the pretreatment structure (the NSBB). This is the most disruptive portion of the project and includes a hydrostatic test of the pipes and structures to ensure that there is no leakage. The third crew specializes in restoration (i.e., paving, brickwork and curbing). The idea is to restore the site to a better-than-before look.

To date, Key West has 39 gravity injection wells working silently to help save the coral reefs, with 10 more scheduled installations in 2008. The results of this innovative project have been a significant improvement in the water quality of the near-shore waters and improved drainage. Whether the objective is to reduce pollution or to use storm water as a resource, injection wells are proving to be an important part of the solution. **SWS**

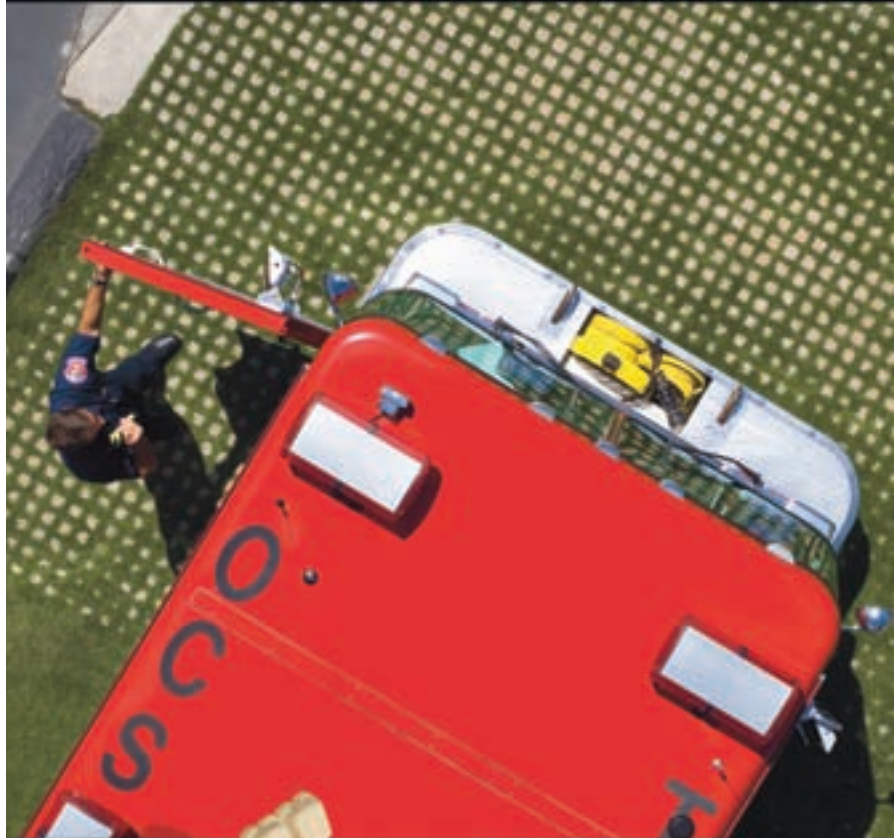
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