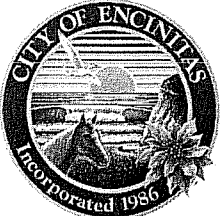


Moonlight Beach Urban Runoff Treatment Facility Final Report



City of Encinitas
Clean Water Program
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EXECUTIVE SUMMARY

Introduction

Moonlight State Beach is the most popular coastal feature in the City of Encinitas (City) and is one of the North San Diego County's most famous recreation areas. The City is a semi-arid coastal community located 22 miles north of downtown San Diego, California with a population of approximately 60,000. The City has estimated beach attendance at over 2 million visitors annually for the past five years and estimates that its beaches bring in \$47 million annually to the local economy.

One of the unique features of Moonlight State Beach is that Cottonwood Creek flows across the beach year-round. It drains approximately three square miles of heavily developed land and has contributed to water quality degradation at Moonlight State Beach for years. In the year 2000 Moonlight State Beach was posted over 70 days due to bacteria indicator exceedances during routine monitoring.

Beginning in 1999, the City implemented best management practices (BMPs) and performed heavy enforcement of urban runoff regulations throughout the Cottonwood Creek watershed. Although these efforts resulted in a reduction in pollutant levels, a more aggressive contaminant removal system was necessary to protect public health. The City obtained funding through the Clean Beaches Initiatives grant program and selected an ultra-violet treatment process. The Moonlight Urban Runoff Treatment Facility (UV Facility) was designed in the fall of 2001 and constructed between June 2002 and August 2002.

Project Description

The UV Facility is located approximately 230 yards upstream of Moonlight State Beach. It is sited adjacent to Cottonwood Creek at the southeast corner of 3rd and B Street within the footprint of the Moonlight Beach Sewer Pump Station. The UV Facility diverts approximately 135 gallons per minute of dry weather flows from the creek into a wet well that consists of a five-foot diameter concrete cistern with two alternating 7.5-HP pumps. The water initially passes through a basket strainer and multi-media filter to reduce turbidity and maximize the effectiveness of the system. The water then is passed through two a disinfection unit designed to inactivate bacteria and viruses in the creek water. The disinfection unit consists of two UV chambers approximately 48 inches in length and 8 inches in diameter. Each chamber has four low-pressure, high intensity UV lamps. The chambers are mounted horizontally. The treated water is finally re-introduced to Cottonwood Creek and discharges to the Pacific Ocean at Moonlight Beach. The UV Facility operates only during dry weather periods, as it does not have the capacity to treat wet weather flows and the high turbidity associated with storm water renders the UV process ineffective.

Monitoring Program

The main objectives of the UV Facility are protection of public health by eliminating or reducing the risk of illness from urban runoff and thereby reducing or eliminating the need for beach postings. In order to monitor the effectiveness of the UV Facility to meet these objectives two assessment methods were used: water quality monitoring and beach posting data. The City routinely monitored the concentrations of bacteria at three locations in Cottonwood Creek and in the mixing zone (ankle to knee deep in the surf) at the creek mouth. Samples were collected above (influent) and below (effluent, at the creek mouth and in the mixing zone) the facility, and

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before and after project implementation. Monitoring locations include influent, effluent, the mouth of Cottonwood Creek, and the Moonlight Beach mixing zone. Approximately 160 routine sampling events occurred during the monitoring period. Beach postings were assessed using data from the San Diego County Department of Environmental Health (DEH).

Results

Bacteria removal efficiencies through the UV Facility were calculated at >99% based on 153 pairs of influent and effluent samples. Through weekly bacteria monitoring and a special study, the City determined that additional sources of bacteria and regrowth contributed to the degradation of water quality downstream of the facility. However, the overall removal efficiency from the facility influent to the creek mouth (50 feet upstream of the mixing zone) was measured at approximately 50%. Monitoring also showed an improvement of water quality in the mixing zone as measured by changes in exceedances of AB411 standards. AB411 exceedances were reduced from 9.4% prior to the project to 4.8% after the project representing nearly a 50% reduction in exceedances in the mixing zone.

Annual days of beach postings at Moonlight State Beach have declined since 2000; reduced by an average of 85%. The beach was posted an average of 42.5 days per year in the two years preceding construction and 6.5 days per year of postings after construction. This assessment is based on DEH beach posting data.

Operations and Maintenance

The facility operated for 68%, 81% and 65% of the year for 2003, 2004, and 2005, respectively. Generally, the facility was in operation for the entire dry season (May through September). The facility was taken off-line in the event of rain, as a result of a sewer spill, or for maintenance. The major maintenance issues for the UV Facility during the first 3.5 years of operation were associated with the intake structure (including the wet well), the filtration system, and UV units. Problems with the intake structure included the height of the weir, algae in the intake screens and maintenance of the pumps.

The filtration system includes basket strainer, a turbidity meter, an anthracite, multi-media filter unit. Basket strainers have required little maintenance, however, the turbidity meter required frequent adjustments and maintenance to operate properly. The multi-media filter was sensitive to suspended solids in the creeks flow which obstruct the filter and required back flushing on a regular basis. The automatic back flushing interval was adjusted to balance the need to increase flow through the system and the cost of potable water for back flushing. Back flush water was discharged to the adjacent sewer pump station.

The most frequent maintenance need for the UV unit included bulb replacement and ballast replacement. Bulbs generally needed to be replaced once per year. The ballast has only needed replacement once. In general, the UV unit maintenance has been relatively low. Weekly water quality monitoring and instrumentation within the facility were used for process control. Increased bacteria in the facility effluent were an indicator of process control problems, typically these were:

- Increased bacteria loading in the creek indicative of rainfall or illicit discharges
- Obstruction of multimedia filters
- Increased turbidity in the influent associated with rainfall or illicit discharges

- Decreased performance of UV bulbs, bulbs burnt out.
- Decreased performance of UV bulbs due to wiper problems.

Conclusion and Recommendations

The UV Facility is instrumental in reducing bacteria concentrations in Cottonwood Creek and at Moonlight State Beach. The facility removes greater than 99% of all pathogenic organisms from creek water prior to its discharge at Moonlight State Beach. With reduced beach postings, fewer bacterial exceedances in the mixing zone, and demonstrated improvements in water quality in the creek and in the mixing zone, the project has been a success; meeting the main objectives of the project.

Exceedances of water quality associated with bacterial regrowth and sources of bacteria in Cottonwood Creek downstream of the UV Facility continue to cause occasional beach postings. Based on the monitoring program and special studies, the following recommendations are provided to mitigate these bacteria sources:

- Regular maintenance and cleaning of the storm drain system to reduce the media for regrowth.
- Placement of UV Facilities as close as possible to the receiving water being protected
- Removal of the kelp wrackline at the creek or storm drain outlet that can contribute bacteria at the beach.
- Continuous monitoring of turbidity and flow data to identify trends and identify illicit discharges.
- Back flush multi-media filters with influent water if it is relatively low in turbidity to save water costs.
- A DNA study to identify sources of bacteria introduced to the creek downstream of the facility.
- An epidemiology study to identify the potential for health risks associated with the sources of bacteria downstream of the facility
- Continued monitoring of influent and effluent bacteria concentrations, influent turbidity, and flow as process controls.

Remaining
contents of
Final Report
are in Master
File for
reference

