

Summary Report of Enhanced Monitoring and Pollution Source Tracking Efforts in the Willard Beach Watershed, South Portland, Maine, 2012-2013

Willard Beach is a popular year-round local recreational area located in South Portland with a history of impaired water quality. Routine beach water quality exceedances on Willard prompted the need to add additional sites to determine the nature and extent of potential bacteria inputs from upland sources. As part of this effort, the City and MHB conducted paired Enterococci (ENT) and optical brightener (OB) monitoring of the stormwater system in 2012 and 2013. There are 6 stormwater outfalls that discharge directly to the beach and drain stormwater from ~ 1 km² of residential, commercial and institutional areas (Figure 1). Of particular concern are outfall WB-15, which collects stormwater from the SMCC athletic fields, and outfalls WB-17 and WB-18, which collect stormwater from a predominantly residential area with several interspersed commercial enterprises. Outfalls WB-11, WB-12 and WB-16 typically have very low discharge volumes and were not monitored as part of this study.

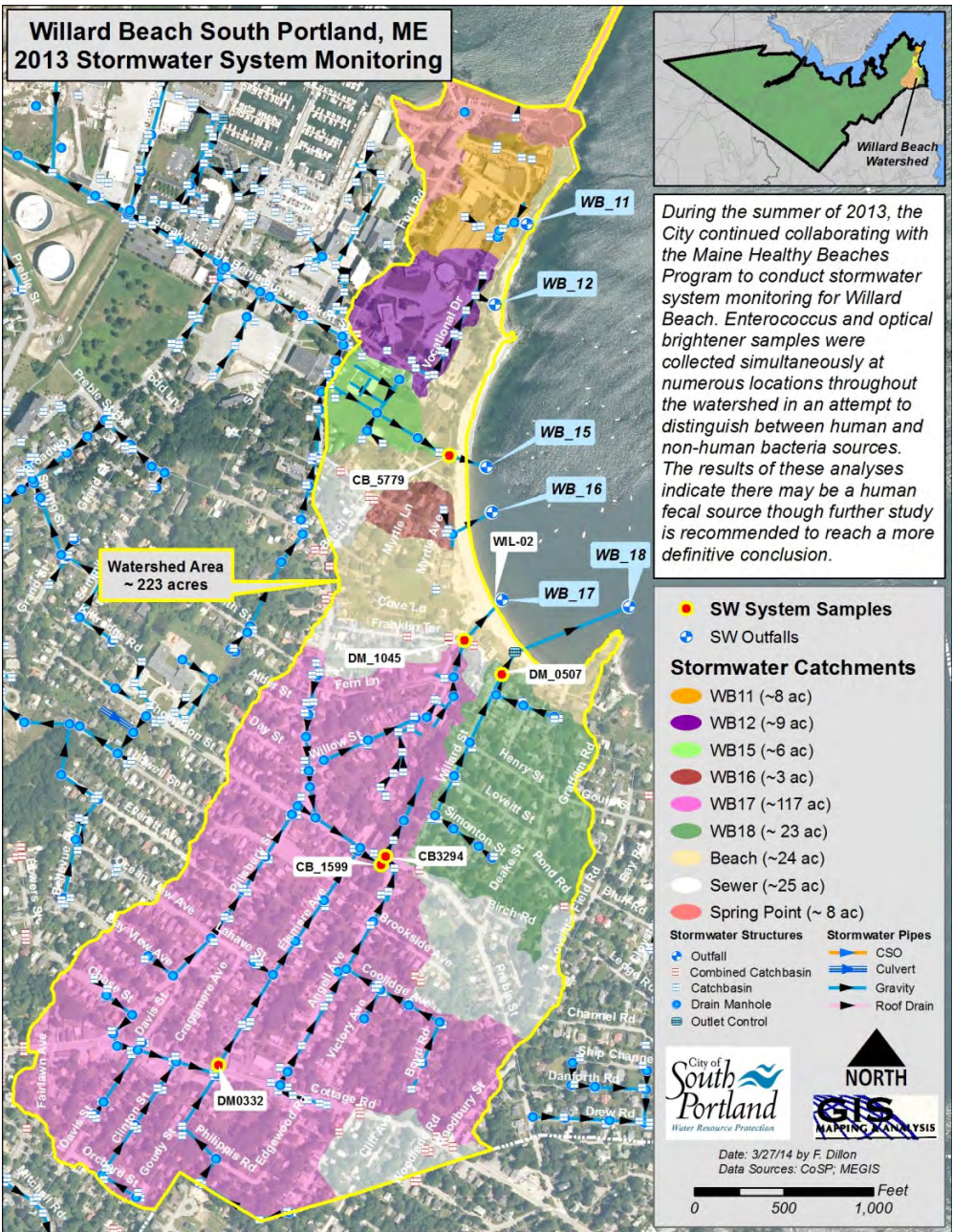


Figure 1. Willard Beach stormwater drainage area (yellow outline) and stormwater sampling stations monitored by MHB and City of South Portland 2012-2013.

Monitoring for the 2012 season targeted wet weather events throughout September and October to ensure presence of adequate water flow, and samples for the 2013 season were collected bi-monthly from June through early September. As a part of this effort, 61 ENT samples and 62 OB samples were analyzed at 8 sites located within the stormwater system. Because this system is entirely subsurface, access to catch basins was provided by the City of South Portland and monitoring was conducted by MHB and the City of South Portland.

ENT geometric mean results ranged from 22-931 MPN/100ml and from 6-98 µg/l for OBs (Table 1). All sites exceeded the US EPA-recommended ENT geometric mean safety threshold of 35 MPN/ml while all sites exhibited OB concentrations below 100µg/l, the level that MHB typically considers as a lower threshold for the potential for human wastewater contamination (Figures 2-3). One site (CB3294) exhibited elevated ENT and OB levels approaching the 100µg/l threshold, suggesting the potential for human-sourced fecal contamination (Table 1).

A Pearson’s Product Moment correlation combining data from all sites from 2012-2013 revealed a significant but weak relationship ($R^2=0.3684$, $p< 0.0000$) between ENT and OB concentrations (Figure 4). While comparison of ENT and OB mean values suggests that non-point sources (wildlife, pets) associated with stormwater are likely the principal contributor to bacterial pollution at 7 of the 8 sites monitored, point sources cannot be ruled out due to the significant (yet weak) correlation between ENT and OBs (Table 1, Figure 2). Additional monitoring of the stormwater system is needed to better delineate the source(s) of bacteria impacting water quality on Willard Beach.

Table 1. Mean Enterococci counts (MPN/100ml), mean optical brightener values (µg/l), and sample size of 8 sites monitored 2012-2013.

Station	GeoMean ENT	Mean OB	Sample Size
DM0507	22	6	11
DM1045	83	34	11
WIL-02	100	11	10
CB5779	76	44	10
CB3294	931	98	7
DM0332	245	83	6
ANGELL-CB*	128**	72	2
WB-17*	201	25	1
Total	100**	41	58

*Note small sample size

**Note mean value due to small sample size

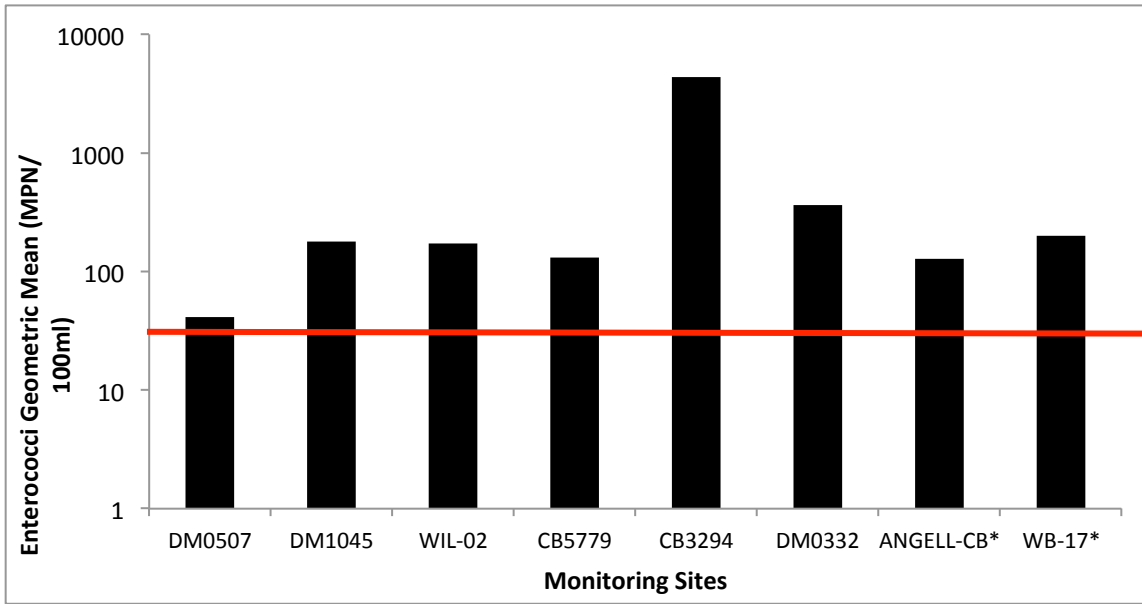


Figure 2. The geometric mean Enterococci (MPN/100ml) values by monitoring site in the stormwater system impacting Willard Beach from 2012-2013. Red solid line indicates the EPA-recommended Enterococci geometric mean safety threshold of 35 MPN/100 ml.

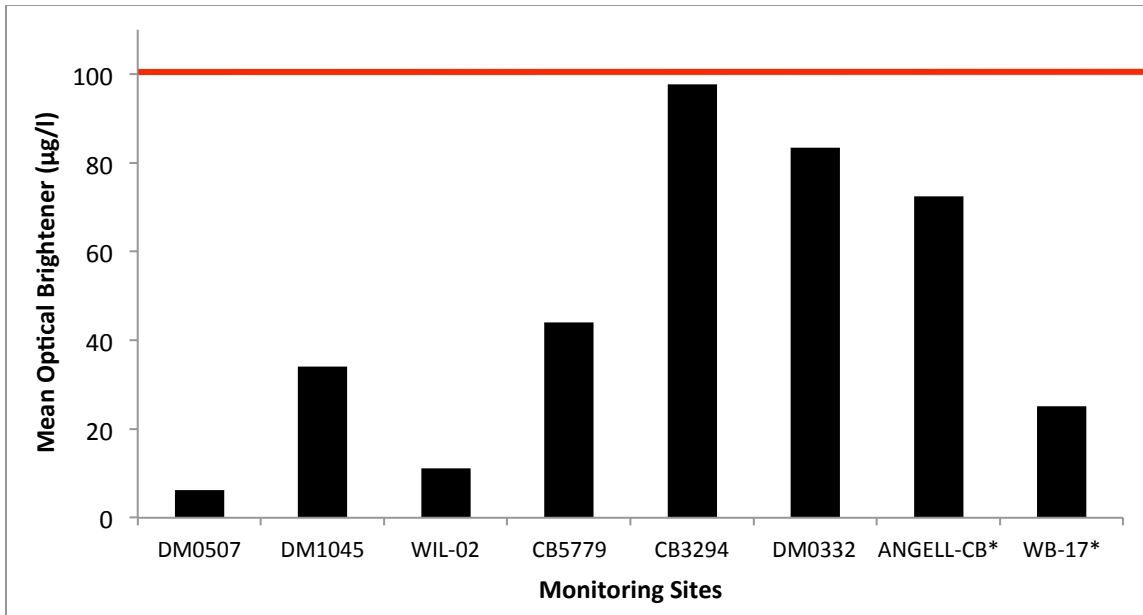


Figure 3. Mean optical brightener (µg/l) concentrations by monitoring site in the stormwater system impacting Willard Beach from 2012-2013. Red solid line indicates the lower threshold level considered by MHB as a “red-flag” for potential human wastewater contamination.

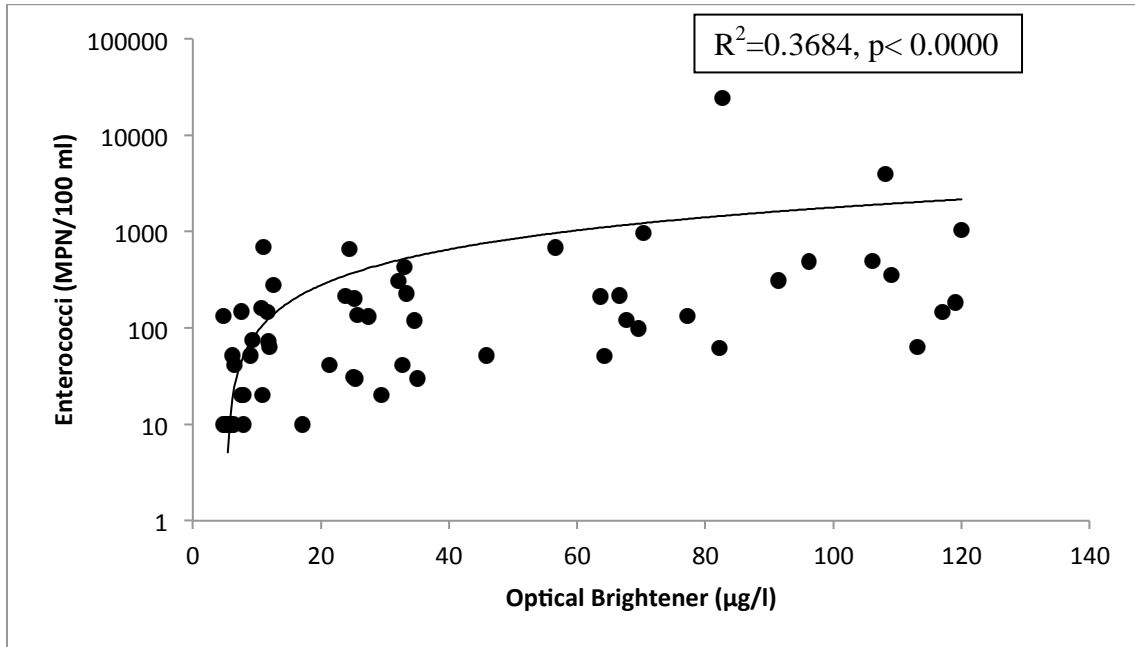


Figure 4. Relationship between Enterococci (MPN/100ml) and optical brighteners (µg/l) for all sites monitored throughout the stormwater system impacting Willard Beach from 2012-2013.

While results suggest primarily non-point sources impacting Willard Beach with the potential for point source contributions, it is important to consider that the Willard Beach watershed is a densely developed residential area. Impervious surfaces, such as roads, houses and driveways cover approximately 41% of the total watershed area. The prevalence of impervious surfaces has been strongly correlated to bacteria concentrations in downstream surface waters. Therefore, educating residents about the effects of land use activities on water quality will be a critical component in any attempts to reduce bacteria loadings to Willard Beach (Figure 5).



Figure 5. Willard Beach watershed drainage area (yellow outline) and percent impervious coverage within the watershed.

The South Portland Water Resources Protection (WRP) Department will post this study on the City’s website. In addition to beach water quality monitoring, the City will also continue to collect bacteria and optical brightener samples from the stormwater system during the summer months. Regardless of the status of future monitoring efforts, the City will assess the feasibility of a public outreach campaign within specific stormwater catchment areas (particularly those contributing the highest bacteria loads). This effort will seek to educate property owners about how their activities potentially affect Willard Beach’s water quality and will suggest best management practices to reduce polluted stormwater runoff from residential properties.

Additionally, the town of South Portland will partner with FB Environmental and Environmental Canine Services in May 2014 to “sniff” out human sources contributing to elevated bacteria impacting Willard Beach. This will include collecting Enterococci data in tandem with employing 2 sewage-sniffing dogs who are trained to alert their trainers to the presence of human sources at distinct locations or in water samples collected from suspect areas. Additionally, MHB will partner with South Portland to continue enhanced monitoring and to launch a pet waste and water quality campaign within the watershed in 2014.