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Tracking Human Fecal Sources in an Urban Watershed During Wet Weather

Joshua Steele¹, John Griffith¹, Rachel Noble², and Kenneth Schiff¹

¹Southern California Coastal Water Research Project ²University of North Carolina, Chapel Hill

EXECUTIVE SUMMARY

Identifying and remediating human fecal sources in wet weather discharges is currently amongst the largest problems vexing urban stormwater managers nationally. In this study, new technology – droplet digital polymerase chain reaction or ddPCR – is used to identify human fecal sources during wet weather in a watershed known to elicit public health concerns at the beach near its discharge following storm events. Thirteen sites located along the mainstem of the river or the end of major tributaries were sampled during two storm events between 2016 and 2017 wet seasons. Results indicated uniformly high 103 – 104 Enterococcus/100 mL at every site during both events. Human sources appeared to be widely distributed in this watershed; all sites in both storm events had detectable levels of HF183 ranging from 101 – 104 gene copies/100 mL. At the tributary with the greatest HF183 concentrations during the first storm, an illicit connection was identified and eliminated during the dry season between sampled storm events. However, HF183 concentrations of 102 gene copies/100 mL persisted in the second storm. This leads to the conclusion that human fecal sources are not arising from single locations, but are numerous and diffuse, potentially including exfiltration from the sanitary sewer collection system, septic leakage, and/or homeless populations (sanitary and storm drainage systems are completely separated in this watershed). HF183 concentrations were greater at all but one site during the second and larger storm event indicating that human sources may vary by storm size, which is consistent with recent epidemiologic data. Norovirus concentrations were patchily distributed reinforcing that ddPCR (or traditional QPCR)-based assays for this pathogen are not recommended as a primary source tracking tool.

Full text:

http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/1002_HumanMarkerTracking.pdf