

Anaerobic Digestion of Blackwater on the CSU Foothills Campus

Gallagher, Neal T.¹ and Sharvelle, Sybil E.²²

Department of Civil and Environmental Engineering, Colorado State University

Abstract. Expansion of development on the Colorado State University's (CSU) Foothills Campus has required examination of alternative methods to manage wastewater produced within the campus. This work builds off previous works including a study which demonstrated that reuse of graywater and treated blackwater effluent could greatly reduce the cost of supplying wastewater treatment to the Foothills Campus, a planning study which recommended wetland treatment of graywater and anaerobic treatment of blackwater as sustainable concepts for decentralized treatment of Foothills Campus wastewater, and a technical study examining constructed wetland treatment of CSU campus graywater. The objective of this work was to examine potential for anaerobic digestion to serve as an effective and sustainable treatment technology for Foothills Campus blackwater. Performance of an upflow anaerobic sludge blanket (UASB) treating Foothills Campus raw blackwater was monitored. Reactor organic loading rate (OLR) varied from 0.23-0.45 kg COD/m³·d and hydraulic retention time (HRT) ranged 2.3-3.6 days during the study period. Total reactor operational time was 108 days with an effluent temperature of 28°C. Substantial removal of chemical oxygen demand (COD), total suspended solids (TSS), volatile suspended solids (VSS), and indicator organisms (*E. coli* & fecal coliforms) was achieved in reactor effluent. Effluent containing dissolved ammonia nitrogen showed potential for reuse in 'fertigation'. Methane biogas produced during digestion showed potential for use as a source of renewable energy.

¹ email: neal.t.gallagher@gmail.com

² email: sybil.sharvelle@colostate.edu