

Evaluation of the Feasibility of Decentralized Anaerobic Digestion for Blackwater Treatment

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Abstract. As population densities continue to increase with urban area expansions, the need to assess alternative methods of domestic wastewater treatment requires increasing attention. Scarcity of water supply around the globe brings to light a growing interest in water reuse. Efforts to promote graywater reuse on a per household basis to produce a zero sum water balance have been ongoing toward the concept of sustainability. Separation of toilet and kitchen effluent from domestic wastewater, and directing this flow to a decentralized anaerobic digester on a smaller community level, a source of renewable energy in the form of biogas can be produced. The biogas, containing high levels of methane, has the potential to provide a supplemental form of energy to offset the costs of wastewater disposal while positively impacting the environment by reducing greenhouse gas emissions. To verify the effectiveness of this approach, a feasibility study was conducted for Northern Colorado. This entailed the use of analytic models for estimation of blackwater effluent flow rates, sizing and costing of the facilities required to treat this effluent, and prediction modeling to determine the volume of methane produced by such processes under optimized operating conditions. Project capital, operation, and maintenance costs will be estimated via Capdet software, and then compared to the benefits of power generation and natural gas supplementation using current utility rates local to Fort Collins, CO. Ultimately, the goal of this project is to determine whether the overall costs and environmental benefits associated with this method of domestic wastewater treatment are more or less than those of traditional centralized treatment.