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Nitrogen removal by Simultaneous Nitrification-Denitrification (SND) has invited much attention in recent years due to possible reduction in capital and operating costs associated with wastewater treatment. The potential of biological nitrogen removal through this process and optimization of its operating parameters were investigated by simulations using Activated Sludge Model No. 1 (ASM1). Adopting typical properties of domestic sewage, simulations of SND process were performed in three sequential phases to optimize the operating parameters and assess reliability of the SND process over variation in the kinetic and stoichiometric parameters. Since dissolved oxygen (DO) concentration and solids retention time (SRT) were considered to have the most significant impact on nitrogen removal, the first set of simulations was aimed at identifying an applicable operating window for these parameters. Simulation results indicated that optimum nitrogen removal occurred at a DO concentration of 0.3 mg/L coupled with a SRT of 15 days. A second set of process simulations was run using this combination of operating DO and SRT to examine the effect of other process parameters; specifically the ratio of biodegradable COD to total Kjeldahl nitrogen (BCOD:TKN) in the influent, hydraulic residence time (HRT), and recycle ratio (R) on total nitrogen removal. The influent BCOD:TKN ratio significantly affected overall nitrogen removal, since availability of electron donor is essential to drive denitrification, with optimal nitrogen removal observed at a BCOD:TKN ratio of 11. Neither HRT nor R had a significant effect on nitrogen removal. The third set of simulations considered the natural variability of the kinetic and stoichiometric parameters of ASM1. Monte Carlo analysis was performed to evaluate the performance of an SND system operated at a DO of 0.3 mg/l and an SRT of 15 d using probability density functions developed by Cox (2004) for the model parameters. Results of these simulations were used to assess the potential reliability of an SND process designed using “typical” model parameter values. A sensitivity analysis was also performed to identify the model parameters that had most significant effect of nitrogen removal.

Keywords: Models, Treatment, Wastewater, Water Quality
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The National Weather Service (NWS) is responsible for issuing river and flood forecasts and warnings to mitigate the loss of life and property. Current NWS text-based products are utilized by emergency managers (EMs). One of the most often requested product from EMs is flood inundation mapping to show the areal extent of flooding. Flood inundation maps would translate the forecasted stages into inundation areas, making it easier for EMs to take action and alert the public. They would also prove invaluable to EMs in their outreach, mitigation, and educational efforts.

By partnering with the Federal Emergency Management Agency (FEMA) and local communities, the NWS is developing flood inundation maps for their forecast locations. When a community performs flood studies to update FEMA Flood Insurance Rate Maps (FIRMs), much of the necessary data are available to develop flood inundation maps. For a small incremental cost above the cost to develop FIRMs, flood inundation maps at various stages above the NWS-established flood stage are being developed. This collection of maps will form a flood inundation map library that can be served up to the public via the Internet.

The NWS has partnered with FEMA and developed flood inundation map libraries at about 15 locations across the country. Currently, work is ongoing to produce these maps for an additional 30 sites in the states that border the Gulf of Mexico. The NWS has established a web site and web structure to serve this data up to the public.

Keywords: Floods, Hydrology, Management and Planning, Models