

Meeting TMDL limits: A cost comparison for mid-sized communities

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Similar to other mid-sized communities situated near water bodies, the city of Atlantic Beach, FL, is facing the challenge of addressing impending total maximum daily load limits.

The city is located in Northeast Florida where its stormwater and wastewater treatment systems discharge to the St. Johns River. These discharges are in excess of the city's anticipated TMDL nitrogen allocation. The costs for improvements to reduce the nitrogen load and meet the TMDL are substantial, and the city has begun evaluating multiple alternatives and combinations of alternatives to develop a cost effective and long term solution.

Wastewater treatment for the city is provided by two plants; one is a 3.0 million gallons a day conventional activated sludge plant and the other is a 1.9 mgd sequencing batch reactor. Based on sampling conducted in 2006, the conventional plant discharged approximately 50,178 kilograms of nitrogen and the SBR plant discharged 16,570 kg. The city's stormwater system is estimated to have discharged another 3,018 kg, for a total nitrogen load to the St. Johns of 69,766 kg in 2006.

Based on preliminary allocations from the Florida Department of Environmental Protection provided in early 2007, the city's annual load must be reduced to 22,608 kg/year, a 67.6 percent reduction. To begin planning for this load reduction, the city included conceptual level analysis of options to meet the anticipated TMDL in its 2006 Sewer Master Plan.

Using the information developed in the 2006 SMP and the allocation numbers provided in early 2007, the city further developed the options and associated costs to determine a cost per kg of nitrogen removed per year for each of the alternatives.

The city's preliminary plan is to upgrade the conventional facility to meet advanced waste treatment levels for nitrogen and to construct a reclaimed water facility to provide reuse to a privately owned golf course. The SBR plant may be upgraded for additional nitrogen reduction without going to advanced treatment levels.

The estimated yearly cost for the amortized capital plus operating expenses per kilogram of nitrogen removed ranges from \$31 for the work at the conventional plant to \$52 for upgrades at the SBR plant. These improvements will result in a total nitrogen reduction of 47,776 kg/year, a 68.5 percent reduction and below the anticipated TMDL requirement.

The city of Atlantic Beach is essentially built out, with over 90 percent of land area already developed. Much of the development predates the Clean Water Act. Runoff from substantial portions of the city receives no water quality treatment before discharge to the Intracoastal Waterway. Based on public works field inspections and review of permit applications from the St. Johns River Water Management District, approximately 41 percent of the land area in the city receives some measure of stormwater treatment.

The high cost of land in the city will probably preclude construction of any more wet detention ponds. The high cost of land and the low nitrogen removal efficiency of available technologies results in much higher costs for removal of nitrogen in stormwater than in wastewater. The costs for nitrogen removal through stormwater projects in the city have ranged from \$12,000 to \$16,500 per kilogram of nitrogen removed.

Based on the significant disparity between the cost for removal of nitrogen through wastewater plant upgrades (\$31 - \$52/kg-N) versus stormwater upgrades (\$12,000 - \$16,500/kg-N), Atlantic Beach's best option for meeting the overall nitrogen reduction allocation proposed for inclusion in the Lower St. Johns River Basin Management Action Plan is to maximize plant upgrades.

By completing the plant upgrades, the city can trade internally between the wastewater and stormwater utilities to meet the required 67.6 percent reduction.

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