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Advanced On-Site Sewage Treatment Systems in New Mexico

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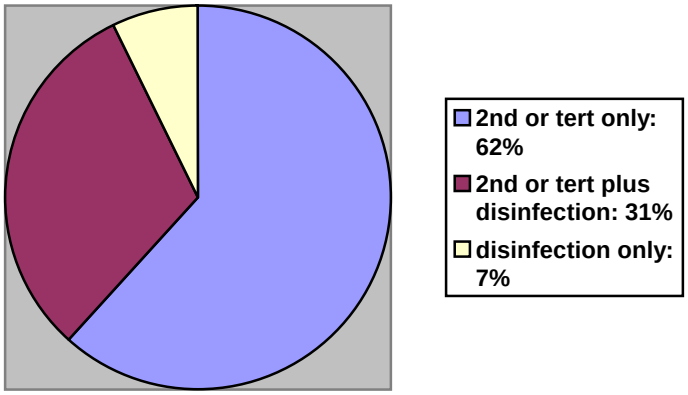
Introduction

"Advanced treatment" is defined in New Mexico's Liquid Waste Disposal and Treatment Regulation, 20.7.3.7.A.2 NMAC, as "any process of wastewater treatment that removes a greater amount of contaminants than is accomplished through primary treatment; advanced treatment may include physical or chemical processes." The regulations specify definitions and performance standards for secondary, tertiary and disinfection treatment. Advanced treatment is typically utilized to overcome site limitations such as inadequate lot size, clearance and setback. The New Mexico Environment Department (NMED) maintains a list of advanced treatment systems (ATSs) that have been approved for use in the state, http://www.nmenv.state.nm.us/fod/LiquidWaste/LW%20product%20disclaimer.htm Many systems approved for secondary or tertiary treatment utilize an aerobic process. Aerobic treatment units (ATUs) are a subcategory of ATSs. Tertiary, nitrogen reducing, treatment is utilized to overcome inadequate lot size. Disinfection, often after secondary treatment, is utilized to overcome inadequate clearance or setback. The purpose of this paper is to evaluate the history and performance of ATS usage in New Mexico.

Permitting History

Approximately 2777 ATSs, mostly ATUs, have been permitted and installed in New Mexico (Figure 1). These ATSs comprise about 1% of the on-site systems in New Mexico.

Figure 1. ATSs in New Mexico.



NMED issued an estimated 1350 permits for ATUs during 1973-79 when the regulations required a 12 foot clearance to ground water. Aerobic treatment systems were authorized for sites where the depth to ground water was between 4 and 12 feet. Non-discharging or mound systems were required for sites

where the depth to ground water was less than 4 feet. The ATUs included both commercial units and conventional septic tanks with aerator inserts. ATU effluent monitoring was not required. Most of the aerobic systems that were installed during this period experienced motor failure, sometimes repeated. Many systems were designed with the motor in the treatment chamber where it was susceptible to corrosion by sulfuric acid, a byproduct of hydrogen sulfide in the sewage. In 1980 the clearance-to-ground-water regulation was reduced to 4 feet, and many of the previously installed aerobic systems eventually began functioning as septic tanks, often undersized, after failed motors were not replaced.

In 1981, NMED published a technical manual on wastewater disposal by land application, which described how to utilize disinfected effluent from either conventional septic tanks or ATUs for irrigation. Land application was widely utilized for the disposal of wastewater in some areas with exposed bedrock and/or inadequate soil. NMED has approved an estimated 800 permits for surface application of liquid waste, about 600 of which require aerobic treatment and disinfection, and 200 require disinfection of conventional septic tank effluent. Prior to 2005, few of these permits required effluent monitoring.

Of the 2777 ATSs that have been installed in the state, 2150 (77 %) were permitted without effluent monitoring requirements (Figure 2). From 1997-2006, 627 ATSs have been permitted and installed with effluent limitations and monitoring requirements total nitrogen, BOD, fecal coliform bacteria and/or chlorine residual. Criteria for establishing effluent limitations have changed over the years, but the current regulations set treatment standards. Current regulations also require effluent monitoring and maintenance service contracts for all ATSs that are being permitted to overcome a site limitation. Compliance with the effluent limitation is based on a six-sample running average.

Compliance with ATS Effluent Monitoring Requirements

Of the 627 permits approved with monitoring requirements, no effluent test reports have been submitted for 382 (61%) of the systems, one to 5 reports have been submitted for 234 (37%) systems, and six or more reports have been submitted for 11 (2%) systems (Figure 3). A total of 507 effluent sample reports have been submitted for all systems.

ATS Performance and Compliance with Effluent Limitations

Of the 507 effluent sample reports that have been submitted, 310 (61 %) comply with permitted effluent limitations (Figure 4). Effluent monitoring time trends for the 11 ATSs with six or more samples are graphed in Appendix A and in Figure 5 (residential only). Three of 627 (0.5%) systems with monitoring requirements have sufficient data to demonstrate a six-sample rolling average for the permitted effluent limitation. Effluent quality can vary considerably in the same system between consecutive samples. Four residential systems appear to be functioning reasonably well, with total nitrogen being consistently reduced from 60 mg/L, the concentration presumed to be in domestic wastewater (Figure 6). Some systems, however, start functioning reasonably well but

later produce poorly treated effluent (Figure 7). ATSs treating non-residential wastewater sometimes produce effluent greatly exceeding 60 mg/L total nitrogen (Figure 8). System LC000851 serves a medical clinic, DA020372 serves a child day care facility, and RU020198 serves a restaurant.

Figure 2. Effluent Monitoring Requirements.

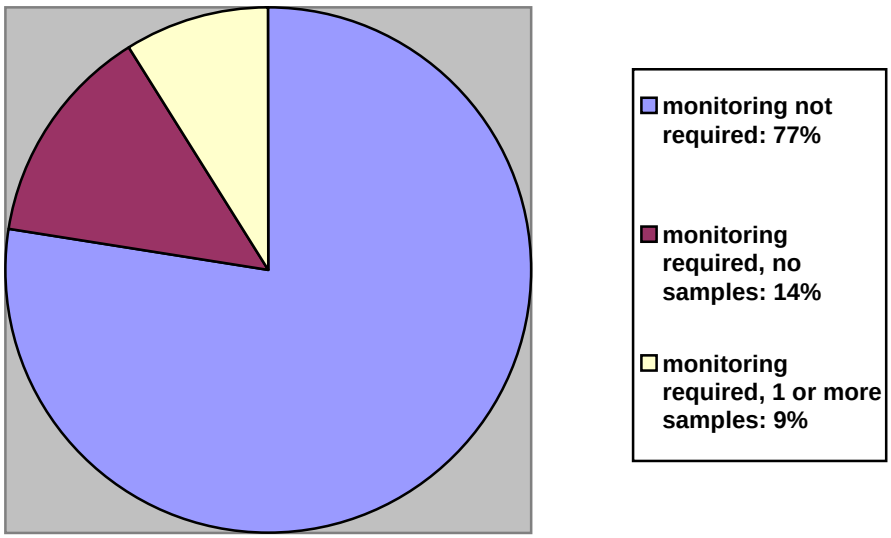


Figure 3. Compliance with Effluent Monitoring Requirements.

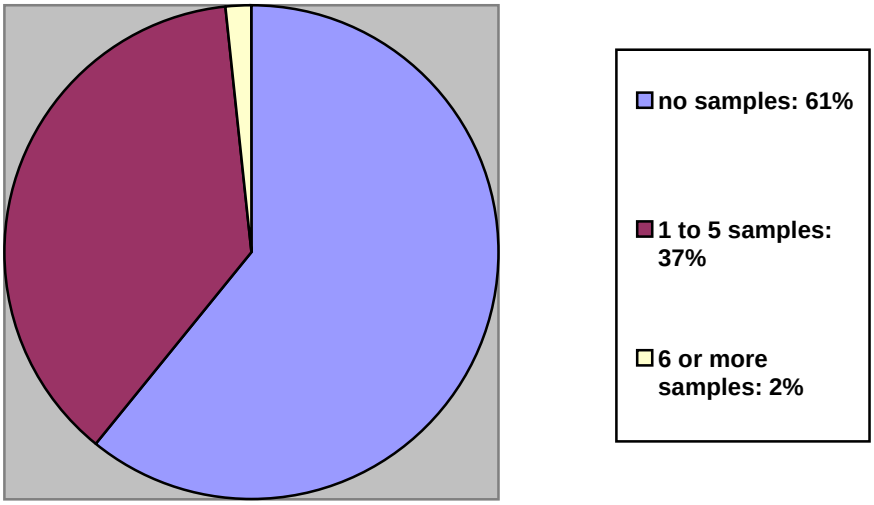


Figure 4. Compliance with Effluent Limitations.

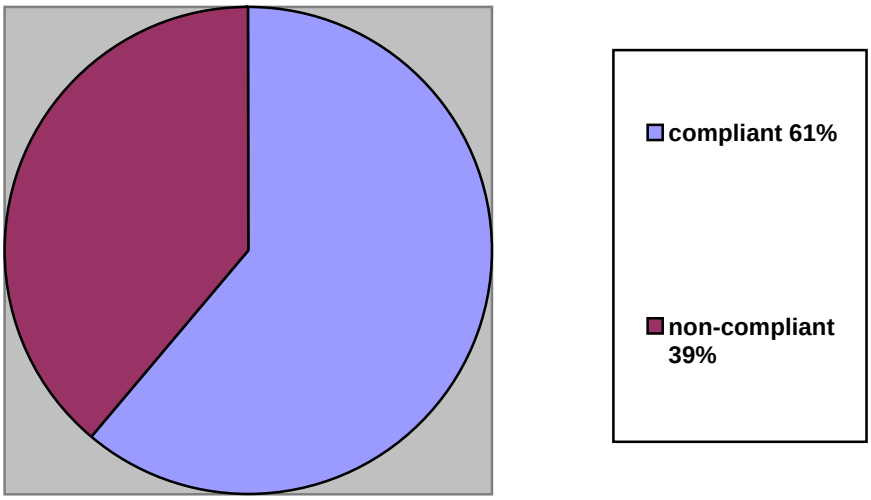


Figure 5. Residential ATSs, Six or More Effluent Samples.

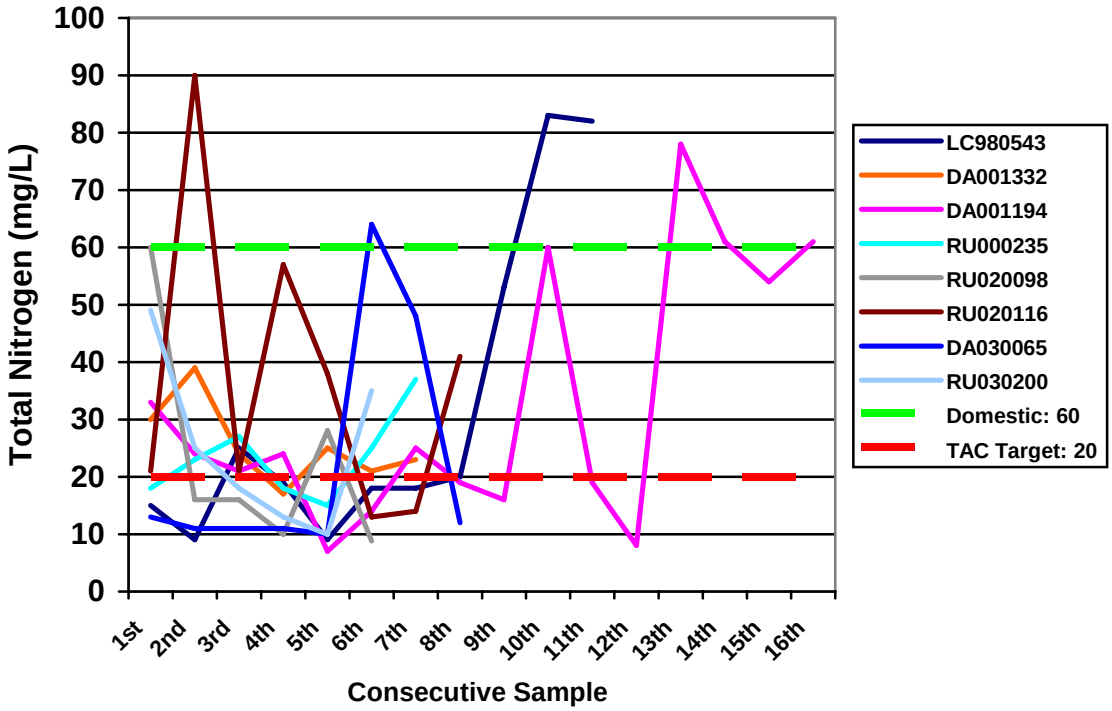


Figure 6. Residential ATSs Functioning Reasonably Well.

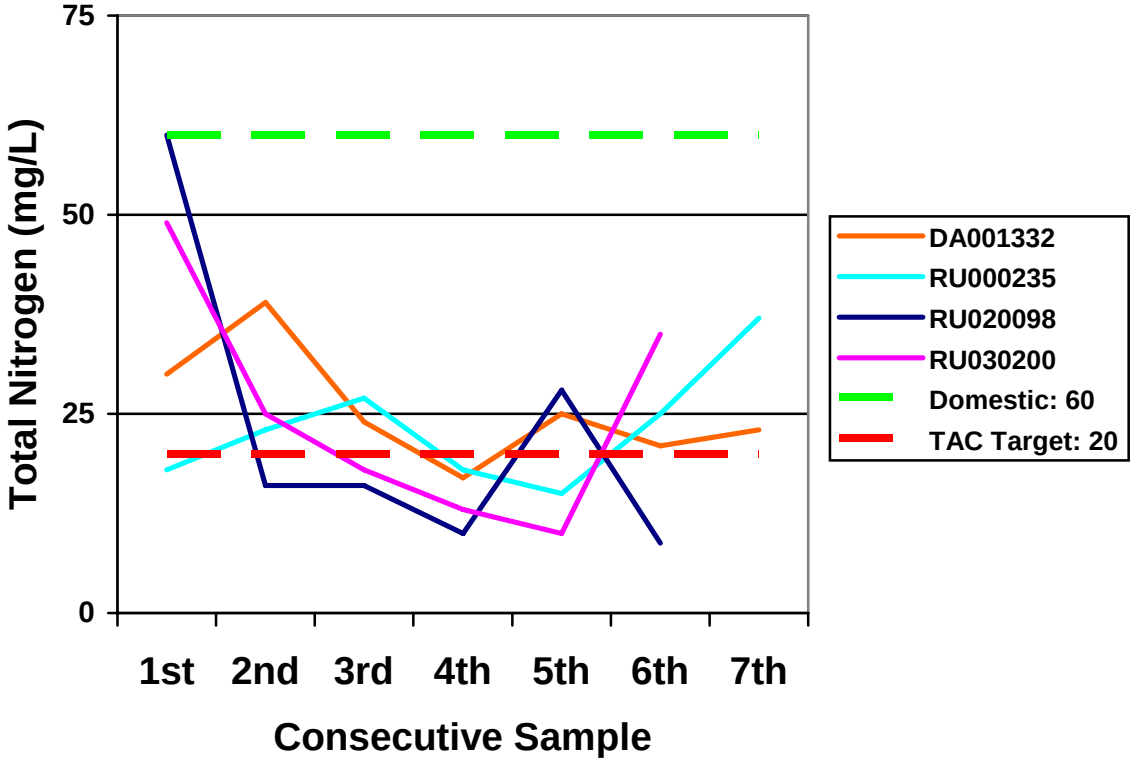


Figure 7. Residential ATSs, Reasonably Good Initial Function, Followed by Episodes of Poor Function.

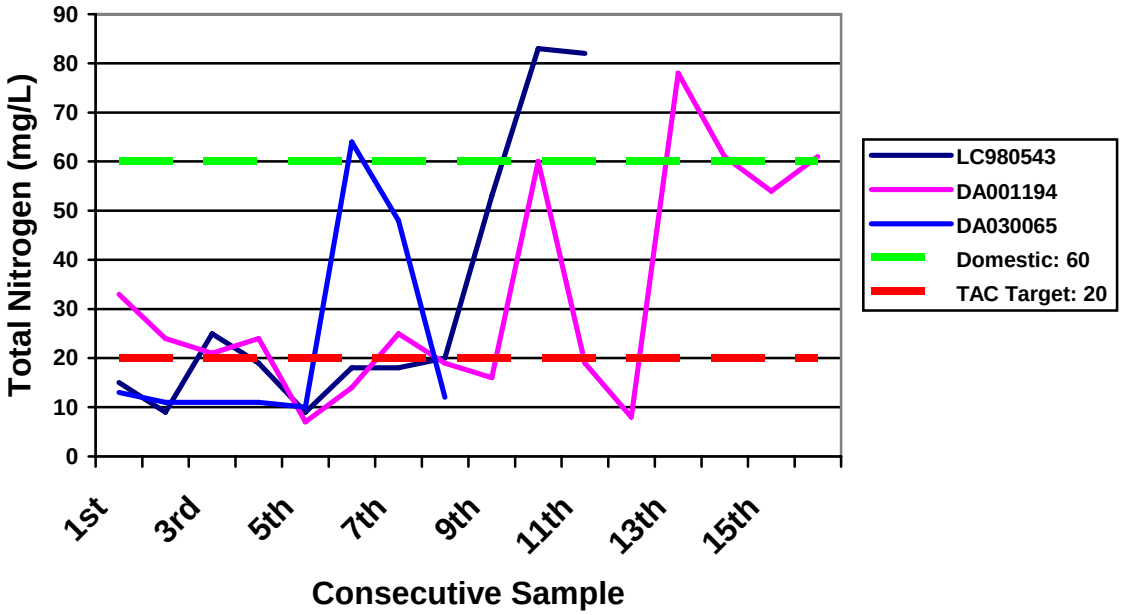
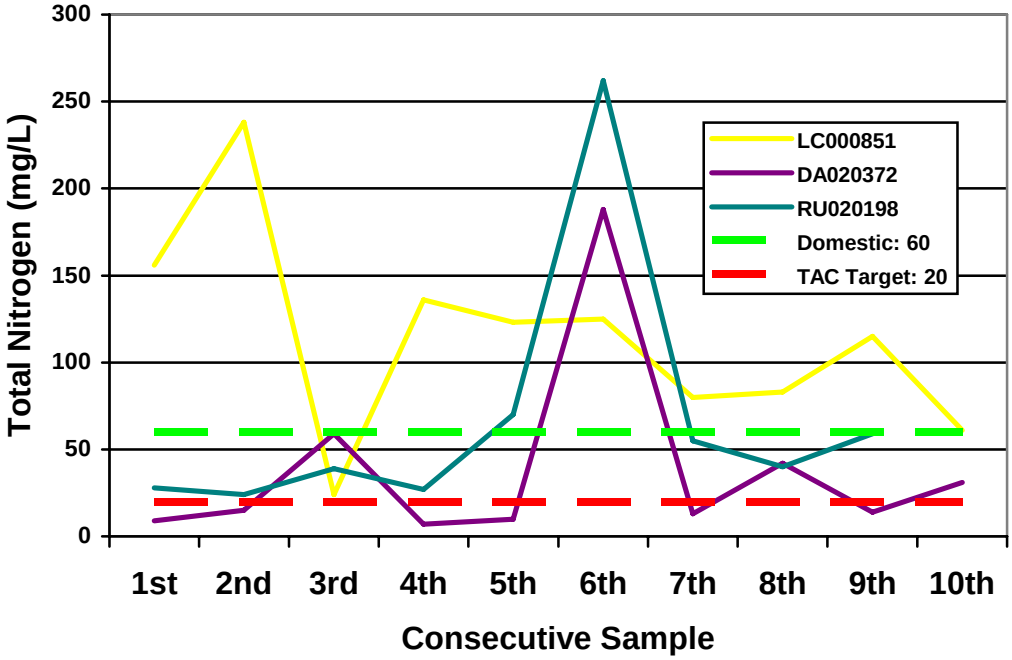


Figure 8. Non-Residential ATSs, Six or More Samples.



Discussion

To date, there has been no consistent statewide tracking system, and assembling available data for this report was difficult and time consuming. NMED is developing an automated statewide system for tracking effluent monitoring requirements, and reports submitted.

NMED continues to have considerable difficulty enforcing effluent monitoring requirements. To date, less than half of the systems permitted with monitoring requirements have submitted a single effluent report. Enforcement of sampling requirements will require a significant commitment of staff time and legal resources, and some compliance efforts have been initiated.

It is difficult to assess the performance of the 2777 ATSs in New Mexico since only 23% were permitted with effluent monitoring requirements, and only 39% of those have submitted any reports.

Although several ATSs appear to be working reasonably well (Figure 6), the overall pattern of effluent monitoring data (Figures 5, 7 and 8) shows that many systems have not consistently treated wastewater to levels at or near the TAC treatment standard of 20 mg/L total nitrogen. The quality of treatment can fluctuate significantly, and sometimes worsens after the first year of operation. We believe that these fluctuations in effluent quality and episodes of poor treatment result largely from lack of maintenance. Effluent from non-residential ATSs sometimes greatly exceeds 60 mg/L, the presumed concentration for domestic wastewater (Figure 8).

There has been a problem with lack of availability of qualified maintenance service providers. Some ATS distributors/installers have not been willing to provide maintenance and effluent sampling services. In other cases, ATS manufacturers have either gone out of business or are no longer interested in doing business in New Mexico resulting in “orphan” ATSs.

The effluent monitoring frequency of quarterly for the first year, semi-annual for the second year, and annually thereafter as prescribed by the Liquid Waste Regulations does not provide a high level of confidence for determining whether or not systems are functioning properly overall, and for identifying malfunctioning systems in a timely manner.