Knoxville Utilities Board
2019 Biosolids Performance Report
July 2020

KUB's Biosolids Program Maintains Platinum Level Certification

For over 30 years, KUB has produced high-quality Class B biosolids, the nutrient-rich product of the wastewater treatment process. KUB's wastewater treatment plant separates solid materials from liquid waste and sends the solids to digesters, where the material is heated and mixed with helpful bacteria to destroy harmful pathogens and reduce odor. After treatment and dewatering, the biosolids can be applied to soil like fertilizer, recycling essential nutrients like phosphorus and nitrogen. KUB's biosolids are registered as a fertilizer with the Tennessee Department of Agriculture and are 100 percent land-applied to area farms.

"KUB's biosolids program is one of the best customer service programs KUB offers," KUB plants analyst David Obenschain said. "The farmers who use the free biosolids benefit greatly from the program by doubling or tripling their yield, and KUB saves money from not having to take our product to a landfill."

KUB's Biosolids Beneficial Reuse Program has been Platinum Certified with the National Biosolids Partnership (NBP) since 2011. The NBP helps advance biosolids management practices and programs across the United States so that they are effective and environmentally sound. As part of KUB's NBP certification, the biosolids program undergoes annual third-party and internal audits. In December 2019, KUB passed a two-day biosolids external audit to recertify its Platinum status through the National Biosolids Partnership (NBP). No major or minor nonconformances were identified during the audit.

KUB Continually Improves Biosolids Program Through Internal Audit

KUB completes an internal audit on portions of the Biosolids Environmental Management System (BEMS). The purpose of this audit is to evaluate the effectiveness of the BEMS. The objective of the review is to identify system problems, improvement opportunities, and adherence to both KUB and NBP requirements. The 2019 internal audit resulted in one finding that noted the need for BEMS training for KUB's Water System Engineering department. The training has since been implemented and consists of initial training and annual refresher training. The role of Water System Engineering staff was also included in KUB's internal document Biosolids Environmental Roles and Responsibilities. The audit also produced seven recommendations for improvement. Progress on these recommendations is ongoing.

KUB Digester Cleaning Improves Process Efficiency

Kuwahee's Anaerobic Digesters are used to digest or "break down" sludge that will eventually become a useful biosolid product. The breakdown of sludge is important because it reduces odors and pathogens, while also providing a stable product that make it beneficial to KUB's farmers. In 2019, two of the five digesters at the Kuwahee Wastewater Treatment Plant (WWTP) were cleaned and inspected. Digester cleanings are important for two main reasons. First, the removal of debris from inside of the digester not only allows more capacity, but also it removes debris from the final biosolids product that ends up on farmers' fields. Second, it provides the opportunity for repairs inside the digester, which improves efficiency. At approximately 2 million gallons each, Kuwahee's digesters will continue to produce a valuable product for years to come with proper maintenance. Another digester cleaning is scheduled to occur in the summer of 2020.

KUB Team Monitors Emerging Contaminants Research, Guidance

Emerging contaminants in water have become an increasingly active topic over the past year. The Environmental Protection Agency is actively working to ensure that all needs are met to address the issue and public concern. Naturally, a relationship exists between water, wastewater, and biosolids. As more regulations emerge to address the issue of contaminants in water, biosolids regulations may also be influenced. KUB has taken a proactive approach in establishing an interdepartmental team focused on emerging contaminants. This team has been charged with observing the regulatory atmosphere and developing science-based communications for the community to stay informed. The team has begun developing a whitepaper that addresses current concerns related to several known emerging contaminants.

KUB Committed to Community Outreach

KUB uses the following methods to inform customers, the community, and interested groups about the KUB Biosolids Beneficial Reuse Program and Environmental Management System:

Community Events
Biosolids staff and/or materials are available at various community events. Staff members are also available to speak at schools, special events, or meetings.

Customer Communications
KUB shares biosolids information with the public primarily through its website. Content found at www.kub.org/biosolids provides an overview of the program, a whitepaper, and audit reports. Other means of public communication include a biosolids brochure, newsletters, KUB's annual Environmental Stewardship Report, and training for employees about the program so they can help answer customer questions.

Interested Farmer Relations
KUB's website (www.kub.org/biosolids) offers a wealth of information about the biosolids program for farmers or other interested parties, including links to more information from the National Biosolids Partnership, the National Association of Clean Water Agencies, the Water Environment Federation, and the Environmental Protection Agency (EPA).

Farmers may call KUB's Customer Information Center (865-524-2911) or e-mail the KUB Biosolids Mailbox at biosolids@kub.org if they have specific questions or are interested in scheduling a farm visit to determine eligibility for biosolids application.

East Tennessee Farmers Benefit from KUB Biosolids

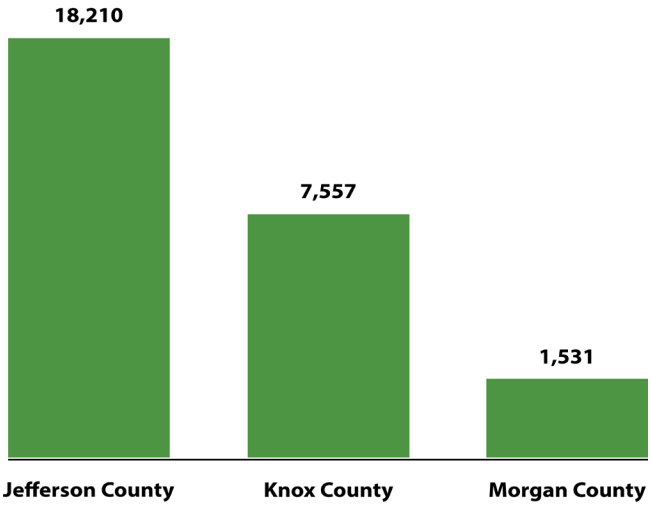
KUB beneficially reuses 100 percent of its biosolids. KUB contracts with Synagro Technologies for dewatering, transportation, and land application. Synagro's highly trained staff ensures that the company's work maintains compliance with applicable federal, state, and local regulatory requirements. KUB performs site visits and inspections when Synagro is land applying to ensure that the relationship between the farmers, Synagro, and KUB is positively maintained.

"These inspections are a great source of communication between the farmers and KUB's biosolids program, and they ensure KUB's involvement in the land application process," wastewater plant supervisor Steve Clettenberg said.

In addition, Synagro works with the Environmental Protection Agency, National Biosolids Partnership, and applicable regulatory agencies to be proactive in meeting changing rules and regulations.

In 2019, 21 farms received over 27,000 tons of biosolids, spread over 1,607 acres of land. As shown in the figure at right, Jefferson County received the largest amount of biosolids. There are currently 52 farms approved for KUB Biosolids and permitted by the Tennessee Department of Environment and Conservation.

2019 Land Applied Biosolids
[In Wet Tons Spread]



Farmers who use KUB biosolids say...

"I saved money on fertilizer, and I like the way the grass grows better, especially in the dry season."

"Other farmers have noticed how well the grass is growing, as it is visible from the roads."

"Biosolids enrich the soil of my pastures that once was a reclaimed strip mine."

2019 Goals Achieved, Continuous Improvement in 2020

The KUB BEMS goals and objectives were developed to seek continual process improvement and enhance biosolids quality. Each year, KUB develops these goals and objectives as part of the National Biosolids Partnership requirements. These goals are recorded and assessed throughout each year and at an annual third party audit of KUB's Biosolids Beneficial Reuse Program. The program goals reinforce KUB's commitment to environmental performance, regulatory compliance, relations with interested parties, and quality biosolids management practices.

In 2019, KUB achieved the following:

- Maintained average fecal coliform levels under 200,000 most probable number (MPN) in all reporting periods.
- Completed the Biosolids Feasibility Study.
- Prepared for the implementation of best practices for the new boilers coming to the Kuwahee Wastewater Treatment Plant in 2020. The boilers are responsible for heating Kuwahee's digesters.

Some of KUB'S 2020 goals and objectives include:

- Improve the KUB customer website biosolids content to make it more accessible to farmers and interested parties.
- Participate in TVA's Demand Response Program to reduce pressure on the region's electric grid during periods of peak demand.
- Continue to improve KUB's asset management program through training and program development.
- Continue to improve capital project close-outs to assure new equipment is accounted for in the asset management system and associated preventative maintenance measures are developed and active upon startup.
- Maintain fecal coliform under 200,000 MPN and volatile solids reduction of 50 percent or higher throughout the year.

KUB Verifies Quality

The table below shows the maximum concentration of each parameter allowed by the EPA 503 regulations in land application. In addition, the table shows how KUB's 2019 results are well below established EPA ceiling limits.

Parameter	EPA Ceiling Limits	2019 KUB Data
Arsenic (ppm**)	75	7
Cadmium (ppm)	85	1.6
Copper (ppm)	4,300	248
Lead (ppm)	840	25.1
Mercury (ppm)	57	0.93
Molybdenum (ppm)	75	6.5
Nickel (ppm)	420	20.9
Selenium (ppm)	100	6.5
Zinc (ppm)	7,500	738

**ppm: parts per million. One part per million is equivalent to a single penny in $10,000 of pennies.

Tennessee Department of Agriculture Certifies KUB Biosolids

The federal Clean Water Act Part 503 regulations identify two classes of pathogen reduction, Class A and Class B. KUB currently produces Class B biosolids, which are certified as fertilizer with the Tennessee Department of Agriculture. While pathogens in Class B products are significantly reduced to levels that are often below those found in animal manures, additional best management practices are required at the site where they are used. Class B biosolids are used in bulk as fertilizers in agriculture and forestry and to reclaim barren land. In Class A biosolids, pathogens are reduced to a level similar to the native soil and environment. Class A products can be used on home lawns and gardens, parks and golf courses, and other places where public contact is likely.

Study Evaluates Program, Prepares KUB for Future

Throughout 2019, KUB conducted a third-party Biosolids Feasibility Study to evaluate the current and emerging biosolids regulations while also analyzing the cost benefit of moving from a Class B product to a Class A product. This study was valuable to KUB as it looks to replace Kuwahee's digesters and dewatering system components in the future. Preparing for future decisions regarding the treatment and disposal of biosolids has been a priority for KUB. The primary goals of the study were:

- Establish current and projected biosolids quantities
- Evaluate the existing dewatering system
- Review current and emerging biosolids regulations
- Evaluate biosolids disposal alternatives and process upgrades needed for Class B and Class A products
- Perform a business case evaluation for two disposal options

The process review concluded with several alternatives and recommendation for consideration as future improvements. Overall, it was concluded that there are no regulatory or product drivers for KUB to begin producing a Class A product. However, if in the future, social or environmental factors warrant the transition, then a thermal drying upgrade has been recommended. The recommended equipment improvements are listed below and will be considerations during the long-range budget planning cycle:

- Centrifuge replacement
- Digester cover replacement
- Digester sludge pump and sludge storage upgrade
- Digester mixing maintenance/replacement allowance

KUB Ensures Excellence

Biosolids produced in Tennessee are monitored for compliance based on the EPA Part 503 Biosolids Rule (40 CFR Part 503). KUB produces Class B biosolids. Pathogen requirements are met by anaerobic digestion and monitoring the density of indicator organisms. Vector attraction reduction requirements are met by meeting a reduction of at least 38 percent volatile solids reduction.

As illustrated in the table below, KUB monitors its biosolids much more frequently than industry regulators require.

Monitoring Category	EPA Part 503 Monitoring Frequency	KUB Monitoring Frequency
Pathogen Requirements	Once every 60 days	Monthly
Vector Attraction Requirements	Once every 60 days	Monthly
Regulated Pollutant Limits (metals)	Once every 60 days	Monthly
Total Solids, pH	N/A	Monthly
Nutrients	N/A	Monthly

Note: Based on biosolids production of equal to or greater than 1,500 dry metric tons but less than 15,000 dry metric tons.

Fast Facts

- 100 percent of KUB's biosolids produced in 2019 were land applied.
- KUB provides approximately 27,000 wet tons of Class B biosolids to local farmers as a fertilizer annually.
- KUB's biosolids are certified as fertilizer by the Tennessee Department of Agriculture.
- KUB has operated a biosolids beneficial reuse program for over 30 years.

Connect with KUB and learn more.

biosolids@kub.org • www.kub.org/biosolids