



Knoxville Utilities Board 2020 Biosolids Performance Report

July 2021

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 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 external and internal audits. In December 2020, KUB passed a two-day biosolids external audit to recertify its Platinum status. One minor nonconformance was identified during the audit relating to KUB's internal Corrective and Preventative Action (CAPA) process. The minor nonconformance was addressed by KUB and approved by the third party auditor. The 2020 external audit was held virtually for the first time in KUB program history due to the ongoing COVID-19 pandemic. The upcoming 2021 external audit will be a program reverification audit. These audits occur on every fifth year of the program and require a full review of the Biosolids Environmental Management System (BEMS) program.

KUB Biosolids Internal Audit Results

KUB also completes internal audits on the BEMS on the same schedule as the external audit, so interim and reverification years always reflect the same review. The purpose of this audit is to evaluate the effectiveness of the BEMS by identifying system problems, improvement opportunities, and adherence to both KUB and National Biosolids Partnership (NBP) requirements. The 2020 internal audit resulted in determining the BEMS is effective with no findings and five opportunities for improvement. Progress on these opportunities is ongoing.

Digester Cleanings at Kuwahee

Kuwahee's Anaerobic Digesters are used to digest or break down sludge that will eventually become a biosolids product utilized by local farmers. Digestion is important because it reduces odors and pathogens, while also providing a stable product that make it beneficial to KUB's farmers. In 2020, one of the five digesters at Kuwahee Wastewater Treatment Plant was cleaned, inspected, and the gas mixer piping was replaced. Digester cleanings are important for two main reasons. First, the removal of debris from inside of the digester allows more capacity and 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. Additionally, KUB has an array of established maintenance programs to support digester operations. Among others, devices related to digester gas mixing and pressure regulating are routinely inspected and maintained and targeted system improvements projects, such the recently completed sludge heating system, ensure those critical support-processes are efficient and reliable. At approximately 2 million gallons each, Kuwahee's digesters will continue to produce a valuable product for years to come with proper maintenance.



Emerging Topics in Biosolids

The world of science is constantly evolving, and researchers are now able to gather more data than ever before. This has led to more information gathering in the water, wastewater, and biosolids fields. In 2020, KUB took a proactive approach in establishing an interdepartmental team focused on emerging regulations, contaminants, and technologies. The team was charged with observing the regulatory and technological landscape and developing science-based communications for the community to stay informed. The team's effort is ongoing, and it has developed several resources to assist the community and KUB in the future, if needed.



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. Recent events include presentations at a local high school and Pellissippi State Community College.

Customer Communications

KUB houses biosolids content on its website at www.kub.org/biosolids, which includes a program overview, audit reports and more. KUB shares various communications materials with customers throughout the year that direct to this website. These materials include a biosolids brochure, newsletters, the annual Environmental Stewardship Report, employee training, and a new video highlighting biosolids used as a local television commercial and posted to social media. Through these efforts, KUB’s biosolids webpage had more than 300 page visits in 2020 - triple the amount in 2019.

Interested Farmer Relations

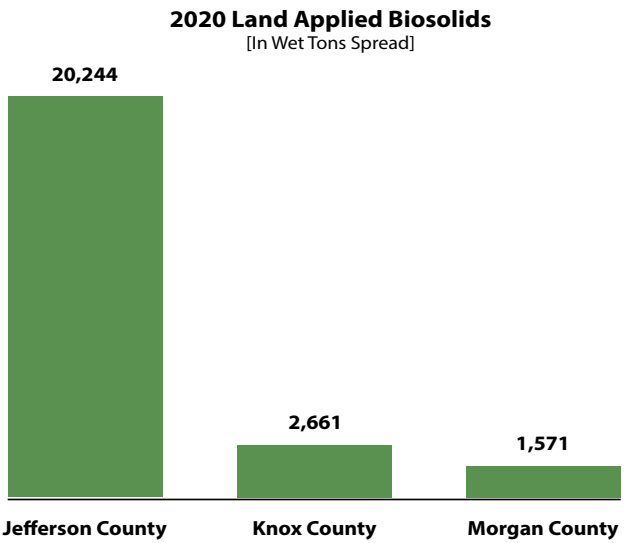
KUB’s website (www.kub.org/biosolids) offers a wealth of information about the biosolids program for farmers or other interested parties, including links to more information from the National Biosolids Partnership, the National Association of Clean Water Agencies, the Water Environment Federation, and the Environmental Protection Agency (EPA). In addition to the website material, KUB employees perform field evaluations every quarter, which promotes stronger relationships with our farmers.

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% of its biosolids. KUB contracts with Synagro Technologies for dewatering, transportation, and land application. Synagro’s highly trained staff 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 maintained. A farmer receiving KUB’s Biosolids stated, “Synagro does a great job land applying biosolids and keeps the onsite stockpile location very neat.” 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 2020, 16 farms received 24,476 wet tons of biosolids, spread over 1,400 acres of land, primarily in Jefferson County. There are currently 50 farms approved for KUB Biosolids and permitted by the Tennessee Department of Environment and Conservation.



2020 Goals Achieved, Continuous Improvement in 2021

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 2020, KUB achieved the following:

- Maintained average fecal coliform levels under 200,000 Most Probable Number (MPN) in all reporting periods.
 - 200,000 MPN is 1/10 of the regulatory limit.
- Maintained volatile solids reduction above 50 percent in all reporting periods.
- Improved KUB biosolids communications content, including revamped web pages and a video used on television, social media, and the web.



Some of KUB'S 2021 goals and objectives include:

- Participate in TVA's Demand Response Program to reduce pressure on the region's electric grid during periods of peak demand.
- Continual improvement of asset management program through training and program development.
- Continual improvement of 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. KUB's 2020 results are well below established EPA ceiling limits.

Parameter	EPA Ceiling Limits	2020 KUB Data
Arsenic (ppm*)	75	8.4
Cadmium (ppm)	85	1.4
Copper (ppm)	4,300	242
Lead (ppm)	840	20.2
Mercury (ppm)	57	0.41
Molybdenum (ppm)	75	16.7
Nickel (ppm)	420	20.4
Selenium (ppm)	100	9.1
Zinc (ppm)	7,500	823

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

KUB Biosolids Production throughout COVID-19

In early 2020, our community was impacted by COVID-19. KUB, like several other business, asked its employees to work from home for a majority of the year. Wastewater Plant Operators, however, were still onsite every day, as wastewater treatment is a continuous and essential part of the community. Just like wastewater treatment, biosolids production is a continuous and essential process. Throughout the pandemic, KUB biosolids were continuously produced and land applied in our community. KUB and Synagro personnel followed strict protocol to ensure employee safety and social distancing when performing tasks. These combined efforts helped keep KUB biosolids out of the landfill and the biosolids program on track.



KUB Kuwahee WWTP Sees an Increase of Grease During 2020 Area Shutdown

In the spring of 2020, during community stay-at-home advisories due to the pandemic, the Kuwahee Plant Operator began noticing equipment issues in the influent and gravity processes due to excess amounts of grease. Grease tends to collect on surfaces and clog equipment as it builds up around the internal walls of piping, pumps, and compactors. As grease continued to enter the plant, the issues spread throughout several process areas. Primary clarification, thickening, and gravity belt thickening were all impacted as a result.

After multiple discussions and analysis for possible sources of the grease, it was determined that it was due to a combination of factors. Restaurants being offline and possibly cleaning grease collection systems may have been a contributor, but it was determined that the plant was likely experiencing side effects of the community being at home and cooking all of their meals. To help combat the issue, Operations, Maintenance and Grease Control Program Technicians developed plans to utilize a third-party contractor to remove grease from primary clarification, primary scum collection system, and from piping where the walls were coated. In one instance, sludge thickening, a sludge line had to be replaced due to grease clogging the pipe and ultimately slowing pump speeds. As the stay at home orders were relaxed, the major grease issues at Kuwahee were resolved.



Grease issues can severely impact WWTPs and will ultimately cause extra maintenance and replacement of equipment. These equipment replacements can be costly, so it is important to remember to always can the grease that is used in the home or elsewhere. For more information on KUB's Grease Program, please visit www.kub.org/protect.

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 2020 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.

