



2017 Biosolids Performance Report

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Our Mission:

Our mission is to act as good stewards of our communities' resources: utility assets, customer dollars, and the environment. We work to safeguard those resources and enhance their value for the people of the communities we serve and generations to come.

KUB's Biosolids Program Maintains Platinum Level Certification

In December 2017, KUB passed a two-day biosolids external audit to recertify its Platinum status through the National Biosolids Partnership (NBP). KUB's biosolids program first received NBP Platinum certification in 2011 and is one of only 33 certified programs nationwide. To maintain certification, it must continue to pass annual external audits.

"KUB's use of a management system approach is generating positive outcomes for KUB's biosolids program in the areas of regulatory compliance, environmental performance, quality practices, and relations with interested parties," said Auditor Jon Shaver. "Internal auditors understand the use and value of process audits, particularly for assessing effectiveness based on interactions between processes." This approach—a unique, recognized strength of KUB's Biosolids Program—is used as a tool for promoting best practices and continuous improvement by the Biosolids Management team.



Biosolids in the hopper at KUB's Kuwahee plant.

Wastewater Plants Celebrate Award-Winning Performance

KUB's wastewater treatment plants have a long history of excellent performance marked by numerous awards from the National Association of Clean Water Agencies (NACWA) over the years. In 2016, for the first time ever, all four KUB treatment plants had zero violations. After more than 18,000 total compliance checks in 2017, our plants met the following criteria for these awards:

- **Eastbridge:**
0 violations; 4,804 compliance checks; treats 0.45 million gallons a day (MGD)
NACWA Platinum 11 Award, WEA Operational Excellence Award
Eastbridge first achieved NACWA Platinum status, awarded for no violations in five years, in 2010. It has qualified for Platinum status each year since.
- **Loves Creek:**
0 violations; 4,450 compliance checks; 2.37 MGD
NACWA Gold Award, WEA Operational Excellence Award
- **Kuwahee:**
1 violation in 4,796 compliance checks; 27.77 MGD
NACWA Silver Award, WEA Operational Excellence Award
- **Fourth Creek:**
1 violation; 4,310 compliance checks; 5.82 MGD
NACWA Silver Award, WEA Operational Excellence Award

Biosolids Around the Globe

Every nation is tasked with biosolids management. As population and gross domestic product rise, so does the amount of biosolids generated. In response, countries are continuously developing and improving management regulations. However, there is large variation in solids management. Much of this variation is due to the differing stages of wastewater infrastructure around the world. The United States is fortunate that infrastructure has been developed for beneficial reuse, but many countries struggle with how to manage this waste product.

In lower income regions of Africa, parts of Asia, and South and Central America, basic sanitation is lacking for much of the population. Focus remains on construction and improving dependability of treatment facilities, rather than developing legislation to regulate Biosolids treatment and disposal. In Senegal, for example, the majority of the population uses individual systems of sanitation such as septic tanks or insulated pits. Solids are collected from domestic systems and disposed of in the environment or transported to stations where it is sold to farmers.

In middle income countries, much of wastewater treatment is at the preliminary or primary level, with secondary treatment found in some urban areas. As a result, the quality of the Biosolids is much lower compared to countries with more advanced treatment infrastructure. Many nations, such as Mexico, have set guidelines for biosolids quality to promote proper disposal. However, infrastructure improvements are needed to achieve a compliant biosolids product on a wide-scale, which would allow focus to shift to beneficial reuse.

Much of the Biosolids in developed regions such as the United States, Canada, Australia, and much of the European Union is treated to greatly reduce pathogens and then applied to agricultural land. Common treatment methods include anaerobic digestion, addition of lime, and composting.



Class A vs. Class B: What's the Difference?

The federal Clean Water Act Part 503 regulations identify two classes of pathogen reduction, as shown below. KUB produces Class B biosolids, which are also certified as a fertilizer with the Tennessee Department of Agriculture.

Class A:

Pathogens are reduced to a level similar to the native soil and environment. Class A biosolids products can be used on home lawns and gardens, parks and golf courses, and other places where public contact is likely. Class A biosolids products include composted biosolids, lime pasteurized biosolids, and fertilizer pellets.

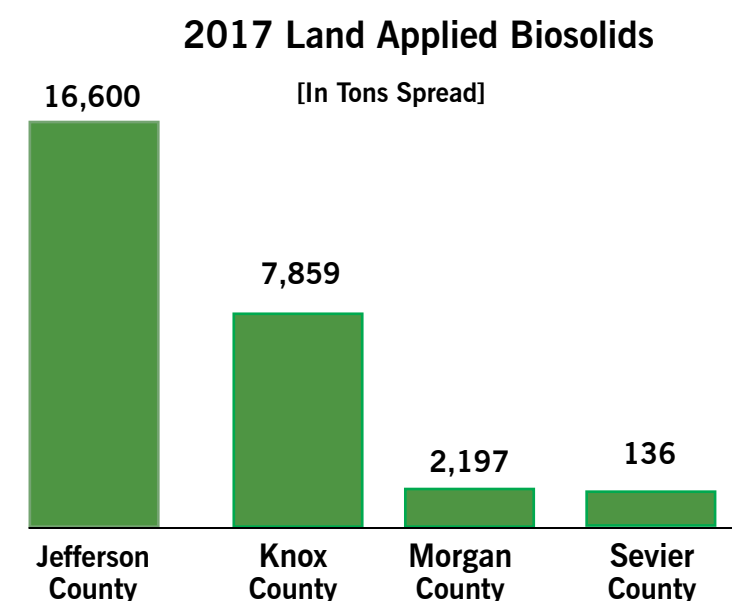
Class B:

While pathogens are significantly reduced to levels that are often below those found in animal manures, additional best management practices (BMPs) 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 lands. Site permits are required for Class B biosolids use.

KUB Biosolids Application

KUB beneficially reuses 100 percent of its Class B biosolids. KUB contracts with Synagro Technologies for dewatering, transportation, and land application. Synagro's highly trained staff ensures that the company's work complies with applicable federal, state, and local regulatory requirements. 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. KUB appreciates the excellent service Synagro provides to us and our customers.

In 2017, 23 farms received over 26,000 tons of biosolids, spread over 1,500 acres of land. As shown in the figure, Jefferson County received the largest amount of biosolids. KUB currently land applies at 57 farms permitted by the Tennessee Department of Environment and Conservation.



2017 Goals, Objectives, and Performance

The KUB Biosolids Environmental Management System (EMS) goals and objectives were developed to seek continual process improvement and enhance biosolids quality. The program goals reinforce KUB's blueprint commitment to being environmentally responsible and supporting the sustainability of our communities' natural resources.

In 2017, KUB achieved the following:

- Maintained average fecal coliform levels under 200,000 most probable number (MPN) in all reporting periods but one
- Updated and improved the KUB Biosolids webpage
- Increased the frequency of public presentations by 150 percent
- Updated the Post-Biosolids Questionnaire in order to collect more quantitative data from farmers
- Evaluated Combined Heat and Power (CHP) and Fats, Oils, and Grease (FOG) projects

Some of KUB'S 2018 goals and objectives include:

- Increasing the frequency of quality control sampling to better understand solids process at Kuwahee Wastewater Treatment Plant
- Provide five opportunities for internal education related to the Biosolids program
- Reduce digester defoamer use by 10 percent
- Complete three public presentations related to Biosolids management
- Maintain fecal coliform under 200,000 MPN and volatile solids reduction above 50 percent for the two month reporting period

Sustainable Agriculture: Phosphorous in Biosolids

Phosphorus, or phosphate in its usable form, is essential for crop growth and health. As such, the element is heavily mined and incorporated into commercial fertilizers. Phosphorus, however, is not a renewable resource and experts estimate the world will eventually run out of reserves. Experts predict phosphorus mines may be stripped in anywhere from 30 to 300 years—making it clear the world is approaching the end of the phosphorous supply.

Biosolids help provide a sustainable, renewable source of phosphorous for agricultural uses. Humans do not need the high levels of phosphorus found in plant matter, so excess phosphorus can be found in significant quantities in biosolids. The phosphorus found in biosolids is immediately available for use by plants, unlike commercial fertilizers. In addition, stringent biosolids regulations lead to minimal nutrient runoff into surface waters. Farmers can apply properly treated biosolids at a rate tailored to the phosphorous needs of their crops, eliminating the need for mined phosphorous and allowing for the beneficial reuse of biosolids.

How Do KUB Biosolids Results Compare to Regulatory Limits?

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 2017 results compare to the limits.

Parameter	EPA Ceiling Limits	2017 KUB Data
Arsenic (ppm**)	75	7
Cadmium (ppm)	85	2
Copper (ppm)	4,300	237
Lead (ppm)	840	21
Mercury (ppm)	57	0.58
Molybdenum (ppm)	75	6.63
Nickel (ppm)	420	27
Selenium (ppm)	100	5
Zinc (ppm)	7,500	733

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

Community Outreach and Interested Farmer Relations

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. The site 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 report to the City of Knoxville, and KUB's Business Education Series, which helps our employees understand biosolids so they can help answer customer questions.

Interested Farmer Relations

KUB's website (www.kub.org) offers a wealth of information about our biosolids program for farmers or other interested parties. It also offers links to more information from the National Biosolids Partnership, the National Association of Clean Water Agencies, the Water Environment Federation, and the EPA.

Farmers may call KUB's Customer Information Center (865-524-2911) or e-mail our Biosolids Mailbox at biosolids@kub if they have specific questions or are interested in scheduling a farm visit to determine eligibility for biosolids application. A representative will be in touch within five business days.



Biosolids Monitoring Requirements

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.

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 2017 were land applied.
- KUB provides approximately 30,000 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 25 years.

For more information on KUB biosolids, visit www.kub.org or e-mail biosolids@kub.



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