



Report
National Biosolids Partnership
Biosolids Management Program
Interim Audit

Knoxville Utilities Board
Kuwahee Wastewater Treatment Plant
Knoxville, Tennessee

Audit Dates: December 6 & 7, 2022

Audit Conducted By: DEKRA Certification, Inc.

Report Written By: Jon Shaver, DEKRA Certification, Inc.

Report Date: December 20, 2021

Reviewed By: Drew Iles, Knoxville Utilities Board (12-19-22)

Approved By: Chris Carson, DEKRA Certification Inc. (12-20-22)

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1. EXECUTIVE SUMMARY

DEKRA Certification, Inc. (DEKRA) conducted an independent third-party audit of the Biosolids Environmental Management System (BEMS) being used by the Knoxville Utilities Board (KUB) in managing its biosolids program. The audit was conducted onsite at KUB's request December 6 and 7, 2022 covering parts of the KUB BEMS and all requirements of the National Biosolids Partnership (NBP) BMP Elements. The audit was an Interim Audit (cycle 3, interim 1) for continuing DEKRA Verification and NBP Certification.

Audit Purposes

This audit was conducted to:

- Verify that the Biosolids Environmental Management System (BEMS) being used by KUB meets National Biosolids Partnership (NBP) expectations and conforms with requirements of the NBP BMP Elements.
- Confirm that the KUB BEMS is functioning effectively, with practices and procedures being performed as documented.
- Examine outcomes KUB is achieving by using a systematic approach for managing its biosolids program.
- Verify the effectiveness of corrective action taken in response to open nonconformances from previous DEKRA third party audits.

Summary of Audit Activities and Results

DEKRA reviewed KUB's biosolids program and audited that program for conformance with expectations and requirements of the NBP Biosolids Management Program Elements and the KUB BEMS (audit criteria). The audit scope was consistent with NBP requirements, as stated in the NBP Auditor Guidance (2011).

No major nonconformances and one minor nonconformance with respect to the audit criteria were found during this audit.

Conclusions

Based on the results of this audit, DEKRA has determined that:

- 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.
- KUB biosolids practices are consistent with NBP expectations and conform to requirements of the NBP BMP Elements, with one minor exception.
- All nonconformances from prior DEKRA audits during the previous Verification Cycle have been effectively corrected and are closed.

This audit has verified that the KUB biosolids management program meets NBP expectations and requirements. We recommend continuing certification of the KUB biosolids management program within the NBP Biosolids Management Program.

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2. AUDIT DETAILS

2A. Agency Details

Agency Name: Knoxville Utilities Board, Knoxville TN (referred to as KUB in this report)

Number of Employees = 42 KUB + 6 Synagro

Biosolids Production Sites: Kuwahee Wastewater Treatment Plant, Knoxville, TN

Volume of Wastewater Treated = 30 MGD (average); design 44MGD, capacity 120 MGD

Biosolids Produced = approx. 25,000 wet tons per year (all Class B). Solids content ranges from 24% to 26%

Biosolids Use Options: 100% agriculture land application

KUB Biosolids Program

KUB manages their biosolids program using a Biosolids Environmental Management System (BEMS) that is guided by the NBP BMP Elements. The scope of the KUB BEMS includes activities within the full biosolids value chain, including Pretreatment, Wastewater Treatment and Solids Generation, Solids Stabilization, Dewatering, Biosolids Storage and Transportation and Biosolids Use (land application). A contractor (Synagro) is employed for managing biosolids dewatering, storage, transportation and use options under KUB supervision.

Contractors Participating in Audit

Synagro

Interested Parties Interviewed

The following interested parties were interviewed to verify the effectiveness of the Communications, Public Participation and Compliance processes.

Tim Evans – Farmer & Biosolids User, Knox County

Bill Loyd – Farmer & Biosolids User, Jefferson County

2B. Audit Criteria

The KUB biosolids program activities were assessed against requirement of the NBP BMP Elements (July 2011) and the KUB BEMS.

2C. Audit Team

KUB authorized DEKRA Certification Inc. to conduct this third-party audit of their biosolids program. DEKRA is an accredited Third-Party Audit Company within the NBP Biosolids Management Program. Mr. Jon Shaver performed this audit on behalf of DEKRA. Mr. Shaver is a qualified Biosolids EMS Lead Auditor and Technical Expert within the NBP BMP. DEKRA and the auditor have an independent and impartial relationship with KUB that meets NBP criteria for third-party audits.

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2D. Audit Scope and Locations

The audit was consistent with NBP requirements for Reverification Audits and the Scope of Work agreed by KUB and DEKRA. It was conducted to cover all requirements of the NBP BMP Elements (July 2011), with special attention to practices and management activities that directly support biosolids-related operations, processes and activities. The audit objectives were achieved.

The scope of this audit included the following:

- 1) Biosolids Management System Dynamics Review:
 - Significant changes affecting the biosolids program
 - BEMS changes
 - Biosolids Policy (demonstrated commitment, including CoGP)
 - Effectiveness Reviews
 - Communications Program
 - Corrective & Preventive Action
 - Goals & Objectives
 - Management Reviews
- 2) Process Audits:
 - Biosolids Dewatering
 - Communication Program (internal & external)
 - Competence, Awareness & Training
 - Compliance (with legal & other requirements)
 - Critical Control Points & Operational Controls
 - Emergency Preparedness
 - Goals & Objectives Process
 - Internal Audits (including Corrective Action)
 - Management Involvement
 - Operations -Biosolids Dewatering
 - Operations - Wastewater Treatment & Solids Generation
- 3) Effectiveness review for corrective action from previous nonconformances found during the current Verification cycle.
- 4) Examination of outcomes being achieved in the areas of regulatory compliance, interested party relations, environmental performance and quality practices

Notes:

- Transactions were tested to verify the continuing health of the BEMS
- Interested party interviews were conducted to verify the effectiveness of the Communications Program and included interviews with two users of KUB biosolids.

2E. Audit Methodology

The audit was conducted by a qualified auditor following guidelines stated in the NBP Auditor Guidance (August 2011). The auditor observed practices in place, interviewed key persons and reviewed pertinent documents and records using standard auditing sampling techniques. The auditor assessed the performance of processes within the BEMS and the consistency of biosolids

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management practices with written procedures. This audit is not a verification of compliance with any legal requirements applicable to biosolids practices performed by the agency or its contractors.

2F. Reference Materials

The following documents were used as references during this audit:

- KUB EMS Manual (July 13, 2021)

- National Biosolids Partnership "BMP Elements" (July 2011)

- National Biosolids Partnership Biosolids EMS Third Party Auditor Guidance (August 2011)

- National Biosolids Partnership Code of Good Practice

- National Biosolids Partnership Manual of Good Practice

2G. Definitions of Potential Audit Findings & Required Corrective Action

Major Nonconformance – a serious omission from requirements and/or other departure that represents, or could cause, a systemic failure, or the existence of multiple related minor nonconformances, or failure to effectively correct a nonconformance in a timely manner. For verification to continue, major nonconformances must be corrected and verified by third party audit within 90 days.

Minor Nonconformance – an isolated departure from requirements that does not represent a systemic failure. Minor nonconformances require timely and effective correction by the agency and verification by the third-party auditor during the next third-party audit.

Opportunity (for improvement) – a possible improvement in the management system based on audit observations. There is no obligation for action in response to these observations.

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3. SUMMARY OF AUDIT RESULTS

3A. Verification Conclusion

The Knoxville Utilities Board has been independently verified by DEKRA Certification, Inc. as having an effective biosolids environmental management system (BEMS) that supports continual improvement in environmental performance, meeting regulatory compliance obligations, utilizing good management practices and creating meaningful opportunities for public participation. The BEMS is in conformance with requirements of the National Biosolids Partnership Biosolids Management Program.”

We recommend continuing Platinum Certification within the NBP Biosolids Management Program.

3B. Audit Findings – Nonconformances from this Audit

Minor Nonconformance JS/22-01/17 NBP BMP Element 17 requires the organization’s management to review the BMP and its performance relative to policy commitments, The Management Review conducted 11/9/22 does not discuss performance in meeting biosolids policy commitments

3C. Status of Nonconformances from Previous DEKRA Audits

Minor Nonconformance JS/21-01/16 NBP BMP Element 16 requires the organization to maintain an internal audit program to periodically analyze its BMP and to determine whether it is effectively meeting its biosolids management policy, program requirements, and program goals and objectives

The internal audit conducted 9/9/21 evaluates program requirements but does not fully evaluate whether biosolids policy and goals / objectives are being met.

Corrective Action – Corrective action for this nonconformance was reviewed. The internal audit conducted September 2022 included an assessment of the Biosolids Policy. The Dekra auditor determined that this nonconformance has been effectively corrected.

3D. Interested Party Interviews

Two biosolids users were interviewed as part of this audit. Both were complimentary about communications and service provided by KUB and Synagro. They both expressed a desire to continue to use KUB bioaolids on their land that is used to produce pasture grass and hay. A question from one of the users was passed on to KUB for handling. The process for interested party input and communications was found to be functioning effectively.

3E. Appeals

The NBP provides an appeal process for biosolids organizations and interested parties that disagree with the Verification conclusion of a third-party audit. The appeals process involves an Appeals Board consisting of biosolids management interested parties, including an environmental advocacy group and wastewater industry professionals. An appeal must be submitted within 30 days of Dekra’s Reverification. Information about the appeals process is available from the National Biosolids Partnership. Contact Ms. Maile Lono-Batura at (MLono-batura@wef.org).

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3F. Agreements

KUB and DEKRA have agreed that the next audit, an Interim Audit (#3-2), will be scheduled for approximately December 2023, with exact timing to be agreed in advance. The scope will be consistent with the Interim Audits Program agreed by KUB and the Lead Auditor and NBP requirements. KUB will arrange for this audit with Dekra.

3G. Additional Information

Further information about this audit and/or the National Biosolids Partnership BMP can be obtained from Knoxville Utilities Board by contacting Ms. Drew Iles at drew.iles@kub.org.

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4. BIOSOLIDS MANAGEMENT PROGRAM DYNAMICS

Review of the biosolids management program dynamics and outcomes is conducted to verify that the biosolids management program is functioning effectively and generating positive outcomes (results) and that changes are being incorporated consistent with requirements. The following summarizes DEKRA's review of the dynamics of the KUB Biosolids EMS.

4A Significant Changes

Significant changes affecting the KUB biosolids program since the previous Dekra audit include:

- A Biologically Enhanced High Rate Clarifier (BEHRC) has been installed to handle high rain events

4B Revisions to the Management System

Minor changes were made in the KUB Biosolids EMS that did not significantly affect operation or control of the management system.

4C Biosolids Policy Commitments

The KUB Biosolids Management Policy remains as previously approved. It was reviewed and approved 7/13/21. The Policy includes a commitment to meet the NBP Code of Good Practice. Review of performance in meeting commitments made in that Policy demonstrated it has been incorporated into the Biosolids Management Program and that continual improvements are occurring.

4D Strengths Identified During this Audit

- An effective Operator Qualification Program is used for bringing new operators on board

4E Examination of Outcomes

The KUB Biosolids EMS is improving through the use of a systematic approach to managing biosolids activities. The following improvement outcomes within the past two years were confirmed.

Regulatory Compliance

- Partnering with local landfill is allowing control of leachate resulting in improved ammonia control in effluent

Environmental Performance

- Addition of a Biologically Enhanced High Rate Clarifier provides secondary treatment for flows in excess of 65 MGD, which improves overall effluent quality and compliance.

Relations with Interested Parties

- The list of farmers who would like to use KUB / Synagro biosolids continues to increase. 100% positive feedback

Quality Practices

- Annual digester cleaning enhances biosolids quality and helps improve the integrity of plant equipment
- Partnering with local landfill is allowing control of leachate resulting in improved ammonia control in effluent

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4F Use of NBP Certification and DEKRA Verification

Use of and references to NBP Certificate and DEKRA Verifications were reviewed. There were no concerns.

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5. BEMS EFFECTIVENESS REVIEWS AND PROCESS AUDITS

5A. Effectiveness Reviews

Biosolids Goals and Objectives Process

Long term goals are set by management team addressing regulatory compliance, environmental performance, quality, relations with interested parties. Eight objectives for 2022 were achieved or in progress. Two objectives were not achieved. The Goals and Objectives process was determined to be effective.

Biosolids Policy

Policy in place & approved by Senior VP. Latest Policy dated 7/13/21 includes commitment to NBP Code of Good Practice.. Consistency with Code of Good Practice was demonstrated throughout this audit.

Corrective and Preventive Action Process

The Corrective and Preventive Action process was used to address nonconformances from previous Third-party Audits and internal audits. The process is working effectively. See Opportunities for Improvement below.

Management Review

Management involvement has been demonstrated through actions taken regarding issues raised in management reviews and programs for measurement and improvement. Actions taken are consistent with defined objectives and are recorded. The Management Review process is functioning effectively, except for one minor nonconformance (22-01).

5B. Process Audits

DEKRA audited the following processes that KUB uses within its biosolids management program and determined the level of conformance of each process with NBP expectations and requirements of the audit criteria.

Biosolids Dewatering (incl contractor control)

Interviewed: Sam Moore – Synagro Operations Manager, Daniel Dodson – Technical Service
Biosolids dewatering (centrifuge) done by contractor (Synagro) under contract with KUB. KPIs in place (e.g. tons per hour processed). Process Control Points & controls are in place, including SOPs/WIDs (Operating Procedures). Control of operations verified consistent with desired parameters, including bearing temperature. Operator competence & skills up to date, including annual BEMS training by KUB. Process is effective and meets requirements.

Competence, Awareness & Training

Interviewed: Drew Iles - Biosolids Coordinator
Operator qualification program in place, including certification and training. Operator Qualification Program being used. Annual EMS training for all employees involved in biosolids, including Synagro. Process is effective and meets requirements..

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Communications Program

Interviewed: Cortney Roark Communications Team Lead

The KUB Communications Program includes proactive methods for communicating with interested parties, including the public and regulators. Communications occurs through public presentations and an interactive website. Inquiries from social media and the KUB website addressed. No odor complaints in past 2 years. Communications Plan reviewed – could be more directly related to biosolids program. Biosolids Program Performance Report for 2021 was issued publicly in July 2022. The public was offered an opportunity to attend this audit, however no observers attended. Interested parties interviewed during this audit noted that effective and useful channels of communication are in place.. Process is effective and meets requirements.

Compliance (with legal & other requirements)

Interviewed: Drew Iles - Biosolids Coordinator, Thomas Pucci (Chief Operator)

Legal requirements for biosolids program identified on list of Legal and Other Requirements. List includes TDEC permits, EPA regulations and OSHA regulations. Identification and application through discussions with TDEC. NPDES permit renewed in 2019. Other requirements include voluntary levels for key quality measures (e.g. volatile solids reduction, e-coli). If noncompliances occur they are addressed by the Corrective Action Process. Internal audits include verification of compliance. Process is effective and meets requirements.

Control of Contractors

Interviewed: Drew Iles - BEMS Coordinator, Daniel Dodson (Synagro)

Synagro operate centrifuge dewatering and biosolids transportation, storage and use on behalf of KUB. These operations are considered to be an integral part of the KUB BEMS. Synagro representatives attend regular meetings with KUB management to maintain and improve the BEMS. KUB conducts monthly inspections for biosolids land application sites. A contract (signed 4/27/20) is in place covering each party's responsibilities. Process is effective and meets requirements.

Critical Control Points & Operational Controls

Interviewed: Drew Iles - BEMS Coordinator, Thomas Pucci (Chief Operator)

Process control points identified in table ("Process Control Points") that includes risk for environmental impacts, compliance obligations, biosolids quality, interested party relations. Operational controls identified. Process is effective and meets requirements..

Emergency Preparedness

Interviewed: Drew Iles - BEMS Coordinator, Chris Thomas (Plant Manager)

Emergency Preparedness plans in place, including Emergency Action Plan, Biosolids Spill Response Plan, Wastewater Emergency Response Plan. Sewer Overflow Response Plan. Equipment in place for responding to emergencies onsite and offsite. Spill Response Plan by Synagro also approved by KUB. Incident Command Structure in place. All operators qualified by annual Hazwoper Training. Process effective and meets requirements

Internal Audits

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Interviewed: Anna Peterson (Regulatory Specialist), Corree Rippitoe (Lab Analyst)
Internal audits were conducted as planned in 2021 and 2022. The most recent audits conducted 9/9/21 covering the full BEMS Program. No “findings” and 5 “opportunities” were found. The Internal Process is effective and meets requirements.

Management Involvement (direction, BMP planning, responsibilities)

Interviewed: John Gresham (Vice President), Chris Thomas (Plant Manager)
Plant management directs biosolids program. Intended outcomes include remaining above and beyond regulatory compliance, focus on biosolids improvement, environmental performance (including beneficial reuse), positive public perception and continual improvement. Management reviews conducted semi-annually to review performance and identify opportunities for improvement. The most recent anagement Review was conducted 11/9/21. Process is effective. See Opportunities for Improvement below. Process is effective and meets requirements.

Wastewater Treatment & Solids Generation

Interviewed: Thomas Pucci – (Chief Operator)

Audit conducted by reviewing SCADA data and speaking with Chief Operator.

Wastewater treatment includes primary and secondary treatment, chlorine disinfection and neutralization. PCPs in place; operational controls in place including SCADA and WIDs.

Solids conditioning includes thickening (GBT) and digestors. Target 4 – 5% solids after GBT being met. Newly installed boiler preheats water which is used to heat biosolids before entering digester. PCPs & operational controls in place. Boiler operation checked – temperature 198F vs set point 195F controlled by PLC. Volatile solids reduction 50% compared to regulatory requirement 38%. Operators qualified (State license) and trained (e.g. new boiler training). Process is effective and meets requirements.

5C. Summary of Conformance Results

Process	Applicable BMP Elements	Conformance
Biosolids Dewatering	3,10,13	Process is effective & conforms with requirements
Communications Program	6, 9, 15	Process is effective & conforms with requirements
Competence, Awareness & Training		Process is effective & conforms with requirements
Compliance (with legal & other requirements)	4, 14	Process is effective & conforms with requirements
Control of Contractors	various	Process is effective & conforms with requirements

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Process	Applicable BMP Elements	Conformance
Critical Control Points & Operational Controls	3, 10, 13	Process is effective & conforms with requirements
Emergency Preparedness	11	Process is effective & conforms with requirements
Internal Audits & Corrective Action	14, 16	Process is effective & conforms with requirements
Management Direction & Involvement	7, 17	Process is effective & conforms with requirements
Wastewater Treatment & Solids Generation	3,10,13	Process is effective & conforms with requirements

5D. Opportunities for Improvement

The following “opportunities” for improving the KUB BEMS were noted during the audit. Opportunities do not represent nonconformances and KUB has no obligation to take any action in response to them.

- When evaluating BEMS performance, consider focusing on key intended outcomes and issues and risks that could prevent or help in achieving these outcomes
- Consider including an evaluation of performance against intended outcomes in management reviews
- When discussing KPIs include a summary of results
- The “Communications Plan” could include specific interested parties and communications if it is used as a key document in the KUB Communications Program
- The definition of critical control points (aka process control points) in the BEMS could be simplified.
- The most recent spill response training occurred over 6 years ago. This training could be more frequent.
- Consider defining what “conforms” means in internal audit reports

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APPENDICES

List of Participants

The following persons participated in this audit. Other persons provided additional explanations, as necessary.

KUB Personnel

Steve Clettenburg	Wastewater Supervisor
John Gresham	VP Plant Operations
Cortney Harris	Communications Analyst
Drew Iles	Biosolids Coordinator
David Obenschain	Business Management Analyst
Anna Peterson	Regulatory Specialist
Thomas Pucci	Chief Operator
Corree Rippetoe	Lab Analyst
Chris Thomas	Plant Manager

Contractor Personnel

Daniel Dodson	Technical Specialist (Synagro)
Sam Moore	Operations Manager (Synagro)

Interested parties

Tim Evans – Farmer (biosolids user) Knox County
Bill Loyd – Farmer (biosolids user) Jefferson County

List of Documents & Records Reviewed

Annual biosolids training program 2022
BEMS Manual 7/13/21
Biosolids Goals & Objectives 11/24/22
Biosolids Policy 7/13/21
Biosolids Spill Plan (Synagro) 10/24/22
Biosolids training records (various)
BMP critical control points & operational controls 10/24/22
BMP Performance Report for 2021 (July 2022)
CAPA 3/18/22, 10/28/21
Code of Good Practice (NBP)
Communications Plan 10/8/22
Contractor performance assessment 11/17/22
Emergency action plan 1/7/22
Internal audit report 8/24/22
Key Performance Indicators 2022
KUB contractor inspections (various)
Legal and other requirements 11/15/22
Maintenance outage request 6/21/19

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Management Review 11/11/22, 11/9/21
Operator Qualification Program – N Galoway
Operator sub-classifications
Post Application Questionnaire 1/3/22
Public input & requests record (10/28/22)
Settleable solids 4/27/22
SOP – centrifuge Oct 2022
Wastewater Dashboard
WID for BEHRC 6/13/22
WID for RAS pumps 5/21/21
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END OF REPORT