



**Biosolids EMS Verification
Audit Report**

**Knoxville Utilities Board
Knoxville, Tennessee**

Audit Dates: November 28 – December 1, 2016

Audit Conducted by:

DEKRA Certification, Inc.

Auditor(s): Mr. Jon Shaver, Biosolids EMS Lead Auditor

Report Written by: Jon Shaver, Biosolids EMS Lead Auditor

Report Date: December 9, 2016

Technical Content Review by: Hannah Clayton Knoxville Utilities Board

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1. EXECUTIVE SUMMARY

DEKRA Certification Inc. (DEKRA) conducted an independent Verification Audit of the Biosolids Environmental Management System (BEMS) being used by the Knoxville Utilities Board (KUB) at the Kuwahee Wastewater Treatment Plant in Knoxville, Tennessee to manage its biosolids activities. The audit was performed at KUB's request as part of their participation in the National Biosolids Partnership (NBP) Biosolids Management Program. DEKRA conducted the audit in two phases, including a review of BEMS documentation and readiness review (phase 1) and an onsite audit at KUB facilities and biosolids use sites (phase 2).

The purposes of this Reverification Audit were to:

- Verify that the program being used by KUB in managing its biosolids activities meets requirements of the NBP Biosolids Management Program, in particular the 17 BMP Elements.
- Confirm that KUB's biosolids program is functioning effectively and in a manner that meets NBP expectations, with practices and procedures being performed as documented.
- Examine outcomes that KUB is achieving using a systematic approach to managing their biosolids program.
- Verify that effective corrective action has been taken in response to open nonconformances from previous DEKRA audits.

Consistent with NBP requirements, the scope of this audit included KUB's complete Biosolids Value Chain. During the audit, DEKRA assessed the processes and activities that KUB uses within its management system for conformance with NBP expectations and requirements of applicable NBP BMP Elements. Interested parties were interviewed to assess relations with interested parties. Transaction tests were conducted to assess overall system health and functionality.

Summary of Audit Results

No major nonconformance and 2 minor nonconformances with respect to the audit criteria were found during this audit. KUB has developed corrective action plans to address the nonconformances and those plans been approved by DEKRA's Lead Auditor.

Audit Conclusions

The audit determined that:

- The KUB documentation meets requirements with minor exceptions.
- The KUB biosolids management program meets NBP expectations and requirements of the NBP EMS Elements, with minor exceptions.
- The program is functioning effectively and generating positive outcomes.
- All nonconformances from prior DEKRA audits have been effectively corrected.

Based on results of this audit, DEKRA verifies that the KUB Biosolids EMS meets NBP expectations and requirements of the NBP BMP Elements. We recommend NBP Certification of the KUB Biosolids Environmental Management System.

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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 = 55

Biosolids Production Sites: Kuwahee Wastewater Plant, Knoxville, TN

Volume of Wastewater Treated = 33 MGD (average); design 44MGD, capacity 120 MGD

Biosolids Produced = 8,000 dry tons per year (28,000 wet tons per year); 100% Class B

KUB Biosolids Program

KUB's Biosolids Program includes defined processes for Pretreatment, Wastewater Treatment and Solids Generation, Solids Stabilization, Dewatering, Biosolids Storage and Transportation and Biosolids Use (2 use options). A contractor is employed for managing biosolids dewatering and transportation and use options.

KUB manages their biosolids program using a "Biosolids Environmental Management System (BEMS)" that is based on the NBP BMP Elements.

2B. Audit Purposes, Criteria and Scope

Purposes

This audit was a Reverification Audit, as defined in the NBP Biosolids EMS Program. Its purposes were to:

- Verify the KUB BEMS meets NBP expectations and requirements of the NBP BMP Elements.
- Confirm KUB is managing its biosolids program in a manner that meets NBP expectations, with practices and procedures performed as documented.
- Examine outcomes KUB is achieving by using a systematic approach to managing its biosolids program.

Audit Criteria

Requirements of the NBP BMP Elements (July 2011) and the KUB Biosolids Environmental Management System, as documented.

Scope of Work

The scope of the audit included all parts of the KUB biosolids program, which includes pretreatment, wastewater treatment and solids generation, solids stabilization, dewatering, biosolids transportation, biosolids use / disposition, with special attention to practices and management activities that directly support biosolids-related operations, processes and activities.

The audit included the following topics, consistent with NBP requirements and the Scope of Work agreed by KUB and DEKRA.

1. Review of KUB's EMS Documentation describing the KUB BEMS (referred to as BEMS Manual).

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2. Review of significant changes affecting the KUB Biosolids Management System that have occurred since the previous DEKRA audit.
3. Process Audits (covering requirements of applicable EMS Elements, including review of process effectiveness):
 - Biosolids Stabilization, Conditioning & Handling
 - Biosolids Dewatering
 - Biosolids Storage & Transportation
 - Biosolids Use – Agriculture
 - Communication Program
 - Competency, Training & Awareness
 - Compliance
 - Control of Contractors
 - Corrective and Preventive Action
 - Critical Control Points & Operational Controls
 - Document Control & Recordkeeping
 - Emergency Preparedness
 - Goals & Objectives Process
 - Internal EMS Audits
 - Maintenance
 - Management involvement
 - Pretreatment
 - Wastewater Treatment & Solids Generation
4. Examination of outcomes being achieved in the areas of regulatory compliance, interested party relations, environmental performance and quality practices.
5. Interested party interviews

Biosolids Use / Disposition Sites Audited

Ansel Galloway farm – Knox County (biosolids spreading conducted during audit)

Interested Parties Interviewed

3 biosolids regulators (TDEC)

2 biosolids users

KUB publicly advised all interested parties in advance that this audit would occur and provide the opportunity to participate in or observe this audit.

2C. Auditing Methodology

The audit was conducted by qualified auditors following guidelines stated in the NBP Auditor Guidance (August 2011). Using sampling techniques, auditors observed practices in place, interviewed key persons and reviewed pertinent documents and records to assess the systematic performance of the processes used in the KUB BEMS and the consistency of biosolids management practices with written procedures. Interested parties were interviewed and transaction tests were performed to verify the effectiveness of the management system.

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This audit was conducted as a systems audit and is not a verification of compliance with any legal requirements applicable to biosolids practices performed by the agency or its contractors.

2D. Audit Team

KUB authorized DEKRA Certification Inc. to conduct an independent Third Party Audit of their biosolids management system. Mr. Jon Shaver led the audit on behalf of DEKRA. Mr. Shaver is certified as a Biosolids EMS Lead Auditor and Biosolids Auditor by the NBP. DEKRA asserts that both our firm and auditor each have an independent relationship with KUB that meets criteria established by NBP for Third Party Audit Companies and Auditors.

2E. Reference Materials

The following documents were used as references during this audit:

- KUB EMS Manual (current version)
- NBP EMS Elements (July 2011)
- NBP Biosolids EMS Third Party Auditor Guidance (August 2011)
- NBP Manual of Good Practice

2F. Definitions of Audit Findings and Required Corrective Action

Major Nonconformance – a serious omission from requirements and/or other departure that represents, or could cause, a systemic failure. Major nonconformances must be corrected within 90 days for DEKRA's verification to be issued.

Minor Nonconformance – an isolated departure from requirements that does not represent a systemic failure. Minor nonconformances require timely and effective correction. Verification of effective correction by a certified DEKRA auditor is necessary for DEKRA's Verification to continue.

Opportunity (for improvement) – possible improvement in the EMS based on auditor observations. There is no obligation for action in response to these observations.

2G. Appeals

The NBP provides an appeals process for biosolids organizations and interested parties that disagree with the findings of a third party EMS audit. The verification appeals process involves an Appeals Board; representing a balance of biosolids management interested parties, including an environmental advocacy group, and wastewater industry professionals. An appeal must be submitted within 30 days of the approval date of this report. Information about the appeals process is available from the National Biosolids Partnership.

2H. Additional Information

Further information about this audit can be obtained from KUB. Contact Ms. Hannah Claytor (e-mail: [hannah.claytor@kub.org]).

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3. SUMMARY OF AUDIT RESULTS

3A. Verification Conclusion

Based on results of this audit, DEKRA issues the following Verification Statement concerning the KUB's biosolids management system.

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

3B. Strengths

DEKRA noted the following strengths in the KUB biosolids environmental management system:

- The cooperative business relationship between KUB and Synagro (contractor) is exemplary and contributes to the effectiveness of the Biosolids Program.

3C. Audit Findings – Nonconformances

During this audit, DEKRA found no major nonconformance and 2 minor nonconformances with respect to the audit criteria. KUB has prepared corrective action plans for the 2 minor nonconformances and DEKRA's Lead Auditor has approved those plans. DEKRA will review the effectiveness of completed corrective actions during the next audit.

The following identifies the minor nonconformances found during this audit.

Minor Nonconformance JS/16-01/1 NBP BMP Element 1 requires the organization's BMP Manual (or equivalent) to describe applicable policies, programs, plans, procedures and management practices in the BMP and contain procedures required by the BMP Elements.

The KUB BEMS Manual + related references do not fully meet requirements. They do not specifically state:

- how the Biosolids Policy is "incorporated into biosolids practices"
- how legal and other requirements are "incorporated into the BMP and operational controls"
- how goals and objectives are "integrated into biosolids activities"

Minor Nonconformance JS/16-02/17 NBP BMP Element 17 requires the organization's management review the BMP and its performance relative to policy commitments, goals, objectives, and established performance measures to ensure its continuing suitability, adequacy, and effectiveness and to address the commitment to continual improvement.

Management reviews conducted in June and November 2016 do not discuss the suitability, adequacy and effectiveness of the BEMS and do not make any recommendations for improvement.

3D. Opportunities for Improvement

The following opportunities for improvement in the KUB biosolids program were noted during the audit. Opportunities do not represent nonconformance and KUB has no obligation to take any action in response to them.

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- Two interested parties (both regulators) asked about the effect of extended storage time for biosolids at application sites. Consider ensuring that KUB communicates with the interested parties about this inquiry.
- The link between KUB “Blueprint” missions, Biosolids Policy and Program “Goals” could be more clearly stated.
- Consider introducing the BEMS as a way to help achieve long term intended outcomes for the biosolids program.
- Terminology for goals, objectives and targets could be used more consistently. Biosolids objectives could be shorter and more specific and measurable.
- When using the Corrective Action process consider using a “pull-down” menu for identifying the cause of systemic problems. This will allow analysis of trends in causes to determine if deeper causes may exist.
- When assessing emergency exercises, consider noting whether the emergency procedures were appropriate or needed modification.
- Consider measuring Maintenance performance using priorities for actions completed and backlogged.

3E. Agreements

DEKRA will develop an Interim Audits Program to schedule ongoing annual interim audits of the KUB Biosolids Environmental Management System for each of the four years between Verification Audits (2017 to 2020). The interim audits will be conducted to verify the KUB BEMS is functioning effectively and continues to conform to NBP expectations and requirements.

KUB and DEKRA have agreed that interim Audit #2-1 will occur in November 2017 and will be a third party audit. The dates and scope of work for that audit will be agreed in advance.

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4. BIOSOLIDS MANAGEMENT PROGRAM DYNAMICS

Review of the management system dynamics and outcomes is intended to verify that the biosolids management system is functioning effectively and generating positive outcomes (results) and that changes are being incorporated into the system. The following summarizes DEKRA's review of the dynamics of KUB's biosolids management program.

4A Review of Documentation and Readiness for Onsite Audit

The KUB BEMS Manual documents requirements and procedures within their Biosolids Environmental Program. DEKRA reviewed that documentation as part of this Reverification Audit. DEKRA reported the results of that review to KUB in advance of the onsite audit and verified readiness for the onsite audit.

The review of KUB's BEMS Manual determined that 1 minor nonconformance exists (see Minor Nonconformance 16-01). DEKRA determined that KUB was ready for the onsite part of this audit.

4B Significant Changes

No structurally significant changes affecting the KUB biosolids management program have occurred since the previous Third Party Audit. The previous BEMS Coordinator has retired and a new BEMS Coordinator has been appointed by plant management.

4C Revisions to the Biosolids Program

No structurally significant revisions have been made in the KUB biosolids program since the previous DEKRA audit in December 2015.

4D Examination of Outcomes

The KUB biosolids management system / program is improving through the use of a systematic approach to managing their biosolids activities. The following improvement outcomes within the past two years were confirmed.

Relations with Interested Parties

NBP Certification is allowing KUB / Synagro to avoid 30-day wait period before applying biosolids.

KUB is participating in a successful program to properly remove unwanted medication from disposal in wastewater.

Regulatory Compliance

Volatile solids reduction has improved by 15% in past 2 years. Now 60% compared to 38% minimum in 503 regulations.

Three regulatory inspections in the past 2 years (EPA and TDEC) resulted in no noncompliance.

Environmental Performance

Improved grit removal and screen washing results in more grit being removed and less organics to landfill.

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Total wet-weather SSOs and diversions have reduced by 95% in the past 10 years due to collection system improvements and addition of wet weather storage tanks. These upgrades have helped prevent SSOs from occurring at any KUB Wastewater Treatment Plant since 2014, resulting in much fewer blending events.

Quality Practices

Improved digester efficiency (e.g. cleaning) has reduced biosolids generation by 25%.

A “Knowledge Management Initiative” is beginning to capture knowledge through operations and maintenance procedures.

4E Correction of Open Nonconformances from Previous Third Party Audits

Corrective action taken in response to nonconformances from the DEKRA's Interim Audit of the KUB Biosolids Management Program in December 2015 and the status of those nonconformances are summarized below.

Minor Nonconformance JS/15-01/5 NBP BMP Element 5 requires the organization to establish and periodically review goals and objectives for its biosolids management activities to continually improve BMP performance. The process for developing biosolids goals (& subsequent objectives) is not clearly defined with inputs and outputs.

Corrective Action – KUB took immediate action to correct this nonconformance by restating the Goals and Objectives process. They determined this nonconformance was caused by misinterpretation of program requirements. In response, KUB provided semi-annual review training to the Management Review Team prior to setting Goals and Objectives to align with the corporate goals and the process in the Biosolids Program Manual. DEKRA's Lead Auditor reviewed the completed correction and corrective actions and determined they have been effectively completed. This nonconformance is now closed.

Minor Nonconformance JS/15-02/10 NBP BMP Element 10 requires the organization's operational controls to include appropriate preventive maintenance procedures and work management systems. Operational controls identified on the “process control points and operational controls” table do not include maintenance or equipment reliability.

Corrective Action – KUB took immediate action to correct this nonconformance by adding maintenance to the identification of process control points. They determined this nonconformance was caused by the initial focus for process control points being limited to operations. In response, KUB updated procedures and review of process control points to obtain both Operations and Maintenance input to ensure all appropriate controls are identified. DEKRA's Lead Auditor reviewed the completed correction and corrective actions and determined they have been effectively completed. This nonconformance is now closed.

Minor Nonconformance JS/15-03/14 NBPBMP Element 14 requires the organization's corrective action process to identify actions to correct the nonconformance; and document the necessary corrective actions taken to prevent a recurrence. Corrective action plans for third party and internal audit findings note how the problem is being corrected (i.e. correction / containment) but do not consistently address action to eliminate the identified cause to prevent recurrence (i.e. corrective action).

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Corrective Action – KUB took immediate action to correct this nonconformance by redefining procedures to emphasize the distinction between correction and corrective actions. They determined this nonconformance was caused by misinterpretation of terminology. In response, KUB included the need to review both correction and corrective action to ensure plans correct the problem and eliminate the cause. DEKRA's Lead Auditor reviewed the completed correction and corrective actions and determined they have been effectively completed. This nonconformance is now closed.

4F Summary – Process Audits

DEKRA audited the following processes that KUB uses to manage its biosolids program. The audits were conducted as process audits and considered the systemic interaction of these processes. The results are summarized below.

Process	Conformance with Applicable BMP Elements
BEMS Documentation	Conforms, except as noted in Minor Nonconformance 16-01
Management Processes	Conforms
Communication Program	Conforms
Competency, Training & Awareness (including internal communication)	Conforms
Compliance (with legal & other requirements)	Conforms
Control of contractors	Conforms
Corrective and Preventive Action	Conforms
Document Control & Recordkeeping	Conforms
Emergency Preparedness	Conforms
Goals & Objectives	Conforms
Identification of Critical Control Points & Operational Controls	Conforms
Internal Audits	Conforms
Management involvement (including direction, Biosolids Policy, biosolids program planning, management review)	Conforms, except as noted in Minor Nonconformance 16-02
Biosolids Preparation & Use	Conforms
Biosolids Dewatering (including contracted operations)	Conforms
Biosolids Storage & Transportation (including contracted operations)	Conforms

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Process	Conformance with Applicable BMP Elements
Biosolids Use – Agriculture + related contractor control (at 1 land application site)	Conforms
Maintenance	Conforms
Pretreatment	Conforms
Solids Stabilization, Conditioning & Handling	Conforms
Wastewater Treatment & Solids Generation	Conforms

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APPENDICES

Appendix 1 List of Participants

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

KUB Personnel

Debbie Ailey	Manager Regulatory Compliance
Hannah Claytor	Business Management Analyst / BEMS Coordinator Plant Operations
Steve Clettenburg	Operator / Team Lead
Jimmy England	Wastewater Plant Supervisor
Terry Fultz	Wastewater Operator
Leslie Glover	Lab Analyst / Pretreatment Coordinator Regulatory Compliance
John Gresham	Vice President – Operations
Brian Hamel	Business Management Analyst Safety and Technical Services
Kelly Lane	Business Management Analyst Communications
Billie Jo McCarley	Manager Plant Operations
David Obenschain	Business Management Analyst Operations
Leanne Parker	BMA Process and Admin Support Team Lead Plant Operations
Taylor Ripley	BMA Regulatory Compliance
Chris Thomas	Water Plant Supervisor
Brittany Travis	BMA Safety Specialist Safety and Technical Services

Contractor Personnel

Doris Magouirk	Senior Project Manager (Synagro)
Bill Bailey	Area Director (Synagro)
Wayne Pearson	Field Manager (Synagro)
Daniel Dodson	Technical Service Specialist (Synagro)

Interested parties

John Newberry	Biosolids Coordinator
Mike Clark	Farmer (Knox County)
Ansel Galloway	Farmer (Knox County)
Bob O'Dette	Former Biosolids Coordinator, TDEC Division of Water Resources
John West	Biosolids Regulator (TDEC)

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Appendix 2 Documentation / Objective Evidence Reviewed

Analyzing sludge at Kuwahee (11/30/16)
Annual regulatory update 12/4/15
BEMS Manual (rev 10/25/16)
Biosolids Policy
Biosolids program goals and objectives
BMP Process Control Points and Operational Controls
CAPA (various)
Contractor performance agreement
Controlled documents and records list
Corrective action backlog (sept 2016 & Oct 2016)
Corrective work order list 11/15/16
Emergency Action Plan 8/29/16
Facility audit report 11/30/16
Grease control permit packet
Incident report 5/22/12
Internal Audit BEMS checklist
Internal audit scope and schedule 6/8/16
KUB Blueprint
KUB website (kub.org /environmental programs)
Management review 6/7/16, 11/7/16
Notice of noncompliance 8/28/16
O&M Manual WAS thickener 4/7/14
Operator Qualification Program 10/1/16
Performance assessment 2/8/16
Plant meeting – general safe driving 6/16/16
Pre-application checklist (Synagro)
Record of legal and other requirements 6/15/16
SOP (Synagro) – truck loading 8/7/16
Synagro employee training plan
WIDs (various)

END OF REPORT