Introduction

Successful biosolids management programs require careful planning, implementation and operation. These programs encompass the entire wastewater treatment system beginning with collection and pretreatment, through the liquid stream treatment processes, to the use or disposal program. To support these efforts, the National Biosolids Partnership has launched an Environmental Management System (EMS) initiative.

The initiative includes four components:

- A *Code of Good Practice* that defines the goals of the program.
- A series of *Common Elements (EMS Elements)* that agencies will use if they choose to develop an Environmental Management System. The EMS Elements are complemented by a guidance document to assist in the preparation of an EMS.
- A *National Manual of Good Practice for Biosolids* that agencies can use in developing and optimizing biosolids management programs.
- A program of independent third party verification to help agencies maintain and improve their environmental management systems.

This *National Manual of Good Practice for Biosolids* is designed to support agencies in the development of biosolids management programs and environmental management systems. It is not intended to be a stand alone reference document, but rather a guide that:

- Provides a link between all the processes that impact a program;
- Provides recommendations to allow an agency to raise the bar on their biosolids management program;
- Highlights the items that should be addressed during the development of an environmental management system; and
- Provides recommendations to support agencies in obtaining additional information.

The manual is designed to complement the *EMS Elements* developed as part of the EMS initiative. The elements include 17 individual management topics that must be considered in the development of an EMS for biosolids.

These 17 elements are contained in five categories and include:

Policy

1. Documentation of EMS for Biosolids
2. Policy

Planning

3. Critical Control Points
4. Legal and Other Requirements
5. Goals and Objectives
6. Public Participation in Planning

Implementation

7. Roles and Responsibilities
8. Training
9. Communication and Public Outreach
10. Operational Control of Critical Control Points
11. Emergency Preparedness and Response
12. EMS Documentation and Document Control

Measurement – Corrective Action

13. Monitoring and Measurement
14. Nonconformances; Preventive and Corrective Action
15. Periodic Biosolids Program Performance Report
16. Internal EMS Audit

Management Review

17. Periodic Management Review of Performance

The third common element (under Planning) is critical control points. These are at the heart of the *National Manual of Good Practice for Biosolids*.

Critical control points are located throughout the "Biosolids Value Chain". The biosolids value chain is the sequence of processes from wastewater pretreatment through the biosolids end use or disposal program. Critical control points are those locations, unit processes, events, and activities throughout the biosolids value chain, which must be managed effectively to assure that biosolids management activities meet legal, quality, and public acceptance requirements and do not have undesirable environmental impacts. Examples of critical control points throughout the biosolids value chain are presented as Appendix F of this manual.

The National Manual of Good Practice for Biosolids has been developed to provide guidance for these critical control points. The manual contains recommendations regarding operational controls for the various critical control points that should be considered when establishing or optimizing a unit process or program.

Chapters within the manual include:

- Wastewater Pretreatment and Collection
- Wastewater Treatment and Biosolids Generation
- Stabilization
- Conditioning and Handling
- Transportation
- Storage
- Land Application
- Incineration
- Disposal

Within each chapter are a series of processes. For example, the processes, within the stabilization chapter, include:

- Anaerobic Digestion
- Aerobic Digestion
- Chemical Stabilization
- Composting
- Air Drying
- Thermal Drying

Within each process are a series of critical control points and operational controls. These are the procedures, parameters and activities that an agency should consider in the implementation or optimization of a system. For example, in the anaerobic digestion section, the critical control points and operational controls include:

- Volumetric loading
- Total Solids loading
- Volatile Solids loading
- Digester mixing time
- Digester temperature
- Detention time
- pH, Nutrients
- Volatile Acids/Alkalinity
- Methane gas production

The manual provides guidance for each process throughout the biosolids value chain. The guidance and recommendations contained within the manual are based on available literature and experience. It is not necessary to incorporate every critical control points and operational control in an EMS – only those that apply to local operations and conditions. It is recommended that each be reviewed and considered when developing the standard operating procedures (SOP) associated with an EMS.

Again using the example of anaerobic digestion, it is not necessary to include each of the nine controls in an agency's SOP for stabilization. It is recommended that a number of the controls be used to verify the adequacy of the system for its intended purpose and that appropriate controls be incorporated into an EMS and be monitored, and documented.

The manual can also be used to optimize existing practices. If an agency composts biosolids prior to distribution, it may consider reviewing the chapters relating to regulations, non-restricted distribution, and stabilization. While reviewing the Composting Systems Section within the stabilization chapter, the agency may determine that the total solids content of its dewatered cake should be investigated. This would lead them to the chapter on thickening and dewatering. If odors at either the dewatering or composting facility are an issue, the agency may also decide to review the chapter on odor control.

The manual also contains six chapters that address considerations. These chapters, while not specific to critical control points, provide information that pertain to most, if not all, biosolids management programs. The six chapters are:

- Odor Control

- Public Acceptance
- Federal and State Regulations
- Nutrient Management
- Environmental Considerations
- Economic Considerations

These chapters provide additional guidance for agencies to consider when evaluating alternatives, developing programs and establishing environmental management systems.

As discussed, the EMS initiative includes a program of independent third party verification. Verification is intended to help agencies maintain and improve their environmental management systems. The guidance contained in this manual is not intended to be interpreted as requirements that third party auditors will use. Auditors may ask if the manual was consulted during the planning and the implementation of the agency's EMS.

Auditors also may compare established operating procedures in an EMS with those contained in this manual. Each facility and biosolids management program is unique. Consequently operating procedures also will be unique. Auditors will recognize these differences and take them into account when reviewing systems.

The development of this manual included the review of the other manuals, texts, and research available regarding biosolids management. This manual summarizes the best practices contained in those references and presents them in a single document. References are cited for each chapter. In addition, a complete list of publications reviewed is contained in the reference section, which follows Chapter 20.