Report

Community Manure Management Feasibility Study

Dane County, WI

February 2008

Report for

Dane County, Wisconsin

Community Manure Management Feasibility Study

Prepared by:

STRAND ASSOCIATES, INC.®
910 West Wingra Drive
Madison, WI 53715
www.strand.com

February 2008

SECTION 1
INTRODUCTION

This section describes the purpose and scope of the Manure Management Feasibility Study and the location of the study area. A list of definitions and abbreviations is provided as an aid to the reader.

1.01 PURPOSE AND SCOPE OF REPORT

This study examines the feasibility of various community or individual farm-based manure management alternatives in the Upper Lake Mendota Watershed area of Dane County, Wisconsin. The study area is shown in Figure 1.01-1.

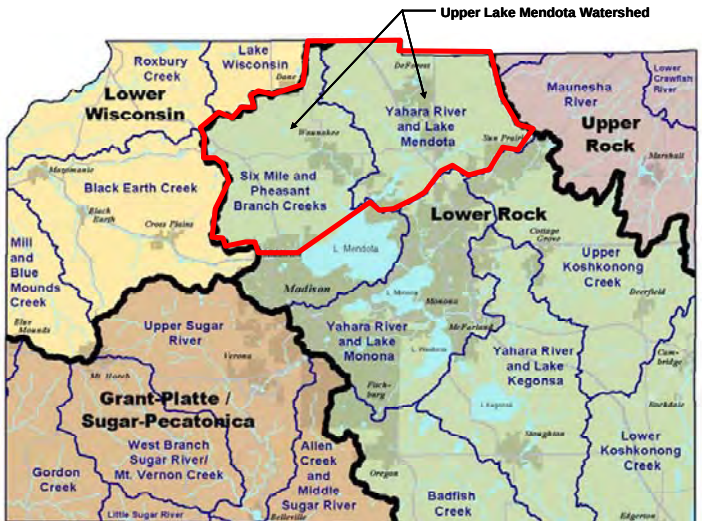

Figure 1.01-1 Upper Lake Mendota Watershed in Dane County

Dane County ("the County") has multiple goals related to the management of manure and numerous issues that need to be considered when meeting the goals. Several goals and issues were developed by the County's Community Manure Feasibility Study Committee and were summarized in the Request for Proposals for this study. The main goal is to both strengthen the livestock industry in the County while protecting water quality as related to manure management. Water quality concerns are currently addressed to some extent through the County's nitrogen (N), phosphorus (P), and potassium (K) nutrient management requirements for land application. At many locations within the study area, however, phosphorus is already present in soils at concentrations exceeding crop fertilizer recommendations (generally around 100 mg/kg for corn). Nutrient-rich soils are a water quality concern because the soils can enter waterways during wet weather or snow melt events that cause runoff. Nutrients can enter waterways more directly if solid or liquid manure is spread too close to drainageways or surface waters. Once in waterways, nutrients contribute to algal growth and associated poor water quality and aesthetics.

In 2006, the Dane County Board resolved to commission a feasibility study of a County community manure handling facility (Resolution 115, Sub 2). In addition to the water quality issues noted above, the Board's goals are to study management alternatives that:

- Are financially feasible.
- Reduce odors.
- Reduce greenhouse gases.
- Are environmentally acceptable.
- Reduce BOD, COD, and ammonia in runoff to mitigate the potential for fish kills.

- Provide alternatives to storing manure on the farm for expanding livestock farms, both large and small.
- Lower the cost of operation for Dane County livestock producers.

The County's list of goals also includes providing a place for manure at times of the year when field and weather conditions increase the risk of manure runoff into surface waters. Another goal is to refine manure so that the nutrients are separated and in a condensed form that could allow farmers to use the nutrients required and excess nutrients could be transported or sold out of the area.

There are numerous issues related to individual or community manure management systems. The issues deemed most important to the County's committee include but are not limited to:

- Biosecurity.
- Animal disease.
- Road and transportation issues.
- Green space and urban sprawl.
- End-markets for manure management products including energy, financing methods, management, and business structure.
- Cost and ease of operation.
- Ability of the system to accept industrial wastes or other substrates.
- Overall costs compared to current methods of management.

The scope of this feasibility study included the following tasks and elements:

1. Survey farmers and their current and expected future manure management practices.

2. Select farms to use in the analysis.

3. Select alternatives to be studied, including the following at a minimum:

    - Community anaerobic digester with biogas utilization.
    - Community combustion system with heat and energy recovery.
    - Solids separation and recovery for both a community system and at individual farms.
    - Phosphorus removal and recovery for both a community system and at individual farms.

4. Perform a technical and economic analysis of the short-listed alternatives (up to eight).

5. Perform a nonmonetary evaluation of alternatives to consider issues such as reliability, flexibility, constructability, ease of operation, and environmental soundness.

6. Describe potential financing methods for the recommended project(s).

7. Describe and discuss potential business structures for the recommended project(s).

8. Prepare a draft report for County review, address comments, and prepare a final report.

1.02 ABBREVIATIONS AND ACRONYMS

The following definitions and abbreviations are provided as an aide to the reader:

A. Definitions

Aerobic digestion–Microbial decomposition in the presence of oxygen.

Anaerobic digestion–Microbial decomposition in the absence of oxygen.

Anoxic–A condition in which dissolved oxygen is not available and other forms of oxygen, such as NO_3- oxygen SO_4- oxygen, are used by microorganisms.

Biochemical oxygen demand–Measurement of the oxygen utilized by microorganisms in the stabilization of organic matter.

Denitrification–Anoxic conversion of nitrate to nitrogen gas.

Honey Wagon-Tanker-spreader used to transport and apply liquid waste. In this report, manure is being transported.

Mesophilic-Occurring at a temperature of approximately 95°F (35°C).

Nitrification–Aerobic conversion of ammonia to nitrate by microorganisms.

Population Equivalent (PE)–A term used to compare nonresidential wastewater flows and loads (i.e., commercial, industrial, institutional) to the number of people that would generate an equivalent amount of wastewater. Generally, flow is used to determine PE at a residential equivalent flow of 100 gallons per day. Thus, 1,000 gallons of commercial or industrial flow would represent a PE of 10.

Sludge–Concentrated organic solids produced during wastewater treatment (also termed “biosolids” when secondary sludge is included).

Suspended solids–Particulate matter suspended in wastewater.

Thermophilic- Occurring at a temperature of approximately 131°F (55°C).

Volatile solids–Portion of the solids that is destroyed at temperatures above 550°C and is an indicator of the organic fraction of the total solids.

Volatile suspended solids–Portion of the suspended solids that is destroyed at temperatures above 550°C and is an indicator of the organic fraction of the suspended solids.

B. Abbreviations

A.U.	-	Animal unit(s)
avg	-	average
BOD	-	five-day biochemical oxygen demand
BPR	-	biological phosphorus removal
BTU	-	British thermal units
CBOD	-	five-day carbonaceous biochemical oxygen demand
cfm	-	cubic feet per minute
cfs	-	cubic feet per second
col/100 mL	-	colonies (bacteria) per 100 milliliters
CPR	-	chemical phosphorus removal
DNR	-	Wisconsin Department of Natural Resources
DO	-	dissolved oxygen
EPA	-	U.S. Environmental Protection Agency
ft	-	feet
ft^2	-	square feet
ft^3	-	cubic feet
gpd	-	gallons per day
gpm	-	gallons per minute
hp	-	horsepower
HRT	-	hydraulic retention time
in	-	inches
K	-	potassium
KWH	-	kilowatt-hours
lbs	-	pounds
max	-	maximum
mil gal	-	million gallons
mgd	-	million gallons per day
mg/L	-	milligrams per liter (parts per million in dilute solutions)
MGE	-	Madison Gas and Electric
min	-	minimum
MMBTU	-	million British thermal units
mo	-	month(s)
N	-	nitrogen
NH_3N	-	ammonia nitrogen
NO_2N	-	nitrite nitrogen
NO_3N	-	nitrate nitrogen
NRCS	-	Natural Resources Conservation Service
P	-	phosphorus
ppd	-	pounds per day (or lb/day)
PS	-	pumping station
SBR	-	sequencing batch reactor
TKN	-	total Kjeldahl nitrogen
TN	-	total nitrogen

TP	-	total phosphorus
TSS	-	total suspended solids (or SS)
USDA	-	United States Department of Agriculture
USGS	-	United States Geological Survey
UV	-	ultraviolet
VS	-	volatile solids
VSS	-	volatile suspended solids
WPDES	-	Wisconsin Pollutant Discharge Elimination System
WWTP	-	wastewater treatment plant