

## Animal Waste Management (AWM) System

# New and Improved

A tool for evaluating and designing animal waste storage facilities

Harbans Lal

**A**s an alternative to obtaining an NPDES permit, the U.S. EPA's 2008 Concentrated Animal Feeding Operations (CAFO) rule includes a process that allows a CAFO to self-certify as a "no potential discharge" facility. Under this provision, the CAFO operator certifies that the CAFO does not discharge or propose to discharge during any rainfall event, either chronic or catastrophic, by signing a certification statement and submitting it to the EPA. In comparison to the process involved in applying for and obtaining an NPDES permit, this easier, cost-saving self-certification option may be attractive to CAFO operators

However, to take advantage of the "no potential discharge" option, CAFO operators need software tools that can help them evaluate their CAFO's production area, its design and construction, its operating and maintenance procedures, and its nutrient management plan (NMP). The newly upgraded Animal Waste Management (AWM) system is one such tool that can help CAFO operators determine whether or not they should pursue self-certification.

AWM can help evaluate existing waste storage facilities for their adequacy to handle the waste flowing into them for the designated storage period, and it can also help in designing new structures for the additional waste not handled by an existing facility or for the total waste of several sources. The AWM evaluation is a good first step in the process of deciding to opt for the "no potential discharge" option. Keep in mind, though, that the EPA strongly recommends that any CAFO operators who have any doubt about their structure's ability to operate, without discharging, under all circumstances should go ahead and obtain NPDES permit coverage. It would be in their best interest to do so.

### The AWM design process

AWM is an evaluation and design tool for the waste facilities associated with animal feeding operations. It estimates the production of manure, bedding, and process water, and it determines the size of the storage and treatment facilities needed for the user-defined storage period. The storage period can be

defined either by the maximum number of months that waste needs to be stored or by specifying the months when the facility will be emptied out. To ensure accuracy, the procedures and calculations used in AWM are based on the USDA-NRCS Agricultural Waste Management Field Handbook.

The AWM design process for a new facility involves the user supplying or selecting information about the operation and its location using the icons on the AWM main menu (fig. 1). This information includes the type and size of the animal herd, the locations where the animals are housed and sheltered, local climatic parameters (monthly averages of precipitation and evaporation), and a definition of the "management train" that takes the waste from its point of origin to the storage facility. AWM then sizes the structure, based on the user-supplied storage period, as mandated by the local regulatory agencies or climatic conditions. AWM can be used to design structures for both solid and liquid wastes, if they are handled separately in the management train. AWM can also handle different type of structures, ranging from simple circular storage tanks, to dry stacks (covered or uncovered), to anaerobic lagoons with permanent storage volumes. Figures 2 and 3 (on page 18) show sample AWM design screens for a storage pond for total waste and additional waste. Standard features of AWM include:

- Manure characteristics for eight animal types, with the ability to modify them and add new animal types as necessary.
- Accounting for bedding, wastewater, flush water, and other additions to the waste stream.
- Tracking of liquid and solid wastes produced in multiple locations through multiple waste streams.
- Identifying and selecting separation, storage, and treatment components for liquid and solid wastes, defined as the management train.
- Estimating precipitation and runoff entering the management train.
- Sizing storage facilities using a defined storage period or drawdown dates specified by the user.

File Edit Data View Tools Window Help	
	The user defines the client, the designer, selects the data source (NRCS, MWPS, etc.), and sets up the operating period(s).
	The user selects the county and weather station for the monthly climate parameters, the 25-year, 24-hour precipitation, and other climate-related factors
	The user selects animal types and enters the number and their average weights. Animal characteristics may be modified and new animal types can be defined within this screen.
	The user defines locations where wastes are generated. Wastes from different locations may have different additions such as waste water, flush water and/or bedding to the waste stream and the wastes may be routed through different treatment/storage components
	The user defines any additions such as from bedding, waste water, and flush water to the waste streams
	This screen is automatically populated with the monthly runoff numbers based upon the monthly precipitation for the weather station selected on the climate screen or the user may enter volumes calculated outside the program
	The user selects a sequence of treatment / storage components for each waste stream flow
	The user can evaluate the adequacy of the existing structures in terms of their capacity to store the waste flowing into them for the specified storage period. This is an <b>optional</b> screen.
	On this screen the user specifies the parameters used to size and calculate the dimensions of treatment/storage components. A monthly waste stream budget is displayed on this screen
	This is a popup screen that can be used within any of the design screens to calculate unit conversions and perform other calculations. The calculator is not available within the ramp design screen. The calculator must be selected from a separate button within the soil liner design screen.
	On this screen the user can generate a gross nutrient budget by selecting crops and entering acres and yield data.

Figure 1. AWM Version 2.4 and key buttons on its main menu bar.

- Developing a monthly water and waste budget for each treatment or storage component.
- Producing a gross nutrient balance from the target yields and crop acreage specified for crops listed in the crop database.
- Providing a schematic drawing for each treatment or storage component.
- Generating and printing standard or custom reports to document the system design.

### The AWM evaluation process

AWM has recently been upgraded to AWM version 2.4, with the ability to evaluate existing facilities. This means that the results from an evaluation can now be incorporated into the design process for a new facility. For example, the user can design a new facility either for the additional waste not handled by the existing facility or for the total waste flowing into the structure.

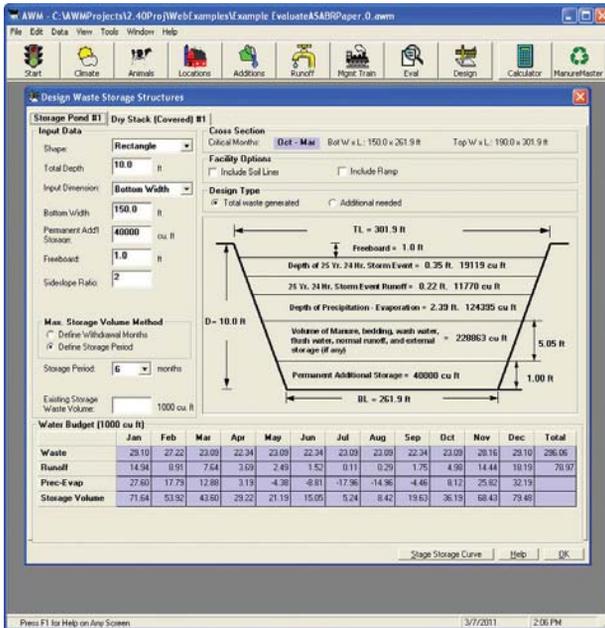


Figure 2. Sample AWM design screen of a storage pond for the total waste.

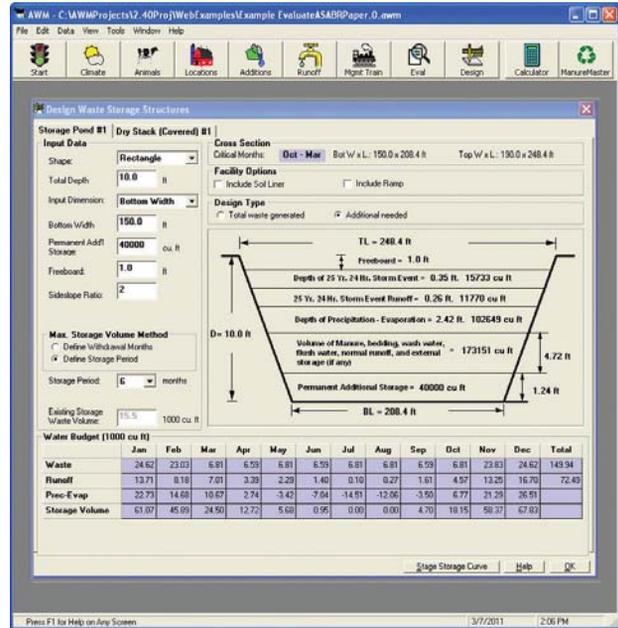


Figure 3. Sample AWM design screen of a storage pond for the additional waste not handled by the evaluated structure.

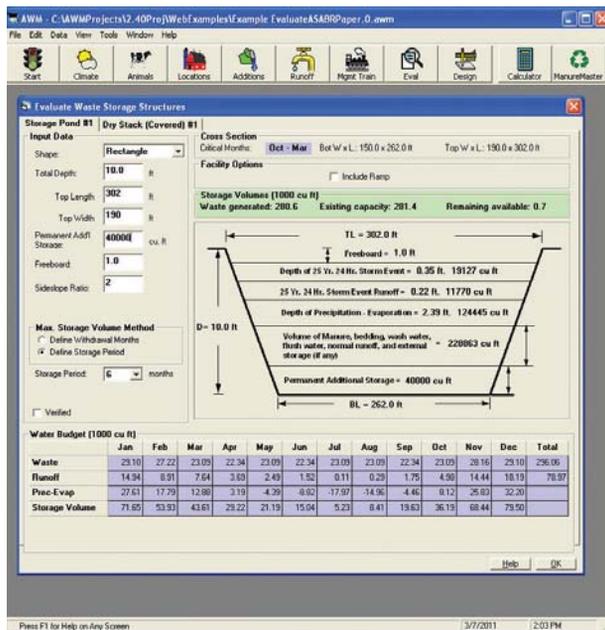


Figure 4. Sample AWM evaluation screen for a storage pond with adequate storage capacity.

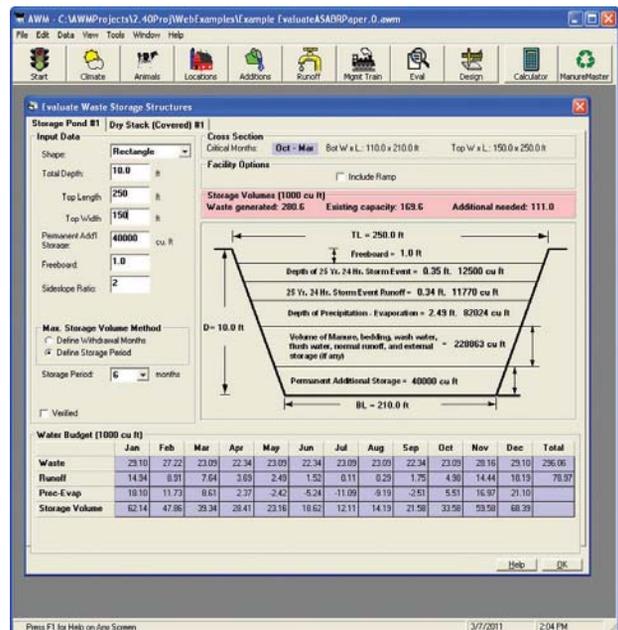


Figure 5. Sample AWM evaluation screen for a storage pond with inadequate storage capacity of 3,142 m<sup>3</sup> (111,000 ft<sup>3</sup>).

The AWM evaluation process involves the user entering the basic dimensions of the existing storage facility along with other parameters, such as herd size, local climatic condition (monthly rainfall), and details about waste additions such as bedding, wash water, and flush water. With these inputs, AWM estimates the total waste flowing into the structure identified in the management train for the selected storage period, and then compares this volume to the available

storage volume of the structure. AWM presents an on-screen color-coded report that immediately indicates whether or not the structure is adequately designed: red for inadequate capacity, or green for adequate capacity. The user can also print a hard copy of this report. Figures 4 and 5 present sample AWM reports for waste storage ponds with adequate and inadequate capacities, respectively. In addition to the capability of evaluating existing waste storage structures, several



**Solid manure storage structure on a dairy farm in Ohio, photographed by the author.**

other improvements were made to the AMWM version 2.4. These include:

- Ability to design new structures for the total waste produced by the operation or for the additional waste not handled by the existing structure.
- Design reports for the total waste or the additional waste.
- Evaluation reports for each evaluated facility.

In addition, several improvements have been incorporated into AWM version 2.4 that have considerably improved its functionality. Some of these improvements include:

- Compatibility with Access 2007 and the Microsoft Vista operating system.
- Improved calculations and display of different waste components on the design and evaluation screens for lagoons and ponds.
- Ability to load and work with earlier versions of AWM project files.
- Animal data updated with the USDA-NRCS 2008 datafile.
- Improved reports with datafile versions printed on each report page.
- A considerably improved “help” document, with context-sensitive links from every AWM window.
- Improved display of the water budget grid on the design and evaluation screen.

So far, AWM has been used by both USDA-NRCS field staff and USDA-NRCS technical service providers (TSPs) primarily for designing new facilities. With these recent upgrades, AWM version 2.4 can be used for both designing new facilities and evaluating existing facilities, which will attract a larger group of users.

#### **AWM Availability and User Support Group**

AWM version 2.4, with example project files and user documentation in Microsoft Word and/or Adobe format, can be obtained by download from the USDA-NRCS website ([www.wsi.nrcs.usda.gov/products/w2q/awm/pgrm24.html](http://www.wsi.nrcs.usda.gov/products/w2q/awm/pgrm24.html)) or by writing directly to the author.

The USDA-NRCS also maintains the AWMCP list server to facilitate communication between the AWM user community and the AWM authors. Information about new releases of the program and related topics is available through this service as it becomes available. Members can also use the service to share their experiences with AWM and report any software bugs that they discover. You can join the AWMCP list service by sending an email to: [listproc@nrcs.usda.gov](mailto:listproc@nrcs.usda.gov). Leave the subject line blank, and enter “Subscribe AWMCP [your first name] [your last name]” in the body of the message.

**ASABE member Harbans Lal** is an environmental engineer at the USDA-NRCS West National Technology Support Center in Portland, Oreg., USA; [harbans.lal@por.usda.gov](mailto:harbans.lal@por.usda.gov).