



GUIDELINE 30 – NUTRIENT MANAGEMENT PLANS FOR AGRICULTURAL PROCESSING

North Dakota Department of Environmental Quality - Division of Waste Management
4201 Normandy St., Bismarck, ND 58503-1324

Telephone: 701-328-5166 ● Fax: 701-328-5200 ● Email: solidwaste@nd.gov

Website: <https://deg.nd.gov/wm>

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I. Introduction

Purpose and Applicability

The purpose of a nutrient management plan is to ensure agricultural waste will be utilized with minimal effects on the soil, surface water, groundwater, air quality, and will protect public health, safety, and welfare. Any person who operates an Agriculture processing operation is subject to the provisions of the North Dakota Solid Waste Management Rules (NDAC 33.1-20). This guideline is intended to provide a framework to formulate a facility-specific nutrient management plan, emphasizing an integrated approach, including waste reduction, waste reuse, recycling, and composting. Under the state solid waste rules, waste generators are liable for their waste management activities. Waste haulers and waste users also have responsibilities. The North Dakota Department of Environmental Quality (Department) reserves the right to require additional information or management practices necessary to ensure orderly operation.

The scope and detail of a nutrient management plan can be varied, depending on the types and amount of material, waste processing, actual management and handling methods, general compliance, contingencies, etc. For example, the plan can be relatively simple for an agricultural waste generator who processes their waste into feed pellets or composts it and provides it to users at a rate wherein the material is stored and utilized in a manner that minimizes environmental concerns. Conversely, facilities with a wider variety of wastes or whose wastes are difficult to handle and/or facilities that have a history of environmental problems may need a more comprehensive plan.

II. Definitions

1. "Agriculture processing operation" means a facility that processes crops, livestock, or other agriculture products for wholesale or retail such as meat packing, the milling of grain, the selling of livestock by licensed livestock auction facilities, or other similar activities.
2. "Recycled agricultural material" (RAM) means agricultural waste generated by an agricultural processing operation that is recycled (used as animal feed, used as feedstock for the manufacture of other products, or composted) or applied to soils (as a nutrient or fertilizer). RAM does not include agricultural waste that is discarded as garbage, refuse, or other solid waste.
3. "Nutrient management plan" means a plan prepared by an agricultural processing operation and submitted to the Department for approval, describing the method and schedule by which the materials generated or stored by the operation are recycled, composted, and/or applied to the land as nutrients or fertilizers. An approved nutrient

management plan must address water pollution, odor, vector, and other relevant environmental and public health concerns.

III. General Issues to be Addressed in the Plan

1. A list of waste streams and quantities of each waste generated on a monthly and/or annual basis;
2. Appropriate analysis, as described in this document, to be submitted to the Department and/or retained by the plan participants must include the following information:
 - a. Material identification (waste, soil, compost material, etc.);
 - b. Date, time, and location of sample collection;
 - c. Name of sampling technician;
 - d. Name of analytical laboratory performing the analysis; and
 - e. Analytical results.
3. A discussion of RAM handling (including equipment), RAM processing (size reduction, dewatering, solidification, etc.), RAM storage (including construction and maintenance of buildings, feedlots, collection systems, storage systems, pads, compost areas, etc.), and diversion of surface water run-on and runoff from contact with the RAM;
4. End use or final disposition of RAM;
5. Transportation methods, equipment, and personnel;
6. Odor control;
7. Appropriate training of staff, transporters, and end users on the state rules and the nutrient management plan;
8. Weather and facility conditions, equipment breakdowns, spills, and any other issues which might reasonably impact operations;
9. Contingency measures in case the primary management method is not workable or feasible;
10. Periodic monitoring to ensure proper management;
11. Recordkeeping on management activities and use must be compiled and/or written in a regular logbook and kept on record for five years to verify proper management. These records must be available for Departmental review; and
12. Any other issues necessary to ensure proper management.

IV. Nutrient Management by Land Application

1. Management Methods

If land application is to be used, the plan must ensure waste is applied to crop land at a rate and method where the nutrients in the waste will be utilized by the crop to be grown, with minimal effects on the soil, surface water, groundwater, and air quality. Review of the nutrient management information could be coordinated with an agronomist or soil scientist who can review waste, soil, and crop information, perform soil testing as needed, and complete land compatibility endorsement on the Site Evaluation Form (see Attachment 1). Hydraulic loading rates must be determined to prevent ponding and runoff from land application sites.

In addition to the general requirements discussed in Section II, a land application nutrient management plan should address the following components, as applicable:

- a. The legal description and owner/user of the land for application of waste, to be accompanied with:
 - (1) Location and boundaries on an aerial photo such as a county NRCS (SCS) Soil Survey; and
 - (2) Completed Site Evaluation Form.
- b. Type of crop(s) to be grown and the nutrient requirements for that crop project for future years as appropriate;
- c. Nutrient content of soil and amount of any commercial fertilizer applied;
- d. Rate of application, the location of fields, the number of acres where the RAM was applied, and when the RAM was applied;
- e. A discussion of timing and methods for the land application of RAM;
- f. Review pertinent limiting factors (such as sodium buildup) and/or to meet the nutrient needs of a crop (Note: If nutrients in the field exceed crop needs, no further application is allowed until the levels drop due to crop uptake); and
- g. A discussion of conservation management practices, including injection or tillage of the RAM into the soils, crop residue, and pasture management practices, use of conservation buffers, and other conservation practices that prevent water pollution.

2. Waste Analysis

Waste analysis must be representative of the wastes. If more than one waste stream is to be managed and/or if the waste streams significantly vary or change over time, additional analysis must be provided. All laboratory analysis must be conducted at a laboratory certified by the Department. Wastes must be analyzed for the following parameters unless it can be shown that the parameter is not likely to be present.

Analysis for additional parameters may be necessary if other constituents or contaminants are suspected.

Nutrients	General Parameters
Nitrogen (Total Kjeldahl, Nitrate, and Ammonia)	Total Suspended Solids
Potassium	pH
Calcium	Total Volatile Solids
Iron	Density
Manganese	Specific Conductance
Sulfur	Carbon to Nitrogen ratio (for composting)
Phosphate	
Boron	
Chloride	
Sodium	
Magnesium	

3. Location Controls for Land Application

The setbacks listed in the table below are appropriate for land application. Maps of the sites showing specific application areas must be retained in the operating records available for Departmental review. These land application site controls may be varied, pending waste analysis and site characteristics.

Land Feature	Minimum Separation (Injected or incorporated the same day)	Minimum Separation (Surface-applied)
Public road right-of-way	None	33 feet
Private driveways	None	100 feet
Surface water (high watermark), surface drainways	None	1,000 feet (unless owner of dwelling agrees to a lesser distance)
Permanent or seasonal groundwater tables	3 feet	3 feet
Wellhead Protection Areas	Outside official boundaries	Outside official boundaries
Site slopes: April 1 - Oct. 30 Nov. 1 - March 30	0-12 percent N/A	0-6 percent 0-3 percent

4. Soil Analysis

Soil on which waste is routinely applied should be tested, at a minimum, every other year to determine the nutrient content of the soil. Prior to land application, proposed sites must be sampled and analyzed for the following parameters:

pH	Potassium
Organic Matter	Cation Exchange Capacity
Phosphorous (Olsen Method)	Sodium Absorption Ratio
Boron	Extractable Sodium Percent
Calcium	Soluble Salts
Sodium	Total Kjeldahl Nitrogen
Magnesium	Nitrate as N 0-6" and 6" to 24"

NOTE: Additional analysis may be required if there are other constituents in the waste material to be land applied.

5. Land Application Loading Rates

Application rates must be justified based on crop or plant needs for nutrients contained in the RAM. The most limiting nutrient or soil amendment properties from an environmental perspective must be identified. Application rates that are protective of the environment are then determined. Application rates must be clearly defined as gallons per acre or lbs/tons of solids per acre.

a. Applying waste to meet nitrogen requirements of the crop:

Waste shall be applied to crop land at a rate so that the sum of all nitrogen sources shall not exceed the recommended nitrogen needs of the crop to be grown. This shall take into account the plant available nitrogen in the soil, from the application of commercial fertilizers, from waste applied the present year, and nitrogen carryover from waste applied in previous years. Maximum loading rates shall be based on plant-available nitrogen.

b. Applying waste to meet phosphorous requirements of crops:

In general, RAM should be applied at a rate not to exceed the phosphorus needs of the crop to be grown, especially in areas close to lakes, wetlands, rivers, streams, or other sensitive areas, where there is a greater potential for impacts to surface water or groundwater. Heavier application may be acceptable if the material is immediately incorporated into the soil. RAM must not be applied to land where the phosphorous content of the soil exceeds

150 parts per million (about 300 lbs per acre).

- c. **Applying waste to meet other limiting criteria, such as sodium, calcium, potassium, magnesium, ESP, or other parameter (i.e., metals) determined through waste analysis and soil analysis.**

Some waste materials may have elevated levels of other constituents which control or inhibit land application or other management options. For example, excess sodium (usually from salt) in some waste materials can severely damage the soil. Knowledge of the waste and the soil onto which it might be applied is essential.

6. RAM Land Application Methods

Operators should use their best judgement to determine where waste should be injected or immediately incorporated so waste will not impact surface waters or become a nuisance to nearby residents. Operators must consider the volume of waste, the topography of the land, the location of surface or groundwater sources, and the distance from neighboring residents when deciding whether waste should be injected or immediately incorporated into the soil. RAM may not be surface-applied to grassed waterways, drainage-ways, wetlands, or any area where there is a concentration of runoff.

For liquids, daily application rates are based on United States Department of Agriculture (USDA) soil textural classifications. Soil texture can usually be determined using published soil survey data.

USDA Soil Textural Classification	Maximum gallons/acre/day*
Clay loam, silty clay loam, sandy clay, silty clay	10,000
Loam, silt, silt loam, sandy clay loam	15,000
Loamy sand, sandy loam	25,000

***Rates may be lower based on limiting factors such as nutrients and metals determined during waste analysis or in factors discussed in the site location controls.**

The application rate must be adjusted, taking into account field conditions (soil moisture, slopes, etc.) to avoid runoff or ponding at the application site.

Winter application poses greater environmental and operational risks. Winter application should be limited to areas with less than a 3 percent slope. Unless runoff and run-on controls and other best management practices are in place, winter RAM application rates should be limited to about 50 percent of the maximum summer rate and should not occur on areas with greater than 8 inches of snow. Best management practices, which may include berms, providing a cover crop, rough tillage on the contour, stubble, mulch, tillage, etc., should be used to slow spring runoff from the site.

In cases of severe winter weather, when access to the fields is difficult, a contingency plan (see Section VII) should provide for alternative management methods. Some follow-up analysis of runoff and/or soil may be necessary.

V. Nutrient Management as Livestock Feed

If the RAM is used as feed for livestock, the nutrient management plan must ensure waste is supplied to the animals in a controlled manner at a rate where RAM will be efficiently utilized by the animals. In addition to the general requirements described in Section II, a livestock feed nutrient management plan should identify the number and type of livestock to be fed and the daily feeding ration.

The Department's approval of any RAM for use as animal feed addresses only environmental issues. It does not constitute any endorsement of the product. Providers of feed are advised to coordinate information on their livestock feed material with the North Dakota Department of Agriculture for any applicable registration requirements.

VI. Nutrient Management by Aerobic Composting

Aerobic composting is the controlled biological decomposition of organic materials utilizing air-breathing bacteria to create humus, the dark, rich component of topsoil. Volume reductions are in excess of 50 percent. Controlling environmental conditions in the composting process plays a significant role in determining the rate of decomposition and the quality of the resultant compost. Microorganisms that "eat" organic materials generate heat which can kill disease vectors, weed seeds, etc. Optimal heat in the pile is about 130°F. Too much heat will kill the microorganisms, slowing the compost process and resulting in more odor. **A well-run compost facility will breakdown wastes year-round, can minimize environmental impact, and can be generally accessible in all weather conditions.** Composting site requirements are very similar to the requirements for a storage pile. More information on composting is available from the Department.

A composting nutrient management plan consists of the following components, as applicable:

1. Address, as appropriate, the general requirements discussed in Section II;
2. A discussion of composting methods, including location and diagram of composting site, windrow or pile size, vessel size and operation, turning equipment to be used, frequency of turning, and the time line for compost finishing;
3. A discussion of RAM handling, processing, and storage, including:
 - a. Maintaining optimal composting conditions (see above); and
 - b. Admixtures, such as carbon or nitrogen sources, durable materials (such as wood chips) to maintain aeration or dry out excessively wet compost, addition of moisture if too dry, etc.).
4. End use of composted material. If heavy or repeated application is to be considered, land application considerations should be addressed as described in the land application section (see Section III).

VII. Other Methods of Nutrient Management

If other methods are used, the applicant should discuss with the Department the nutrient management method, including the physical and chemical basis of the process, timeline of the method, etc., and address the general requirements described in Section II.

VIII. Contingency Plans

All nutrient management plans must address contingency issues, including:

1. What will be done if RAM management sites or facilities are out of accordance with the approved nutrient management plan and/or state or local environmental rules; and
2. What waste management methods will be used should the primary nutrient management method become unworkable. Adverse conditions making management difficult might include severe winter weather, wet weather, impassible roads, inaccessible fields, equipment breakdowns, plant upsets, environmental impact, disruption of end users or markets, and any other potential shortfalls that might prevent normal, orderly management. A secondary outlet for the RAM must be clearly identified in the plan. The contingency description should identify what composting operations, storage facilities, permitted landfills, and any other facilities or methods will be used. The contingency procedures must be adequate to ensure proper management of the materials at all times.

IX. Transportation

1. Vehicles used for collection and transportation of agricultural waste must be loaded and moved in such a manner that the contents will not fall, leak, or spill therefrom. Where spillage does occur, the collector or transporter shall immediately return spilled waste to the vehicle or container and, if necessary, clean and decontaminate the area.
2. Vehicles used for the commercial collection and transportation must be leakproof. Any spilled material must be immediately returned to the transport vehicle and, if necessary, the area must be cleaned and decontaminated.
3. The cargo-carrying body of a vehicle used for commercial collection or transportation of solid waste must be maintained in good repair and in sanitary condition.
4. A waste hauler=s permit is required for all **commercial** haulers transporting RAM. An application for a waste hauler=s permit is available from the Department. A state permit is not required for facilities that transport their own waste or for individual farmers picking up RAM for their own use.

X. Training

Training is essential to ensuring the successful management of materials, training of appropriate plant staff, truck drivers, and end users (farmers, feedlot operators, compost operators, etc.) on the state rules and the nutrient management plan is important. Training may need to be repeated as necessary, especially if there are personnel changes among the waste generators,

haulers, end users, and/or if there are problems or restricting conditions on the management of RAM. Training should explain all aspects of the management process.

Example for Site Evaluation Form		
Date:		
Landowner/User Name (print):		(Signature):
Address:		
Home Phone:	Business Phone:	Cell Phone:
Location, County		
Section, Township, Range or legal/GIS description (specific as possible)		
Application Methods:		
Identify distance to land features:		
Streams or other surface waters:		
Drainage Channels:		
Public Roads:		
Private Drives:		
Adjacent Property Boundaries:		
Occupied Dwellings:		
Drinking Water Well:		
Wetlands:		
Wellhead Protection Area:		
Groundwater Depth:		
Field Slope:		
Lab Analysis and Compatibility Determination Section:		
Soil Sample Taken (date):		Amount:
Site Location on soil map:		
Dominant Soil Type and Texture:		
Soil Mapping Unit Description:		
N, P, K Results:		
Soil ESP Test Results:		
Other Soil Analysis:		
Previous Use History:		
Compatibility Endorsement: Name		
Signature (print):		Signature:
Agency:		
Home Phone:	Business Phone:	Cell Phone:
Net Annual N, P, K Demand:		
Net Annual Na Threshold:		

Example for Site Use Form

Date:	
Landowner Name (print):	Signature:
Address:	
Home Phone:	Business Phone: Cell
Phone:	
Location, County:	
Section or part thereof:	
Township:	
Range:	
Total Acres:	
From Site Evaluation:	
Total RAM (pounds) allowed:	
Total RAM (gallons) allowed:	
Begin Application (date):	
End Application (date):	
Pounds of RAM applied/fed:	
Gallons of RAM applied/fed:	
Comments:	
Form completed by (print):	Signature:
Date:	