

**Part 600.5 – Comprehensive Nutrient Management Planning Technical
Guidance**

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Part 600.5 – Comprehensive Nutrient Management Planning Technical Guidance

600.50 - Background

Conservation planning is a natural resource problem-solving process. The process integrates ecological (natural resource), economic, and production considerations in meeting both the owner's/operator's objectives and the public's natural resource protection needs. This approach emphasizes identifying desired future conditions, improving natural resource management, minimizing conflict, and addressing problems and opportunities. Comprehensive nutrient management plans (CNMPs) are developed in accordance with NRCS conservation planning policy and rely on the planning process and established conservation practice standards.

A CNMP identifies management and conservation actions that will be followed to meet clearly defined soil and water conservation goals, including nutrient management, on an animal feeding operation (AFO). Defining soil and water conservation goals and identifying measures and schedules for attaining these goals are critical to reducing potential and actual threats to water quality and public health from AFOs. The CNMP fits within the total resource management objectives of the entire farm/animal feeding operation.

The CNMP Technical Guidance is for use by those individuals who develop or assist in the development of CNMPs. The purpose of this document is to provide technical guidance for the development of CNMPs, whether they are developed for USDA 's voluntary programs or as a means to help satisfy the United States Environmental Protection Agency's (USEPA) National Pollutant Discharge Elimination System (NPDES) permit requirements.

The Technical Guidance is not intended as a sole-source reference for developing CNMPs. Rather, it is to be used as a tool in support of the NRCS conservation planning process, as described in the preceding Sections 600 through 600.4 of this handbook and NRCS Technical References, Handbooks, and Policy Directives. The conservation planning process has not been changed by the introduction of CNMPs.

600.51 - Definition of a Comprehensive Nutrient Management Plan (CNMP)

A CNMP is a conservation plan that is unique to animal feeding operations. It is a grouping of conservation practices and management activities which, when implemented as part of a conservation system, will help to ensure that both production and natural resource protection goals are achieved. A CNMP incorporates practices to utilize animal manure and organic by-products as a beneficial resource. A CNMP addresses natural resource concerns dealing with soil erosion, manure, and organic by-products and their potential impacts on water quality, which may derive from an AFO. A CNMP is developed to assist an AFO owner/operator in meeting all applicable local, tribal, State, and Federal water quality goals or regulations. For nutrient impaired stream segments or water bodies, additional management activities or conservation practices may be required to meet local, tribal, State, or Federal water quality goals or regulations.

The conservation practices and management activities planned and implemented as part of a CNMP must meet NRCS technical standards. For those elements included by an owner and/or operator in a CNMP for which NRCS currently does not maintain technical standards (i.e., feed management, vector control, air quality), producers should meet criteria established by Land Grant Universities, industry, or other technically qualified entities. Within each state, the NRCS State Conservationist has the authority to approve non-NRCS criteria established for use in the planning and implementation of CNMP elements.

600.52 - Objective of a CNMP

The objective of a CNMP is to document the AFO owner's and/or operator's plan to manage manure and organic by-products by combining conservation practices and management activities into a conservation system that, when implemented, will achieve the goal of the producer and protect or improve water quality.

In developing a CNMP with an AFO owner and/or operator, alternatives are developed that address treatment of the resources of concern and are in accordance with the applicable NRCS technical standards. The AFO owner/operator, as decision-maker, selects from these alternatives to create a CNMP that best meets his/her management objectives and environmental concerns.

CNMP implementation may require additional design, analysis or evaluations. It is important for the certified conservation planner to maintain a relationship with the producer throughout CNMP implementation to address changes or new challenges. Evaluation of the effectiveness of the CNMP may begin during the implementation phase and not end until several years after the last practice is applied. Follow-up and evaluation determines whether the implemented alternative is meeting the client needs and solving the conservation problems in a manner beneficial to the resources.

600.53 - General Criteria for CNMP Development

CNMPs will, as a minimum, meet the following criteria:

- Provide documentation that addresses the items outlined in Section 600.6, [Exhibit 15](#), Comprehensive Nutrient Management Plan-Format and Content.
- Document the AFO owner's/operator's consideration of the six CNMP elements. It is recognized that a CNMP may not contain all six elements; however, they need to be considered by the AFO owner/operator during development of the CNMP, and the owner's and/or operator's decisions regarding each must be documented. These elements are as follows:
 - Manure and Wastewater Handling and Storage
 - Land Treatment Practices
 - Nutrient Management
 - Record Keeping
 - Feed Management
 - Other Utilization Activities
- CNMPs will contain actions that address water quality criteria for the feedlot, production area, and land on which the manure and organic by-products will be applied (i.e., as a minimum the plan would address CNMP element numbers 1, 2,3, and 4 listed above). This includes addressing soil erosion to reduce the transport of nutrients within or off of a field to which manure is applied. For AFO owners and/or operators who do not land apply any manure or organic by-products, the CNMP would address only the feedlot and production areas (i.e., address CNMP element numbers 1,4, and 6 listed above).
- Meet requirements of the NRCS Field Office Technical Guide (FOTG) conservation practice standards for all practices contained in the CNMP.
- Meet all applicable local, Tribal, State, and Federal regulations. When applicable, ensure that USEPA-NPDES or State permit requirements (i.e., minimum standards and special conditions) are addressed.

600.54 - Element Criteria for CNMP Development

The degree to which each CNMP element is addressed is determined by the General Criteria (NPPH, Section [600.53](#)) and the specific criteria provided for each element in this section.

(a) Manure and Wastewater Handling and Storage

This element addresses the components and activities associated with the production facility, feedlot, manure and wastewater storage and treatment structures and areas, and any areas used to facilitate transfer of manure and wastewater. In most situations, addressing this element will require a combination of conservation practices and management activities.

(1) Criteria for Manure and Wastewater Handling and Storage

Provide for adequate collection, storage, and/or treatment of manure and organic by-products that allows land application in accordance with NRCS Nutrient Management Policy and the conservation practice standard for Nutrient Management (Code 590). Collection, storage, treatment, and/or transfer practices shall meet the minimum requirements as addressed in the following NRCS conservation practice standards contained in Section IV of the NRCS FOTG, as appropriate:

- Waste Storage Facility (Code 313)
- Waste Treatment Lagoon (Code 359)
- Manure Transfer (Code 634)
- Heavy Use Protection Area (Code 561)

Comply with existing federal, Tribal, State, and local regulations, associated with the following activities:

- Disposal of dead animals.
- Disposal of animal medical wastes.
- Disposal of spoiled feed or other contaminants that may be regulated by other than an NPDES or State concentrated animal feeding operation (CAFO) permitting program.

Note: NRCS does not have national conservation practice standards that address all these activities. Generally, federal, Tribal, State and local regulations dictate acceptable procedures, however, NRCS in some States has developed standards that address the disposal of dead animals by incineration or freezing.

Document the following:

- Types of animals and phases of production that exist at the facility.
- Numbers of each animal type, average weight, and period of confinement for each phase of production.
- Total estimated manure and wastewater volumes produced at facility. Where historical manure and wastewater production volumes are not documented, an estimate may be made using the procedures and tabular data provided in the NRCS Agricultural Waste Management Field Handbook (AWMFH), Chapter 4, "Waste Characteristics".
- Manure storage type, volume, and length of storage. (For more information on storage and treatment systems, how they function, their limitations, and design guidance see NRCS AWMFH, Chapter 9, "Animal Waste Management Systems", and Chapter 10, "Component Design").
- Existing transfer equipment, system, and procedures.

- Operation and maintenance activities that address the collection, storage, treatment, and transfer of manure and wastewater, including associated equipment, facilities, and structures.
- Nutrient content and volume of manure, if transferred to others.
- An emergency action plan to address spills and catastrophic events.

(2) Considerations for Manure and Wastewater Handling and Storage

Additional considerations associated with CNMP development and implementation should be addressed. However, NRCS does not have specific technical criteria for these considerations required for CNMPs. These considerations are:

(i) Air Quality

During the CNMP development process, AFO operators and/or owners need to consider the impact of selected conservation practices on air quality. Air quality in and around structures, waste storage areas, and treatment sites may be impaired by excessive dust, gaseous emissions, and odors. Poor air quality may affect the health of workers, animals, and persons living in the surrounding areas. Ammonia emissions from animal operations may be deposited to surface waters, increasing the nutrient load. Proper siting of structures and waste storage facilities can enhance dispersion and dilution of odorous gases. Conservation buffers placed with regard to prevailing wind patterns can intercept movement of some airborne pollutants. Enclosing waste storage or treatment facility can reduce gaseous emissions from AFOs in areas with residential development.

(ii) Pathogens

During the CNMP development process, AFO operators and/or owners need to consider the impact of selected conservation practices on pathogen control. Pathogenic organisms occur naturally in animal wastes. Exposure to some pathogens can cause illness to humans and animals, especially for immune-deficient populations. Many of the same conservation practices used to prevent nutrient movement from animal operations, such as leaching, runoff, and erosion control are likely to minimize the movement of pathogens. Certain waste treatment systems can further reduce the pathogen content of manure.

(b) Land Treatment Practices

This element addresses evaluation and implementation of appropriate conservation practices on sites proposed for land application of manure and organic by-products from an AFO. On fields where manure and organic by-products are applied as beneficial nutrients, it is essential that runoff and soil erosion be minimized to allow for plant uptake of these nutrients. An understanding of the present land use of these fields is essential in developing a conservation system to address runoff and soil erosion adequately.

(1) Criteria for Land Treatment Practices

- An on-site visit is required to identify existing and potential natural resource concerns, problems, and opportunities for the conservation management unit (CMU).
- Identification of the potential for nitrogen and phosphorus losses from the site.
- At a minimum, the conservation system developed for this element will address the NRCS Quality Criteria for water quality, found in Section III of the FOTG. Soil erosion is to be addressed to reduce the transport of manure nutrients within or off of a field to which manure is applied. Typical NRCS conservation practices, and their

corresponding NRCS conservation practice standard code number, used as part of a conservation system to minimize runoff and soil erosion are:

- Conservation Crop Rotation (Code 328)
- Residue Management, No Till and Strip Till (Code 329A)
- Residue Management, Mulch Till (Code 329B)
- Residue Management, Ridge Till (Code 329C)
- Contour Buffer Strips (Code 332)
- Cover Crop (Code 340)
- Residue Management, Seasonal (Code 344)
- Diversion (Code 362)
- Windbreak and/or Shelterbelt Establishment (Code 380)
- Riparian Forest Buffer (Code 390)
- Filter Strip (Code 393)
- Grassed Waterway (Code 412)
- Prescribed Grazing (Code 528A)
- Stripcropping (Code 585)
- Terrace (Code 600)
- Compliance with existing, federal, Tribal, State and Local regulations or ordinances associated with soil erosion and runoff.
- Document the following:
 - Land application areas on aerial photos.
 - Individual field maps with setbacks, buffers, waterways, and other planned conservation practices marked.
 - Soils information such as features, limitations, and capability for each field.
 - Conservation practice design information.
 - Identification of sensitive areas such as sinkholes, streams, springs, lakes, ponds, wells, gullies, and drinking water sources.
- Other site information features of significance, such as property boundaries.
- Identification of operation and maintenance (O&M) practices and/or activities.

(c) Nutrient Management

This element addresses the requirements for land application of all nutrients and organic by-products that must be evaluated and documented for each CMU.

Land application of manure and organic by-products is the most common use of manure because of the nutrient and organic matter content of the material. Land application procedures must be planned and implemented in a way that minimizes potential adverse impacts to the environment and public health.

(i) Criteria for Nutrient Management

- Meet the NRCS Nutrient Management Policy as contained in the General Manual, Title 190, Part 402, (May 1999), and clarified by the National Instruction, Nutrient Management -Policy Implementation, Title 190, Part 302, October 2000.
- Meet criteria in NRCS conservation practice standard Nutrient Management (Code 590) and, as appropriate, Irrigation Water Management (Code 449).
- Develop a nutrient budget for nitrogen, phosphorus, and potassium that includes all potential sources of nutrients.
- Document the following:
 - Planned crop types, cropping sequence, and realistic yield targets.

- Current soil test results for nitrogen, phosphorus, potassium, heavy metals, and sodic condition.
- Manure and organic by-product source testing results.
- Form, source, amount, timing, and method of application of nutrients, by field.
- Description of application equipment and method used for calibration.

(ii) Considerations for Nutrient Management

Additional considerations associated with CNMP development and implementation should be addressed. However, NRCS does not have specific required technical criteria for these considerations for CNMPs. These considerations are:

Air Quality

AFO operators/owners should consider the impact of selected conservation practices on air quality during the CNMP development process. Air quality on land application sites may be impaired by excessive dust, gaseous emissions, and odors. Poor air quality may affect the health of workers, as well as animals and persons living in the surrounding areas. Ammonia emissions from animal operations may be deposited to surface waters, increasing the nutrient load. Soil incorporation of manure and organic by-products on land application sites can reduce gaseous emissions.

Pathogens

AFO operators and/or owners should consider the impact of selected conservation practices on pathogen control during the CNMP development process. Pathogenic organisms occur naturally in animal waste. Exposure to some pathogens can cause illness in humans and animals, especially for immune-deficient populations. Many of the same conservation practices used to prevent nutrient movement from animal operations, such as leaching, runoff and erosion control, are likely to prevent the movement of pathogens.

Salt and Heavy Metals

Build up of salt and heavy metals (i.e., arsenic, selenium, cadmium, molybdenum, zinc) in soils can create a potential for human and animal health problems and threaten soil productivity and crop marketability. Federal and State regulations do not address the heavy metal content associated with agricultural by-products. In developing a CNMP, the build-up of salt and heavy metals should be tracked through soil testing. Additional guidance on salt and heavy metal contamination from manure is available in the following:

- NRCS Agricultural Waste Management Field Handbook, Sections 651.1103 and 651.0604(b) deal with the salt content of agricultural waste.
- NRCS Agricultural Waste Management Field Handbook, Sections 651.0603(g) and 651.0605(a and b) deal with the heavy metal content of agricultural waste.
- USEPA Title 40 Part 503 -Standards for the Use or Disposal of Sewage Sludge. Section 503.13 contains pollutant limits for biosolids heavy metal content and cumulative loading rates, but does not address resident levels of metals in the soil.

(d) Record Keeping

It is important for AFO owners and/or operators to document and demonstrate implementation activities associated with their CNMPs. Documentation of implementation and management activities associated with a CNMP provides valuable benchmark information that the AFO

owner/operator can use to adjust his/her CNMP to meet production and natural resource conservation objectives.

It is the responsibility of AFO owners and/or operators to maintain records that document the implementation and management of CNMPs.

Documentation will include:

- Annual manure tests for nutrient contents for each manure storage containment.
- Current soil test results, in accordance with Nutrient Management Code 590.
- Application records for each manure or commercial fertilizer application event, including:
 - Containment source or type and form of commercial fertilizer,
 - Field(s) where manure or organic by-products are applied,
 - Amount applied per acre,
 - Time and date of application,
 - Weather conditions during nutrient application,
 - General soil moisture condition at time of application (i.e., saturated, wet, moist, dry), and
 - Application method and equipment used.
- Crops planted and planting and/or harvesting dates, by field.
- Records that address manure and wastewater storage containment structures:
 - Dates of emptying, level before emptying, and level after emptying,
 - Discharge or overflow events, including level before and after event.
- Transfer of manure off-site or to third parties:
 - Manure nutrient content,
 - Amount of manure transferred,
 - Date of transfer, and
 - Recipient of manure.
- Activities associated with emergency spill response plan.
- Records associated with any reviews by NRCS, third-party consultants, or representatives of regulatory agencies:
 - Dates of review,
 - Name of reviewer and purpose of the review,
 - Recommendations or follow-up requirements resulting from the review, and
 - Actions taken as a result of the review.
- Records of maintenance performed associated with operation and maintenance plans.
- Nutrient application equipment calibration.
- Changes made in CNMP.

(e) Feed Management

Feed management activities may be used to reduce the nutrient content of manure that may result in less land being required to effectively utilize the manure. Feed management activities may be dealt with as a planning consideration and not as a requirement that addresses specific criteria; however, AFO owners and/or operators are encouraged to incorporate feed management as part of their nutrient management strategy. Specific information and recommendations should be obtained from the Cooperative State Research, Education, and Extension Service; Land Grant Universities; industry; the Agricultural Research Service; or professional societies such as the Federation of Animal Science Societies (FASS) or American Registry of Professional Animal Scientists (ARPAS); or other technically qualified entities.

An example of the effective use of feed management is presented as follows:

“If a dairy cow is fed 0.04 percent above recommended levels of dietary phosphorus she will excrete an additional six pounds of phosphorus annually. For a herd of 500 cows, this is an additional 3,000 pounds of phosphorus per year. In a single cropping system, corn silage is about 0.2 percent phosphorus on a dry matter basis. For a field yielding 30 tons of silage per acre, at 30 percent dry matter, this is 36 pounds of phosphorus in the crop. If an additional 3,000 pounds of phosphorus are recovered in manure it takes considerably more land for application if manure is applied on a phosphorus basis ”
Dr. Deanne Meyer, Livestock Waste Management Specialist, Cooperative Extension, University of California.

Specific feed management activities to address nutrient reduction in manure may include phase feeding, amino acid supplemented low crude protein diets, or the use of low phytin phosphorus grain and enzymes, such as phytase or other additives.

Feed management can be an effective approach to addressing excess nutrient production and should be encouraged; however, it also is recognized that feed management may not be a viable or acceptable alternative for all AFOs. A professional animal nutritionist should be consulted before making any recommendations associated with feed ration adjustment.

(f) Other Utilization Activities

Using environmentally safe alternatives to land application of manure and organic by-products could be an integral part of the overall CNMP. Alternative uses for animal manure are needed in areas where nutrient supply exceeds the nutrient requirements of crops, and/or where land application would cause significant environmental risk. Manure use for energy production, including burning, methane generation, and conversion to other fuels, is being investigated and even commercially tested as a viable source of energy. Methods to reduce the weight, volume, or form of manure, such as composting or pelletizing, can reduce transportation cost, and create a more valuable product. Manure can be mixed or co-composted with industrial or municipal by-products to produce value-added material for specialized uses. Transportation options are needed to move manure from areas of over supply to areas with nutrient deficiencies (i.e., manure brokering).

More efficient and cost-effective methods are needed for manure handling, treatment, and storage. Areas in need of targeting include:

- Improved systems for solids removal from liquid manure.
- Improved manure handling, storage, and treatment methods to reduce ammonia volatilization.
- Treatment systems that transform and/or capture nutrients, trace elements, and pharmaceutically active compounds from manure.
- Improved composting and other manure stabilization techniques.
- Treatment systems to remediate or replace anaerobic lagoons.

As many of these alternatives to conventional manure management activities have not been fully developed or refined, industry standards do not always exist that provide for their consistent implementation. NRCS does not have conservation practice standards that address these other utilization options.

This element of a CNMP should be presented as a consideration for the AFO owner and/or operator in his/her decision-making process. No specific criteria need to be addressed unless an alternative utilization option is decided upon by the AFO owner and/or operator. When an AFO owner and/or operator implements this element, applicable industry standards and all federal, Tribal, State, and local regulations must be met.

Exhibit 15 - Comprehensive Nutrient Management Plan - Format and Content

A comprehensive nutrient management plan (CNMP) should address all land units that the animal feeding operation (AFO) owner and/or operator owns or has decision-making authority over **and** on which manure and organic by-products will be generated, handled, stored, or applied. This Exhibit describes the general contents of a CNMP and lists suggested items under each major section. The intent of this guidance is to help to maintain quality and provide appropriate documentation of a CNMP. The precise content of a CNMP will vary as it is tailored to the meet the needs of the AFO owner and/or operator.

Contents of a Comprehensive Nutrient Management Plan

1. Site information

- Names, phone numbers, and addresses of the AFO owner(s) and operator(s).
- Location of production site: legal description, driving instructions from nearest post office, and the emergency 911 coordinates.
- Farmstead sketch.
- Plat map or local proximity map (Optional).
- Emergency action plan covering: fire, personal injury, manure storage and handling, and land application operations.
- Operation procedures specific to the production site and practices.
- Existing documentation of present facility components that would aid in evaluating existing conditions, capacities, etc. (i.e., as-built plans, year installed, number of animals a component was originally designed for, etc.).

2. Production information

- Animal types, phases of production, and length of confinement for each type at this site.
- Animal count and average weight for each phase of production on this site.
- Calculated manure and wastewater volumes for this site.
- Manure storage type, volume, and approximate length of storage.

3. Applicable permits or certifications

- Federal, Tribal, State or local permits and/or ordinances.
- Operator or manager certifications.
- Manure applicator certifications.
- Record of inspections or site assessments.
- Changes made to CNMP.

4. Land application site information

- Date plan prepared.
- Written manure application agreements. (Where Applicable)
- Aerial maps of land application area.
- Individual field maps with marked setbacks, buffers, and waterways, and environmentally sensitive areas, such as sinkholes, wells, gullies, tile inlets, etc.
- Landowner names, addresses, and phone numbers.
- Legal description of land sites, including watershed codes.
- Specific and unique field identification codes.
- Land use designation.

- Soil map, with appropriate interpretations.
- Risk assessments for potential nitrogen or phosphorus transport from fields. (See NRCS GM_190, Part 402, Nutrient Management, Section 402.07)
- Land treatment practices planned and applied, and level of treatment they provide.

5. Manure application plans

- Crop types, realistic yield targets, and expected nutrient uptake amounts.
- Application equipment descriptions and methods of application.
- Expected application seasons and estimated days of application per season.
- Estimated application amounts per acre (volume in gallons or tons per acre, and pounds of plant available nitrogen, phosphorous as P2O5, and potassium as K2O per acre).
- Estimate of acres needed to apply manure generated on this site, respecting any guidelines published for nitrogen or phosphorous soil loading limits.

6. Actual activity records

- Soil tests not more than 5 years old.
- Manure test annually for each individual manure storage containment.
- Planned and applied rates, methods of application, and timing (month and year) of nutrients applied. (Include all sources of nutrients, i.e., manure, commercial fertilizers, etc.)
- Current and planned crop rotation.
- Weather conditions during nutrient application. (Optional)
- General soil moisture condition at time of application (i.e., saturated, wet, moist, dry). (Optional)
- Actual crop and yield harvest from manure application sites.
- Record of internal inspections for manure system components.
- Record of any spill events.

7. Mortality disposal

- Plan for mortality disposal.
- Methods and equipment used to implement the disposal plan.

8. Operation and Maintenance

- Detailed operation and maintenance procedures for the conservation systems, holding facility, etc., contained in the CNMP. This would include procedures as calibration of land application equipment, storage facility emptying schedule, soil and manure sampling techniques, etc.