Comprehensive Nutrient Management Plan
Data and Calculations (Draft)

Last Revised: 24-July-2009

2.3. Manure Storage

Storage ID	Type of Storage	Pumpable or Spreadable Capacity	Annual Manure Collected	Maximum Days of Storage
Holding pond	Holding pond	502,000 Gal	1,244,000 Gal	147
Calf shed	Manure pack	300 Tons	270 Tons	406

(1) **Storage ID** – Producer's identification for manure storage unit. Entered by the planner (Storage panel).

(2) **Type of Storage** – Identifies the type of storage unit. Selected by the planner (Storage panel) from a state-specific list of storage types.

(3) **Pumpable or Spreadable Capacity** – Useable capacity of the storage unit. Entered by the planner (Storage panel).

(4) **Annual Manure Collected** – Amount of manure directed to the storage unit on a yearly basis, not including manure manually transferred to or from the unit (see tables 2.6, 2.7, 2.8). A measured value should be entered by the planner (Analysis panel). If none is entered, MMP calculates an estimate based on animal excretion reference values, number and size of animals present (see table 2.4). Estimate is calculated as:

	Number of Animals	2.4(3)
x	(Average Weight	2.4(4)
÷	1000 lbs/AU)	
x	Daily Excretion per AU	reference value
x	Number of half-months in confinement	2.4(5)
x	(365 ÷ 24) days per half-month	
x	Percent of Manure Collected	2.4(6)
x	Correction factor for dilution/dry-down according to animal type, rations, storage, etc.	reference value(s)
	Rounded to nearest ton or 1000 gal.	

(5) **Maximum Days of Storage** – Based on the annual collection rate, the time to exhaust the useable capacity of the storage unit. Calculated as:

	(Capacity	(3)
÷	Annual Manure Collected)	(4)

x   365 days/year
Rounded to the nearest full day

2.4. Animal Inventory

Animal Group	Type or Production Phase	Number of Animals	Average Weight (Lbs)	Confinement Period	Manure Collected (%)	Storage Where Manure Will Be Stored
Lactating cows	Milk cow (dairy)	175	1,300	Jan Early - Dec Late	50	Holding pond
New calves	Calf (dairy)	75	200	Jan Early - Dec Late	100	Calf shed

(1) Number of Animals is the average number of animals that are present in the production facility at any one time.
(2) If Manure Collected is less than 100%, this indicates that the animals spend a portion of the day outside of the production facility or that the production facility is unoccupied one or more times during the confinement period.

(1) **Animal Group** – Producer's identification for the animal group or housing unit. Entered by the planner (Animals panel).
(2) **Type or Production Phase** – Type of animal represented by the animal group. Selected by the planner (Animals panel) from a state-specific list.
(3) **Number of Animals** – Average number of animals present in the storage facility when occupied during the confinement period (see column 5). Entered by the planner (Animals panel).
(4) **Average Weight** – Average weight of an individual animal during the confinement period or production phase. Entered by planner (Animals panel).
(5) **Confinement Period** – Period when animals are present in the facility to the nearest half-month. Entered by the planner (Animals panel).
(6) **Manure Collected** – Portion of manure generated during the confinement period that is collected. If portion is less than 100%, this may indicate that the animals spend a portion of the day outside the production facility or that the facility is unoccupied one or more times during the confinement period. Entered by the planner (Animals panel).
(7) **Storage Where Manure Will Be Stored** – Manure storage unit to which animal group's collected manure is ultimately directed and from which manure will be transferred, exported or land applied. Selected by the planner (Animals panel) from list in table 2.3.

All data in tables 2.6, 2.7 and 2.8 is entered by the planner in the Manure Transfer Editor dialog, unless otherwise indicated.

2.6. Manure Exports Off the Farm
(1) **Month-Year** – Planned month when export is expected to take place. Selected by the planner (Nutrient Management panel).
(2) **Manure Source** – Storage unit from which exported manure will be taken. Selected by the planner (Nutrient Management panel).
(3) **Amount** – Amount of manure to be exported.
(4) **Receiving Operation** – Name of external operation that will receive the exported manure.
(5) **Location** – Location of the receiving operation.

2.7. Planned Manure Imports Onto the Farm
(1) **Month-Year** – Planned month when import is expected to take place. Selected by the planner (Nutrient Management panel).
(2) **Manure's Animal Type** – Type of animal from which imported manure is derived.
(3) **Amount** – Amount of manure to be imported.
(4) **Originating Operation** – Name of external operation from which manure will be imported.
(5) **Location** – Location of the originating operation.

2.8. Planned Internal Transfers of Manure
(1) **Month-Year** – Planned month when transfer is expected to take place. Selected by the planner (Nutrient Management panel).
(2) **Manure Source** – Storage unit from which the transferred manure will be taken. Selected by the planner (Nutrient Management panel).
(3) **Amount** – Amount of manure to be transferred.
(4) **Manure Destination** – Storage unit to which the transferred manure will be sent.

5.1. Soil Information

Field	Soil Survey	Map Unit	Soil Component Name	Surface Texture	Slope Range (%)
4	157	Em	Emory	SIL	1-3%
6a	157	DcD2	Decatur	SICL	12-20%

Information contained in this table will vary depending on the requirements of the state, and will include at a minimum:

(1) **Field** – Field and subfield names (6.1(1), (2)).

(2) **Soil Survey** – Soil survey identifier.

(3) **Map Unit** – Soil survey map unit symbol. Selected by the planner (Fields panel) or determined by GIS.

(4) **Soil Component Name** – Soil component name.

(5) **Surface Texture** – Surface texture of the soil type.

(6) **Slope Range** – Slope range of the soil type.

5.2. Predicted Soil Erosion

Field	Predominant Soil Type	Slope (%)	Wind (Ton/Ac/Yr)	Irrigation (Ton/Ac/Yr)	Gully (Ton/Ac/Yr)	Ephemeral (Ton/Ac/Yr)	Plan Avg. Soil Loss (Ton/Ac/Yr)
4	Em (Emory SIL)	2.0					1.5
6a	DcD2 (Decatur SICL)	16.0					3.4

Field	Crop Year	Starting Date (mm/dd/yyyy)	Ending Date (mm/dd/yyyy)	Soil Loss (Ton/Ac)	Primary Crop
4	2008	9/2/2007	9/1/2008	1.5	Corn silage
	2009	9/2/2008	9/1/2009	1.5	Corn silage
	2010	9/2/2009	9/1/2010	1.5	Corn silage
6a	2008	9/2/2007	9/1/2008	3.7	Corn silage
	2009	9/2/2008	9/1/2009	3.3	Corn silage
	2010	9/2/2009	9/1/2010	3.1	Corn silage

The content of this table will vary depending on whether the planner has used RUSLE2 within MMP to calculate soil loss.

(1) **Field** – Field and subfield names (6.1(1), (2)).
(2) **Predominant Soil Type** – Map unit, component name and surface texture of the dominant soil type within the field (see table 5.1).
(3) **Slope** – Representative slope of the field. Entered by the planner (6.1(9)); otherwise calculated as the midpoint of soil type slope range (5.1(5)), rounded to nearest 0.1 %.
(4) **Wind** – Average annual wind erosion. Entered by the planner (Assessment panel).
(5) **Irrigation** – Average annual irrigation induced erosion. Entered by the planner (Assessment panel).
(6) **Gully** – Average annual gully erosion. Entered by the planner (Assessment panel).
(7) **Ephemeral** – Average annual ephemeral erosion. Entered by the planner (Assessment panel).
(8) **Plan Avg. Soil Loss** – Average RULSE2-calculated soil loss value across the length of the plan. Rounded to nearest 0.1 tons/acre/year.

(9) **Field** – Field and subfield names (6.1(1), (2)).
(10) **Crop Year** – Crop year.
(11) **Starting Date** – Month, date and year on which the RUSLE2 crop year begins. Calculated based on RUSLE2 management operations.
(12) **Ending Date** – Month, date and year on which the RUSLE2 crop year ends. Calculated based on RUSLE2 management operations.

(13) **Soil Loss** – RUSLE2-calculated soil loss for the crop year. Rounded to nearest 0.1 tons/acre.

(14) **Primary Crop** – Primary harvested crop for the crop year (6.5(3)).
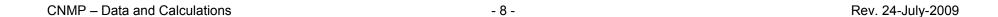
5.2. Predicted Soil Erosion (without RUSLE2)

(1) **Field** – Field and subfield names (6.1(1), (2)).

(2) **Predominant Soil Type** – Map unit, component name and surface texture of the dominant soil type within the field (see table 5.1).

(3) **Slope** – Representative slope of the field. Entered by the planner (6.1(9)); otherwise calculated as the midpoint of soil type slope range (5.1(5)), rounded to nearest 0.1 %.

(4) **Water** – Average annual water erosion. Entered by the planner (Assessment panel).

(5) **Wind** – Average annual wind erosion. Entered by the planner (Assessment panel).

(6) **Irrigation** – Average annual irrigation induced erosion. Entered by the planner (Assessment panel).

(7) **Gully** – Average annual gully erosion. Entered by the planner (Assessment panel).

(8) **Ephemeral** – Average annual ephemeral erosion. Entered by the planner (Assessment panel).

(9) **Total** – Total of the above erosion values.

5.3. Nitrogen and Phosphorus Risk Analysis

The content of this table(s) will vary depending on the requirements of the state nitrate and/or phosphorus risk assessments, if any. See notes accompanying risk assessment tools or source publications for calculation details.

5.4. Additional Field Data Required by Risk Assessment Procedure

The content of this table will vary depending on the requirements of the state nitrate and/or phosphorus risk assessments. All information here is entered by the planner.

6.1. Field Information

Field ID	Sub-field ID	Total Acres	Spread-able Acres	FSA Farm	FSA Tract	FSA Field	County	Predominant Soil Type	Slope (%)
4		33.9	33.9		1234	4	Washington	Em (Emory SIL)	
6a		17.6	16.9		1234	6	Washington	DcD2 (Decatur SICL)	

(1) **Field ID** – Producer's identification for field. Entered by the planner (Fields panel).

(2) **Subfield ID** – Subfield identification. Entered by the planner (Fields panel).

(3) **Total Acres** – Total farmed acres in the field. Entered by the planner (Fields panel) or calculated by GIS. Rounded to nearest 0.1 acres.

(4) **Spreadable Acres** – Portion of the field available for manure application, i.e. excluding areas within application setbacks. Entered by the planner (Fields panel) or calculated by GIS. Rounded to nearest 0.1 acres.

(5) **FSA Farm** – FSA farm identification number. Entered by the planner (Fields panel).

(6) **FSA Tract** – FSA tract identification number. Entered by the planner (Fields panel).

(7) **FSA Field** – FSA field identification number. Entered by the planner (Fields panel).

(8) **County** – County in which the field is located. Selected by the planner (Fields panel). If no county is selected, the operation's county is used instead.

(9) **Predominant Soil Type** – Map unit, component name and surface texture of the dominant soil type within the field (see table 5.1).

(10) **Slope** – Representative slope of the field, if different from typical slope of the soil survey unit. Entered by the planner (Fields panel).

6.2. Manure Application Setback Distances

Setback Requirements: NRCS Standard

Feature	Setback Criteria	Setback Distance (Feet)
Well	Application upgradient of feature	300
Well	Application down-gradient of feature	150
Waterbody	Predominant slope <5% with good vegetation	30
Waterbody	Predominant slope >8%	100
Waterbody	Poor vegetation	100
Public road	All applications	50
Dwelling (other than producer)	All applications	300
Public use area	All applications	300
Property line	Application upgradient of feature	30

Source: Nutrient Management Standard 590

Data in the setbacks table is drawn from state and national regulations and guidance. This information, as used by MMP, can be reviewed at http://nmplanner.missouri.edu/software/setbacks.asp.

(1) **Feature** – Physical feature from which manure application setback is measured.

(2) **Setback Criteria** – Application conditions under which setback must be observed.

(3) **Setback Distance** – Distance from feature (1) within which manure application is prohibited under the given conditions (2).

6.3. Soil Test Data

Field	Test Year	OM (%)	P Test Used	P	K	Mg	Ca	Units	Soil pH	Buffer pH	CEC (meq/ 100g)
4	2003			220	340			lbs/a	6.4		
6a	2003			86	208			lbs/a	6.0		

The content of this table may vary depending on the state. Eastern U.S. states will typically include:
  (1) **Field** – Field and subfield names (6.1(1), (2)).
  (2) **Test Year** – Year of most recent soil test for the field. Entered by the planner (Soil Tests panel).
  (3) **OM** – Percentage of organic matter in the soil. Entered by the planner (Soil Tests panel).
  (4) **P Test Used** – Phosphorus test method. Entered by the planner (Soil Tests panel).
  (5) **P** – Phosphorus test result. Entered by the planner (Soil Tests panel).
  (6) **K** – Potassium test result. Entered by the planner (Soil Tests panel).
  (7) **Mg** – Magnesium test result. Entered by the planner (Soil Tests panel).
  (8) **Ca** – Calcium test result. Entered by the planner (Soil Tests panel).
  (9) **Units** – Test result units for preceding columns. Generally ppm or FIV unless lbs/ac is indicated by the planner (Soil Tests panel).
  (10) **Soil pH** – Soil pH test result. Entered by the planner (Soil Tests panel).
  (11) **Buffer pH** – Buffer pH test result. Entered by the planner (Soil Tests panel).
  (12) **CEC** – Cation exchange capacity. If sufficient data has been entered (K, Ca, Mg, Buffer pH) for MMP to calculate CEC, MMP's estimate is used. Otherwise, entered by the planner (Soil Tests panel).

Western U.S. states will typically include these additional columns:
  (13) **Na** – Sodium test result, units determined by Units column (9). Entered by the planner (Soil Tests panel).
  (14) **NO$_3$-N** – Nitrate test result. Entered by the planner (Soil Tests panel).
  (15) **EC** – Electrical conductivity test result. Entered by the planner (Soil Tests panel).

6.4. Manure Nutrient Analysis

Manure Source	Dry Matter (%)	Total N	NH₄-N	Total P₂O₅	Total K₂O	Avail. P₂O₅	Avail. K₂O	Units	Analysis Source and Date
Holding pond		10.0	5.0	3.0	12.5	3.0	12.5	Lb/1000Gal	Lab analysis 11/08/2003; no NH4-N so assume 50%.
Calf shed		4.5	0.9	1.6	5.7	1.6	5.7	Lb/Ton	MMP Estimate

(1) Entered analysis may be the average of several individual analyses.

    (1) **Manure Source** – Name of storage unit (2.3(1)).
    (2) **Dry Matter** – Percent dry matter test result. Entered by the planner (Analysis panel).
    (3) **Total N** – Total nitrogen content test result. Entered by the planner (Analysis panel), otherwise estimated based on excretion data.
    (4) **NH₄-N** – Ammonium N test result. Entered by the planner (Analysis panel), otherwise estimated based on excretion data.
    (5) **Total P₂O₅** – Total phosphorus test result. Entered by the planner (Analysis panel), otherwise estimated based on excretion data.
    (6) **Total K₂O** – Total potassium test result. Entered by the planner (Analysis panel), otherwise estimated based on excretion data.
    (7) **Avail. P₂O₅** – Estimated phosphorus availability, based on (5). Actual calculation based on state requirements.
    (8) **Avail. K₂O** – Estimated potassium availability, based on (6). Actual calculation based on state requirements.
    (9) **Units** – Unit of measurement for preceding values.
    (10) **Analysis Source and Date** – Source (i.e. testing lab) and date of manure analysis. Entered by the planner (Analysis panel).

6.5. Planned Crops and Fertilizer Recommendations

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P₂O₅ Rec (Lbs/A)	K₂O Rec (Lbs/A)	N Removed (Lbs/A)	P₂O₅ Removed (Lbs/A)	K₂O Removed (Lbs/A)	Custom Fert. Rec. Source
4	2008	Small grain cover*		0	0	0				
4	2008	Corn silage	22.0 Ton	150	0	0	176	66	176	
4	2009	Small grain cover*		0	0	0				
4	2009	Corn silage	22.0 Ton	150	0	0	176	66	176	
4	2010	Small grain cover*		0	0	0				
4	2010	Corn silage	22.0 Ton	150	0	0	176	66	176	
6a	2008	Small grain cover*		0	0	0				
6a	2008	Corn silage	22.0 Ton	150	60	100	176	66	176	
6a	2009	Small grain cover*		0	0	0				
6a	2009	Corn silage	22.0 Ton	150	60	100	176	66	176	
6a	2010	Small grain cover*		0	0	0				
6a	2010	Corn silage	22.0 Ton	150	60	100	176	66	176	

(1) **Field** – Field and subfield names (6.1(1), (2)).

(2) **Crop Year** – Year in which primary crop will be harvested.

(3) **Planned Crop** – Type of crop to be grown. An asterisk indicates that this is a cover crop or first crop in a double-crop system. Entered by the planner (Crops panel).

(4) **Yield Goal** – Expected yield. Entered by the planner (Crops panel).

(5) **N Rec** – Nitrogen fertilizer recommendation, unless a custom recommendation is entered by the planner (Crops panel), this is calculated according to published state recommendations (see References section for specific publications).

(6) **P₂O₅ Rec** – P₂O₅ fertilizer recommendation.

(7) **K₂O Rec** – K₂O fertilizer recommendation.

(8) **N Removed** – Nitrogen removed by the expected yield of the crop, calculated according to published crop removal rates (see References section for specific publications).

(9) **P₂O₅ Removed** – P₂O₅ removed by the expected yield of the crop.

(10) **K₂O Removed** – K₂O removed by the expected yield of the crop.

(11) **Custom Fert. Rec. Source** – Source or reason for customer fertilizer recommendation entered by the planner.

6.6. Manure Application Planning Calendar – September 2007 through August 2008

Field	Total Acres	Spread Acres	Predominant Soil Type	Primary 2008 Crop (Prev. Primary Crop)	Sep '07	Oct '07	Nov '07	Dec '07	Jan '08	Feb '08	Mar '08	Apr '08	May '08	Jun '08	Jul '08	Aug '08
4	33.9	33.9	Em (Emory SIL)	Corn silage (same)	X	X										
6a	17.6	16.9	DcD2 (Decatur SICL)	Corn silage (same)		90.0										
Total	*51.5*	*50.8*			X	90.0 X										

Crop in field	No. indicates total loads "X" indicates other manure apps

(1) **Field** – Field and subfield names (6.1(1), (2)).
(2) **Total Acres** – Total size of the field (6.1(3)).
(3) **Spreadable Acres** – Portion of field available for manure application (6.1(4)).
(4) **Predominant Soil Type** – Map unit, component name and surface texture of predominant soil type (6.1(8)).
(5) **Primary Crop (Prev. Primary Crop)** – Primary crop for the current crop year and for the previous crop year (see table 6.5).
(6) **Months** – For each for in the plan year, the number of loads of manure applied, if any. An "X" indicates that manure is applied during this month using methods not measurable in loads (irrigation, etc.). Shaded cells indicate possible conditions that may preclude or limit manure application, such as a growing crop in the field, high soil test, frozen ground, etc. The list of conditions is state-specific. Where multiple warning conditions exist, priority is given to more severe conditions, indicated by those furthest left in the legend. For a growing crop cells are shaded starting with the month after planting and ending before harvest, unless the planting or harvest date is the first or last day of the month, respectively, in which case the month of planting or harvest is also shaded.

6.7. Planned Nutrient Applications

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P₂O₅ (Lbs/A)	Avail K₂O (Lbs/A)
4	Sep 2007	Corn silage	Holding pond	Splash plate unit, Not incorporated	Custom	19,000 Gal	0.8 mph	553,600 Gal	29.1	86	57	238
4	Oct 2007	Corn silage	Holding pond	Splash plate unit, Not incorporated	Custom	19,000 Gal	0.8 mph	91,200 Gal	4.8	86	57	238
4	Jun 2008	Corn silage	28-0-0	Surface band	Supp. N	22 Gal		746 Gal	33.9	66	0	0
4	Sep 2008	Corn silage	Holding pond	Splash plate unit, Not incorporated	Custom	19,000 Gal	0.8 mph	562,200 Gal	29.6	86	57	238
4	Oct 2008	Corn silage	Holding pond	Splash plate unit, Not incorporated	Custom	19,000 Gal	0.8 mph	81,700 Gal	4.3	86	57	238
4	Jun 2009	Corn silage	28-0-0	Surface band	Supp. N	17 Gal		576 Gal	33.9	51	0	0
4	Sep 2009	Corn silage	Holding pond	Splash plate unit, Not incorporated	Custom	19,000 Gal	0.8 mph	571,000 Gal	30.1	86	57	238
4	Oct 2009	Corn silage	Holding pond	Splash plate unit, Not incorporated	Custom	19,000 Gal	0.8 mph	72,200 Gal	3.8	86	57	238
4	Jun 2010	Corn silage	28-0-0	Surface band	Supp. N	15 Gal		509 Gal	33.9	45	0	0
6a	Oct 2007	Corn silage	Calf shed	Flail spreader, Not incorporated	Custom	16 Ton	90 Lds	270 Ton	16.9	29	26	91
6a	Oct 2007	Corn silage	0-46-0	Surface broadcast	Supp. P	73 Lbs		1,234 Lbs	16.9	0	34	0
6a	Jun 2008	Corn silage	28-0-0	Surface band	Supp. N	41 Gal		693 Gal	16.9	122	0	0
6a	Oct 2008	Corn silage	0-46-0	Surface broadcast	1-yr P	73 Lbs		1,234 Lbs	16.9	0	34	0
6a	Oct 2008	Corn silage	Calf shed	Flail spreader, Not incorporated	Custom	16 Ton	90 Lds	270 Ton	16.9	29	26	91
6a	Jun 2009	Corn silage	28-0-0	Surface band	Supp. N	38 Gal		642 Gal	16.9	113	0	0
6a	Oct 2009	Corn silage	0-46-0	Surface broadcast	1-yr P	73 Lbs		1,234 Lbs	16.9	0	34	0
6a	Oct 2009	Corn silage	Calf shed	Flail spreader, Not incorporated	Custom	16 Ton	90 Lds	270 Ton	16.9	29	26	91
6a	Jun 2010	Corn silage	28-0-0	Surface band	Supp. N	37 Gal		625 Gal	16.9	110	0	0

(1) **Field** – Field and subfield names (6.1(1), (2)).

(2) **App. Month** – Calendar month and year in which the nutrient application will be made. Entered by the planner (Nutrient Management panel).

(3) **Target Crop** – Primary crop in the targeted crop year. MMP does not distinguish applications targeting different crops within the same crop year.

(4) **Nutrient Source** – For manure applications, the storage unit from which manure was applied; for fertilizer applications, the analysis of the applied product (e.g. 82-0-0, 18-46-0, etc.) Entered by the planner (Nutrient Management panel or Fertilizer Application Editor dialog).

(5) **Application Method** – A description of the method of nutrient application. For manure applications, names the equipment used to apply the manure and how long until the manure will be incorporated, if at all; for fertilizer applications described the application method. Entered by planner (Nutrient Management panel or Fertilizer Application Editor dialog).

(6) **Rate Basis** – Indicates the nutrient target for MMP-calculated application rates. Rates entered by the planner (Nutrient Management panel) will be designated as "Custom." Fertilizer applications following other nutrient applications in the same year, also supplying the targeted nutrient are designated as supplemental.

(7) **Rate/Acre** – Manure or fertilizer application rate. This can be entered by the planner or calculated by MMP to target a specific nutrient amount or requirement (7). Rates calculated by MMP **will never under-apply** a targeted nutrient; MMP will always round up to the next applicable increment. For fertilizers, MMP will calculate to whole pounds or gallons of product per acre. For poultry litter MMP will calculate rates in 0.1 ton increments, 0.5 tons for other solid waste and 100 gallon increments for liquid waste. Calculated as:

	Target nutrient amount per acre	based on (6)
÷	Available nutrient content per unit	N availability per unit not listed in CNMP; 6.4(7), (8) for P and K

(8) **Loads, Speed or Time** – For manure applications with a conventional liquid or solid spreader, indicates the number of loads required to cover the field or empty the storage if not enough manure is on hand to finish the entire field. MMP calculates in 0.1 load increments and will not under-apply, as per (6). For irrigation systems, this is the amount of time required to apply based on the pump capacity of the system or the speed required for a hose pull or traveling gun to apply the given rate. For fertilizer applications, this column is left blank.

(9) **Total Amount Applied** – Total amount of material (fertilizer, manure, irrigation water, etc.) applied to the field. For conventional manure applications this is calculated as:

	Number of loads	(8)
x	Usable capacity of spreader	not listed in CNMP

(10) **Acres Covered** – For fertilizer applications this is the area of the portion of the field covered by the applications (i.e. spreadable area, non-spreadable area or entire field). For manure applications, this is calculated as:

	Total Amount Applied	(9)
÷	Rate/Acre	(7)
	Rounded to the nearest 0.1 acres	

This result may be greater or less than the spreadable acres of the field if there is not sufficient manure available to cover the spreadable area or if rounding up to the nearest load increment in (8) results in over-application.

(11) **Avail. N** – First-year plant-available nitrogen from the application. For manure apps, calculated according to nutrient availability method specified by the state. Fertilizer nutrients are calculated as:

	Application rate	(7)
x	Product density	reference value, liquids only
x	(Product analysis ÷ 100)	(4)

(12) **Avail P_2O_5** – First-year plant-available P_2O_5 from the application. For manure apps, calculated according to nutrient availability method specified by the state.

(13) **Avail K_2O** – First-year plant-available K_2O from the application. For manure apps, calculated according to nutrient availability method specified by the state.

6.8. Field Nutrient Balance (Manure-spreadable Area)

Year	Field	Size (Acres)	Crop	Yield Goal /Acre	Fertilizer Recs[1] N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	Nutrients Applied[2] N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	Balance After Recs[3] N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	Balance After Removal[4] P_2O_5 Lb/A	K_2O Lb/A
2008	4	33.9	Small grain cover		0	0	0								
2008	4	33.9	Corn silage	22	150	0	0	152	57	238	2	57	238	-9	62
2009	4	33.9	Small grain cover		0	0	0								
2009	4	33.9	Corn silage	22	150	0	0	137	57	238	0†	114	476	-9	124
2010	4	33.9	Small grain cover		0	0	0								
2010	4	33.9	Corn silage	22	150	0	0	131	57	238	0†	171	714	-9	186
Total	**4**				**450**	**0**	**0**	**420**	**171**	**714**					
2008	6a	16.9	Small grain cover		0	0	0								
2008	6a	16.9	Corn silage	22	150	60	100	151	60	91	1	0	-9	-6	-85
2009	6a	16.9	Small grain cover		0	0	0								
2009	6a	16.9	Corn silage	22	150	60	100	142	60	91	0†	0	-9	-6	-85
2010	6a	16.9	Small grain cover		0	0	0								
2010	6a	16.9	Corn silage	22	150	60	100	139	60	91	0†	0	-9	-6	-85
Total	**6a**				**450**	**180**	**300**	**432**	**180**	**273**					

Field Nutrient Balance (Non-manure-spreadable Area)

Year	Field	Size (Acres)	Crop	Yield Goal /Acre	Fertilizer Recs[1] N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	Nutrients Applied[2] N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	Balance After Recs[3] N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	Balance After Removal[4] P_2O_5 Lb/A	K_2O Lb/A
2008	6a	0.7	Small grain cover		0	0	0								
2008	6a	0.7	Corn silage	22	150	60	100	152	60	100	2	0	0	-6	-76
2009	6a	0.7	Small grain cover		0	0	0								
2009	6a	0.7	Corn silage	22	150	60	100	152	60	100	2	0	0	-6	-76
2010	6a	0.7	Small grain cover		0	0	0								
2010	6a	0.7	Corn silage	22	150	60	100	152	60	100	2	0	0	-6	-76
Total	**6a**				**450**	**180**	**300**	**456**	**180**	**300**					

[1] Fertilizer Recs are the crop fertilizer recommendations. The N rec accounts for any N credit from previous legume crop.

[2] Nutrients Applied are the nutrients expected to be available to the crop from that year's manure applications plus nutrients from that year's commercial fertilizer applications. With a double-crop year, the total nutrients applied for both crops and the year's balances are listed on the second crop's line.

[3] For N, Nutrients Applied minus Fertilizer Recs for indicated crop year. Also includes amount of residual N expected to become available that year from prior years' manure applicaitions. For P_2O_5 and K_2O, Nutrients Applied minus Fertilizer Recs *through* the indicated crop year, with positive balances carried forward to subsequent years. Negative values indicate a potential need to apply additional nutrients.

[4] Nutrients Applied minus amount removed by harvested portion of crop through the indicated year. Positive balances are carried forward to subsequent years.

¤ Indicates a custom fertilizer recommendation in the Fertilizer Recs column.

a Indicates in the Balance After Recs N column that the legume crop is assumed to utilize some or all of the supplied N.

† Indicates in the Balance After Recs N column that the value includes residual N expected to become available that year from prior years' manure applications.

Table 6.8 may have two sections: one for manure-spreadable areas and one for non-manure-spreadable areas, if any.
   (1) **Year** – Crop year
   (2) **Field** – Field and subfield names (6.1(1), (2)).
   (3) **Size** – Size of the pertinent area of the field, i.e. spreadable acres for the manure-spreadable section, etc. (6.1(3), (4)).
   (4) **Crop** – Crop to be grown (6.5(3)). In systems with a cover crop or a double crop, the cover/first crop is shown on a separate line preceding the primary crop.
   (5) **Yield Goal** – Expected yield of the crop, if harvested (6.5(4)).
   (6) **Fertilizer Recs – N** – Nitrogen fertilizer recommendation (6.5(5)).
   (7) **Fertilizer Recs – P_2O_5** – Phosphorus fertilizer recommendation (6.5(6)).
   (8) **Fertilizer Recs – K_2O** – Potassium fertilizer recommendation (6.5(7)).
   (9) **Nutrients Applied – N** – Applied nitrogen available to the crop(s) in the current crop year. All applied nutrients are listed on the same line with the year's primary crop. This does not include available nutrients from prior year applications. Note that partial-field applications or over-applications are prorated to the entire field. The proration is calculated as:

	Available N	6.7(11)
x	Acres covered	6.7(9)
÷	Area of field (spreadable or non-spreadable)	6.1(3), (4)
	Rounded to the nearest pound per acre.	

   (10) **Nutrients Applied – P_2O_5** – Applied phosphorus available to the crop(s) in the current crop year. This does not include available nutrients from prior year applications. Partial-field applications and over-applications are prorated in a like manner to (9).
   (11) **Nutrients Applied – K_2O** – Applied potassium available to the crop(s) in the current crop year. This does not include available nutrients from prior year applications. Partial-field applications and over-applications are prorated in a like manner to (9).
   (12) **Balance After Recs – N** – Balance of applied nutrients against fertilizer recommendations. Residual N from prior year applications becoming available to the crop in this year is included. Additionally, legumes may be assumed to utilize some nitrogen even if the fertilizer recommendation is zero. This legume utilization will never reduce the balance below zero. Calculated as:

	N applied	(9)
+	Prior year residual N, if any	not listed in CNMP
-	N recommendation or legume utilization	(6), reference value

   (13) **Balance After Recs – P_2O_5** – Balance of applied nutrients against fertilizer recommendations. Positive balances are carried forward to succeeding year. Calculated as:

      Previous year positive balance, if any   line above

+ P_2O_5 applied   (10)

-   P_2O_5 recommendation   (7)

(14) **Balance After Recs – K_2O** – Balance of applied nutrients against fertilizer recommendations. Positive balances are carried forward to succeeding year. Calculated as:

      Previous year positive balance, if any   line above

+ K_2O applied   (11)

-   K_2O recommendation   (8)

(15) **Balance After Removal – P_2O_5** – Balance of applied nutrients against nutrients removed by the crop. Positive balances are carried forward to succeeding year. Calculated as:

      Previous year positive balance, if any   line above

+ P_2O_5 applied   (10)

-   P_2O_5 removed   6.5(9)

(16) **Balance After Removal – K_2O** – Balance of applied nutrients against nutrients removed by the crop. Positive balances are carried forward to succeeding year. Calculated as:

      Previous year positive balance, if any   line above

+ K_2O applied   (11)

-   K_2O removed   6.5(10)

6.9. Manure Inventory Annual Summary

Manure Source	Plan Period	On Hand at Start of Period	Total Generated	Total Imported	Total Trans-ferred In	Total Applied	Total Exported	Total Trans-ferred Out	On Hand at End of Period	Units
Holding pond	Sep '07 - Aug '08	450,000	1,244,000	0	0	1,234,600	0	0	459,400	Gal
Calf shed	Sep '07 - Aug '08	225	270	0	0	270	0	0	225	Ton
Holding pond	Sep '08 - Aug '09	459,400	1,244,000	0	0	1,234,400	0	0	469,000	Gal
Calf shed	Sep '08 - Aug '09	225	270	0	0	270	0	0	225	Ton
Holding pond	Sep '09 - Aug '10	469,000	1,244,000	0	0	1,232,200	0	0	480,800	Gal
Calf shed	Sep '09 - Aug '10	225	270	0	0	270	0	0	225	Ton

(1) **Manure Source** – Manure storage unit name (2.3(1)).

(2) **Plan Period** – Twelve-month period starting with beginning of the plan.

(3) **On Hand at Start of Period** – The amount of manure in storage at the beginning of the period. For the first year this number is entered by the planner (Storage panel). Thereafter, it is equal to the amount on hand at the end of the previous period (line above (10)).

(4) **Total Generated** – Amount of manure produced during the plan period that is directed to this storage unit (2.3(4)).

(5) **Total Imported** – Amount of manure imported from external operations to this storage unit (see table 2.7).

(6) **Total Transferred In** – Amount of manure transferred to this storage unit from other units within the operation (see table 2.8).

(7) **Total Applied** – Amount of manure applied to fields from this storage unit (see table 6.7).

(8) **Total Exported** – Amount of manure exported to external operations from this storage unit (see table 2.6).

(9) **Total Transferred Out** – Amount of manure transferred to other storage units within the operation (see table 2.8).

(10) **On Hand at End of Period** – Amount of manure in the storage unit at the end of the plan period. Calculated as:

      On hand at start of period   (3)

  +   Additions (generated, imported or transferred)   (4), (5), (6)

  -   Reductions (applied, exported or transferred)   (7), (8), (9)

(11) **Units** – Unit of measurement for the storage unit. Tons for solid manure storage, gals. for liquid.

6.10. Fertilizer Material Annual Summary

Product Analysis	Plan Period	Product Needed Sep - Dec	Product Needed Jan - Aug	Total Product Needed	Units
0-46-0	Sep '07 - Aug '08	13,116	0	13,116	Lbs
0-0-60	Sep '07 - Aug '08	17,845	0	17,845	Lbs
28-0-0	Sep '07 - Aug '08	0	5,975	5,975	Gal
33-0-0	Sep '07 - Aug '08	4,545	35,824	40,369	Lbs
0-46-0	Sep '08 - Aug '09	12,252	0	12,252	Lbs
0-0-60	Sep '08 - Aug '09	16,252	0	16,252	Lbs
28-0-0	Sep '08 - Aug '09	0	5,212	5,212	Gal
33-0-0	Sep '08 - Aug '09	4,545	37,026	41,571	Lbs
0-46-0	Sep '09 - Aug '10	12,421	0	12,421	Lbs
0-0-60	Sep '09 - Aug '10	15,857	0	15,857	Lbs
28-0-0	Sep '09 - Aug '10	0	5,345	5,345	Gal
33-0-0	Sep '09 - Aug '10	4,545	36,795	41,340	Lbs

(1) **Product Analysis** – Nutrient analysis of the fertilizer product selected by the planner (Fertilizer Application Editor).

(2) **Plan Period** – Twelve-month period starting with beginning of the plan.

(3) **Product Needed** – Amount of fertilizer product used during the given season. This will be either two or three columns in the table, depending on the starting month of the plan.

(4) **Total Product Needed** – Amount of fertilizer product used during the plan year. Calculated as the sum of value sum columns under (3).

(5) **Units** – Unit of measurement for the indicated storage product. Lbs for solids and gaseous products, gals. for liquid products.

6.11. Whole-farm Nutrient Balance

	N (Lbs)	P$_2$O$_5$ (Lbs)	K$_2$O (Lbs)
Total Manure Nutrients on Hand at Start of Plan[1]	5,512	1,710	6,908
Total Manure Nutrients Collected[2]	40,965	12,492	51,267
Total Manure Nutrients Imported[3]	0	0	0
Total Manure Nutrients Exported[4]	0	0	0
Total Manure Nutrients on Hand at End of Plan[5]	5,820	1,802	7,292
Total Manure Nutrients Applied[6]	40,661	12,422	50,928
Available Manure Nutrients Applied[7]	20,574	12,422	50,928
Commercial Fertilizer Nutrients Applied[8]	14,458	1,724	0
Available Nutrients Applied[9]	35,032	14,146	50,928
Nutrient Utilization Potential[10]	34,920	15,365	40,973
Nutrient Balance of Spreadable Acres[11]	112	-1,219	9,955
Average Nutrient Balance per Spreadable Acre per Year[12]*	0	-5	43

* Non-trivial, positive values for N indicate that the plan was not properly developed. Negative values for N indicate additional nutrient utilization potential which may or may not be intentional. For example, plans that include legume crops often will not utilize the full N utilization potential for legume crops if manure can be applied to non-legume crops that require N for optimum yield. Positive values for P$_2$O$_5$ and/or K$_2$O do not necessarily indicate that the plan was not developed properly. For example, producers may be allowed to apply N-based application rates of manure to fields with low soil test P values or fields with a low potential P-loss risk based on the risk assessment tool used by the state. Negative values for P$_2$O$_5$ and K$_2$O indicate that planned applications to some fields are less than crop removal rates.

Note that table 6.11 has two versions: one for spreadable area, as listed below, and one for non-spreadable areas, which omits the manure-related information, but is otherwise identical in content and calculation.

(1) **Total Manure Nutrients on Hand at Start of Plan** – Total manure nutrients present in storage units at the start of the plan.
    Calculated as the sum across all storage units of:
        Manure on hand at start   6.9(3)
      x   Total nutrient content   6.4(3), (5), (6)

(2) **Total Manure Nutrients Collected** – Total manure nutrients collected on the farm. Calculated as the sum across all storage units of:
        Manure generated   6.9(4)
      x   Total nutrient content   6.4(3), (5), (6)

(3) **Total Manure Nutrients Imported** – Total manure nutrients imported onto the farm. Calculated as the sum across all storage units of:
        Manure imported   6.9(5)

x   Total nutrient content   6.4(3), (5), (6)

(4) **Total Manure Nutrients Exported** – Total manure nutrients exported from the farm to external operation(s). Calculated as the sum across all storage units of:

     Manure exported   6.9(8)
  x   Total nutrient content   6.4(3), (5), (6)

(5) **Total Manure Nutrients on Hand at End of Plan** – Total manure nutrients present in storage units at the end of the plan. Calculated as the sum across all storage units of:

     Manure on hand at end   6.9(10)
  x   Total nutrient content   6.4(3), (5), (6)

(6) **Total Manure Nutrients Applied** – Total nutrients in land-applied manure. Losses due to rate, timing and method of application are not included. Calculated as the sum across all manure applications of:

     Application rate   6.7(7)
  x   Total nutrient content   6.4(3), (5), (6)
  x   Area covered   6.7(10)

(7) **Available Manure Nutrients Applied** – Available manure nutrients applied on the farm based on rate, time and method of application. For nitrogen, this also includes residual N expected to become available prior to the end of the plan. Calculated as the sum across all manure applications of:

     Available nutrient rate   6.7(11), (12), (13)
  x   Area covered   6.7(10)

(8) **Commercial Fertilizer Nutrients Applied** – Nutrients applied as commercial fertilizers to spreadable areas of the fields. Calculated as the sum across all fertilizer applications of:

     Available nutrient rate   6.7(11), (12), (13)
  x   Area covered   6.7(10)

(9) **Available Nutrients Applied** – Applied nutrients available to the crops from all sources. Calculated as:

     Available manure nutrients   (7)
  +   Fertilizer nutrients   (8)

(10) **Nutrient Utilization Potential** – Nutrient utilization potential of crops grown. For N the value is generally based on crop N recommendation for non-legume crops and crop N uptake or other state-imposed limit for N application rates for legumes. P_2O_5 and K_2O values generally are based on the greater of fertilizer recommendation or crop removal.

(11) **Nutrient Balance of Spreadable Acres** – Balance of available nutrients against crop utilization potential. Positive values indicate over-application, and negative values indicate additional nutrient utilization potential. Calculated as:

     Available nutrients applied   (9)
  -   Utilization potential   (10)

(12) **Average Nutrient Balance per Spreadable Acre per Year** – Average per acre nutrient balance over the length of the plan. Calculated as:

     Nutrient balance   (11)
  ÷   (Sum of spreadable acreage   6.1(4)

x   Number of years in plan)   see page 1 of CNMP