FACT SHEET

Ontario

Ministry of
Agriculture and Food

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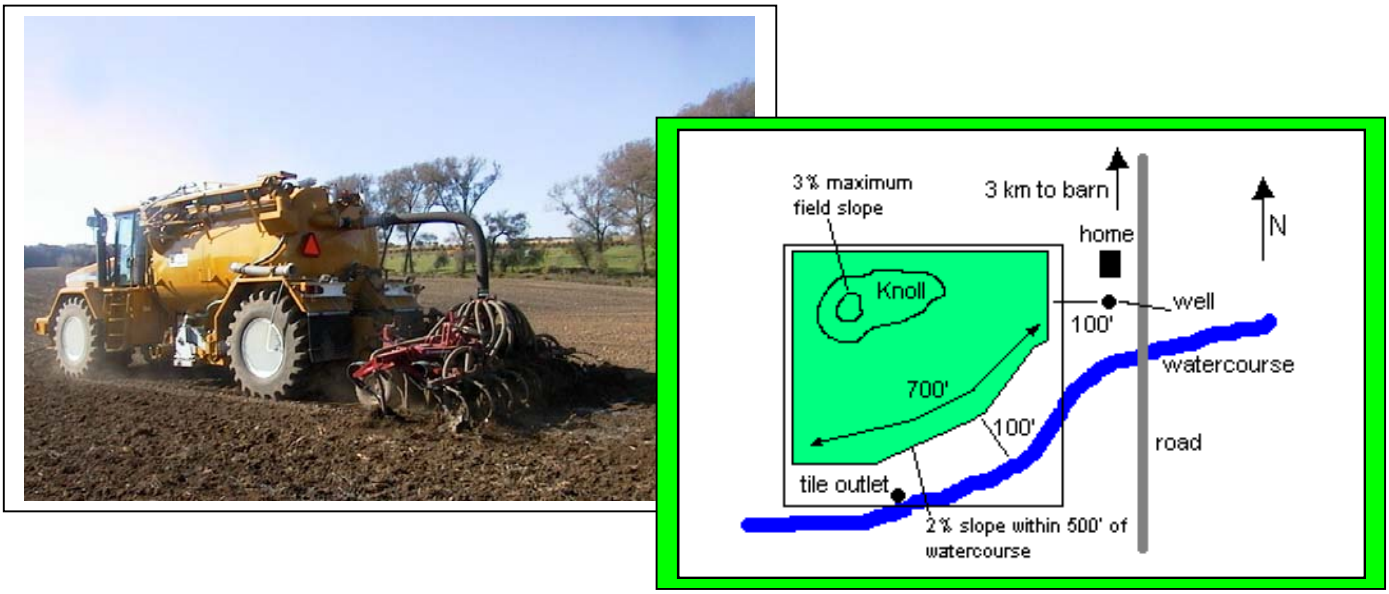
Nutrient Management Workbook



Farm Name _____

Prepared by _____

Cropping Year _____ **Date** _____

This workbook provides a hand method for preparing nutrient management plans and strategies for agricultural source materials. This workbook matches the process used in OMAF's Nutrient Management Software (NMAN, December, 2003)

Replaces Nutrient Management Workbook 98-027

Part 1 Nutrient Management Strategy
Farmstead Information and Nutrient Analysis

Name			
Legal Farm Name		Roll Number	
Address			
City/Town	Province	Postal Code	
County/Region	Municipality	Lot	Concession
Telephone	Fax	Cell	
Email			
Manure/Nutrient Receiver ❑ Yes ❑ No		Status ❑ Owned ❑ Rented or Leased ❑ Application Agreement	

Manure / Prescribed Material Source Summary – Type 1

Name	*Source*	*Type*	*Amount*	*Destination*	
	☐ This farm unit ☐ Another farm unit ☐ Non-farm source		Gallons tons	This Farm Unit Transferred	_____% _____%
Analysis	% N _____ NH_4-N _____ppm (or %) (or NO_3-N)		% P _____ % K _____	% Dry Matter	

Manure / Prescribed Material Source Summary – Type 2

Name	*Source*	*Type*	*Amount*	*Destination*	
	☐ This farm unit ☐ Another farm unit ☐ Non-farm source		Gallons tons	This Farm Unit Transferred	_____% _____%
Analysis	% N _____ NH_4-N _____ppm (or %) (or NO_3-N)		% P _____ % K _____	% Dry Matter	

Manure / Prescribed Material Source Summary – Type 3

Name	*Source*	*Type*	*Amount*	*Destination*	
	☐ This farm unit ☐ Another farm unit ☐ Non-farm source		Gallons tons	This Farm Unit Transferred	_____% _____%
Analysis	% N _____ NH_4-N _____ppm (or %) (or NO_3-N)		% P _____ % K _____	% Dry Matter	

Manure/Prescribed Material Destination Summary other than this Farm Unit

Type of Prescribed Materials	Annual Amount	Name of Destination (ie. Farm)	Location of Destination	Description of Transfer
				☐ Intermediate Operation (Nutrient Transfer Agreement) ☐ Broker (Broker Agreement) ☐ Another Farm Unit or Operation (Nutrient Transfer Agreement) ☐ Another Farm Unit (no NMP or NMS required O.Reg.267/03)
				☐ Intermediate Operation (Nutrient Transfer Agreement) ☐ Broker (Broker Agreement) ☐ Another Farm Unit or Operation (Nutrient Transfer Agreement) ☐ Another Farm Unit (no NMP or NMS required O.Reg.267/03)

Attach extra sheets if there are more types or destinations of manure/prescribed materials

Nutrient Application Summary **(for Manure/Prescribed Material transferred to a farm not required to have a Nutrient Management Plan or Strategy under O. Reg. 267/023)**

Farm/Field	Date	Type	Useable Acres	Crop	Amount Applied

Note: This Nutrient Application Summary will be completed only for transfers to other farms, not required to have a NMS or NMP under O. Reg. 267/03. Nutrient Application Summary for fields in this Farm Unit in contained in Part 2: Nutrient Management Plan.

Note: In this document, **NMA** refers to the **Nutrient Management Act.** The **NMA** and **O.Reg.267/03** (the general regulation under the NMA) can be found on the OMAF website or at www.e-laws.gov.on.ca

Comments

List of Required Appendices

Appendix	Title	Attached	Not Applicable
A	**Sign-Off Form** See Nutrient Management Protocol, Part 15 for the Form		
B	**Farm Unit Declaration** See the Nutrient Management Protocol, Part 15 for the Form		
C	**Description of Operation** Describe the general operation for which the strategy / plan is being developed, as well as the size of the operation. If a new barn is involved the description should include details on the size, type of barn and associated manure storage.		
D	**Application Agreement** An application agreement allows a farm to be brought into a farm unit. See the Nutrient Management Protocol, Part 15 for the Form.		
E	**Farm Unit Sketch** Attach a sketch showing the location and boundaries of the farm unit. Include road names, municipal boundaries, neighbours and other local features. Show the location and dimensions of the farm livestock/ poultry buildings and nutrient storage facilities and the distance between these facilities and lot lines. Show the location of known used and unused wells, tile inlets and outlets, and surface water and other non-agricultural land uses within the farm unit and outside the farm unit within regulated distances as outlined in O. Reg 267/03.		
F	**MDS Information** Include MDS calculations if a new or expanded livestock barn or manure storage is part of this strategy. This is not a required component of a Nutrient Management Plan or Strategy under O. Reg. 267/03 but may be required in some municipalities.		
G	**Manure / Prescribed Material Storage and Volume** Include information to show livestock numbers, manure / prescribed material storage size, days of storage and annual manure / prescribed material volume (ie MSTOR printout). For each storage facility include the dimensions, capacity and type (ie circular).		
H	**Manure / Prescribed Material Transfers** A Nutrient Transfer Agreement or Broker Agreement accounts for nutrients transferred into or out of the Farm Unit as outlined in O. Reg. 267/03.		
J	**Contingency Plan** A contingency is an event (ie. an emergency) that may happen, but is not certain to occur. A contingency plan is a document that explains what would be done in the event that the NMS or NMP cannot be followed. For example, the storage capacity that the NMS has planned to be available may get filled with a heavy rain event before the planned application of manure. The most traditional contingency event, that everyone must be prepared for is a spill (an unanticipated release of nutrients). Another contingency is that the field intended for application is unavailable. A contingency plan is prepared along with NMS or NMP so that it is ready to be implemented on short notice. Key people in every operation should be familiar with the contingency plan and how to implement it.		
L	**Feed Additive Documentation** Include feed additive documentation for the manure / prescribed material where nitrogen and/or phosphorus are adjusted from conventional values.		
M	**Manure Test Results** Include analysis results from manure / prescribed material samples.		

Nutrient Management Workbook Summary (METRIC VERSION)

This summary represents 1 field – A summary must be completed for each field in the plan.

Refer to the sections with the corresponding letters for more detailed instructions and calculations

A

Field Information

Field No._____ Field ID_____
Crop Type_____ Average Yield_____
Tillable Acres_____ Previous Crop_____
Tile Drained: Systematic ❑
Random ❑
Maximum Slope _____ (within 150 m of watersource. If unknown, use 7%.)

Soil Series _____
Soil Texture _____
Hydrologic Soil Group (Table 17)_____
Soil Test: Sodium Bicarbonate P_____ mg/L
Ammonium Acetate K _____ mg/L
Watercourse within 150 m? ❑yes ❑ no
❑ in field ❑ adjacent field

B

Planned Application Rate _____L/ha or tonne/ha
_____L/ha or tonne/ha

Maximum Allowable Application Rate _____L/ha or tonnes/ha
(From Section S)

C

Manure Nutrient and Application Information

Description_____

Nutrient Values	(1st)	(2nd Application)
Nitrogen	_____	_____kg/1000/ L or kg/tonne
P205	_____	_____kg1000/ L or kg/tonne
K20	_____	_____kg/1000/ L or kg/tonne

"This Year's Manure" (Line G) is calculated as *Nutrient Value* multiplied by *Planned Application Rate*

Time of Application
- ❑ Late Summer
- ❑ Early Fall
- ❑ Late Fall
- ❑ Spring pre plant
- ❑ Spring Side dress

Time to Incorporation
- ❑ 1 day
- ❑ 3 days
- ❑ 5 days
- ❑ not incorporated
- ❑ injected

Agronomic Nutrient Balance

		(kg/ha) N	$P_2 0_5$	$K_2 0$
D	Fertilizer (Total Nutrients from all Applications)	+_____	+_____	+_____
E	Previous Crop	+_____		
F	Previous Manure	+_____		
G	This Year's Manure	+_____	+_____	+_____
H	Production Requirements	-_____	-_____	-_____
I	Agronomic Nutrient Balance	_____ *	_____ *	_____

⚠ * Where Agronomic Nutrient Balance exceeds 17 kg/ha (15 lb/ac), Crop Removal Balance must be completed.

Crop Removal Balance

		(kg/ha) N	$P_2 0_5$	$K_2 0$
J	Field Inputs (Line D+E+F)	+_____	+_____	+_____
K	This Year's Manure	+_____	+_____	+_____
L	Crop Removal	- _____	- _____	- _____
M	**Crop Removal Balance**	_____ *	_____	_____
N	N Available for Potential Loss	_____		

⚠ * Where Crop Removal Balance exceeds 17 kg/ha, Nitrogen Index must be completed. (Section O)

O

Nitrogen Index

N-Index Value _____ (sum of) Value A_1 (previous crop)_____ + Value B _____

Maximum N-Index Value =_____
(Determine from Table 14 in Section O)

Value A_2 (current crop) _____
⚠ a high value A2 could be limiting to fall manure application in next year's plan

P

Phosphorus Index

a) _____ + b) _____ + c) _____ + d) _____ + e) _____ = _____

Q

Minimum Separation Distance from Surface Water _____ (Greatest of Table 15 or 16 in Section Q)

R

Useable Hectares _____ Tillable hectares – [(Setback distances length x width) / 10,000 m^2]

In this workbook "Manure" includes any agricultural source material other than commercial fertilizer.

Nutrient Management Workbook Summary (IMPERIAL VERSION)

The requirements provided in O. Reg. 267/03 are in metric units. Imperial units appear in the Imperial version of the Workbook summary and in brackets throughout this document. Values in imperial units are provided for information purposes only and provide a conservative conversion of the metric measurement.

Refer to the sections with the corresponding letters for more detailed instructions and calculations

A

Field Information

Field No._____ Field ID_____
Crop Type_____ Average Yield_____
Tillable Acres_____ Previous Crop_____
Tile Drained: Systematic ❑
Random ❑
Maximum Slope _____ (Within 492 ft of watersource. If unknown, use 7%)

Soil Series _____
Soil Texture _____
Hydrologic Soil Group (Table 17)_____
Soil Test: Sodium Bicarbonate P_____ mg/L
Ammonium Acetate K _____ mg/L
Watercourse within 492 ft? ❑yes ❑ no
❑ in field ❑ adjacent field

B

Planned Application Rate _____gal/ac or ton/ac
_____gal/ac or ton/ac

Maximum Allowable Application Rate _____gal/ac or ton/ac
(From Section S)

C

Manure Nutrient and Application Information

Description_____

Nutrient Values	(1st)	(2nd Application)
Nitrogen	_____	_____lbs/1000 gal or lb/tons
P205	_____	_____lbs/1000 gal or lb/tons
K20	_____	_____lbs/1000 gal or lb/tons

"This Year's Manure" (Line G) is calculated as *Nutrient Value* multiplied by *Planned Application Rate*

Time of Application
- ❑ Late Summer
- ❑ Early Fall
- ❑ Late Fall
- ❑ Spring pre plant
- ❑ Spring Side dress

Time to Incorporation
- ❑ 1 day
- ❑ 3 days
- ❑ 5 days
- ❑ not incorporated
- ❑ injected

Agronomic Nutrient Balance

(lb/acre)

		N	P_2O_5	K_2O
D	Fertilizer (Total Nutrients from all Applications)	+_____	+_____	+_____
E	Previous Crop	+_____		
F	Previous Manure	+_____		
G	This Year's Manure	+_____	+_____	+_____
H	Production Requirements	-_____	-_____	-_____
I	Agronomic Nutrient Balance	_____ *	_____ *	_____

⚠ * Where Agronomic Nutrient Balance exceeds 15 lb/ac, Crop Removal Balance must be completed.

Crop Removal Balance

(lb/acre)

		N	P_2O_5	K_2O
J	Field Inputs (Line D+E+F)	+_____	+_____	+_____
K	This Year's Manure	+_____	+_____	+_____
L	Crop Removal	- _____	- _____	- _____
M	**Crop Removal Balance**	_____ *	_____	_____
N	N Available for Potential Loss	_____		

⚠ * Where Crop Removal Balance exceeds 15 lb/ac, Nitrogen Index must be completed. (Section O)

O

Nitrogen Index

N-Index Value _____ (sum of) Value A_1 (previous crop)_____ + Value B _____

Maximum N-Index Value =_____
(Determine from Table 14 in Section O)

Value A_2 (current crop) _____

⚠ a high value A2 could be limiting to fall manure application in next year's plan

P

Phosphorus Index

a) _____ + b) _____ + c) _____ + d) _____ + e) _____ = _____

Q

Minimum Separation Distance from Surface Water _____ (Greatest of Table 15 or 16 in Section Q)

R

Useable Acres _____ Tillable acres – [(Setback distances length x width) ÷43,560 ft^2]

In this workbook "Manure" includes any agricultural source material other than commercial fertilizer.

Part 2 Nutrient Management Plan

Farmstead Information

(If Farmstead Information was already recorded in Part 1 Nutrient Management Strategy and the Nutrient Management Strategy and the Nutrient Management Plan are submitted together it is not necessary to repeat the information here.)

Name			
Legal Farm Name		Roll Number	
Address			
City/Town	Province	Postal Code	
County/Region	Municipality	Lot	Concession
Telephone	Fax	Cell	
Email			
Manure/Nutrient Generator ❑ Yes ❑ No	Manure/Nutrient Receiver ❑ Yes ❑ No	Status ❑ Owned ❑ Rented or Leased ❑ Application Agreement	

Manure / Prescribed Material for Application – Type 1

Source	Type	Amount	Date received (if applicable)	Operation Identifier of source (if received from an operation with an identifier number assigned by Ministry)
		Gallons tons		
Analysis	% N _____ NH_4-N _____ppm (or NO_3-N)	% P _____ % K _____		% Dry Matter

(If nutrient analysis information was already recorded in Part 1 Nutrient Management Strategy, it is not necessary to repeat the information here.)

Manure / Prescribed Material for Application – Type 2

Source	Type	Amount	Date received (if applicable)	Operation Identifier of source (if received from an operation with an identifier number assigned by Ministry)
		Gallons tons		
Analysis	% N _____ NH_4-N _____ppm (or NO_3-N)	% P _____ % K _____		% Dry Matter

Attach extra sheet if there are more types of manure / prescribed materials for application

Nutrient Application Summary (Complete this table following completion of Sections A to R)

Liquid

Field	Date	Type and Source of Nutrients	Application Method	Incorporation Method / Date	Application Frequency	Application Rate	Amount Applied
						Total Liquids Applied	

Solid

Field	Date	Type and Source of Nutrients	Application Method	Incorporation Method / Date	Application Frequency	Application Rate	Amount Applied
						Total Solids Applied	

If manure is only applied once every 2 or 3 years to some fields, additional landbase is required.

Additional Landbase

Field Name or Number	Identification (ie Location)	Size (ac)
	Total Additional Landbase	

Comments

The following documentation must accompany the Nutrient Management Plan.

List of Required Appendices

Appendix	Title	Attached	Not Applicable
A	**Sign-Off Form** [1] See Nutrient Management Protocol Part 15 for the Form		
C	**Description of Operation** [1] Describe the general operation for which the strategy / plan is being developed, as well as the size of the operation and the prescribed material being produced or received. See OMAF NMAN website for example descriptions.		
E	**Farm Unit Sketch**[1]**/ Field Sketch** Attach a farm unit sketch showing the location and boundaries of the farm unit. Include road names, municipal boundaries, neighbours and other local features. Include a sketch for each field in the farm unit identifying the location of all surface water, wells and non-agricultural land uses within proximity of the field. Show the separation distances to surface water and wells to meet the requirements of O.Reg. 267/03. Identify the minimum depth to saturated soil conditions, the presence of tile drains, field boundaries and Field Identifier from the Farm Unit Declaration form.		
I	**Soil Test Results** Include soil test results for all fields identified in the plan. In accordance with section 91 of O.Reg. 267/03 if this is the first NMP for the operation a soil test for available phosphorus, available potassium and soil pH may be provided or default values may be used. If this is a subsequent NMP, soil test values for the available phosphorus, available potassium and soil pH must be provided. Each soil test should be taken in accordance with the Sampling and Analysis Protocol and should not cover more than 10 hectares (25 acres) unless there is evidence that the nutrient content of the field and the management of the field is uniform.		
H	**Manure / Prescribed Material Transfers** A Nutrient Transfer Agreement or Broker Agreement accounts for nutrients transferred into or out of the Farm Unit as outlined in O. Reg. 267/03.		
J	**Contingency Plan**[1] A contingency is an event (ie. an emergency) that may happen, but is not certain to occur. A contingency plan is a document that explains what would be done in the event that the NMS or NMP cannot be followed. For example, the storage capacity that the NMS has planned to be available, may get filled with a heavy rain event before the planned application of manure. The most traditional contingency event, that everyone must be prepared for is a spill (an unanticipated release of nutrients). Another contingency is that the field intended for application is unavailable. A contingency plan is prepared along with NMS or NMP so that it is ready to be implemented on short notice. Key people in every operation should be familiar with the contingency plan and how to implement it.		
M	**Manure Test Results** [1] Include analysis results from manure / prescribed material samples.		
K	**Crop Yield Documentation** Include documentation (ie. crop insurance records) to support yields for fields where the estimated crop yields exceed the township (municipality) average by 120%. Include documentation to support yields for fields with continuous crops where the estimated yield exceeds township (municipality) averages.		
N	**Winter Application Documentation** You have indicated that manure /prescribed materials are being spread between Dec 1 and Mar 31. Different practices may be required for these applications. The requirements for winter application under O. Reg. 267/03 are outlined in Part VI of the regulation. Please indicate how you are meeting these requirements.		

[1] Not required if the appendix has been included with the Nutrient Management Strategy – Part 1 of the Workbook

Guide to Completing the Workbook – Sections A to S

The workbook is a tool that simulates the NMAN software.

This workbook is organized in sections, from A to S, with each line of the Worksheet corresponding to the detailed descriptions found here help you develop the required information.

Section A – Field Information

Crop Year: Refers to the time between harvest of one crop to harvest of the next crop. For example, from completion of winter wheat harvest until the harvest of the following corn crop would represent one crop year. For perennial crops such as forages, strawberries, etc., the break between crop years is the beginning of dormancy in the fall.

⚠ Attach soil test results. Plans required under Nutrient Management Act must attach soil test results. For other plans where soil test results are not available, use default values: 101 mg/L for P and 251 mg/L for K.

Section B – Manure Application Information

Enter the description, time of application, and incorporation details for the manure applied between December 1 and March 31. See *Nutrient Management Act* for restrictions or requirements. Estimate a manure application rate. For liquid manure, make sure that the rate does not exceed the maximum allowable application rate specified in Section S. To determine the maximum allowable rate per application, find your Runoff Potential in Table 1. Then, using the Runoff Potential Factor, find the maximum allowable liquid loading rate in Table 2. You may consider several separate applications to allow higher rates (provided nutrient levels are acceptable and there is only a single application within 24 hours). **For solid manure, or liquid manure application on slopes less than 3%, it is not necessary to evaluate the maximum application rate for runoff concerns.**

Slope determination is required when within 150 m (493 ft) from surface water. Where a measured slope is not available, a default slope value of 7% is used in the NMAN Software.

Table 1: **Runoff Potential**

Hydrologic Soil Group (Drainage Class)	Maximum Field Slope within 150 m of surface water			
	< 3%	3 – <6 %	6 – <9 %	9 – 12 %
A (Rapid)	Very Low	Very Low	Low	High
B (Moderate)	Very Low	Low	Moderate	High
C (Slow)	Low	Moderate	High	No Application
D (Very Slow)	Moderate	High	High	No Application

Hydrologic Soil Groups corresponding to the various soil series names found in Ontario are listed in Table 17. Group A is often associated with sand, Group B with loam, Group C with clay loam and Group D with clay soil textures.

Table 2: **Maximum Application Rate**

Runoff Potential	Surface Applied m^3/ha	(gal/ac)	Incorporated or Pretilled m^3/ha	(gal/ac)
High	**50**	(4450)	**75**	(6700)
Moderate	**75**	(6700)	**100**	(8900)
Low	**100**	(8900)	**130**	(11600)
Very Low	**130**	(11600)	**150**	(13400)

STOP The Application rate must not exceed the numbers in Table 2

Note: $1m^3$ = 1000 L

Example:
A farmer planned an application rate of 3000 gal/ac, surface applied. For the clay loam soil (hydrologic soil group C-slow) on a 4% slope, the runoff potential is moderate. The selected rate is less than the maximum allowable loading rate of 6700 gal/ac.

Section C – Manure Nutrient Information

Calculate the **available** P_20_5 and K_20. (Some labs may already have done these calculations). If a manure analysis is not available, use the values in Table 3. The Nutrient Management Act requires manure nutrient testing.

The following conversions may be required:

Convert		To		Metric	Convert		To		Imperial
%	→	kg/1000 L	multiply by	10	%	→	lbs per 1000 gallons	multiply by	100
%	→	kg/tonne	multiply by	10	%	→	lbs per ton	multiply by	20
mg/L	→	%	divide by	10,000	ppm	→	%	divide by	10,000

Available P_2O_5:

Percent P _____ X 0.92 = _____ % available P_2O_5 (From Table 3 or Lab Analysis) | x 10 = _____ kg/1000 L _____ kg/tonne | OR x 100 = _____ lb/1000 gal OR X 20 = _____ lb/ton

Available K_20:

Percent K _____ X 1.08 = _____ % available K_20 (From Table 3 or Lab Analysis) | x 10 = _____ kg/1000 L _____ kg/tonne | OR x 100 = _____ lb/1000 gal OR X 20 = _____ lb/ton

Example:

A farmer took a liquid hog manure sample, which came back with the analysis of 0.3% N, 0.1% P, 0.2% K, and 1000 ppm. NH_4-N (0.1%). He will incorporate the manure within 3 days.

N	Availability depends on additional factors. See Method 1 or 2 below
P_2O_5	0.1 x 0.92 = 0.092% = 9.2 lb/1000 gal
K_2O	0.2 x 1.08 = 0.216% = 21.6 lb/1000 gal

Use Method 1 or 2 to calculate available nitrogen. Method 1 should be used where there is no manure analysis available and where manure is "Late Summer" or "Fall" applied (with Lab Analysis). Method 2 should be used for "Spring, Pre-plant or Side-dress" applied manure with Lab analysis.

Method 1: Available Nitrogen (For Fall Applied Manure and/or Using Nutrient Averages)

Where manure is being fall applied, use the total percent nitrogen from the analysis and determine available N (using Table 4). Where a manure analysis is not available, use the numbers in the typical analysis chart (Table 3).

Available N:

% Total N (Table 3 or Lab Analysis) x Available N (Table 4) = _____ x _____ = _____% | x 10 = _____ kg/1000 L _____ kg/tonne | OR x 100 = _____ lb/1000 gal OR x 20 = _____ lb/ton

Table 3: **Typical Manure Analysis by Livestock Type**

Type of Manure	% Dry Matter	% Total Nitrogen	% Organic N[3]	% P	% K
Liquid Manure					
Beef [2]	6.0	0.28	0.13	0.08	0.18
Dairy (outside storage)[2]	6.0	0.30	0.14	0.07	0.23
Dairy (under barn storage)[1]	8.0	0.41	0.20	0.09	0.29
Dairy heifers	11.0	0.55	0.30	0.13	0.32
Poultry layers	10.0	0.74	0.22	0.26	0.30
Swine – sows / weaners	3.0	0.35	0.11	0.10	0.15
Swine – finishers	5.0	0.49	0.19	0.16	0.20
Swine finishers –wet/dry feeders	6.5	0.58	0.23	0.20	0.24
Liquid Runoff	1.0	0.10	0.04	0.02	0.12
Liquid Biosolids – anaerobic	4.4	0.28	0.19	0.14	0
Milk-fed Veal	1.5	0.08	0.24	0.02	0.18
Solid Manure					
Beef	25.0	0.72	0.64	0.25	0.59
Dairy	20.0	0.55	0.42	0.16	0.47
Poultry – layers	20.0	1.15	0.51	0.51	0.43
Poultry – broilers	> 50.0	2.73	2.30	1.30	1.45
Sheep	30.0	1.06	0.61	0.59	0.70
Horses	50.0	0.32	0.28	0.26	0.61

Source: NMAN Databank

[1] assumes milkhouse wastes are stored with manure
[2] includes some yard runoff
[3] Ammonium Nitrogen (%) can be calculated by subtracting Organic N from Total N.

Table 4: **Available Nitrogen** (as a Proportion of Total Nitrogen[2])

Application Time	**Incorporated** (<24 hours)					**Not Incorporated**[3]					
	Late Summer	Early Fall	Late Fall	Pre[1] Plant	Side-dress[1]	Late Summer	Early Fall	Late Fall	Pre-plant[1]		Side-dress[1]
									Bare Soil	Residue	
Urea (commercial N)	.10	.20	.50	.95	1.00	---	.10	.40	.85	.75	.85
Solid Cattle/Sheep	.27	.26	.30	.34	.34	.26	.24	.24	.23	.27	.26
Solid Swine	.34	.34	.34	.38	.36	.34	.32	.28	.27	.30	.33
Solid Poultry – Layers	.28	.35	.45	.52	.65	.25	.30	.35	.32	.40	.48
Solid Poultry – Pullets	.33	.37	.39	.43	.48	.31	.34	.33	.31	.36	.41
Solid Poultry – Broilers	.36	.39	.35	.38	.37	.35	.37	.32	.31	.33	.36
Liquid Cattle	.29	.36	.41	.44	.54	.27	.31	.32	.26	.34	.41
Liquid Swine	.23	.33	.48	.56	.70	.20	.27	.35	.29	.40	.50
Liquid Poultry	.26	.33	.51	.62	.78	.22	.26	.39	.33	.44	.55
Liquid Biosolids	.33	.37	.42	.43	.48	.32	.34	.36	.31	.36	.40

Source: Adapted from Barry, Beauchamp et. al., U of Guelph 2000

[1] assumes a spring planted crop; Side-dress refers to application to a growing crop

[2] accounts for ammonia loss to atmosphere and mineralization of organic N

[3] for manure incorporated within 3 days (incorporated value + non incorporated value) / 2

Late Summer = up to Sept 20, **Early Fall** = Sept 21 to Nov 9, **Late Fall** = Nov 10 to Winter

The NMAN software uses a more detailed method of determining available nitrogen. For different incorporation periods, NMAN will provide more precise estimates of available nitrogen.

⚠ Where a cover crop (ie clover, rye, oats or barley) is utilized, and manure is applied in late summer or fall, use the "Late Fall" column in Table 4 to determine the Available Nitrogen for the next crop.

⚠ Where manure is applied in late summer or early fall (following the harvest of a crop), on a soil in the Hydrologic Group AA, or A or in late summer on a soil in the B Hydrologic Group, without a cover crop, the Nitrogen Index (Section O) must be completed.

Example:

A farmer has liquid hog manure from a finishing barn. He does not have wet/dry feeders. He plans to apply the manure in late April and plans to incorporate his manure within 24 hours. Since a manure test is not available he uses a typical analysis from Table 3 and using Table 4, calculates the available N, P_20_5 and K_20. He finds his manure to have the following nutrients available for the next growing season.

Available N: .49 % (Manure Analysis, Table 3) x .56 (Available N factor) x 100 = **27.4** lb/1000 gal

Method 2: Available Nitrogen for Spring Applied Manure Using Results from a Lab Analysis

This method gives a more accurate estimate of available Ammonium-N and Organic-N from spring, pre-plant or in-crop applications of manure where an analysis is available. Determine the proportion of available organic and retained ammonium-N using Tables 5 and 6 respectively.

Available Nitrogen Using Available Organic and Ammonium-N portions **(Using Lab Analysis Results):**

[(percent N – percent NH4-N) x Available Organic N (Table 5)] + [(percent NH4-N x Retained Ammonium (Table 6))]

[(_____ - _____) x _____] + (_____ x _____) = _____ x 10 = _____ kg/1000 L

= _____ x 10 = _____ kg/tonne

= _____ x 100 = _____ lb/1000 gal

= _____ x 20 = _____ lb/ton

Table 5: **AVAILABLE ORGANIC-N**

Liquid		Liquid & Solid	Solid				
Poultry	All Other	Biosolids	Poultry	Swine	< 50% DM	> 50 % DM*	Compost
0.3	**0.2**	**0.3**	**0.3**	**0.25**	**0.15**	**0.05**	**0.3**

* DM = dry matter

Table 6: **RETAINED AMMONIUM-N**

Incorporation Details	Injected	Incorporated			Not Incorporated		
		1 day	3 days	5 days	Bare Soil	Residue	Standing Crop
Retention Factor	**1.00**	**0.75**	**0.65**	**0.55**	**0.34**	**0.50**	**0.66**

Example:

A farmer took a liquid hog manure sample, which came back with the analysis of 0.3% N, 0.1% P, 0.2% K, and 1000 ppm NH4-N (0.1%). He will incorporate the manure within 3 days.

Available N: (0.3 – 0.1) x 0.2 (available Organic N)+ 0.1 x 0.65 (retained ammonium) = 0.105% x 100 = 10.5 lb/1000 gal

AGRONOMIC NUTRIENT BALANCE (Section D to Section I)

Section D - Commercial Fertilizer

Calculate the commercial fertilizer application for N, P_2O_5, and K_2O from all applications during the crop year. Use one of the examples for dry or liquid fertilizer below, to help with calculations.

Application Date	Product	Incorporation Method	Rate	Actual (kg/ha or lb/ac)		
				N	P_2O_5	K_2O
			Total			

Example – Dry Fertilizer

Dry fertilizer with a blend of 8-32-16 is applied at 100 lb/ac. This fertilizer contains 8% N, 32% P_2O_5, and 16% K_2O.

N 100 lb/ac x 8 % = 8 lb/ac

P_2O_5 100 lb/ac x 32% = 32 lb/ac

K_2O 100 lb/ac x 16 % = 16 lb/ac

Example – Liquid Fertilizer

Liquid fertilizer with a blend of 6-18-6 and a density of 12.8 lb/gal is applied at 4 gal/ac.

The fertilizer contains 6% N, 18% P_2O_5 and 6% K_2O. The application rate is 4 gal/ac x 12.8 lb/gal = 51.2 lb/ac.

N 51.2 lb/ac x 6 % = 3.1 lb/ac

P_2O_5 51.2 lb/ac x 18% = 9.2 lb/ac

K_2O 51.2 lb/ac x 6 % = 3.1 lb/ac

Section E – Previous Crop Nitrogen

Use the following chart to determine the reduction in nitrogen requirement for this year's crop.

Table 7: **Nitrogen Contribution From Previous Crop**

Crop	**N (kg/ha)**	**N (lb/ac)**
Established Forage –< 1/3 legumes	0	0
Established Forage – 1/3 to 1/2 legumes	56	50
Established Forage –> 1/2 legumes	112	100
Perennial Legumes plowed in Seeding Year	45	40
Corn following Soybeans (< 2800 chu)	34	30
Corn following Soybeans (> 2800 chu)	17	15
Corn following Silage Corn (< 2800 chu)	11	10
Corn following Cereals – straw removed (< 2800 chu)	11	10
Other crops	0	0

Source: OMAF Publication 811 – Agronomy Guide for Field Crops

Example:

A corn field that receives 2900 crop heat units (chu) was planted to soybeans last year. Using Table 7, the N contribution for this year's crop is 15 lb/ac.

Section F – Previous Manure Nitrogen

Calculate the amount of nitrogen from previously applied manure that is available to this year's crop. Then total the result for each for the past three years and place the number on Line F on the Workbook Field Summary.

If a representative manure test is available, use the following formula to determine the organic N content of the manure. (To convert % to kg/1000 L or kg/tonne multiply by 10. To convert % to lb/1000 gal, multiply by 100; % to lb/ton, multiply by 20)
If a manure test is not available, use Table 3 in Section "C".

(Metric)	% organic N _____ x 10 = _____kg/1000 L (÷ 1000 = _____ kg/L)
% Total N - % NH_4-N = % Organic N	% organic N _____ x 10 = _____kg/tonne

Year of manure application	Manure Type Applied	Rate Applied		Organic N (kg/L or kg/tonne)		Portion of Organic N available to crop		
Last year		X		x		0.10	=	kg/ha
2 years ago		X		x		0.05	=	kg/ha
3 years ago		X		x		0.02	=	kg/ha
						Total	=	kg/ha

(Imperial)	% organic N _____ x 100 = _____lb/1000 gal (÷ 1000 = lb/gal)
% Total N - % NH_4-N = % Organic N	% organic N _____ x 20 = _____lb/ton

Year of manure application	Manure Type Applied	Rate Applied		Organic N (lb/gal or lbs/ton)		Portion of organic N available to crop		
Last year		X		x		0.10	=	lb/ac
2 years ago		X		x		0.05	=	lb/ac
3 years ago		X		x		0.02	=	lb/ac
						Total	=	lb/ac

Example:
Last year liquid swine manure was applied to this field at 5000 gal/ac and three years ago at 7000 gal/ac. The manure, when tested, had an organic N content of 0.19% (19 lbs/1000 gal or 0.0190 lb/gal).

Last year:	5000 gal/ac	X	0.0190 lb/gal	X	0.10	= 9.5
Two years ago:	none					= 0
Three years ago:	7000 gal/ac	X	0.0190 lb/gal	X	0.02	= 2.5

= 12 lb/ac available N (Line F)

Section G – This Year's Manure

The available nutrients from this year's manure application are calculated by multiplying the application rate by the available nutrients per thousand gallons or per ton (as determined in section C). Add the available nutrients together from each application if manure is applied more than once.

Example:
Manure is applied at a rate of 3000 gal/ac with nutrient values of 26.3 lbs/1000 gal N, 21.2 lb/1000 gal P_20_5 and 26.0 lb/1000 gal K_20. The manure nutrients applied to the field are:

N:	26.3	divided by 1000 =	0.0263	lb/gal	x	3000	gal/ac =	79 lb/ac
P_20_5:	21.2	divided by 1000 =	0.0212	lb/gal	x	3000	gal/ac =	64 lb/ac
K_20:	26.0	divided by 1000 =	0.0260	lb/gal	x	3000	gal/ac =	78 lb/ac

Section H – Ontario Crop Production Requirements

Using soil test results, obtain production requirements from OMAF Publication 811, 360 or 363. Recommendations for some common field crops are displayed in the tables below. If a soil test is unavailable, assume that the P test is 101 mg/L, and the K test is 251 mg/L and use. a zero recommendation for phosphorus and/or potash. O. Reg 267/03 requires soil samples for all but initial required regulated NMP.

Table 8: **P_2O_5 and K_2O Recommendations (Metric)**

Soil Test	P_2O_5 Recommendations (kg/ha)					Soil Test	K_2O Recommendations (kg/ha)				
(mg/L)	Corn	Beans	Wheat	Canola	Alfalfa	(mg/L)	Corn	Beans	Wheat	Canola	Alfalfa
0 - 3	110	81	71	71	180	0 - 15	170	121	50	71	480
4 - 5	100	61	61	61	120	16 - 30	160	111	40	50	400
6 - 7	90	50	50	50	90	31 - 45	140	91	30	40	319
8 - 9	69	40	30	30	61	46 - 60	110	81	20	30	270
10 - 12	50	30	20	20	30	61 - 80	80	61	20	20	200
13 - 15	20	20	20	20	20	81 - 100	50	40	20	20	130
16 - 20	20	0	20	0	0	101 - 120	30	30	20	0	69
21 - 25	20	0	0	0	0	121 - 150	0	0	0	0	20
26 - 30	20	0	0	0	0	> 151	0	0	0	0	0
> 31	0	0	0	0	0	Source: OMAF Publication 811 Agronomy Guide for Field Crops					

Table 8: **P_2O_5 and K_2O Recommendations (Imperial)**

Soil Test (ppm)	P_2O_5 Recommendations (lb/ac)					Soil Test (ppm)	K_2O Recommendations(lb/ac)				
	Corn	Beans	Wheat	Canola	Alfalfa		Corn	Beans	Wheat	Canola	Alfalfa
0 - 3	98	72	63	63	161	0 - 15	152	108	45	63	428
4 - 5	89	54	54	54	107	16 - 30	143	99	36	45	357
6 - 7	80	45	45	45	80	31 - 45	125	81	27	36	285
8 - 9	62	36	27	27	54	46 - 60	98	72	18	27	241
10 - 12	45	27	18	18	27	61 - 80	71	54	18	18	178
13 - 15	18	18	18	18	18	81 - 100	45	36	18	18	116
16 - 20	18	0	18	0	0	101 - 120	27	27	18	0	62
21 - 25	18	0	0	0	0	121 - 150	0	0	0	0	18
26 - 30	18	0	0	0	0	> 151	0	0	0	0	0
> 31	0	0	0	0	0	Source: OMAF Publication 811 Agronomy Guide for Field Crops					

Table 9: **Nitrogen Recommendations For Common Field Crops** Metric **(** Imperial)

Nitrogen Recommendations – Corn

Expected Yield **tonne/ha** (bu/ac)	**6** (100)	**8** (130)	**9** (150)	**10** (160)	**11** (175)
Location	Nitrogen Recommendations kg/ha (lb/ac)				
Eastern Ontario	**95** (85)	**135** (120)	**168** (150)	**179** (160)	**202** (180)
Western/Central (<2700 chu)	**106** (95)	**123** (110)	**135** (120)	**135** (120)	**140** (125)
Midwestern Ontario (2700-2900 chu)	**140** (125)	**157** (140)	**168** (150)	**168** (150)	**179** (160)
Southwestern Ontario (> 2900 chu)	**168** (150)	**185** (165)	**196** (175)	**202** (180)	**213** (190)

For sidedress applications in SW Ontario reduce N recommendations by 15%

Nitrogen Recommendations – Cereals and Canola

Expected Yield **tonnes/ha** (bu/ac)	Nitrogen Recommendations kg/ha (lb/ac)			
	2.4 (35)	**4.0** (60)	**4.7** (70)	**5.4** (80)
Winter Wheat (soft white/red)	---	**84** (75)	**95** (85)	**112** (100)
Winter Wheat (hard red)	---	**123** (110)	**135** (120)	**151** (135)
Spring Wheat, Barley (< 2600 chu)	**71** (63)	**71** (63)	**71** (63)	**71** (63)
Barley, Mixed Grain (> 2600 chu)	**45** (40)	**45** (40)	**45** (40)	**45** (40)
Winter Barley, Winter Rye*	**91** (81)	**91** (81)	**91** (81)	**91** (81)
Oats, Spring Rye (<2600 chu)	**56** (50)	**56** (50)	**56** (50)	**56** (50)
Oats, Spring Rye (>2600 chu)	**36** (32)	**36** (32)	**36** (32)	**36** (32)
Spring Canola (< 2300 chu)	**135** (120)	**135** (120)	**135** (120)	---
Spring Canola (>2300 chu)	**101** (90)	**101** (90)	**101** (90)	---
Winter Canola (at planting)	**39** (35)	**39** (35)	**39** (35)	---
Winter Canola (spring)	**163** (145)	**202** (180)	**213** (190)	---

* N rec for Winter Rye not in rotation with Tobacco

Nitrogen Recommendations – Forages	Nitrogen Recommendations **kg/ha** (lb/ac)			
Forage Value **$/tonne** ($/ton)		**33** (30)	**55** (50)	**77** (70)
Hay or Pasture (> 1/ 2 legumes)		0	0	0
Hay or Pasture (1/3 to 1/ 2 legume)		**67** (60)	**67** (60)	**67** (60)
Grass hay * (less than 1/3 legume)		**56** (50)	**95** (85)	**112** (100)
New legume seeding (with a nurse crop)		**16** (14)	**16** (14)	**16** (14)
New legume seeding (without a nurse crop)		0	0	0

***** Assumes a 2 cut system **–** (one cut decrease by 20%; three cuts increase by 20%)

Nitrogen Recommendations – Beans	**kg/ha** Nitrogen Recommendations (lb/ac)
Soybeans	**0** 0
Dry Edible Beans	**45 to 67** (40 to 60)

Source: Agronomy Guide for Field Crops OMAF Publication 811

Example:
A field located in Eastern Ontario has a P soil test of 35 mg/L (or ppm) and K soil test of 79 mg/l (or ppm). The field is to be planted to corn and its expected to yield 135 bu/ac. The N requirement is obtained from the top chart by estimating the yield between 130 bu/ac and 150 bu/ac. The N recommendation is approximately 128 lb/ac. The phosphorus recommendation will be zero, and the potash recommendation will be 71 pounds of K_20 per acre.

Section I – Agronomic Nutrient Balance

Calculate the agronomic nutrient balance for N, P_20_5 and K_20.

N:	N	Balance	=	Line D	+	Line E	+	Line F	+ Line G	-	Line H	(on the Worksheet)
P_20_5	P_20_5	Balance	=	Line D	+	Line G	-	Line H				(on the Worksheet)
K_20	K_20	Balance	=	Line D	+	Line G	-	Line H				(on the Worksheet)

Discussion of Limits

If the agronomic nutrient balance shows a negative number, a reduction in crop yield may be observed. Consider adding commercial fertilizer or increasing manure application rate.

A positive number indicates over-application of nutrients (surplus) while negative numbers indicate under-application (potential deficiency) of nutrients for this crop. If nitrogen, phosphorus and/or potash balance exceeds 17 kg/ha (15 lb/ac), then significantly more nutrients are being applied to the field than are required by the crop. It may be more economical to apply the extra nutrients to another field.

⚠ If the N or P_20_5 agronomic balance (Line I) exceeds 17 kg/ha (15 lb/ac), complete Section J to M to calculate "Crop Removal Balance". If manure is fall applied, the Nitrogen Index may also need to be completed (Section O).

Crop Removal (Section J to Section N)

Section J – Field Inputs

Calculate the field inputs for the crop removal balance

N:	N	Inputs	=	Line D	+	Line E	+ Line F	(on the Worksheet)
P_20_5	P_20_5	Inputs	=	Line D				(on the Worksheet)

Section K – Manure Nutrients Applied

Calculate the manure nutrients applied for the crop removal balance

N:	N	Applied	=	Line G			(on the Worksheet)
P_20_5	P_20_5	Applied	=	Line G	**x**	**2**	(on the Worksheet)

⚠ The same value for N applied in manure is used in the agronomic and crop removal balances. The value for P_20_5 applied in manure is doubled to account for a greater proportion of phosphorus available for soil buildup than for this year's crop (80% rather than 40%).

Section L – Crop Removal

Use the following chart and equation to determine the nutrient removal value(s) for this year's crop.

Table 10: **Nutrient Removal of Common Field Crops**

Crop	Base Yield		Removal Base Value					
			N		**P_20_5**		**K_20**	
	tonne/ha	Imperial	**kg/ha**	lb/ac	**kg/ha**	lb/ac	**kg/ha**	lb/ac
Corn	**9.1**	145 bu/ac	**135**	120	**68**	61	**47**	42
Corn Silage (12 ton/ac DM)	**40**	18 ton/ac	**231**	206	**103**	92	**215**	192
Wheat (soft red/white)	**5**	75 bu/ac	**101**	90	**49**	44	**30**	27
Wheat (soft red/white) + straw	**5**	75 bu/ac	**165**	147	**59**	53	**138**	123
Wheat (hard red)	**5**	75 bu/ac	**118**	105	**49**	44	**30**	27
Barley	**4**	75 bu/ac	**84**	75	**34**	30	**26**	23
Barley + straw	**4**	75 bu/ac	**112**	100	**41**	37	**103**	92
Oats	**3.1**	80 bu/ac	**62**	55	**21**	19	**17**	15
Soybeans	**3**	45 bu/ac	**217**	194	**47**	42	**78**	70
Dry Edible Beans	**2**	30 bu/ac	**84**	75	**28**	25	**28**	25
Legume Forage (dry matter basis)	**11.2**	5 ton/ac	**352**	314	**73**	65	**336**	300
Mixed Forage (dry matter basis)	**11.2**	5 ton/ac	**314**	280	**73**	65	**336**	300
Grass Forage (< 1/3 legumes) (DM basis)	**11.2**	5 ton/ac	**196**	175	**56**	50	**196**	175
Canola	**2.5**	45 bu/ac	**106**	95	**62**	55	**30**	27

Source: Potash and Phosphate Institute, 1997

$$\text{Crop Removal} = (\text{Base Value}) \left(\frac{\text{Estimated Yield}}{\text{Base Yield}} \right)$$

Example:

A crop of corn is expected to yield 135 bu/ac.
What is the $P_2 0_5$ crop removal value?

$$P_2 0_5 \text{ Crop Removal} = (61 \text{ lb/ac}) \left(\frac{135 \text{ bu/ac}}{145 \text{ bu/ac}} \right)$$

$$= \mathbf{57 \text{ lb/ac}}$$

Section M – Crop Removal Balance

Calculate the crop removal balance for N, $P_2 0_5$ and $K_2 0$.

N:	N	Balance	=	Line J	+	Line K	-	Line L	(on the Worksheet)
$P_2 0_5$	$P_2 0_5$	Balance	=	Line J	+	Line K	-	Line L	(on the Worksheet)
$K_2 0$	$K_2 0$	Balance	=	Line J	+	Line K	-	Line L	(on the Worksheet)

Discussion of Limits

A negative balance indicates that this year's crop is removing more nutrients from the soil than are being added through manure and field inputs. Soil test values may decrease when the next soil test is completed.

A positive balance indicates that manure and field input nutrients exceed those removed from the soil by this year's crop. Soil test values may increase when the next soil test is completed. Upper limits for the application of nutrients have been established and are outlined below.

A positive nitrogen balance indicates nitrogen could be available after crop harvest. If Nitrogen balance (Line M) exceeds + 17 kg/ha (+15 lb/ac), then complete the Nitrogen Index (Section O).

STOP The total amount of Nitrogen (Line J + Line K) applied to the field should not exceed +224 kg/ha (+200 lb/ac) (in any single year). Attach supporting documentation if this is the case. The exception is if OMAF crop recommendations show greater than 224 kg (200 lb) N requirement for the planned crop.

STOP The $P_2 0_5$ balance (Line M) must not exceed +78 kg/ha (+70 lb/ac). If manure is applied once every two years, this limit may be raised to +191 kg/ha (+170 lb/ac). If manure is applied once every three years, this limit may be raised to +303 kg/ha (+270 lb/ac). Additional land base must be documented. Above these levels, the risk of surface water contamination may exist.

Section N – Nitrogen Available for Potential Loss

Note: This section can be skipped if the 4 conditions listed below are met. Value B will be 0.

The nitrogen index is a tool for limiting nitrogen movement below the root zone in agricultural fields. It consists of evaluating nutrient management practices for nitrogen remaining after crop harvest and nutrients applied during the non-growing season to predict potential nitrogen loss.

The Value B portion of the Nitrogen Index is 0 if all of the following conditions are met:

1. N application (from previous crop) is less than either agronomic requirement of N +17 kg/ha (+ 15 lb/ac) OR Crop Removal of N + 34 kg/ha (+ 30 lb/ac).
2. Total available nitrogen applied is less than 224 kg/ha (200 lb/ac).
3. Where manure is applied in late summer on an AA, A, or B hydrologic soil group, or in early fall on an AA or A hydrologic soil group, a cover crop is established.
4. Late summer, or early fall, or late fall manure application is less than the rate shown for the livestock type as shown in Table 11.

Table 11: **Maximum Fall Manure Application Rates (before requiring N-Index)**

Livestock Type	DM range %	Maximum Fall Rate[1] for Manure Application on A or AA soils (with cover crop), or B soils (no cover crop) (L/hectare)	(gallons/acre)	Maximum Fall Rate[1] for Manure Application on C or D soils, or B soils (with a cover crop) (L/hectare)	(gallons/acre)
Liquid Swine	7 – 18[2]	**33700**	3000	**44900**	4000
	5 – 7	**39300**	3500	**51700**	4600
	3 - 5	**44900**	4000	**59500**	5300
	< 3	**56150**	5000	**74100**	6600
Liquid Poultry	10 - 18	**28100**	2500	**37100**	3300
	< 10	**33700**	3000	**44900**	4000
Liquid Dairy	10 - 18	**39300**	3500	**51700**	4600
	6 - 10	**56150**	5000	**74100**	6600
	< 6	**89800**	8000	**119000**	10600
Liquid Beef	8-18	**67400**	6000	**89800**	8000
	< 8	**89800**	8000	**119000**	10600
		(tonnes/hectare)	(tons/acre)	(tonne/hectare)	(tons/acre)
Solid Swine	>18	**22.2**	10	**29.1**	13
Solid Poultry	60 - 100	**9.0**	4	**11.2**	5
	30 - 60	**11.2**	5	**15.7**	7
	18 - 30	**15.7**	7	**20.2**	9
Solid Dairy Goats	18 - 100	**44.8**	20	**60.5**	27
All other Solid Manure	18 - 100	**67.3**	30	**89.7**	40

[1] Per one type of manure. If more than 1 type is fall applied, the nitrogen index must be completed. All other application limits apply.
[2] Any ranges of numbers are considered to be greater than the lower number, up to equal to the greater number

Determine the proportion of Nitrogen available for loss during the non-growing season (ie. fall/winter) from applications of manure or nitrogen fertilizers following crop harvest. Use Total N values from Table 3, or from manure analysis, and the proportions available for loss from Table 12. This will be used to determine Value B in the Nitrogen Index (Section O).

	Total N (kg/1000 L or lbs/1000 gal)	divided by 1000	X	Application Rate	X	N Available for Loss (Table 12)	= N Available for Loss
Liquid	_____	divided by 1000	X	_____ L/ha _____ gal/ac	X X	_____ (Table 12)	= _____ (kg/ha) = _____ (lb/ac)

	Total N (kg/tonne or lbs/ton)	X	Application Rate	X	N Available for Loss (Table 12)	= N Available for Loss
Solid	_____	X	_____ tonne/ha _____ ton/ac	X X	_____ (Table 12)	= _____ (kg/ha) = _____ (lb/ac)

Table 12. **Estimate of Nitrogen Available for Loss (Leaching or Denitrification)**

Application Time	INCORPORATED (< 24 hours)					NOT INCORPORATED				
	Late Summer[2]	Early Fall[2]	Late Fall	Pre-Plant[1]	Side-dress[1]	Early Fall[2]	Late Fall[2]	Pre-plant[1] Bare Soil	Pre-plant[1] Residue	Side - dress[1]
Urea (commercial N)	.8	.7	.5	0	0	.4	.5	0	0	0
Solid Cattle/Sheep	.15	.125	.1	.05	---	.1	.05	0	0	---
Unbedded Solid Poultry[3]	.4	.3	.2	.1	---	.3	.2	.1	.05	---
Bedded Solid Poultry	.4	.3	.2	.1	---	.1	.05	0	0	---
Liquid Cattle	.4	.3	.2	.1	.05	.3	.2	.1	.05	0
Liquid Swine	.6	.5	.3	.1	.05	.3	.2	.15	.1	0
Liquid Biosolids	.4	.3	.2	.1	.05	.3	.2	.1	.05	0

Source: Adapted from Barry, Beauchamp et. al., U of G. 2000
[1] Assumes a spring planted crop; side-dress refers to application to a growing crop
[2] Where a fall cover crop is being grown, use "Late Fall" value
[3] Unbedded solid poultry manure is usually from caged layers and has dry matter > 50%
Late Summer = up to Sept 20, **Early Fall** = Sept 21 to Nov 9, **Late Fall =** Nov 10 to Winter

For manure incorporated within 3 days use:
(Incorporated value + not incorporated value) ÷2

Section O – Nitrogen Index

The Nitrogen Index is a tool for limiting nitrate nitrogen movement below the root zone in agricultural fields. It assesses the vulnerability of nutrient management practices with respect to the movement of nitrates in groundwater and is based on nutrient management practices and characteristics of the soil.

The Nitrogen Index must be completed when there is nitrogen remaining over the winter season:
1) When the Agronomic Balance exceeds 17 kg/ha (15 lbs/ac) or
2) When Section N has been completed.

To calculate **"Value A_1"** take "Previous Crop" (from Section A) and go through steps J through M (or use Crop Removal Balance - Line M - from previous year's nutrient management plan).

Add the values from each section to get the total N-Index

N-Index Value (Line O) = Value A_1 (from Previous Crop) Line M from Last Year's Plan _____ + Value B _____ = _____

Value A_2 (Line M from Current, Crop - to use in next year's plan) _____

STOP Value A_1 or A_2 cannot exceed the Maximum N-Index Value from Table 14 for the Hydrologic Soil Group

⚠ A high Value A_2 could be limiting to next year's fall manure application rate.

For all crops, use Table 13 below to calculate the Nitrogen Index (N-Index). Because the N-Index is targeting nitrogen leaching during the winter following crop harvest, the Value A_1 refers to the crop removal balance calculated for the crop just harvested, while Value B refers to the N available for loss from manure applied after crop harvest.

Table 13: **Nitrogen Index Values**

Nitrogen in Excess of Crop Removal Balance			**Nitrogen Available for Loss**		
Crop Removal Balance **(kg/ha)** (Line M)	(lb/ac)	Value A	N Available for Loss **(kg/ha)** (Line N)	(lb/ac)	Value B
<17	< 15	0	**<17**	< 15	0
17 – 34	15 – 30	1	**17 – 28**	15 – 25	1
35 – 50	31 – 45	2	**29 – 39**	26 – 35	2
51 – 67	46 – 60	3	**40 – 50**	36 – 45	3
68 – 89	61 – 80	4	**51 – 67**	46 – 60	4
90 – 134	81 – 120	5	**68 – 89**	61 – 80	5
135 – 202	121 – 180	6	**90 – 134**	81 – 120	6
>202	> 180	STOP	**>134**	> 120	STOP

Determine the Hydrologic Soil Group Category for the field from the soil types (soil series names) present in the field. Hydrologic soil groups corresponding to the various soil series names found in Ontario are listed in Table 17, or in the Drainage Guide for Ontario (OMAF Publication 29).

Where a field has more than one soil series, pick the soil in the hydrologic group that is most vulnerable to leaching (i.e. soil group A) or the dominant soil series if it represents more than two thirds of the field).

Determine the Maximum N-Index Value for the Critical Hydrologic Soil Group for the field from Table 14, below:

Table 14: **Maximum N-Index Value Related to Soil/Site Risk**

Hydrologic Soil Group	**Leaching Risk**	**Maximum N-Index Value**
AA	Very high	1
A	High	3
B	Medium	4
C	Low	6
D	Very Low	9
Soils shallow to bedrock (< 0.9m or < 3 ft.) move up one risk level; A soils with shallow bedrock become AA		

STOP The N-Index Value must not exceed the Maximum N-Index value determined from the above chart for the field of concern. The N-Index value can be lower by reducing application rates, or changing application timing to spring pre-plant or side-dress, or by including a cover crop.

Example:

- Corn is the intended crop to be planted on a Guelph Loam (Hydrologic Soil Group B from Table 17)
- 5500 gal/ac dairy manure (9% dry matter with 41 lbs/1000gal total N) is planned for application in early September
- The previous, recently harvested, crop is winter wheat (straw removed) which yielded 75 bu/ac.

Section N: Since the application rate exceeds 5000 gal/ac, (from Table 11) Section N must be completed.

41 lbs/1000gal total N divided by 1000 (to give lb/gal) x 5500 gal/ac x 0 .4 (from Table 12) **= 90 lb/ac** potential N loss

Section O: Value A_1 = 0 Previous crop of wheat had 90 lb/ac (Table 9) nitrogen (no manure) spring applied. (Line J)
Crop removal (Line L) is 147 lbs N. (Table 10)
Crop removal balance is 90 lbs – 147 lbs = 0 (Line M)
Value B = 6 (from Table 13)

Nitrogen Index : The maximum allowable N-Index is 4 for a Guelph Loam (hydrologic soil group B from Table 14). In this example the N-Index is: (Value A_1) 0 + (Value B) 6 = **6** STOP

Therefore other management options must be considered. Alternative options include a cover crop, adjusting the application rate or timing of the fall applied manure.

If a red clover cover crop were planted or manure application was delayed to late fall, then the N available for loss would change from 90 to 45 lb/ac and the Value B would be 3.

(41 lbs/1000gal total N divided by 1000 (to give lb/gal) x 5500 gal/ac x 0 .2 (from Table 12) **= 45 lb/ac** potential N loss)

Nitrogen Index : The maximum allowable N-Index is 4 for a Guelph Loam (hydrologic soil group B from Table 14). After management changes in the example the N-Index is: (Value A_1) 0 + (Value B) 3 = **3** The planned application of manure with a fall cover crop of red clover meets the Nitrogen Index requirements.

Section P – Phosphorus Index

This section needs to be completed if the P soil test exceeds 30 mg/L (ppm). The P-Index is divided into 5 sections. Add the values from each section to get the total P-Index.

Note: For a more detailed analysis of the Phosphorus Index refer to the Nutrient Management Computer Program (NMAN) or Phosphorus Index Factsheet.

Table a: Soil Erosion Value

Slope within 150 m (493 ft) of Watercourse	Length of Slope	Hay	Other Crops			
			Up & Down Slope		Cross Slope	
			Plow	No-till	Plow	No-till
Flat (< 0.5%)	All	2	4	2	4	2
Gentle (0.5 to ≤ 2%)	Short (61 m) (200 ft)	2	4	2	4	2
Gentle (0.5 to ≤ 2%)	Medium (244 m) (800 ft)	2	8	3	8	2
Gentle (0.5 to ≤ 2%)	Long (488 m) (1600 ft)	2	16	4	16	2
Moderate(>2 to ≤ 5%)	Short (61 m) (200 ft)	2	16	2	8	2
Moderate(>2 to ≤ 5%)	Medium (244 m) (800 ft)	2	16	4	12	3
Moderate(>2 to ≤ 5%)	Long (488 m) (1600 ft)	2	16	8	16	4
Steep (> 5%)	Short (61 m) (200 ft)	2	16	4	16	4
Steep (> 5%)	Medium (244 m) (800 ft)	2	16	8	16	8
Steep (> 5%)	Long (488 m) (1600 ft)	2	16	16	16	16

Note: These values simulate a worst case scenario of soybeans on very fine sand in a high rainfall area. To obtain more accurate results using the universal soil loss equation refer to the NMAN nutrient management software.

Table b: Water Runoff Value

Hydrologic Soil Group (Drainage Class)	Maximum Field Slope within 150 m of Top of Bank of Surface Water			
	< 3%	3 – 6 %	6 – 9 %	9 – 12%
A (Rapid)	1	1	2	8
B (Moderate)	1	2	4	8
C (Slow)	2	4	8	16
D (Very Slow)	4	8	8	16

Hydrologic Soil Groups corresponding to the various soil series names are found d in Table 17. Group A is often associated with sand, Group B with loam, Group C with clay loam and Group D with clay soil textures

Table c: P Soil Test Value

P Soil Test	Factor
< 15 mg/l (ppm)	2
15 – 30 mg/l (ppm)	4
31 – 60 mg/l (ppm)	8
61 – 100 mg/l (ppm)	16
> 100 mg/l (ppm)	32

Table d: $P_2 0_5$ Fertilizer Value (Metric)				
Rate (Line D)	Method			
(kg / ha)	Placed with Planter	Incorporated < 2 weeks	Incorporated > 2 weeks	Not Incorporated
None	0	0	0	0
< 50	2.5	4	7	13
51 – 75	3.5	5	8	14
> 75	5.5	7	10	16

Table e: $P_2 0_5$ Manure Value (Metric)				
Rate (Line K)	Method			
(kg / ha)	Injected	Incorporated < 5 days	Not Incorp: Cover Crop	Not Incorp: Bare Soil
None	0	0	0	0
< 37	2.5	4	7	13
38 – 60	3.5	5	8	14
> 61	5.5	7	10	16

Table d: $P_2 0_5$ Fertilizer Value (Imperial)				
Rate (Line D)	Method			
(lb / ac)	Placed with Planter	Incorporated < 2 weeks	Incorporated > 2 weeks	Not Incorporated
None	0	0	0	0
< 45	2.5	4	7	13
46 – 67	3.5	5	8	14
> 67	5.5	7	10	16

Table e: $P_2 0_5$ Manure Value (Imperial)				
Rate (Line K)	Method			
(lb / ac)	Injected	Incorporated < 5 days	Not Incorp: Cover Crop	Not Incorp: Bare Soil
None	0	0	0	0
< 33	2.5	4	7	13
34 – 54	3.5	5	8	14
> 54	5.5	7	10	16

Example: a) corn no-till planted on a short 3% slope: **2.0** b) hydrologic soil group C on a 3% slope: **4.0**
c) P soil test of 35 ppm: **8.0** d) 9 lb/ac, placed with planter: **2.5**
e) 128 lb/ac $P_2 0_5$ applied in manure, incorporated 3 days: **7.0**

Total P-Index = a) + b) + c) + d) + e)
Total P-Index = 2 + 4 + 8 + 2.5 + 7 = 23.5

Section Q – Minimum Separation Distance from Surface Water

Tables 15 and 16 determine the minimum distance that manure and/or any phosphorus nutrient source must remain away from surface water.
Slope, soil texture and application method will determine the distance that manure application must remain away from surface water. This is determined in Table 15. In addition, where the P-Index value is high (i.e. the risk of phosphorus getting to water is high) there could be an additional separation distance for any source of phosphorus. This is determined in Table 16. The minimum separation distance from surface water becomes the greater distance (determined from Table 15 or 16).
Use Table 1 in Section B to determine the surface water runoff potential. Use the runoff potential to determine the minimum separation distance from surface water (using Table 15).

Table 15: **Minimum Separation Distance** (with established buffer zone)								
Runoff Potential	Surface Applied				Incorporated or Pretilled			
	Liquid		Solid		Liquid		Solid	
High	**30.5 m**	100 ft	**15.2 m**	50 ft	**18.3 m**	60 ft	**9.1 m**	30 ft
Moderate	**22.9 m**	75 ft	**13 m**	43 ft	**13.7 m**	45 ft	**6.1 m**	20 ft
Low	**15.2 m**	50 ft	**13 m**	43 ft *	**9.1 m**	30 ft	**4.6 m**	15 ft
Very Low	**13 m**	43 ft *	**13 m**	43 ft *	**3.0 m**	10 ft	**3 .0 m**	10 ft

⚠ All farms that require a nutrient management plan (*Nutrient Management Act*) must have a minimum 3 m (10 ft) vegetated buffer adjacent to all surface water if nutrients are to be applied to that field.
* Application can be made within the same distance as the incorporated values, if applied to a living crop or to greater than 30% residue cover.

Note: Manure / Prescribed material or commercial fertilizer application must be at least 100 m (328 ft) from any municipal well. Manure application must be at least 15 m (50 ft) from private drilled wells or 30 m (100 ft) from other private wells. Commercial fertilizer or compost must be at least 3 m (10 ft) from private wells.

Table 16: **Separation Distances and Application Rates for Various P-Index Values**

P-Index	Separation Distance			
	<3m (< 10 ft)	**3 – 30.5 m** (10 – 100 ft)	**30.6 – 61 m** (>100 – 200 ft)	**> 61 m** (> 200 ft)
< 30		⚠	No additional restriction due to P-Index	
30 – 50		Only apply P_2O_5 up to crop removal (Line L)		
> 50	STOP	No Application		

Source: Nutrient Management Planning BMP

Example: For a hydrologic soil group C soil on a 4% slope the runoff potential is "moderate" (from Table 1). For surface applied liquid manure the minimum separation distance is 75 ft. However, since the phosphorus index of 23.5 was calculated and P_2O_5 is applied above crop removal (i.e. Line M > 0) the minimum distance must be increased to 100 ft. Between 75 ft and 100 ft, manure could be applied up to crop removal.

Section R – Useable Acres/Hectares

Calculate the number of usable acres in each field by deducting the acreage in any setback areas from wells, surface water, or residences from the total tillable area of each field. (Note 1 hectare is 10,000 m^2 and 1acre is 43,560 ft^2)

Section S – Maximum Rates

This section double checks to ensure that no "stops" have been triggered in the completion of the field worksheet. Complete this section after all other sections have been completed to ensure that all cautions and environmental limits have been considered.

Metric

Maximum Liquid Loading Rate	(From section B)	METRIC IMPERIAL	_____ (L/hectare) _____ (gallons/acre)
N Crop Removal Maximum Rate	(From section M)	METRIC L or tonne / ha IMPERIAL gal or ton / ac	(N Crop Removal - Line J) + 17 kg/ha ÷ Available N (kg/1000 L) x 1000 = _____ or (kg//tonne) = _____ (N Crop Removal - Line J) + 15 lb/ac ÷ Available N (lb/1000 gal) x 1000 = _____ or (lb//ton) = _____
P_2O_5 Crop Removal Maximum Rate	(From section M)	METRIC L or tonne / ha IMPERIAL gal or ton / ac	[(P_2O_5 Crop Removal - Line J) + 78 kg/ha] ÷ Available P_2O_5 (kg/1000 L) x 1000 = _____ or 191 or (kg / tonne) = _____ or 303 = _____ [(P_2O_5 Crop Removal - Line J) + 70 lb/ac] ÷ Available P_2O_5 (lb/1000 gal) x 1000= _____ or 170 or (lb / ton) = _____ or 270 = _____
Nitrogen Index Maximum Rate	(From section O)	METRIC IMPERIAL	Maximum allowable application rate only if N-Index is required _____ (kg/ha). _____ (gal/ac).
Minimum Separation Distance Rate (for P-Index Value)	(From section Q)		☐ No application (P-Index is greater than 50) ☐ Application to Crop Removal Rate ☐ No P-Index Restriction

The Maximum Allowable Application Rate will be the lowest rate of the above numbers. Write this number in section B on the worksheet summary.

STOP If the planned rate is higher than the Maximum Allowable Application Rate.

Table 17 **– Ontario Soil Series and Hydrologic Soil Groups**

SOIL SERIES	HYDROLOGIC SOIL GROUP	SOIL SERIES	HYDROLOGIC SOIL GROUP	SOIL SERIES	HYDROLOGIC SOIL GROUP	SOIL SERIES	HYDROLOGIC SOIL GROUP	SOIL SERIES	HYDROLOGIC SOIL GROUP
Alberton	D	Cramahe	A	Hendrie	B	Morrisburg	C	St. Clements	C
Allendale*	C	Craigleith	C	Hespeler	C	Moscow*	D	St. Jacobs	A
Alliston*	B	Crombie	C	Hillier	B	Mountain	C	St. Peter	A
Almonte	C	Dalton	C	Hillsburgh	A	Muck	D	Ste. Rosalie	D
Ameliasburg	D	Darlington	B	Hinchinbrooke*	C	Muriel	C	St. Samuel*	C
Ancaster	B	Deloro*	B	Honeywood	B	Murray	C	St. Thomas	A
Appleton	B	Donald	B	Howland*	B	Napanee*	D	St. Williams	B
Atherley	D	Donnybrook	A	Huron	C	Nelson	C	Stafford	B
Ayr	C	Dorking	D	Innisville	C	Newburgh	B	Stockdale	C
Bainsville	C	Dumfries*	A	Jeddo	D	Newcastle	B	Styx	B
Balderson	B	Dummer*	B	Kagawong	B	Niagara	C	Sullivan	A
Bamford	B	Dundonald	B	Kars	A	Nipissing	C	Tansley	C
Bancroft	A	Dunedin	C	Kelvin	D	Norham	B	Tavistock	C
Bass	D	Eamer	B	Kemble*	C	Normandale	B	Tecumseh	B
Battersea	C	Earlton*	B	Kenabeek	C	North Gower*	D	Teeswater	B
Bearbrook	D	Eastport	A	Killean	B	Oakland	B	Tennyson*	B
Belmeade	D	Edenvale	C	King	C	Oakview	D	Thames	C
Bennington	B	Eganville*	B	Kirkland	A	Oneida	C	Thorah	C
Berriedale	A	Elderslie	C	Kossuth	B	Ontario	C	Thwaites	B
Berrien	C	Eldorado	B	L'Achigan	B	Osgoode	C	Tioga*	A
Beverly*	C	Ellwood	C	Lambton	C	Oshtemo	A	Toledo*	D
Binbrook	C	Elmbrook	C	Lanark	C	Osnabruck	D	Trafalgar	B
Blackwell	D	Elmira	C	Landsdowne*	D	Osprey	B	Trent	C
Bolingbroke	A	Elmsley	B	Leech*	D	Otonabee*	B	Tuscola*	C
Bondhead*	B	Embro	C	Leith	B	Otterskin	C	Tweed	B
Bookton	B	Emily*	B	Leithrim	B	Parkhill*	C	Uplands	A
Boomer	B	Englehart	C	Lily	C	Peat	D	Vanessa	C
Brady*	B	Evanturel*	B	Lincoln	D	Peel	C	Vars	B
Brant*	B	Farmington	B	Lindsay*	D	Pelham	A	Vasey*	B
Brantford	C	Ferndale	D	Lisbon	A	Perch	D	Vincent	C
Bridgman	A	Flamboro*	C	Listowel	B	Percy	B	Vineland*	B
Brighton	A	Floradale	B	Little Current	B	Perth	C	Vittoria	C
Brisbane*	B	Font	A	Lockport	B	Petherwick	C	Wabi	B
Brockport	B	Fonthill	A	London*	B	Phipps*	D	Walshear	C
Brooke	C	Fox*	A	Lonsdale	D	Piccadilly	D	Walsingham	A
Brookston	D	Foxboro	C	Lovering	C	Pike	C	Waterloo	A
Bucke	B	Franktown	B	Lowbanks	B	Pike Lake	A	Watford	A
Burford*	A	Freeport	B	Lyons*	C	Plainfield	A	Watrin	C
Burnbrae	B	Galesburg	B	Macton	B	Pontypool	A	Waupoos	C
Burnstown*	B	Gananoque*	C	Magnetawan	C	Preston	B	Wauseon	C
Burpee	C	Gerow	C	Mallard*	B	Renfrew	D	Wayside	B
Buzwah*	C	Gilford	C	Malton	D	Rideau	D	Welland	D
Caistor	C	Gobles	C	Mannheim	B	Rubicon*	B	Wellesley	C
Caledon	A	Gordon*	D	Manotick	B	Sargent	A	Wemyss	B
Camilla	B	Granby	C	Maplewood	C	Saugeen	C	Wendigo	A
Campbell*	C	Grand	B	Marionville	C	Schomberg	C	Wendover	D
Cane*	D	Grenville*	B	Marsh	D	Scotland	A	Westmeath	A
Carp*	C	Grimsby*	A	Maryhill	C	Seely's Bay	C	Whitby	B
Casey	B	Guelph*	B	Matilda	B	Senaca	B	White Lake*	A
Cashel	C	Guerin*	B	Matson	C	Shashawandah	B	Whitfield	B
Castor*	C	Gwillimbury	B	Medonte	C	Sidney*	D	Wiarton	B
Chesley	D	Haldimand	C	Miami	C	Silver Hill	B	Wilmot	D
Chinguacousy*	C	Hampden	D	Mill	C	Simcoe	D	Wilsonville	A
Christy	C	Harkaway*	B	Milliken	B	Smithfield	C	Winona	C
Clyde	D	Harriston	B	Minesing	D	Smithville	C	Woburn	B
Codrington	C	Harrow	A	Mississauga	D	Snedden	D	Wolford	C
Colborne	A	Havelock	A	Monaghan	C	Solmesville	C	Wolsey*	D
Colwood*	C	Hawkesville	C	Monteagle*	B	South Bay	C	Wooler	B
Conestoga	B	Haysville	B	Morley	D	Springvale	A	Woolwich	B
Conover	C	Heidelberg	B					Wyevale	A
Cooksville	B								

Source: OMAF Publication 29 – Drainage Guide for Ontario

* Soil series having shallow phases over bedrock. The hydrologic grouping for the rocky phases of these soils should be reduced one group (for example a 'C' soil is reduced to 'B').

Conversions – Metric and Imperial

Common Conversions					
1 gallon	=	4.546 litres	1 acre	=	0.405 hectare
1 gallon	=	1.201 US gallons	1 acre	=	43,560 $feet^2$
1 gallon	=	0.161 ft^3	1 lb/ac	=	1.12 kilogram/hectare
1 US gallon	=	3.785 litres	1 ton/ac	=	2.25 tonnes/hectare
1 US gallon	=	0.833 Imp gallons	1 gal/ac	=	11.2 litre/hectare
1 ton	=	0.907 tonne	1000 gal/ac	=	11200 litre/hectare
1 pound	=	0.454 kilogram	1000 gal/ac	=	11.2 $metre^3$/hectare
1 tonne	=	2205 pounds	1 metre	=	3.28 feet
1 $foot^3$	=	6.229 gallons	1 metre	=	39.4 inches
Application Rate Conversions					
Metric to Imperial (Approximate)			Imperial to Metric (Approximate)		
Litres per hectare x 0.09	=	gallons per acre	Gallons per acre x 11.23	=	litres per hectare (L/ha)
Litres per hectare x 0.36	=	quarts per acre	Quarts per acre x 2.8	=	litres per hectare (L/ha)
Litres per hectare x 0.71	=	pints per acre	Pints per acre x 1.4	=	litres per hectare (L/ha)
Millilitres per hectare x 0.015	=	fluid ounces per acre	Fluid ounces per acre x 70	=	millilitres per hectare (mL/ha)
Grams per hectare x 0.015	=	ounces per acre	Tons per acre x 2.24	=	tonnes per hectare (t/ha)
Kilograms per hectare x 0.89	=	pounds per acre	Pounds per acre x 1.12	=	kilograms per hectare (kg/ha)
Tonnes per hectare x 0.45	=	tons per acre	Ounces per acre x 70	=	grams per hectare (g/ha)
Kilograms per 1000L x 10	=	lbs per 1000 gallons	Pounds per ton x .5	=	Kilograms per tonne

Glossary

Ammonium-N

This is most common form of mineral N in manure and other organic soil amendments. It is as available to plants as fertilizer nitrogen, but is also subject to loss into the air if manure is left laying on the surface of the soil. Ammonium N will bind to soil particles so does not normally leach.

K_20

Potash (K_20) is the form in which fertilizer potassium is expressed. To calculate the fertilizer replacement value of potassium from various sources, it has to be converted from elemental K to potash, and then multiplied by an availability factor.

Manure

Manure includes only agricultural source material other than commercial fertilizer.

Nitrogen (N)

N is the chemical symbol for nitrogen. It is present in soil and organic materials in three main forms: Ammonium-N, Nitrate-N, and Organic N. The availability of the nitrogen to plants depends on its form.

Nitrate-N

Most ammonium-N is converted into nitrate-N in the soil before being taken up by plants. If there is more N than the plants can absorb, it can leach downwards with soil water, creating a risk to groundwater quality.

Nutrient Management Plan

An NMP is a document prepared for a farm that gives an assessment of what application rate is appropriate for the land base and what other standards for land application must be met.

Nutrient Management Strategy

An NMS is a document prepared for a farm that shows how much prescribed material(s) is going to be produced over a five-year period, as well as how it will be stored and where it will be used.

Organic N

Much of the nitrogen in manure and other soil amendments is in the organic form. This is not available to plants until it has been converted into ammonium-N. The rate at which this occurs depends on temperature and moisture, as well as on degradability of the organic material.

P_20_5

Phosphate (P_20_5) is the form in which fertilizer phosphorus is expressed. To calculate the fertilizer replacement value of phosphorus from various sources, it has to be converted from elemental P to phosphate, and then multiplied by an availability factor.

Surface Water

- Natural or artificial channels flowing all year or occasionally with wetland
- lakes, reservoirs, ponds or wetlands
- Does **not** include: grassed waterways, furrows, roadside ditches, areas normally farmed, or artificial water bodies intended for the storage of treatment of runoff from farm animal yards and manure storages.

Additional Comments