

PENNSYLVANIA'S NUTRIENT MANAGEMENT ACT PROGRAM TECHNICAL MANUAL

Version 9.0

Provided by:

The Pennsylvania State Conservation Commission
(With the assistance of the PDA, PSU and NRCS)

The Technical Manual Version 9.0 released in October 2015 supports:

Version 4.x of the Nutrient Management Plan Standard Format
Version 3.x of the Nutrient Balance Sheet Standard Format
Version 2.x of the Pennsylvania Phosphorus Index

The guidance in Technical Manual 9.0 is required for:

Nutrient Management Plan submissions for crop year 2017 and beyond.

Preface

The **Pennsylvania Act 38 Nutrient Management Program Technical Manual** has been developed in order to provide consistent program guidance, further refining the requirements in the regulations, to be utilized in the development, review, and implementation of Act 38 nutrient management plans. This manual describes how the various calculations and decisions are made during plan development, review, and implementation. Additional program refinements will be incorporated into later revisions of the manual as time and resources permit.

The State Conservation Commission (Commission) is pleased to provide this guidance document to assist you in understanding the provisions of Pennsylvania's Nutrient Management Act (NMA) program. We hope that the manual will provide the needed program guidance to assure consistent implementation of the program statewide. The manual is a compilation of guidance directives providing further refinement of the nutrient management regulations; however, the guidance in the manual does not supersede the regulations. Where conflicts may be perceived the regulations take precedence.

The main audience for the manual is the Certified Nutrient Management Specialists who will be developing, reviewing, or assisting with implementing plans to meet the NMA or related programs. All specialists are encouraged to become very familiar with the information in the manual and are directed to follow this guidance closely in order to ensure consistent program implementation throughout the state.

The Act 38 program strives to provide consistent program requirements throughout Pennsylvania and this document has been developed to assist in this effort. Program staff is directed to follow the program guidance provided in the manual and to implement the program in accordance with Commission direction in order to maintain this important program consistency. For questions relating to the implementation of program requirements, policies, or general use of the manual, please contact NMA program staff from the Commission, PA Department of Agriculture (PDA) or PA Department of Environmental Protection (DEP) for assistance.

Penn State University has been the lead entity in assisting the Commission in the development of the manual. Information in the manual has been provided by the Commission, PDA, Penn State University (Penn State), the Natural Resources Conservation Service (NRCS), and DEP and other contributing program staff throughout the state. The Commission thanks all of those people who provided excellent input into the development of this edition of the technical manual. Please keep the manual up to date by including into the manual any updates provided by program staff. The date of the most recent edition of each section is provided in the footer.

The manual is organized to reflect the various sections and appendices of an Act 38 nutrient management plan. For each section or appendix of the plan, the manual provides technical and policy guidance of how that portion of the plan is to be completed. The supplement section of the manual provides examples and blank forms

that may be useful in the development of Act 38 nutrient management plans

If you have any questions or comments relating to the format or use of the manual, please contact the Commission office at 717-787-8821.

How to Use This Manual

This manual has been developed to assist both planners and reviewers in consistently carrying out the requirements of Pennsylvania's Nutrient Management Act Program. The format of this manual has been developed to provide an "easy to read" description of the technical aspects and program policies related to the various elements of the plan and other program elements.

The manual includes a detailed table of contents of the various topics and calculations discussed in the manual. This reference source can assist the user in finding where the various topics are discussed in the manual.

If you have questions on how to complete a certain element of an Act 38 plan, you can simply turn to the section or appendix of the manual that covers that portion of the plan to read the documented policies or technical guidance on how to address the issue. This manual is formatted to follow the various sections and appendices of an Act 38 nutrient management plan. For each 'section' or 'appendix' of a plan, the manual provides technical and policy guidance of how that portion of the plan is to be completed. The 'supplement' portion of the manual provides examples and blank forms that may be used in the development of the nutrient management plan.

The Penn State Agronomy Guide, the Agricultural Analytical Services Lab (AASL) Soil Test Recommendations Handbooks, and the Supplements in this manual are the primary references for standardized values utilized in developing Act 38 nutrient management plans. Nutrient management specialists working within the program are directed to use the most recent versions of these documents for their planning and review activities. The specialist can be assured that the values in these documents are acceptable under the program, except where directed to use different figures through further program guidance such as program newsletters, fact sheets, program bulletins or notes developed by Commission staff, other program approved written materials, or state staff direction. When using values other than those found in these documents, the planner will need to justify the use of these numbers.

This manual will be updated periodically as additional information is developed to assist in plan development, review and implementation. Updates will most likely be in the form of revised pages or sections that can be inserted into the manual to replace outdated information. A full manual update will take place as the need arises. You may reference the program website (<http://extension.psu.edu/plants/nutrient-management>) in order to determine if you have the most recent edition of all components of this manual. The website will list each of the various sections, appendices and supplements to the manual, along with the date of the most recent update to that portion of the manual.

Nutrient Management Act Program Technical Manual

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* The Current Date listed will match the footer date and indicates when the Section, Appendix or Supplement was updated.

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Nutrient Management Plan Submission Required Appendices and Supplemental Information

Act 38 requires review and approval of nutrient management plans in order for these plans to be considered official under the program. This review and approval activity requires the submission of all relevant data and information so that the plan reviewer can determine if all program requirements have been met.

Only new plans and plan amendments developed using the most current version of the standardized Act 38 Nutrient Management Plan Spreadsheet or Nutrient Balance Sheet Spreadsheet Excel programs, will be accepted for review and approval under the Act 38 program.

The most current version of the standardized Act 38 Nutrient Management Plan Spreadsheet or Nutrient Balance Sheet Spreadsheet will be identified by a “version number” and can contain any edition of the “update number”. For example, Version 4 is initially released as Version 4.0. Subsequent updates of Version 4 would be designated as 4.1, 4.2, 4.3, etc. If Version 4.3 is the most current edition of the spreadsheet, Versions 4.0, 4.1, 4.2 and 4.3 would all be considered the “current” version and could be used for planning. Each of these designations would be acceptable for review and approval under the Act 38 program. When a version with a new “version number” is released, in this example Version 5.0, all previous versions and updates would no longer be acceptable for planning purposes. Version 5.0 would become the current version.

A copy of the most recently approved plan is required to be maintained at the farm and copies of the most recent Nutrient Balance Sheets need to be provided to the importers. Note: When a NMP that contains NBSs for importers is amended, the NBSs are to be updated to the most recent planning version of the Nutrient Balance Sheet Spreadsheet.

Nutrient Management Plan Submission Requirements

All of the following plan components and Appendices are required to be submitted with the **initial Act 38 plan or any plan amendment submissions**.

1. Cover Page
2. Nutrient Management Plan Summary (along with summary notes, the manure rate calibration table, and additional NM plan requirements and the operator management map)
3. Appendix 1: Nutrient Management Plan Agreement and Responsibilities
4. Appendix 2: Operation Information
5. Appendix 3: Manure Group Information
6. Appendix 4: Crop and Manure Management Information
7. Appendix 5: Phosphorus Index
8. Appendix 6: Manure Management
9. Appendix 7: Stormwater Control
10. Appendix 8: Importer/Broker Agreements and Nutrient Balance Sheets

11. Appendix 9: Operation Maps (including topographic maps and soils maps)
12. Appendix 10: Supporting Information and Documentation

Submission of the following worksheets and forms is required when they are relevant to a plan.

- Rainfall Additions Worksheet - Submission is required when manure generation is calculated and includes the addition of rainfall and/or runoff.
- Winter Manure Application Matrix – Submission is required when winter manure application is included in the plan. A winter Application Matrix is also required to be included along with the NBSs where winter manure application is planned to occur on these importing sites.
- Manure storage setback waiver forms – Submission is required if a manure storage setback waiver is required in order to implement the plan as proposed.
- Manure N Residual Calculator Worksheet – Submission is required when residual manure nitrogen availability is calculated using Agronomy Guide Table 1.2-15. Refer to Appendix 4: Crop and Manure Management Information for more information about the use of Agronomy Guide Table 1.2-15.
- Table 3 Worksheet – Submission is required when crops are entered into the NMP Spreadsheet.
- Table 4 Worksheet – Submission is required when a legume nitrogen residual management scenario is entered into the NMP Spreadsheet.
- For CAFO Operation only, supporting information, calculations and references for manure storage winter capacity planning levels must be included in Appendix 10: Supporting Information and Documentation. This may include, as applicable, worksheets from the Manure Storage Winter Capacity Planning Level Determination Spreadsheet for Sloped Waste Storage Facilities.

The plan must include separate Nutrient Management Plan Summary and Nutrient Management Plan Summary Notes tables for each individual crop year included in the plan. The crop year is entered in the Nutrient Management Plan Summary.

A crop year is typically understood as the growing season when the crop is harvested. However for manure management planning purposes, the manure and nutrient planning year actually begins following the harvest of the previous crop. Therefore, plan implementation for a specific crop year actually begins in the late summer/fall timeframe. Based on this understanding, crop years in Act 38 nutrient management plans are understood to begin on October 1.

Under Act 38, nutrient management plans cover three crop years. Two approaches can be used to address the multiple crop years in a single plan.

- One option is to plan for one crop year in the initial nutrient management plan. Updates for subsequent crop years would be submitted and approved annually prior to the beginning of the next crop year. The updates may use the soil and manure analysis results from the first crop year plan or update each annual submission using the most recent soil and manure analysis results. See NMP Submission: Required Appendices and Supplemental Information for guidance on what is to be included in these annual updates. Plan updates must be submitted, but are not considered plan amendments, and therefore do not require approval. See Section VI: Plan Amendments and Transfers for more information on plan amendments.
- Another option is to submit three sets of annual plans for each of the three crop years in the nutrient management plan time-frame. See NMP Submission: Required Appendices and Supplemental Information for guidance on what is to be included in these three year plan submissions.

The plan must be approved before any manure is applied or transferred (exported), for the crop years identified in the plan. If the plan is not approved manure may not be applied or transferred (exported) until plan approval. **Any manure applications or manure transfers (exports) made during a crop year, when there is not an approved plan, are not in compliance with the law.** In layman's terms "no manure application or export without a plan" is the bottom line. It is very important to remember that the review and approval process can take up to 180 days, so we cannot stress more the need to plan ahead so that the NMP is submitted in time to be approved before manure is planned to be applied or transferred (exported).

For CAOs and VAOs the plan should be submitted at a minimum 4-5 months prior to the planned 1st manure application or manure transfer (export), to give time for the plan review and approval process. For those CAOs and VAOs that plan fall manure application, the plan should be submitted 4-5 months prior to application, so plan submission should be before May/June. For those CAOs and VAOs that do not plan fall manure application, the plan should be submitted 4-5 months prior to spring application, so plan submission should be before October/ November.

For CAFOs, the NMP must be approved before the beginning of the crop year (October 1), to remain in compliance with the CAFO National Pollutant Discharge Elimination System (NPDES) permit. CAFO NMPs should be submitted at a minimum 5-6 months before the start of the crop year the plan is to cover, as to allow time for public noticing and the plan review and approval process.

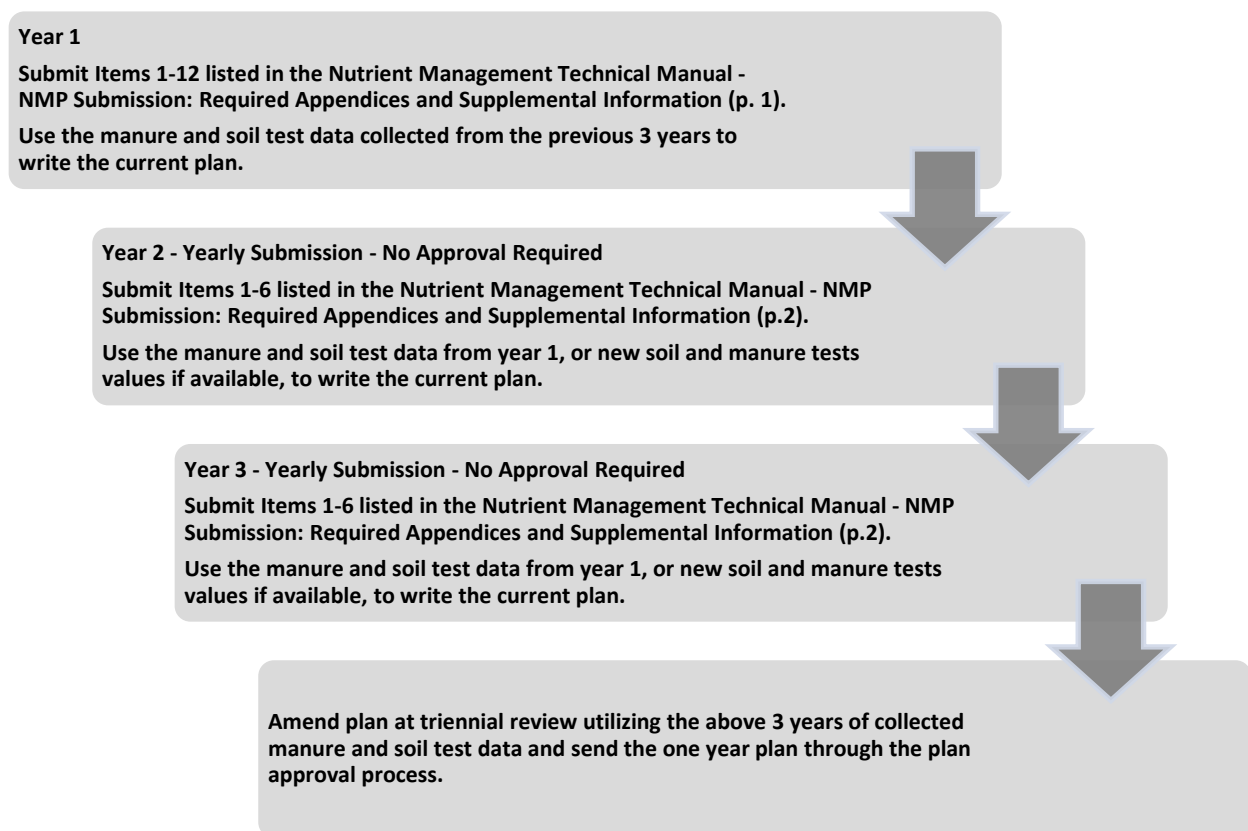
All **NMP yearly submissions** must include all of the following materials:

1. Cover Page
2. Nutrient Management Plan Summary
3. Nutrient Management Plan Summary Notes (along with the Manure Rate Calibration table)

4. Appendix 3: Manure Group Information (only the first page is required, addressing each of the manure groups used in the plan, if no changes in the manure group are expected)
5. Appendix 4: Crop and Manure Management Information
6. Appendix 5: Phosphorus Index

The yearly submissions must be submitted, but do not require conservation district board or SCC formal approval unless an NMP amendment is required. District and SCC staff may provide a cursory review of the yearly submission if their resources permit, to ensure the yearly submission is complete and accurate, prior to filing the yearly submission in the operator's Act 38 plan file. When the yearly submission is accepted to be included in the operator's Act 38 plan file, the district or SCC should send the standardized plan update acknowledgement letter to the operator (and copy the planner) indicating that the yearly submission has been accepted and that it is valid until the end date identified in the letter. See Section VI: Plan Amendments and Transfers for additional information about NMP amendments.

Below is a flow chart that assists in explaining the yearly submission option:



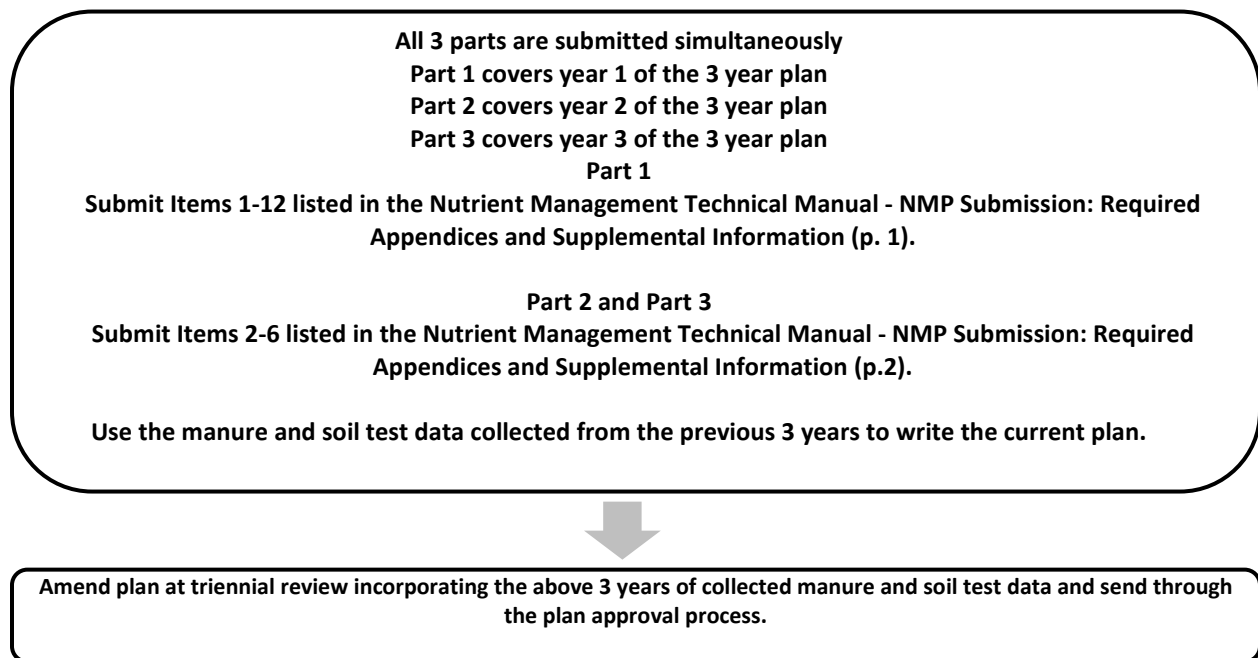
A second option (3 year plans) is to submit all elements (1-12 as outlined above) along with additional:

1. Nutrient Management Plan Summary chart

2. Nutrient Management Plan Summary Notes (along with the Manure Rate Calibration table) for each of the three crop years covered under the NMP with the initial NMP submission
3. Appendix 3s (only the first page is required, addressing each of the manure groups used in the plan, if no changes in the manure group are expected)
4. Appendix 4s
5. Appendix 5s

At the end of the triennial planning period, formal plan amendments will need to be submitted. For scenario 1 listed above, yearly submissions, the triennial review is to incorporate all the yearly submissions, as well as any new information and new soil and manure test values. For scenario 2 listed above, three year plans, the plan amendment is to incorporate all changes that have occurred including new soil and manure test values.

Below is a flow chart that assists in explaining the 3 year plan option:



It is possible that some plans will not need formal amendments at the triennial review but is probably only relevant to total manure export plans, especially those using a broker.

All formal plan amendments are required to submit all the information that is listed above in the Nutrient Management Plan Submission Requirements section.

The NMP provided to the farmer must include all of the NMP requirements (items 1-12) described above. The following plan elements must be provided to the farmer in a separate Farmer Packet so the farmer can focus their attention on those plan elements most relevant to his day-to-day activities:

1. Cover Page
2. NMP Summary (including the NMP summary application chart, summary notes, manure rate calibration table, and the farm management map)
3. Appendix 1: Nutrient Management Plan Agreement and Responsibilities
4. Appendix 8: Importer/Broker Agreements and NBSs

Only **new plans and plan amendments** developed using the standardized Act 38 Nutrient Management Plan Spreadsheet (Excel) program, will be accepted for review and approval under the Act 38 program. A **yearly submission** that would not require a plan amendment is not required to be converted to the Excel spreadsheet version since this is not a document requiring board approval. Only plan submissions requiring formal board action need to be developed using the official Act 38 spreadsheet (Excel) program.

Even though particular farms may be operated where one or more of the above appendices are not relevant, all of the appendices for an Act 38 plan must be submitted. For these situations where a particular appendix is not relevant, the non-relevant appendix must be submitted with the plan along some indication (either on the appendix cover page or in the beginning of the appendix) informing the reader that the given appendix is not relevant to this operation.

For example, a farm that has no acreage included in the plan (such as a total export broiler operation where the owned fields are rented out to another farmer and no manure from the broiler operation is applied on these rented out lands) the Nutrient Management Plan Summary, Nutrient Management Plan Summary Notes, Appendices 4, 5 and 7 and possibly Appendix 10 would not be necessary. These non-relevant appendices would have an entry (preferably on the cover page or alternatively on the first line of the appropriate appendix) that would read; “This appendix is not relevant to this farm situation since no cropped fields are included in the plan.” If a farm situation is such that any given required section of the plan (as outlined above) is not necessary, it is not acceptable to leave that section blank or to leave it out of the submitted plan. It is required to submit either the section cover page or the section cover page and first page, with an indication that the information in that section is not relevant for this plan.

The standardized Act 38 plan development computer spreadsheet program defaults to the basic required elements of an Act 38 nutrient management plan.

In addition to the above listed required plan components and appendices, certain farm management practices may require the completion and submission of supplemental plan information. Completion of additional plan components is required for the following farm management scenarios. These additional plan components must be included with the initial plan submission.

- Farms that **apply manure in the winter**: Include the Winter Manure Application Matrix in Appendix 10: Supporting Information and Documentation of the plan. A sample copy of the matrix is provided in Supplement 10: Winter Manure

Application Matrix, and is provided in a computer spreadsheet format on the Nutrient Management Program website.

- Farms proposing to **build a storage within the property line setback area**: Include a completed neighbor waiver form as part of Appendix 10: Supporting Information and Documentation of the plan. A sample neighbor waiver form is provided in Supplement 16: Sample Manure Storage Setback Waiver.
- Farms proposing to **build a storage within the stream, sinkhole or active water well setback area**: Include a completed waiver request form, or a letter from the conservation district or SCC approving the setback waiver, as part of Appendix 10: Supporting Information and Documentation of the plan. A sample waiver request form is provided in Supplement 15: Waiver Request for Manure Storage Setback Requirements. The plan cannot be approved until the manure storage setback waiver is approved (these actions, acting on the waiver and the plan, can take place at the same board meeting).

Concentrated Animal Feeding Operation (CAFO) nutrient management plan or plan amendment submissions are to be submitted, by the planner to both the Pennsylvania Department of Environmental Protection (DEP) regional office, and to the Act 38 reviewing agency (either the conservation district or SCC) for review and action under the Act 38 program. The plan is to be sent initially to the conservation district (or SCC) for administrative review. Once the planner is informed that the plan is administratively complete, the planner is then to send a copy of the administratively complete plan to the DEP regional office for their concurrent review. DEP accepts these plans in electronic format. DEP communicates any comments they may have on CAFO nutrient management plans to the reviewing entity (generally the conservation district or alternatively to the SCC). DEP comments will be included with the district review comments to the plan writer. In this way, the plan writer only has one person to work with for review comments.

CAFO plans submitted for review are required to be noticed in the PA Bulletin prior to action by the Conservation District Board. The district or Commission is not permitted to act on this plan or plan amendment until at least 30 days have elapsed since the date the plan was noticed in the PA Bulletin. If a planner withdraws a CAFO nutrient management plan prior to action by the Conservation District Board (rescinds the submission, generally to address comments when the 90 day review clock is running out), the planner has 30 days to resubmit that plan in order to avoid having to re-advertise the resubmitted plan in the PA Bulletin. If the planner resubmits the CAFO plan within 30 days, neither the Conservation District nor DEP need to re-advertise the resubmitted plan in the PA Bulletin. If the planner does not resubmit the plan within 30 days, the Conservation District and DEP will need to re-advertise the plan resubmission in the PA Bulletin.

The Act 38 program does accept electronic submissions of certain sections of initial Act 38 nutrient management plan and plan amendment submissions developed using the standardized Act 38 computer spreadsheet (Excel) program. It should be noted that

when the plan or plan amendment is determined to be in its final form for board action, a hard copy of the entire plan, and all plan maps, will need to be provided to the district or Commission for formal action. The electronic submission allowance is only for the initial submissions of certain sections of new plans or plan amendments and any follow up plan correction submissions, and these electronic submissions need to be followed up with a hard copy once the plan or plan amendment is determined by the reviewer to be ready for final action. This allowance is not provided for the submission of yearly submissions to the conservation district, for filing in the farmer's approved plan file.

Electronic submission of an Act 38 nutrient management plan is only relevant to the following plan sections:

- Appendices 3, 4, 5, 6, 7, 8, 9, and 10
- Winter Manure Application Matrix (if developed using the Act 38 program winter matrix spreadsheet)
- Signed exporter agreements
- Nutrient Balance Sheets (if developed using the Act 38 program nutrient balance sheet spreadsheet)

The parts of the plan submission that **must always be submitted in hard copy** include:

- Cover Page
- Plan Summary (including the Farm Management Maps)
- Appendix 1: Nutrient Management Plan Agreement and Responsibilities
- Appendix 2: Operation Information
- Any relevant approved manure storage setback waivers or waiver request forms

Appendix 1: Nutrient Management Plan Agreement and Responsibilities is where the farmer and planner sign the plan. These signatures are required with the initial plan or plan amendment submission in order to consider the plan to be administratively complete. If there are significant changes made during the review process that affect the rates, timing or method of nutrient applications or the BMPs to be installed on the operation, new signatures by the farmer and the planner on Appendix 1: Nutrient Management Plan Agreement and Responsibilities will be required for SCC or district approval of the plan or plan amendment.

The planner is required to review the plan with the farmer (focusing on the Nutrient Management Plan Summary, Appendix 1: Nutrient Management Plan Agreement and Responsibilities, and Appendix 8: Importer/Broker Agreements and NBSs) prior to submission to ensure that the farmer understands and agrees with the obligations outlined in the plan. The farmer's signature on the plan is his acknowledgement that he will follow the plan, and he cannot make that statement until he understands what the plan is requiring.

Section I

Identification of CAOs

The Nutrient Management Act requires all Concentrated Animal Operations (CAOs) to develop, submit, and implement a nutrient management plan meeting the requirements of the Act and the regulations. **A “Concentrated Animal Operation” (CAO) is defined as an agricultural operation that meets both of the following criteria: 1) contains 8.00 or more Animal Equivalent Units (AEUs) and, 2) has an animal density in excess of two (2.00) AEUs on an annualized basis per acre of land suitable for manure application.** It should be noted that this definition was changed significantly in 2006, by adding the “8.00 or more AEUs” portion of the determination and non-production livestock, such as boarding horses, to the animal density calculation. There has been much work to define what is meant by this definition, and this work is detailed in this section. The following topics are included under this section:

1. Conservation district assistance with the CAO calculation
2. The CAO calculation
3. Example calculation
4. Appendix 10: Supporting Information and Documentation (CAO Calculation Worksheet)

Conservation District Assistance with the CAO Calculation

Delegated conservation districts have the **responsibility to assist** with these calculations (other agencies and individuals may also assist) when requested.

The CAO Calculation

The equation to calculate the animal density of an operation, for the purpose of determining CAO status, takes into account the number of animals, the weight of the animals, the amount of time during the year that the animals are located on the operation, and the number of acres to be used for manure application. The generic equation and detailed description below lay out the steps to be followed to complete this calculation.

In general, the equation for calculating the animal density of an operation for the purpose of determining the CAO status of an operation is as follows:

- **the number of animal equivalent units ÷ the number of acres**

The total AEU figure for the operation, necessary to determine if the operation meets the “at least 8 AEUs” portion of the CAO determination, is calculated during the process of determining the animal density of the operation. In determining the number of animals to use, the weight of those animals, and the number of acres to include, the program has developed some guidelines to follow to assure consistency in completing this equation. These issues are described below within the detailed description of the equation.

Supplement 5: Standard Animal Weights provides the necessary “book value” animal weights information that are needed to complete the CAO calculation described below. A discussion on the use of actual animal weights versus standard animal weights is

provided below under *Step 1, (b) Weight per animal*.

Agronomy Facts 54 - Pennsylvania's Nutrient Management Act (Act 38): Who Is Affected? provides helpful information and examples related to the topic of calculating animal density for the purposes of determining Act 38 regulatory status.

Detailed Description of the AEU and AEU per Acre (CAO) Calculation

"AEU and AEU per Acre" CAO Status Calculation

Step 1 (calculate AEU for each animal type and for the operation)

$$\frac{\text{no. of animals}}{(a)} \times \frac{\text{weight/animal}}{(b)} \times \frac{\text{no. of days on the operation}}{(c)} \div \frac{365 \text{ days/yr}}{(d)} \div \frac{1,000 \text{ (lbs/AU)}}{(e)} = \frac{\text{AEUs}}{(f)}$$

Step 2 (calculate the total AEU for the operation)

$$\frac{\text{AEUs for animal group 1}}{(f)} + \frac{\text{AEUs for animal group 2}}{(f)} + \frac{\text{AEUs for animal group 3}}{(f)} + \frac{\text{etc.}}{(f)} = \frac{\text{total AEU for the operation}}{(g)}$$

Step 3 (calculate the AEU per acre)

$$\frac{\text{total AEU for the operation}}{(g)} \div \frac{\text{acres suitable for manure application}}{(h)} = \frac{\text{AEUs per acre}}{(i)}$$

Step 1. Calculate AEU for each animal type and for the operation:

(a) **Number of animals** = the average number of animals of a particular animal type, on a typical production day (*Information is obtained from the operator*).

Act 38 requires nutrient management plans on larger scale agricultural operations with a high density of livestock per acre. These basic elements of the law have directed the Commission to develop a program that regulates the agricultural community in the management of all livestock animals. For this reason **the CAO status determination is to include all livestock on the operation including animals raised and/or maintained for generating income, food, fiber, work, recreation or transportation**. This determination would not include a family's companion animals such as the family dogs, cats (including barn cats), etc. This calculation would include all horses, donkeys, llamas, and other animals raised on the operation that would be considered livestock and would not be considered a family's companion animals.

Dogs being raised, maintained or produced in commercial dog kennels (such as boarding kennels, rescue and adoption facilities, and breeders) are not considered livestock in Pennsylvania and therefore are not addressed as livestock within the Act 38 program. The handling of the manure generated at these commercial dog facilities is overseen by the DEP regional office under their residual waste regulations. Contact the DEP regional office for guidance on addressing nutrient management issues on

operations containing a commercial dog kennel.

It should be noted that not only are all livestock now considered in the CAO determination, but all livestock on the operation are to be included in all elements of the plan to ensure that the manure they generate is handled appropriately.

See Appendix 3: Manure Group Information - Small Quantities of Manure for more information on allocating the manure from these “small animal groups”

(b) Weight per animal = estimated weight of the animal (refer to Supplement 5: Standard Animal Weights” or use documented weights averaged over the production cycle).

The **operator may use weights other than those listed in** Supplement 5: Standard Animal Weights in determining if their operation is a CAO. These non-standard weights must be justified. There may be circumstances where non-standard weights need to be used because of non-standard animals or production cycles used on the operation. For the purposes of this program, justification for non-standard animal weights shall be documented (and furnished upon request to the Commission or delegated district) by the operator in writing. For existing operations, non-standard weights are to be based on past weights of the animals and for proposed operations, non-standard weights are to be based on the animal weights of an identical operation. A statement justifying the need for use of non-standard animal weights, along with the summarized data and calculation that was used for determining these non-standard weights, are to be included in Appendix 10: Supporting Information and Documentation of the nutrient management plan when non-standard weights are used. Where there is no data to support the non-standard weights, generally the standard weights in Supplement 5: Standard Animal Weights should be used.

There is no specific requirement that animals must be weighed by a representative of the program. A farmer using non-standard weights in their plan must maintain on site, the documentation or data used for determining the non-standard weights in the plan. The preferred method of documenting these non-standard weights is to **maintain on site copies of actual weight slips representing animals on the operation**. Because the CAO calculation will often utilize an average weight over a production cycle, a final market weight may not directly provide this information. An average of the weight at the start and finish of the production cycle would then be used.

For those **animal types not included in Supplement 5: Standard Animal Weights**, the average animal weight for the particular operation shall be used for this calculation, taking into account, if applicable, the range of animal weights throughout the production cycle of the animal.

(c) Number of days on the operation = the actual number of days out of 365 that these animals are on the operation (Information is obtained from the operator).

(d) 365 (days in a year) = conversion factor to put calculation into a yearly basis

(constant)

(e) **1,000 (lbs. per AEU)** = conversion factor to change total pounds into AEU
(constant)

(f) **AEUs** = the number of Animal Equivalent Units for the particular animal type
(calculated)

Note: repeat this calculation for each animal group on the operation

Step 2. Calculate the total AEU for the operation:

(g) **Total AEU for the operation** = total animal equivalent units for the operation
(calculated, by adding together the AEU for all the animal types on the operation to determine the total AEU for the operation).

If an operation has less than a total of 8.00 AEU based on this calculation, the CAO status determination is complete and the operation is not a CAO. But, if this calculation comes out to 8.00 or more total AEU for the operation, then you need to continue on with the calculations below to determine animal density and CAO status.

Step 3. Calculate the AEU per acre:

(h) **Acres suitable for manure application** = acres of the operation suitable for manure application (determined using the criteria described below and information from the operator)

According to the regulations, acres that **can be included** in this calculation are:

- Cropland, hayland, or pastureland (owned or rented) that is an integral part of the operation.
- Land that is or will be used for the application of manure from the operation

Acres that **cannot be included** in the AEU per acre calculation are.

- Farmstead and forest land

Lands to be counted in the AEU/acre calculation are those **lands under management control** of the operator **where manure is or will be applied** under the normal cropping sequence of the operation. Management control generally includes the authority to determine what crops are grown and what nutrients are to be applied. In addition, management control generally relates to those situations where the operator or a person working for the operator is doing the actual farming practices on the land. This includes all owned lands (that are not rented out to another farmer) under the management control of the operator and all rented acres where manure from this operation will be applied to meet crop needs sometime during the normal cropping system. If an operator has rented his owned land to another operator those lands are generally not considered under the owner's management control for the purpose of the CAO calculation. The Commission does not require a written rental agreement for

rented land, but the operator must be willing to sign a form indicating the amount of rented lands that the operator is managing or in some other way document their control of this land if the Commission would require such documentation.

Only one operator may count the acres of any given field for the purpose of the CAO calculation. For example, where the landowner of a given field rents that field out to a tenant farmer, the landowner in this case cannot count the acres of that field in his CAO calculation. The renter of the field may be able to count these acres (based on whether or not he applies manure to this site) because these acres are considered under his management control for the purposes of the CAO calculation.

(i) AEU per acre = This is the final AEU per acre figure used to determine if the particular operation is a CAO or not (calculated).

A CAO is an operation having at least 8.00 AEU, **and** where the animal density of the operation exceeds two (2.00) AEU per acre on an annualized basis.

For the purposes of determining if a particular operation is a CAO or not, the AEU/acre calculation should be **rounded off to the nearest 100th** of an AEU/acre. Two examples are:

- 1.638 AEU/acre would equal 1.64
- 1.9523 AEU/acre would equal 1.95

For operations that have no acres to count in this determination (such as operations that rent out all their owned acres, or operations that just rent a barn but no acres), the AEU per acre calculation assumes 1 acre of land under their management control. So in the case where an operator has no land to include in this calculation, the AEU figure for the operation will match the AEU per acre figure. For example, an operation raising 2,400 finishing hogs (calculated to be 320 AEU) in a rented barn, and they do not rent any acres at the site or elsewhere for application of the manure, would be calculated to have 320 AEU per acre.

Example Calculation

An example of this calculation is shown below and how this information is to be listed on the standard plan is **shown in the sample nutrient management plan** (Supplement 2: Sample Nutrient Management Plan).

Example Farm Data:

Animal Inventory: 110 dairy cows @ 1,300 lbs
35 heifers @ 900 lbs average weight
20 calves @ 375 lbs average weight
15,000 heavy broilers @ 3 lbs average weight
(Average weights taken from Supplement 5: Standard Animal Weights)

Production Period: Cows, heifers, and calves = 365 days per year
Broilers = 5 flocks for 57 days each, or 285 days per year

Land Inventory: Farmstead = 5 acres; Woodland = 3 acres; Pasture = 4 acres;
Cropland, home farm = 60 acres; Cropland, rented farm = 36 acres

Using this example data and the worksheet, the calculation of animal density (AEUs per acre) for this farm would be as follows:

Animal Type	No. Animals	x Animal Weight (lbs.)	x Prod. Days	÷ Factor =	AEU
Dairy	110	x 1,300	x 365	÷ 365,000 =	143.0
Heifers	35	x 900	x 365	÷ 365,000 =	31.5
Calves	20	x 375	x 365	÷ 365,000 =	7.5
Broilers	15,000	x 3	x 285	÷ 365,000 =	35.14
Total* =					217.14
Acres available for manure**				÷ 100	
AEUs/Acre				= 2.17	

* If this figure is less than 8, then the farm would not be a CAO, regardless of the AEU/acre figure calculated below.

** Includes only cropland, hayland, and pastures; for this example there are 96 acres of cropland/hayland and 4 acres of pasture.

Cover Page

This page of the plan is to be provided consistent with the format provided in the Act 38 standard plan. The cover page is to be no longer than one page in length and can include additional company related logos or symbols in order to indicate to the farmer the company used to develop the plan.

The standard plan format wording outlining the required information on the cover page is not to be included with the completed cover page. For example, the Operator Name states “John and Missy Brown” and does not state “Operator’s Name: John and Missy Brown”. The dates area should include what that date relates to, such as “Date of Plan Submission: October 1, 2007”.

For Crop Year(s)

The cover page will indicate what Crop Year(s) the plan is written to cover (such as: “2017 – 2019” or “2017”. Specific guidance on crop years is provided in the NMP Submission section of this manual.

Operator’s Name, Address and Telephone Number

The cover page will include the following:

- Operator’s Name
 - The operator’s name for a family run farm is to include both the husband and wife, if the wife is part owner of the business.
 - The farm name can and should be included in this part of the plan, but also the main contact person’s contact information should immediately follow the farm name (such as: “Happy Acres Farm; Bob and Brenda Smith
- Operations Physical Address
- Operators Mailing Address, if different from physical address
- Telephone Number.
 - The phone number should be whatever number is most appropriate for contacting the operator if program staff would need to contact the operator for setting up farm visits or the like.

Planner’s Name, Certification Number, Address and Telephone Number

The cover page will include the Nutrient Management Specialist’s Name, Address and Telephone Number as well as the PDA Nutrient Management Specialist Program Certification Number for the planning specialist.

Date of Administrative Complete Plan Submission

The “dates” part of the cover page is important to help ensure that the plan is kept current as required through the regulations. The Administrative Complete Date of Plan Submission date is to be completed by the conservation district or Commission staff reviewing the nutrient management plan and would refer to the date the administratively complete plan was officially received in the district or Commission office for review. Therefore, the planner should leave this date blank when submitting a plan or plan amendment for review. This date would not change when the plan submission is revised during the review process to address technical comments provided by the plan

reviewer.

It should be noted that a plan amendment would have a new cover page submitted with the amendment, and an Administrative Complete Date of Plan Submission date would be used indicating when the administratively complete plan amendment was submitted. Also note that this plan submission date would change if the plan was officially withdrawn during the review process. In the case where a plan is officially withdrawn, a new Administrative Complete Date of Plan Submission date would be filled-in by the reviewing entity indicating when the administratively complete plan resubmission was received. In summary, this line addresses initial plan submissions and would also be completed for plan amendments. The submission dates for plan updates are handled in a separate line, as explained below.

The administrative completeness letter sent to the farmer (and copied to the planner) indicating that the submitted plan or plan amendment was determined to be administratively complete and a technical review will now begin, should indicate the date the district received the administratively complete plan (which would be the same date entered onto the Administrative Complete Date of Plan Submission line on the cover page).

Date of Plan Approval

The Date of Plan Approval line is to be completed by the Conservation District or Commission staff reviewing the nutrient management plan and would refer to the date that the plan was approved by either the Conservation District Board of Directors or the State Conservation Commission. The planner should leave this date blank when submitting a plan or plan amendment for review.

Date(s) of Plan Update Submissions

The Date(s) of Plan Update Submissions (not requiring board action) would be completed by the conservation district or Commission staff receiving the nutrient management plan updates indicating when the plan update was received in the district or SCC office. The cover page (which would include the original plan submission date) would be submitted by the planner with the plan updates date blank for completion by the conservation district or Commission staff.

Nutrient Management Plan Summary

The Nutrient Management Plan Summary is comprised of five components:

- Nutrient Management Plan Summary
- Nutrient Management Plan Whole Farm Notes
- Nutrient Management Plan Summary Notes
- Additional Nutrient Management Plan Requirements
- Operator Management Map

The purpose of this section is to summarize for the farmer all that is required to implement the nutrient management plan for this operation. The information generated by the planning process, such as manure and crop information, manure and storm water management evaluations, and excess manure provisions, is summarized succinctly in the Nutrient Management Plan Summary. More detail is provided in the various appendices but everything required to be implemented is summarized here to assist the farmer in easily identifying the plan requirements.

The planner is required to review the contents of each section of the Nutrient Management Plan Summary with the farmer prior to submission of the plan for review. “Agronomy Facts 76: Nutrient Management to Improve Nitrogen Use Efficiency and Reduce Environmental Losses” is an excellent educational resource to help farmers understand and evaluate how to effectively implement their nutrient management plan.

Nutrient Management Plan Summary

The plan shall include a summary of the application rates by field or crop management unit for all nutrient sources applied to meet crop nutrient needs for all fields on the entire operation (owned and rented acres). The farmer should be able to tack this portion of the plan up on the wall of the barn or carry it in the tractor cab. Using this information alone, the farmer should be able to direct manure and other nutrient applications to each field.

The plan must include separate Nutrient Management Plan Summary and Nutrient Management Plan Summary Notes tables for each individual crop year included in the plan. Each set of NMP tables must identify the specific crop year the plan information addresses. Specific guidance on crop years is provided in the NMP Submission section of this manual. The development of one summary covering a number of crop years is not a valid submission unless there are explanatory circumstances on the farm in which fields are not expected to change from year to year (such as a farm that is comprised of all pasture or hayland throughout the plan’s lifespan, etc.).

Also, the development of a plan which provides a plan summary covering all cropping options for each field on one summary is not a valid submission unless there are explanatory circumstances with the farm, and the Commission has specifically approved this planning approach for the farm. The plan summary is expected to document the farmer’s decisions on what specifically is planned to be done on each individual CMU/Field during that specific crop year.

The NMP Summary chart columns for pasture fields are filled in the same manner as crop fields except for the “Planned Manure Rate” column. Instead of an actual application rate a note is inserted to direct the farmer to the NMP Summary Notes which must include the management practices and information which was used to calculate the amount of uncollected manure in that pasture. The required pasture notes information is outlined below.

The sample nutrient management plan in Supplement 2: Sample Nutrient Management Plan illustrates how this section of the plan should look when completed appropriately.

Nutrient Management Plan Whole Farm Notes

At the top of the Nutrient Management Plan Summary, there is a place to include notes to the farmer that apply to the whole plan. These may be notes about global management changes or general information that the farmer needs to be aware of when he implements the plan. For example if the starter fertilizer program was changed for all of the corn fields in the plan that could be included here as a Whole Farm Note.

The following standard note is required in every nutrient management plan and is automatically inserted by the NMP Excel Spreadsheet in the “Whole Farm Note” box at the top of the NMP Summary chart:

“If manure runs out for any field, consult Appendix 4 of the plan for that field. The fertilizer required on any part of the field that does not receive manure can be determined from the ‘Net Nutrients Required’ for that field.”

This standard Whole Farm Note details what the farmer should do when the manure from a manure group planned for a field or several fields runs out. The specific purpose is to provide instruction to the farmer on how to determine the amount of fertilizer required to meet that crop’s nutrient needs.

Nutrient Management Plan Summary Notes

This area of the summary is provided to help the farmer implement the plan on individual fields. Generally (with two exceptions), there are no required elements to this section of the plan summary. Planners are encouraged to use the notes section to provide additional explanation or clarification to the farmer on specific aspects of the NMP Summary that may be confusing or unclear. Common examples are multiple applications, split applications, or the use of the PSNT or chlorophyll test. Other information, such as manure application setbacks may be helpful for the farmer to have noted here. This section is for the farmer, not others who may read the plan, and should focus on helping the farmer implement the nutrient management plan.

There are three scenarios where plan summary notes are required to be included in the plan.

The first scenario requiring plan summary notes is for pasture fields. For each of the pasture fields included in the plan, the planner must list the following in the NMP Summary Notes:

1. The animal group(s) using the pasture,
2. The number of animals in that group,
3. The grazing season(s),
4. The amount of hours/day animals are planned to spend on the pasture, and
5. Where the animals are fed and watered in scenarios where grazed animals have unrestricted access to both a barn and/or lot where manure is collected and a pasture.

The second scenario requiring plan summary notes is for winter application fields. For each of the fields in the plan that are to receive winter manure applications, the planner must note the following field conditions for the winter application of manure in the NMP Summary Notes:

1. 25% cover requirement
2. Whether or not the field will be allowed to be used if it is snow or ice covered
3. Additional setbacks proposed to be used for added water quality protection, etc.

Additional requirements for winter manure applications are outlined below.

The third scenario is for small quantities of manure. If manure from the small quantity manure group will be applied to cropland, a note for the crop management unit(s) receiving the manure must be included in the NMP summary notes.

Manure Spreader Settings to Meet Planned Manure Application Rates

The Nutrient Management Plan Summary includes a “Manure Spreader Calibration Notes” table. For each planned manure application rate listed in the nutrient management plan the equipment and settings used to obtain that calibrated rate must be recorded in the table. Calibrated and planned manure application rates for liquid manure should be rounded to the nearest 100 gallons. Solid manure rates less than 5 tons per acre should be rounded to tenths. Solid manure rates equal to or greater than 5 tons per acre should be rounded to whole numbers.

The “Manure Spreader Calibration Notes” table provides an accessible reference for the farmer or other applicators to use to find the appropriate equipment and settings used to achieve the various manure application rates included in the nutrient management plan.

The following data, recorded during the spreader calibration for each planned manure application rate included in Appendix 4: Crop and Manure Management Information is required to be included in the Nutrient Management Plan Summary: Manure Spreader Calibration Notes table:

- Planned manure application rate
- Manure spreader used
- Spreader settings
- Tractor used (if applicable)
- Tractor settings (speed, gear, rpm, pto, etc.)

If a farmer uses more than one piece of equipment to achieve a particular application rate a separate line is needed for each piece of equipment used to meet a particular application rate.

Following are two examples of completed Manure Rate Calibration tables, one using a tractor and one using horses

Example 1: Tractor Driven

Manure Application Rate	Manure Spreader Used	Spreader Settings	Tractor Used (if applicable)	Tractor Settings (speed, gear, rpm, pto, etc.)
7850 gallons	Nuhn 6500		John Deere 8300	1.8 mph @ 1700 rpm
18 tons	Knight 8018 Pro-Twin		John Deere 8300	2.8 mph @ 1700 rpm
10 tons	Knight 8018 Pro-Twin		John Deere 8300	4.5 mph @ 1700 rpm

Example 2: Horse Driven

Manure Application Rate	Manure Spreader Used	Spreader Settings	Tractor Used (if applicable)	Tractor Settings (speed, gear, rpm, pto, etc.)
4500 gallons	Stoltzfus 800 gal tank	valve fully open	horse driven	5 horses

Actual manure spreader calibration data is required to be included in the NMP.

If an operator uses a commercial applicator to apply their manure, the planner should indicate in the chart or plan notes that this plan element is not applicable (by indicating “NA, commercial applicator used”) for the given plan.

If manure spreader calibration is impractical at the time of plan development due to situations such as the operation being new and there is no manure to use to calibrate their equipment, the planner should indicate in the chart that calibration of equipment will be completed as soon as manure is available.

Winter Manure Application Season Requirements

The ‘Nutrient Management Plan Summary’ chart (under the “Application Season” column) indicates whether or not specific fields or crop groups are proposed to have manure applied to them in the winter. Winter is defined as a time when any one of the following conditions exists:

1. the date is on or between December 15 and February 28, **or**
2. the ground is frozen at least 4 inches, **or**
3. the ground is snow covered

All fields identified for winter manure application must be assessed using the most recent version of the Winter Manure Application Matrix (Supplement 10). A completed Winter Manure Application Matrix assessment, addressing each field proposed for winter application, must be submitted for review for any nutrient management plan that includes fields proposed for winter manure application. Along with the winter matrix, the

P-Index will need to be submitted addressing winter manure application for any fields proposed for this practice. Lastly, the additional winter application setbacks will also need to be assessed for these fields.

This Winter Manure Application Matrix is a guidance tool developed to highlight the field characteristics that are most relevant for assessing a field for potential manure runoff during the winter season. The planner or reviewer may disagree with the results of the winter matrix based on specific understanding of how this particular farm site has, and is planned to be managed. Considerations that may affect whether or not the winter matrix can be fully relied on for assessing these fields can include:

- Ground cover at the time of application
- Whether the fields will be snow or ice covered at time of application
- Whether there are environmentally sensitive areas adjacent to the application fields
- If the farmer is using some unique on-farm management practices to further address winter runoff from the application fields.

For those situations where the results of this guidance tool are questioned due to additional site specific knowledge of the area, the results should be discussed with SCC staff to determine if the fields should be accepted for winter application or not.

Recognize that winter application of manure is generally not a preferred practice for addressing water quality, and therefore should only be considered for use where it is a necessary practice for operation of the farm, and where fields identified for winter manure application are situated in such a way as to minimize the potential for manure or nutrient runoff during the winter season.

On farms where winter manure application is a necessity, either planned or written as a contingency to the approved plan, these applications should be minimized as much as possible. This would include:

- Spreading only that amount of manure that is absolutely necessary to spread during the winter (such as not completely emptying the storage during the winter, but only drawing it down to a sufficient level to allow for storage of the manure through the remainder of winter). If the farm produces solid manure, winter application of this manure is easily avoided by stockpiling that manure during the winter, rather than applying the manure if fields and conditions are not fully suitable for this practice.
- Manure application on snow or ice provides for the highest level of risk for runoff of the applied manure and therefore should only be approved for unique situations that have a very low risk of runoff to a water body. If winter application is proposed, the plan, if possible, should indicate that application will only take place at times when the ground is neither snow nor ice covered. Following this direction will open more fields up to the possibility of winter application and can help minimize manure runoff in the winter season.
- When it is necessary to apply manure in the winter, the application fields should primarily be those with a “growing” crop (either cover crop or hay crop) in order to minimize runoff of manure nutrients with this practice. The regulations allow for

winter application on approved fields that do not have a growing crop, but have significant crop residue (greater than 25%), but these fields relying solely on residue to hold manure in place will generally need to be of a lower slope and further separated from water conveyances, than fields with a growing crop.

- Significantly reducing the application rate for winter applied manure can help minimize manure runoff at these times of the year, and possibly allow for additional areas of the farm to be considered for winter application.

For additional information of how to assess fields for winter application and for recommendations of winter manure application field ratings, refer to Supplement 10: Winter Manure Application Matrix.

Plans that do not call for the winter application of manure, but due to unforeseen circumstances (such as problems spreading in the fall, or barn issues that generated a significantly higher volume of manure on a given year (such as water control problems)) this practice becomes necessary in a particular year, the plan can be amended by a certified planner to incorporate this practice for the given year. These plan amendments should be developed and submitted to the reviewing agency prior to spreading in the winter (for situations that are not related to acute situations requiring immediate action). It should be noted that this would only be relevant to liquid manures, as solid manures can be stockpiled on the emergency stacking areas until winter is over.

For acute (unanticipated emergency) winter manure application prior notification to the reviewing agency is not required. Notification is required within 30 days of implementation. See Section VI: Plan Amendments and Transfers for guidance related to unforeseen circumstances.

Note: The Act 38 winter manure application requirements stay with the manure, independent of the final user's animal density classification (i.e. importers of Act 38 manure that plan to spread that manure in winter must develop a winter manure application matrix for each importer that plans winter applications). Importing operations should assess their fields for winter application using the same criteria that is used and explained above for CAO and/or CAFOs.

Manure Management and Stormwater BMP Implementation Summary

This chart is used to list the various stormwater and manure management BMPs required to be implemented on this operation, and when they are to be installed. The BMPs listed on this chart come from 1) the "BMPs to address Manure Management Problem Areas (Appendix 6)" and 2) the "BMPs to address Critical Runoff Problem Areas (Appendix 7)".

This chart lists the structural and management practices necessary to be implemented, and when they are to be implemented, on this farm to provide runoff controls in the farmstead and crop fields. The nutrient application procedures described in the plan (such as application rates and timing, etc.) are to be implemented as soon as the plan is approved and where the cropping sequence, available equipment and facilities allow.

This listing is not to include procedures that are already listed in the record keeping requirements under the plan. Required practices such as soil and manure testing are not to be listed in this section of the plan. Soil and manure testing are addressed in the record keeping requirements on the agreement and responsibilities page, and therefore they are not to be listed here. Conservation planning is a requirement addressed elsewhere in the program (under the review and approval element of the program) and therefore is not to be included here.

The implementation times listed on this chart need not be more specific than the season (**Spring:** April-May; **Summer:** June-August; **Fall:** September-November; or **Winter:** December-March) and year that the given practice is planned to be installed.

A farmer needs to recognize the importance of the need to install these practices and the time frame provided for installation. If a farmer is not able to install a practice by the approved time frame, he/she will need to contact the plan review authority (generally the conservation district) to discuss the requirement to revise the plan or install a different or interim practice.

The structural BMPs outlined in the plan are to be implemented within 3 years. Certain BMPs, such as very severe manure runoff problem areas (i.e. severe barnyard problems) may not be appropriate to be held off for three years, and should be scheduled sooner so that future pollution is minimized.

The BMP summary **does not need to give dimensions or exact locations** for the BMPs to be installed. The plan summary just needs to list the type of BMP to be installed (name of practice and NRCS practice code) and where the BMP is to be installed (field number or location in farmstead). The plan map is required to provide a pictorial location of where the planned BMPs are to be located (as well as existing BMPs).

In-Field Manure Stacking Procedures

For operations that plan to stack manure on crop fields for later application to that field, this area of the plan would outline the criteria under which this stacking will be allowed. Information in this section needs to be site specific of how this farmer will manage his in-field stacks of manure. Only describe what direction is needed for this particular farm, and recognize that the location issues will be addressed through the site selection on the map and do not need to be described here. This manual includes a guidance document (Supplement 17) which provides in-field manure stacking criteria for use when stacking manure on farms covered under the Act 38 program.

For farms that will be field stacking manure, this section of the plan would include a statement noting that field stacking of manure is planned to occur on locations as identified on the plan maps, and that the stacks will follow the appropriate shape, and timing of application. Example text could read:

“This operation will be field stacking manure on the locations identified on the plan maps. These stacks cannot be maintained on these crop fields for longer than 120

days without the stacks being covered with a watertight covering, [or the plan could read “stacks will be maintained on sites meeting the NRCS manure stacking pad standard”].

Stacks will be shaped in a cone or windrow shape to best shed rainwater falling on the stacks.

Stacks must be rotated every year, with a minimum 4-year rotation, to ensure that the stack is not located on the same footprint that it was on within the past 4 years.”

For farms that will not be field stacking manure, this section will still need to be completed and could read:

“No in-field stacking of manure will take place on this operation.”

Note: The Act 38 and/or CAFO in-field stacking requirements stay with the manure, independent of the final user’s animal density classification.

Additional CAFO Requirements

This is the section of the plan where any additional CAFO program requirements would be listed. Those requirements may relate to:

- **Additional manure stacking requirements.** These additional requirements relate to shortening the time allowed for manure to be stacked uncovered on the CAFO’s application fields. This would be worded as follows: “Manure may not be stacked in crop fields on this operation for greater than 14 days without covering the stack with an impermeable cover to keep rainwater from falling on the pile.”
- Addressing the **Manure Storage Winter Capacity Planning Level** for the storage in the nutrient management plan: For CAFOs that will be storing their manure over the winter, useable space and capacity should be maintained in the manure storage to sufficiently manage manure over the winter. Documentation of useable space and winter storage capacity should be listed in the NMP and must account for multiple factors.

The specific factors that must be considered when determining the manure storage winter capacity planning level, as well as, supporting example calculations and conversions are referenced in the “Manure Storage Winter Capacity Planning Level Guidance” publication located on the Nutrient Management Program website at: <http://extension.psu.edu/plants/nutrient-management/planning-resources/other-planning-resources/cafo-manure-storage-winter-capacity-planning-level-guidance> and <http://extension.psu.edu/plants/nutrient-management/planning-resources/other-planning-resources>

For a CAFO operation, the winter manure storage capacity planning level expressed in feet must be documented in the NMP Summary materials of the NMP Standard Format. Supporting information, calculations and references must be documented in Appendix 10 of the NMP Standard Format.

Technical questions regarding Manure Storage Winter Capacity Planning level questions can be directed to USDA-NRCS Nutrient Management Program staff. Contact information is located at <http://extension.psu.edu/plants/nutrient-management/directory>

Regulatory questions regarding Manure Storage Winter Capacity Planning level questions can be directed to PA DEP Nutrient Management Program staff. Contact information is located at <http://extension.psu.edu/plants/nutrient-management/directory>

Proposed Manure Storage Description

When construction of a new manure storage is proposed for the operation the following information must be listed here:

- Type of the proposed manure storage system such as above ground cylindrical concrete manure storage tank, under the barn concrete manure storage tank, or HDPE lined structure, etc.
- Dimensions of the proposed manure storage facility. If the facility is sloped sided; the top dimension and the bottom dimension, as well as the depth and the slope of the inside of the berm are to be listed.
- Calculated volume of the proposed manure storage facility such as 450,000 gallons, or 3,000 cubic feet, taking into account the appropriate freeboard for any liquid or semi-solid storage facility.
- Freeboard for the proposed facility such as 6" or 2', etc.

The location of the proposed facility must be shown on the farm map.

- If the location is within the setback distance, and a waiver is applicable for the operation, the waiver is to be approved prior to, or at the same time as the approval of the plan. If a waiver is not available or not able to be approved, the location will need to be changed to ensure that the storage is in compliance with setback requirements.

Please note that this is the location in the plan where any **proposed** manure storage facilities would be described. This is **not** where existing manure storage facilities are documented. Existing manure storage facilities are documented in Appendix 2 ("*Operation Information*"), under the topic "Manure Storages and Capacity".

Description of Planned Alternative Manure Technology Practices

If the operation is planning to implement alternative technologies to address manure management issues on the operation, this area of the plan is where those proposed practices would be listed.

Alternative manure technologies are those activities implemented by farmers to process raw manure in order to make it easier to transport and/or apply; as well as treatments that assist in segregating the nutrient content of the manure so that it will better address farm nutrient balance issues. Several alternatives include: composting, incineration, and solid/liquid manure separation (with and without binding agents).

For these situations, the plan would list what practice is planned, what volume of manure is to be processed annually with this practice, and the expected result of the implementation of the practice. Text for this section could read:

“The operation will be mechanically separating solids at the facility using a screw press system. All 1.2 million gallons of the manure coming from the dairy barn will be processed through this system. This process will remove a majority of the solids from the manure, taking the manure effluent coming out of the screw press down to 1% solids (99% liquid). This will also reduce the phosphorus in the dairy manure coming from the dairy barn, taking the manure content down from 13 lbs. per 1,000 gallons to 1.5 lbs. per 1,000 gallon (based on other operations using this system). The solids will be handled separately and exported off the operation to areas in need of phosphorus.”

Exported Manure Summary

The exported manure portion of the plan summary shall include **a general description** of how the operator plans to use manure for other than agricultural land application on the operation. This portion of the summary is not intended to provide a high level of detail, but to give a general concept of how much, where, and when manure will be utilized in this manner.

Some examples of how this might look include:

1. If the farmer were planning to export 200 tons to neighbor Jones in the spring, 300 tons to neighbor Robinson in the fall, and 500 tons to neighbor Zimmerman in the summer for agricultural land use, the summary would say:

“1,000 tons of manure will be exported to neighboring landowners various times throughout the year for agricultural land use.”

2. If the farmer was planning to export 500 tons of manure to neighbor Mains for agricultural land use and 300 tons to Organo-King for bagging and use as a commercially sold fertilizer, the plan summary would say:

“500 tons of manure will be exported to a neighboring landowner for agricultural land use and an additional 300 tons of manure will be exported to a commercial company to process for use as a commercially sold organic fertilizer.”

This information is a **concise summary** of the information contained in Appendix 8 (*Importer/Broker Agreements & Nutrient Balance Sheets*), which generally shall contain all the necessary documentation related to manure exported from the operation.

For operations that will be implementing an unusual exporting procedure, such as relying on small quantity importers (as may be the case with horse operations exporting less than 25 tons of manure per year for any given importer), this section of the plan will provide a brief description of what is being proposed. These unusual situations are generally not detailed in Appendix 8 and therefore need to be described here for review and approval. See Appendix 8 for further detail on what needs to be documented in this

section of the plan for farms that export small quantities of manure, or if manure is exported or used on site for other than agricultural land application.

For the case of the small quantity exporter, the wording required in this section of the plan could look something like the following:

"This operation will export its manure to neighboring land owners who will use it to fertilize their gardens or other small parcels. No individual importer will receive more than 25 tons of manure during any calendar year. I recognize that I need to keep manure exporting records documenting who took manure, the date they took it, and how much they received. I also recognize that I will be required to maintain these records at my operation for at least three years."

"If an importer wishes to import more than 25 tons of manure during any calendar year, I recognize that I will be required to submit a signed agreement and Nutrient Balance Sheet(s) to address this importer taking more than 25 tons in a year's time, prior to the manure being exported to the importer."

Operator Management Map

There are three map types required in an Act 38 nutrient management plan. Those three types include 1) Topographic Map, 2) Soils Map, and 3) Operator Management Map. The Operator Management Map is to be included in the Nutrient Management Plan Summary section to provide easy reference for the farmer. This is the map that is considered to be the most valuable to the farmer on a day-to-day basis for the implementation of the approved nutrient management plan. It is highly recommended that Aerial Photography be used as an underlay on the Operator Management Map. The Topographic and Soils maps described here belong in Appendix 9 (*Operations Maps*).

The operator map is to include the following:

1. farm boundary,
2. field boundaries,
3. field identification,
4. field specific acreage (this information can be shown directly on the map for each field, or can be included as part of the map legend indicating the field acreage for each individually identified field),
5. manure application setbacks and buffers in accordance with 83.294 (f) and (g) (with an identification of the landscape feature that requires the setback, such as an indication of where the stream or sinkhole are, well locations, etc.),
6. location of existing and proposed structural BMPs (including manure storage facilities),
7. location of existing or proposed emergency manure stacking areas or in-field manure stacking areas, and
8. roads and road names adjacent to and within the operation.

It is recommended that the operator map also include the following:

1. Aerial Photography as an underlay

2. Stream, Lake, Pond names, if available
3. For operations that contain multiple farms, a county or township map, that shows the location of each individual farm, that make up the larger operation.

The above items must be clearly identified on the operator management map, either by direct notation on the map, or through a clear legend. Manure application setbacks and vegetative buffers must be clearly identified on the map with an indication of the required setback or buffer width. The farmer and program staff need to be able to interpret the information provided on the legend, so the legend needs to identify the given feature using legible font sizes and easily understood words or symbols. Avoid using cryptic symbols or phrases that are not well understood by those using this map.

Only setback landscape features on the map that are relevant to actual setbacks or buffers required on this operation need to be identified. Landscape features on adjoining properties that do not require a setback should not be included on the farm map. For example, a neighbor's well which is beyond 100' from fields on the operation does not need to be included on the nutrient management plan operator management map, although any wells on adjoining properties that fall within the 100 foot setback need to be identified.

To test if this map is adequate, just imagine if you were a new manure hauler brought into this operation to help them apply their manure. Would the direction given on this map, in conjunction with the application rates in the Nutrient Management Plan Summary, be adequate to allow someone new to find the field and apply manure properly on this operation.

Act 38 Manure Application Setbacks

Manure application setbacks, for the purposes of the Act 38 program, are defined as areas where manure will not be mechanically applied next to an environmentally sensitive area such as a wells, sinkholes, streams, lakes or ponds, for the purpose of minimizing the potential for applied manure (or nutrients associated with the applied manure) to run off into the environmentally sensitive area. This setback area has no cropping limitations on it through Act 38, but where used to meet regulatory requirements, does have a mechanical manure application limitation.

The specific manure application setback options provided in the Act 38 regulations are a 100 foot manure application setback next to environmentally sensitive areas or, with the exception of wells, a 35 foot permanent vegetative buffer. Nutrient Balance Sheets using options 1 or 2 require a 150 foot manure application setback from streams, lakes and ponds. In the case of the importing farms, this 150 foot setback serves as the importing operation's method for addressing phosphorus loss without having to run the full P-Index on the importing operation. If option 3 is used, the 100 foot setback or 35 foot permanent vegetative buffer may be used. The setbacks for Nutrient Balance Sheets for wells and sinkholes are the same as for Nutrient Management Plans.

The manure application setback area is not restricted under Act 38 from being cropped to the extent that the crops and cropping practices used in this area are consistent with

the setback criteria. If this management includes the application of fertilizer (non-organic) nutrients, the setback area should be broken out as a new field or sub field for the purposes of determining nutrient application rates and final nutrient balances.

Act 38 Buffers

The purpose of a buffer is to reduce runoff velocity, increase infiltration of runoff water, provide a filter area for manure contaminated water, and minimize the risk of nutrient pollution. This area is not restricted under Act 38 from being cropped to the extent that the crops and cropping practices used in this area are consistent with the buffer criteria.

A permanent vegetative buffer, for use in the Act 38 program, must meet the following general requirements. Specific requirements for cropland and pastures are outlined below:

- A permanent strip of perennial vegetation (existing or established) parallel to the contours of, and perpendicular to, the dominant slope of the field.
- Located between the field and the protected land feature (stream, lake, pond, and sinkhole).
- Flow characteristics are primarily sheet flow with no obvious concentrated flow (converging rills, ephemeral gullies, classic gullies) into/within/leaving the buffer.

The vegetative buffer area is not restricted under Act 38 from being cropped to the extent that the crops and cropping practices used in this area are consistent with the buffer criteria. If this management includes the application of fertilizer (non-organic) nutrients, the buffer area should be broken out as a new field or sub field for the purposes of determining nutrient application rates and final nutrient balances.

Cropland Buffer Criteria

If the CMU/Field being evaluated is **cropped and not a grazed pasture**, then the following criteria must be met for the 35 foot area adjacent to the stream, lake, pond or sinkhole to be considered a 35 foot buffer in an Act 38 nutrient management plan. If the following criteria cannot be met then the mechanical manure application must be setback 100 feet from a stream, lake, pond or sinkhole.

1. Thirty-five feet of perennial vegetation (woody, herbaceous or any combination).
 - a. Plants identified by PDA as noxious weeds must be eliminated and controlled in these areas. For a listing of noxious weeds refer to Pennsylvania's Weed Control list (<http://plants.usda.gov/java/noxious?rptType=State&statefips=42>).
 - b. The vegetation must be maintained in a healthy condition such that it provides at least an 80% vegetative canopy across the 35 foot area during the growing season.
 - c. Vegetation in these 35 foot buffer areas may be harvested periodically. This includes using buffer areas for hay production.
2. Manure may not be applied mechanically within the 35 foot buffer. Chemical fertilizer may be applied according to the nutrient management plan to maintain adequate plant growth for situations where the buffer vegetation is harvested, or when nutrients are required to establish or reestablish a non-harvested buffer.

3. Criteria 1 must be met and implemented at the time the manure will be mechanically applied to the CMU/Field.

Pasture Buffer Criteria

If the CMU/Field or is a **grazed pasture**, then the following criteria must be met to use the pasture for the 35 foot area adjacent to the stream, lake, pond or sinkhole to be considered as a 35 foot buffer in an Act 38 nutrient management plan. If the following criteria cannot be met then the mechanical manure application must be setback 100 feet from a stream, lake, pond or sinkhole. In addition, the pasture must be assigned a "9" for the Contributing Distance factor in the Pennsylvania Phosphorus Index (P Index).

1. Ground cover provided by perennial vegetation must be maintained at a level of 80% or more to minimize soil erosion and nutrient runoff. Plants identified by PDA as noxious weeds must be eliminated and controlled in these areas. For a listing of noxious weeds refer to Pennsylvania's Weed Control list (<http://plants.usda.gov/java/noxious?rptType=State&statefips=42>).
2. Livestock access to the 35 foot buffer area must be managed to maintain the minimum 80% vegetative cover at all times across the entire buffer area. Established stabilized stream crossings or watering areas are exempted. Meeting this requirement can involve:
 - a. Fencing off the 35 foot buffer area and controlling the duration, intensity, and frequency of the grazing season.
 - b. Establishing alternate off-stream water sources or watering systems, and/or establishing stabilized stream access for crossings or watering access for livestock.
 - c. Installing other alternative management systems, structural practices or management techniques.
3. All animal concentration areas (such as feeding, watering or shade areas) within the pasture must be addressed in such a manner as to eliminate the direct discharge of runoff from these areas from entering any adjacent water bodies.
4. Fields with poor, somewhat poor, or very poor drainage characteristics must limit grazing on these areas during times of high water table.
5. No manure may be mechanically applied within the 35 foot buffer area.
6. Criteria 1 thru 4 must be met and implemented at the time the animals are grazing the pasture.

Appendix 1

Nutrient Management Plan Agreement and Responsibilities

This section of the nutrient management plan (plan) identifies what programs are being satisfied with this plan, implementation requirements for the operation, record keeping requirements, compliance with certain program efforts, and signatures from the planner and the operator. This is a key element of the plan documenting the operator's agreement to follow the plan and other program requirements.

It should be noted that the plan **MUST** be reviewed with the operator prior to submission to the conservation district for review. **This is the planner's responsibility.** The plan cannot be submitted until the farmer understands and agrees with all the provisions of the plan. The plan reviewer is to verify, during their on-site review of the plan, that the planner explained the plan to the farmer (at least the following sections: Nutrient Management Plan Summary, Appendix 1: Nutrient Management Plan Agreement and Responsibilities, and Appendix 8: Importer/Broker Agreements and NBSs) and that the farmer is in agreement with the provisions in the plan. If the reviewer finds that the planner has not reviewed at least the Nutrient Management Plan Summary, Appendix 1 and Appendix 8 with the farmer, the plan reviewer is to relay that information, in writing, to the certification program staff for their consideration. It is the intent of this guidance to ensure that the producer is involved with, and agreeable to the provisions outlined in the plan.

Program Checkoff

The planner must check the appropriate boxes indicating what program(s) the plan is being developed to satisfy. This is important to help the reviewer understand under what program provisions the plan is to be reviewed.

If the CAFO box is checked, the district is to coordinate their review with the appropriate regional DEP office that covers the county where the operation is located. The planner is to submit a copy of the plan, as soon as it is determined to be administratively complete, to the DEP office for their review. The DEP office is to send its comments to the district so they can incorporate the DEP comments in with the comments the district may have. The district should copy the regional DEP office on CAFO plan approval letters so DEP is aware if and when the CAFO plan was approved.

A CAFO is defined as any animal operation that meets any of the following criteria:

- A total of 1,000 or more AEUs on the operation, or
- Any CAO with a total of 300 or more AEUs on the operation, or
- Any animal operation with more than the following head numbers: 700 mature dairy cows; 1,000 veal calves; 1,000 cattle other than mature dairy cows or veal calves; 2,500 swine each weighing 55 pounds or more; 10,000 swine each weighing less than 55 lbs.; 500 horses; 10,000 sheep or lambs; 55,000 turkeys; 30,000 laying hens or broilers if using a liquid manure handling system; 125,000 chickens (other than laying hens) if using a dry manure handling system; 82,000 laying hens if using a dry manure handling system; 5,000 ducks if using a liquid manure handling system; or 30,000 ducks if using a dry manure handling system.

Additional conditions to be addressed with CAFO nutrient management plans include:

1. 14 day limitation to dry manure stacking on the CAFO, unless the stack is protected. There needs to be a statement in the plan addressing this issue if it is relevant to the particular farm situation (this statement would not be necessary for plans that address only liquid manure).
2. Manure application setbacks may be imposed on additional water conveyance areas than those outlined in the Chapter 83 nutrient management regulations. These additional setback areas will be identified by DEP and will need to be addressed in the plan map(s).

Verifications

Agricultural Erosion and Sedimentation Control Plan (E&S): The planner is to indicate here that the operation has a completed Agricultural Erosion and Sedimentation Control Plan (E&S), or conservation plan, which meets DEP Chapter 102 requirements for the acres listing in the NMP. The planner should only check this box if they have developed or seen the completed ag E&S plan for the operation. The ag E&S plan does not need to be submitted with the Act 38 plan submission, but it needs to be located on the farm. The farmer will no doubt be asked to show this ag E&S plan during the district's on-site plan review and future status reviews.

Emergency Response Plan: The planner is to indicate here that the operation has a completed Emergency Response Plan (ERP) on the farm. The planner should only check this box if they have developed or seen the completed ERP for the operation. The Commission has developed a standardized ERP format to use for this purpose. That standardized format is included as Supplement 13: Emergency Response Plan. The ERP does not need to be submitted with the Act 38 plan submission, but it needs to be placed somewhere on the operation, easily accessible to the farmer and relevant farm workers. The farmer will no doubt be asked to show this ERP during the district's on-site plan review and future status reviews. Farmers and their employees and contractors need to know where this plan is at all times, and how to carry it out in case of an emergency.

Communications with the landowners of rented lands: The planner is to indicate that the operator has communicated with those landowners that he rents land from, letting them know that a nutrient management plan has been developed which calls for manure to be applied to their lands and that they have no objections to the plan requirements. The various landowners renting land to this operator do not need to sign the plan, but they need to be contacted during the planning effort and the landowners must not object to the renters applying the planned manure to their lands. Again, this box should only be checked if the planner is fully aware that this obligation has been met. If the plan contains no rented lands, than the "no rented/leased lands" box must be checked.

Signatures

It is important the planner understands that it is his/her responsibility to review the plan with the operator prior to submission and, the operator understands the content of the

plan and agrees to follow the plan. This is an important step in the planning process that can avoid a lot of future problems with approval and implementation of the plan. These required signatures provide important confirmation ensuring that a plan approved under the program is accurate and that the operator agrees to implement the plan.

Planner signature: The planner, completing his/her signature, is indicating that the information used to develop the plan is accurate and complete to the best of their knowledge. The planner's signature affirms that the planner has reviewed the contents of the plan and the implementation schedule of the planned management practices with the operator prior to submission of the plan for review.

Operator's signature: The operator, completing his/her signature, is indicating that the information in the plan is accurate and correct and reflects the current and planned management practices for the operation. By signing Appendix 1, the operator is affirming that he/she understand the contents of the plan, understands the implementation schedule of the plan and understands their record keeping obligations outlined in Appendix 1. The operator's signature on the plan also affirms that he/she understands when a commercial hauler or broker is used for transport, application or export of manure, that a commercial manure hauler or broker must hold a valid certification issued by the Pa Department of Agriculture (PDA). PDA and conservation districts can provide operators with a list of certified manure haulers and manure brokers for their use in implementing their nutrient management plan.

Operator Title: The operator needs to list their title when signing Appendix 1. This is especially important for plans developed for farms operated by management companies. Titles would include entries such as "Owner/Operator" for owned farms, and "Operator" for farmers renting their livestock production facilities. If the operation is a **partnership**, then the title of the signing individual would need to be "General Partner". If the operation is a **corporation**, the title of the signing person would need to be "President" or "Vice President" or another individual authorized by the corporation to sign the plan. If the operation is a corporation, then the plan must include an attached letter (on corporation letterhead) developed and signed by the secretary of the corporation stating that the person signing on behalf of the corporation is authorized to do so.

Please note that an initial plan submission is not considered to be administratively complete until the operator's and planner's signatures are completed on Appendix 1. Also note, the planner and operator may need to sign a new (second) Appendix 1 if the final form of the plan has significant changes to either the nutrient application provisions or the BMPs proposed to be implemented on the farm, as compared to the initial version of the plan submitted for review.

Appendix 2

Operation Information

Completing Appendix 2

The following information provides guidance for completing each area of Appendix 2: Operation Information.

Operation Description

The nutrient management plan (NMP) must include an agricultural operation identification sheet which includes a brief description of the operation including the following information:

- Animal types and numbers included on the operation.
- Acreage of cropland, hayland and pastureland.
- Acreage of farmstead.
- The crop rotation planned to be used on the operation. The crop rotation includes, the crops grown, the sequence of crops grown and the number of years each crop is grown in the rotation.
- Provide a brief description of how the various manure groups on the operation are generated, stored, and handled, including a description of any mortality compost and how it will be handled, and any atypical manure handling strategies. Below is an example of information to be included and integrated into the Operation Description:

“ The manure from the cows is collected in gutters behind the animals and scraped two times a day into a reception pit which is then pumped to the circular concrete storage once a day. Milkhouse wastewater and barnyard runoff is collected in a reception pit at the bottom of the barnyard and pumped when ready into the circular concrete storage. Manure from all of the calf and heifer pens is scraped once a month into a roofed manure storage that is part of the heifer facility. Both storages are emptied in the spring and fall and the manure is land applied on the operation.”

County(s)

This information is to be obtained from the operator. This is to include all the counties that are included in the NMP within the state. The farm's physical address determines which county reviews and approves the NMP.

Name of Receiving Stream(s)/Watershed(s)

The regulations require that the watershed(s) where this operation is located be included in the NMP. To meet this requirement, the planner shall identify the “blue line streams” at this operation.

The “**blue line stream**” would be the nearest blue line stream (taken from the appropriate USGS topographic map) that would receive runoff from this operation. Where there is more than one named stream that would take runoff from this operation, all should be listed. Every NMP should indicate a “blue line stream” regardless of the distance from the operation.


Notation of Special Protection Waters

The NMP is required to **list any special protection watersheds** that this operation lies within. Special Protection Waters are those areas that have waters with an **Existing Use or a Designated Use** as High Quality (HQ) or Exceptional Value (EV) as defined in Chapter 93 (Water Quality Standards) of the DEP regulations. This list of Special Protection Waters is continuously revised based on water quality assessments and public comment.



Information on special protection waters can be found online in the following locations

1. An interactive map format called eMapPA - <http://www.emappa.dep.state.pa.us/emappa/viewer.htm>.
2. Designated uses are listed in Title 25 Chapter 93.9 of the PA Code – <http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>.
3. DEP's listing of Statewide Existing Use Classifications - http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556/statewide_existing_use_classifications/553974.

On the eMapPA site, locate the farm and all the fields which will be included in the NMP. Then turn on the stream use layers by doing the following:

1. Turn on the stream use layers by clicking on the “Features” Tab on the left hand side of the page.
2. Scroll down the features list, click on the  symbol next to “Streams and Water Resources” to see all of the options available.
3. Check the square boxes next to the “Streams Designated Use” and “Streams Existing Use” items.
4. Click on “Refresh Map” at the bottom. The streams that were found to receive runoff from the farm and fields on the USGS map should be visible on the map.

The uses can be determined as follows:

1. Click on the round circle next to “Streams Designated Use,” then click on the  symbol, and then click on the first stream receiving runoff from the farm/fields on the map. An “Attribute Data” table with the heading “Streams Designated Use” will pop up in a new window. The designated use will be shown in the column “Use Description.” If there are additional streams receiving runoff, check their uses in the same manner.
2. Click on the round circle next to “Streams Existing Use,” then click on the  symbol, and then click on the first stream receiving runoff from the farm/fields on the map. Either an “Attribute Data” table with the heading “Streams Existing Use” or a box stating “Streams Existing Use: No Feature Found!” will pop up in a new window. If an attribute table pops up, the existing use will be shown in the column “Use Description.” If there are additional streams receiving runoff, check their uses in the same manner.
3. If either the Designated or Existing Use has HQ or EV the farm and/or fields are in a Special Protection watershed.
4. The Designated or Existing use determination should be verified with Chapter 93 or the current Existing Use list.

5. In the case that a designated or existing use is not listed for one or more of the streams, please contact DEP for assistance.

For additional information on using the DEP [eMapPa](http://extension.psu.edu/plants/nutrient-management/planning-resources/other-planning-resources/using-emap) website tool refer to “Using eMAP to Identify Special Protection Watersheds” posted on the PA Nutrient Management Program website (<http://extension.psu.edu/plants/nutrient-management/planning-resources/other-planning-resources/using-emap>) under the Planning Resources section.

Nutrient Management Plans developed for farms on these areas do not have to include any additional information but additional planning procedures (see Appendix 5: Phosphorus Index) may be required.

Operation Acres: Total Acres

The NMP is to include all the lands that are an integral part of this animal operation. These lands may be different from those lands counted in the AEU/acre calculation. The lands to be included in the NMP are specifically defined as **those lands owned by the operator which are located at the animal production facility, as well as other lands under the management control (owned or rented) that are an integral part of this animal production facility** (see definition of Farming Resources in the regulations). There may be a number of situations that will require an individual determination based on the specific circumstances of a given farm but the following examples are shown in order to give you an understanding of how the program interprets this provision.

This definition in the regulations provides direction to the planner concerning **owned lands that are contiguous** with the animal operation.

1. If manure produced at the operation is applied to these owned acres, whether or not these acres are rented to another operator, the owned acres located at (contiguous with) the animal facility, would need to be included in the NMP. This can be Appendix 4: Crop and Manure Management Information and Appendix 5: Phosphorus Index or Option 3 of the Nutrient Balance Sheet (NBS).
2. If no manure from the operation is applied to these acres, but they are farmed by the operator or someone under his direction, these acres must be included in the NMP.
3. If no manure from the operation is applied to these acres, and these acres are rented out to another operator, these acres do not need to be included in the NMP.

If the **owned lands are non-contiguous** (even if they are rented to another operator) with the animal facility, the following criteria will be followed in determining if the land is to be included in the NMP.

1. If the owned land is non-contiguous and **is not** used for application of the manure from the animal operation during the normal cropping rotation, those owned, non-contiguous lands **would not** need to be considered in this NMP.
2. If the owned land is non-contiguous and **is** used for application of the manure from the animal operation during the normal cropping rotation, those owned, non-contiguous lands **would be** included in the NMP.

All **rented land** that will be receiving manure generated by the animal production facility at any time within the planned cropping rotation for the operation will need to be included in the NMP.

For those situations **where the animal operator is permitted to apply manure to fields owned and managed by other people**, and the animal operator does not have an agreement (verbal or written) with the landowner allowing for management control (defined in Section I: Identification of CAOs) of that land related to crop production, that land is not required to be included in the NMP and the manure sent to those lands shall be considered to be exported and applied by the animal facility operator.

Operation Acres: Total Acres Available for Nutrient Application Under Operator's Control

List the number of **acres, from the total acres in the NMP that will receive nutrients** during the normal cropping rotation for the operation. This includes nutrients from manure, sewage sludge or bio-solids, chemical fertilizers, etc. Provide the number of acres of owned land and also include, separately, the number of acres of rented ground. Rented or leased lands, under the management control of the operator of the facility, which are used for the application, treatment, or storage of manure generated at the facility shall be included in the NMP.

Names & Addresses of Owners of Rented or Leased Land

The NMP must include the names and addresses of owners of the rented and leased lands.

Animal Equivalent Units

An AEU is 1,000 pounds of live animal weight on an annualized basis. Annualized means that if the animals are not present on an operation for a whole year, the animal units are adjusted for the proportion of time during the year the animals are present on the operation. The calculation involves determining the number of AEUs of all animals on the farm based on the number of animals and their average weights and then adjusting that for the actual number of days (out of 365) that the animals are on the operation. A description of the information that goes into this calculation is covered in Section I: Identification of CAOs.

Animal Equivalent Units Per Acre

A description of the information that goes into this calculation is covered in Section I: Identification of CAOs.

Existing Manure Storages & Capacity

For each manure storage on the operation, briefly describe the type of storage, storage dimensions, useable design capacity, freeboard, top or bottom loaded, dimensions and description of contributing run-off area, description of wastewater additions, and types and amounts of bedding.

In addition, briefly describe the manure storage management during removal for each manure group. As applicable, describe the degree of agitation, method of manure removal, extent that the storage is emptied, type of unremoved manure, and any other pertinent information. This description must also detail the manure sampling procedures for each manure group.

Manure Application Equipment Capacity & Practical Application Rates

The purpose of the manure application equipment capacity and practical application rates section of the NMP is to ensure that the **application rates listed in the NMP** have been determined to be practical and achievable by the application equipment used to apply the manure on the operation. There would be no purpose in developing a NMP that would require rates that are not able to be met by the farmer. This is a key element of ensuring the NMP can be implemented.

The Act 38 regulations (83.294) state that manure application rates be consistent with the capabilities of the application equipment, including calibration. It states that “...**the plan must include a statement indicating that the existing equipment has been calibrated to ensure the implementation of the application rates described in the plan...**” The Act 38 standard NMP requires the following information to be included: description of the application equipment, **practical application rates based on calibration and calibration method used. The data recorded during the equipment calibration is to be retained on the farm.**

Manure Spreader Calibration

As noted the NMP requires a description of the application equipment. An important part of that description is the capacity of the equipment. However, capacity is not calibration.

Manure application rates are determined by equipment speeds and settings along with application management, such as overlaps. Therefore determining actual application rates or manure spreader calibration is an event. It requires that the spreader is filled with manure to the typical full load and applying the manure to the field. It involves recording the applicable speeds and settings such as ground speed and/or PTO speed, gear box settings, gate opening settings, operating pressures, spread widths, spread lengths, and overlaps. Using the recorded information the actual application rate at those speeds and settings is calculated.

Each rate listed in an Act 38 NMP must be based on equipment calibration. Specific guidance on rounding calibrated and planned rates is provided in the NMP Summary section of this manual. The actual calibration data does not need to be submitted with the NMP, but it does need to be maintained on file at the operation for review by program staff as necessary.

Agronomy Facts 68: Manure Spreader Calibration has been developed by the program to facilitate meeting this planning requirement. It outlines calibration methods for both liquid and solid manures and includes tables to record and calculate application rates. These tables could be filed as documentation on the operation. This factsheet is

available in print form or can be downloaded from the Pennsylvania Nutrient Management Website (<http://extension.psu.edu/plants/nutrient-management/educational/manure-storage-and-handling/manure-spreader-calibration>). Additionally, Conservation District personnel will assist with the manure spreader calibration upon request.

Following is some general guidance from an NMP development standpoint in meeting this NMP requirement.

- **Farms that apply their own manure, with existing equipment:** For farms that can identify their application equipment prior to submitting the NMP, the NMP is to list the type and capacity of equipment they are using, the practical application rates that have been determined by calibration, and the method of calibration should also be listed.
- **Farms not able to complete calibration prior to NMP submission:** Because manure calibration requires actually land applying manure, a good time to complete this management practice is during the application season. Therefore, there will be frequent instances where NMP development and manure application timeframes do not conveniently coincide. For existing operations that were not able to calibrate their spreader prior to NMP submission, the operator is to calibrate the spreader during the next manure application season. These plans will include a statement indicating what equipment is planned to be used, that the equipment is expected to be able to meet the planned rates (so planned rates should be in a realistic range for the planned type of equipment) and that the equipment will be fully calibrated when the manure storage is emptied for the first time after NMP submission. If, when the equipment is calibrated during the first year and cannot be adjusted to closely match the planned rates, then the NMP will need amended to provide rates that will be realistic for the given equipment.
- **Custom applied manure:** For farms that have their manure custom applied, the NMP would just need to indicate that the operator uses a custom applicator and that the application rates listed in the NMP are rates that can be met by the custom applicator. The NMP writer should confirm with the custom applicator what rates he can apply for the manure type in question. Most custom applicators have calibrated their equipment and have a range of rates that can be achieved with their equipment.
- **For proposed animal operations:** For proposed operations that NMP to use their own equipment to spread the manure, the operator is to calibrate the spreader prior to the first full application of manure in order to properly adjust their equipment to closely match the application rates outlined in the NMP. These plans will include a statement indicating what equipment is planned to be used (if it is known at the time, if not, the NMP will list the type of equipment planned), that the specific equipment (or type of equipment) is expected to be able to meet the planned rates (so planned rates should be realistic for the planned type of equipment) and that the equipment will be fully calibrated before the manure

storage is emptied for the first time. If, when the equipment is calibrated during the first year and cannot be adjusted to closely match the planned rates, then the NMP will need amended to provide rates that will be realistic for the given equipment.

In summary, the goal of nutrient management planning is to provide manure application rates that are accurate and achievable. Along with soil testing and manure analysis, manure spreader calibration is a fundamental nutrient management practice necessary to achieve this goal.

Appendix 3

Manure Group Information

Introduction

The purpose of Appendix 3 is to identify manure groups on the operation, inventory the amount of manure generated in each manure group, and summarize the required manure analysis results for each manure group.

There are two types of manure that are accounted for in the nutrient management plan. The first type is manure that is collected, stored and land applied. It is this manure that is allocated to specific fields in the nutrient management plan. The second type of manure is uncollected manure. Uncollected manure is deposited on pastures by grazing animals.

The regulatory requirements for this information are outlined in section 83.291 of the Act 38 regulations.

Manure Group Identification

The starting point, regardless of manure inventory method, is the identification of the specific manure groups on the operation. Manure groups are the distinct portions of manure generated on the operation. Determination of manure groups is critical in the planning process, because manure will be allocated by manure group designation to specific crops and fields on the operation. Generally, it is differences in species, storage, and land application season that determine manure groups. Also, each manure group on an operation most likely will have a unique manure analysis.

The best way to identify manure groups is to ask two questions regarding all the manure generated on an operation.

1. Where are the specific locations on the operation where manure is stored and equipment is taken to load the manure? Different storage locations usually indicate different manure groups.
2. When is the manure loaded for land application at each storage location? Different application windows (seasons) usually indicate different manure groups.

Using this approach means that different animal groups may contribute to one manure group or the same animal group may contribute to multiple manure groups.

Operations that do not have long term storages and need to haul manure frequently (often called “daily haul”), must include four manure groups corresponding to the four seasons with the season included in the manure group name. Each season would be three months in length. This is necessary to provide season-specific manure production totals that account for uncollected manure during the grazing season. In addition, this provides accurate allocation balances in Appendix 4: Crop and Manure Management Information and permits the selection of the appropriate nitrogen availability factors.

Although represented as four manure groups, daily haul manure requires only one manure analysis annually.

For planning purposes, each manure group must be given a unique name. This is the name that will be used to allocate manure to specific crops and fields. It is recommended that the season of application be included in the name if there are multiple manure groups from one storage. It is also recommended that names be used that the farmer understands. Some common designations of manure groups are:

- Spring Dairy
- Spring Liquid
- Fall Dairy
- Fall Liquid
- Bedded Pack
- Dairy Solid
- Storage 1 Spring
- Storage 2 Fall
- Broiler Manure
- Turkey Litter
- Finish House
- Pit Spring
- Lagoon Fall
- Animal Mortality Compost

In addition to manure generated on the operation, all imported organic sources of nutrients such as biosolids or manure imported from other operations should be treated as manure groups in the plan.

Multiple Manure Groups – Same Storage and Season

In most liquid manure storage systems, there is considerable variation in the proportion of liquids and solids throughout the storage profile. Likewise there is a corresponding variation in nutrient levels. Ideally, the manure should be agitated sufficiently during the emptying of the storage to obtain a homogenous product. If liquid manure is agitated sufficiently to achieve uniformity throughout the storage, one manure sample is adequate to determine the nutrient levels of that manure group.

If the storage is not adequately agitated and there are obvious changes, such as consistency, in the manure as the storage is being emptied, multiple samples will be required to represent the nutrient levels of the manure that is being land applied (See the section titled “Annual Manure Nutrient Generation Values”). This will require the identification of multiple manure groups and separate samples for each manure group. This can be done by noting when the manure consistency changes and estimating the percentage of manure volume in that portion.

Small Quantities of Manure

Livestock and poultry operations may have minor animal groups that produce a relatively small amount of manure. Examples include a horse for family recreation, animals for FFA or 4-H projects, or a small flock of laying hens.

A small quantity manure group may be created in Appendix 3 if the following two criteria are met:

1. The animal groups included in the manure group represent less than 5 AEUs **and the,**
2. The AEUs of the animal groups included in the manure group is less than 5% of the total AEUs in the nutrient management plan.

The animals in this manure group can be of multiple species, but only one miscellaneous grouping of animals is permitted in a nutrient management plan.

The animal types, number and weights must be entered into Appendix 3 but manure production data does not need to be entered. The animal information is necessary to complete the CAO determination for the operation.

Documentation of how the manure produced by these animals is handled and utilized must be included the nutrient management plan according to the following requirements.

- The Operation Description section of Appendix 2: Operation Information must include a description of how the manure in the small quantity manure group will be handled and utilized. If manure will be applied to cropland, a statement indicating that the manure will be applied to cropland suitable to receive manure must be included.
- If manure from the small quantity manure group will be applied to cropland, a note for the crop management unit(s) receiving the manure must be included in the NMP Summary Notes.

Likewise, composting of animal mortalities may yield a small amount of manure. Small quantities of mortality compost of less than 5 tons of poultry mortality compost or 25 tons of non-poultry mortality compost do not need to be included in Appendix 3. Documentation of small quantities of mortality compost must be described in the Operation Description section of Appendix 2: Operation Information and a note included in the NMP Summary Notes if applied to cropland.

Manure Production Inventory Method

There are two acceptable methods that can be used to inventory the manure generated on an operation.

- Estimating manure production by using book values to calculate manure amounts.
- Measuring manure production by using operation records.

After manure groups have been identified, the first decision that is required in completing Appendix 3 in the NMP Spreadsheet is to select the inventory method that will be used to determine manure production amounts.

The preferred, and most accurate, method is to measure the amount of manure generated on the operation. The Act 38 regulations state that, “If actual manure production records are available for the operation, these records shall be used for determining the manure produced on the operation.” Field application records (number of loads, spreader capacity) and manure storage dimensions (total capacity and capacity at unloading) are common ways to measure the amount of manure produced.

For new operations, production records from similar operations can be used for planning purposes until the operation generates manure.

Manure Analysis Regulatory Requirements

Refer to “Section 83.291 – Determination of Available Nutrients” of the Act 38 regulations for the specific regulatory requirements regarding the analysis of manure. Manure analysis is required annually for each manure group. There are four exceptions to this requirement:

- Manure analysis is optional for manure groups associated with less than five AEU's. See the guidance above for small quantity manure groups.
- Some storages, such as under-building swine manure storages, receive no rainwater and there is little variation in management such as feeding practices. Although the storage is emptied two or more times each year, the nutrient content in the multiple manure groups will be very constant. Therefore, only one annual manure sample is required for the storage rather one annual sample for each manure group associated with the storage.
- Manure analysis is optional for small quantities of mortality compost. Analysis is required for quantities exceeding 5 tons of poultry mortality compost or 25 tons of non-poultry mortality compost unless the material used to compost the mortalities is exclusively from a manure group generated on the operation, such as poultry litter. In those cases, that manure group analysis could be used for the mortality compost.
- Manure that is not land applied for agricultural production, such as manure exported to composting facilities or mushroom houses.

Manure analysis is **not** to be obtained for uncollected manure deposited on pasture. Obtaining representative samples including both manure and urine deposited on pasture is extremely difficult. Therefore, manure sampling for nutrient content and PSC values for manure deposited on pasture will not be accepted for Act 38 nutrient management plans.

When manure sampling and analysis is not required by the regulations, the nutrient management specialist should use the nutrient content levels contained in the Penn State Agronomy Guide, Table 1.2-13 or other levels approved by the Commission. The source of these values should be noted in Appendix 10: Supporting Information and Documentation.

Appendix 3 must include manure analysis values for each manure group. Manure analysis reports used for Act 38 nutrient management plans must include the following results: total nitrogen, ammonium nitrogen, total phosphate, total potash, and percent solids. Manure analysis reports that do not contain these specific results cannot be used for Act 38 planning.

Manure nutrient analysis will vary from sample to sample on a farm, even with consistent management and careful sampling. A running average of manure analyses will better reflect manure nutrient content than any one sample result. It is recommended that a running average manure analysis be used to develop manure management plans. Refer to “Agronomy Facts 69: Manure Sampling for Nutrient Management Planning” (<http://pubs.cas.psu.edu/FreePubs/pdfs/uc207.pdf>) for a detailed explanation of this approach. All manure reports used to report the manure nutrient values in Appendix 3 must be maintained on the operation or included in Appendix 10: Supporting Information and Documentation.

An optional manure analysis is the water extractable phosphorus (WEP) test. The water soluble phosphorus test result is converted by the laboratory to provide a Phosphorus Source Coefficient (PSC) value that can be used in the Pennsylvania Phosphorus Index. If the WEP test is not run, book values for the PSC are to be used. These values can be found in Appendix 5: Phosphorus Index or in “The Pennsylvania Phosphorus Index: Version 2” (<http://pubs.cas.psu.edu/freepubs/pdfs/UC180.pdf>).

Manure Sampling Procedures

It is imperative that the manure samples obtained for analysis represent the manure that is actually applied. Representative manure samples should be obtained using accepted manure sampling methods as outlined in “Agronomy Facts 69: Manure Sampling for Nutrient Management Planning” (<http://pubs.cas.psu.edu/FreePubs/pdfs/uc207.pdf>) and Part 1, Section 2, “Manure Nutrient Content” in the Penn State Agronomy Guide. It is recommended that nutrient management specialists work with producers to develop operation specific manure sampling procedures.

Manure nutrient levels obtained from a well-designed and diligently managed manure sampling program will be more representative of an operation’s manure than book values. It is important to understand that manure analysis nutrient levels will most likely vary from book values.

Nutrient Management Plan Format

Act 38 regulations require that all nutrient management plans use a standard format for organizing and presenting the required plan elements. The Nutrient Management Program has developed a spreadsheet which includes all the required plan elements and performs most of the necessary calculations using the data entered. All plans developed and submitted for approval must use the current version of the NMP spreadsheet. The current version is the one posted on the Nutrient Management Program website (<http://panutrientmgmt.cas.psu.edu/>).

Completing NMP Spreadsheet: Appendix 3

The row titles from Appendix 3 in the Standard Format NMP Spreadsheet are used as the outline below to provide guidance for completing Appendix 3. The focus will be on the information entry points. The information entry points are identified in the NMP Spreadsheet with yellow shading. Most of the calculations are completed internally within the spreadsheet. Several of the rows are populated from these calculations. This will be noted below where applicable.

Manure Group Information

The spreadsheet can include up to 16 manure groups and 6 animal groups for each manure group. The manure groups from one to sixteen are organized horizontally, from left to right, in Appendix 3. The animal groups from one to six are organized vertically within each manure group.

Before entering any information for a manure group, the inventory method must be selected by clicking either “Calculated” or “Records” button. The inventory method will be recorded in the row titled “Inventory Method” below.

If the “Calculated” button is selected, a data entry screen will appear. The following information should be entered using this screen:

- Manure Group ID
- Manure Group Description
- Manure Analysis Results

If the manure group includes rainfall, click the “Rainfall/Runoff Worksheet” button. A new data entry screen will appear where the following information is entered or selected from pull down tabs:

- County
- No Evaporation or Evaporation
- Paved or Unpaved
- Beginning Month
- Ending Month
- Storage Surface Area
- Runoff Surface Area

See Supplement 7: Rainfall, Runoff and Evaporation Data for detailed information on completing the “Rainfall/Runoff Worksheet”.

If the manure group does not include rainfall, click the “OK” button.

If the “Records” button is selected, a data entry screen will appear. The following information should be entered using this screen:

- Manure Group ID
- Manure Group Description
- Manure Analysis Results
- Total Amount of Manure Collected

In each of these screens, when the information has been entered, click the “OK” button and the spreadsheet will perform the necessary calculations and enter the results in appropriate boxes in Appendix 3.

It is strongly recommended that when creating a manure group data be entered using the data entry screens. Once a manure group is created, information can be changed directly into any “yellow” highlighted box in Appendix 3.

Manure Group Identification

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. For guidance on determining manure groups see “Manure Group Identification” above.

Manure Report Date

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. If several reports are used to obtain an average, enter the date of the most recent report and note that several reports are being used. This can be done by entering “avg” after the date. If book values are used for Total Nitrogen, Phosphate and Potash manure nutrient content, enter “Book Values” in the Manure Report Date entry. Refer to the Manure Analysis Regulatory Requirements in this document for more information.

Laboratory Name


This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. If several reports are used to obtain an average and are from different labs, enter the name of the laboratory of the most recent report. If book values are used for Total Nitrogen, Phosphate and Potash manure nutrient content, enter an indication of the book value information source in the Laboratory Name entry. For example, enter “PSU Agronomy Guide” for the Penn State Agronomy Guide. Refer to the Manure Analysis Regulatory Requirements in this document for more information.

Manure Type

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. The manure type is used by Appendix 4: Crop and Manure Management Information to correctly identify Nitrogen Availability Factors. Therefore, a few general categories are provided and “Other” should be used for manure types that do not fit specifically into the provided categories. Because the “Manure Type” is used to lookup information from tables, it is important that this be exactly what is in the tables.

Therefore, use the drop down tab  to select the “Manure Type” rather than typing in a “Manure Type”.

Manure Unit

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. The manure unit must be entered as lbs/ton or lbs/1000 gallons into Appendix 3. A few labs may report the manure analysis for liquid manure as lb /100 gal. To convert to lb/1000 gal multiply the manure analysis results by 10. Because the “Manure Unit” is used to lookup information from tables, it is important that this be exactly what is in the tables. Therefore, use the drop down tab  to select the “Manure Unit” rather than typing in a “Manure Unit”.

Be sure that the analysis units in the following inputs agree with the “Manure Unit” entered here.

Total Nitrogen (N)

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. Enter the analysis results from the manure report(s).

Ammonium Nitrogen (NH₄-N)

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. Enter the analysis results from the manure report(s). If book values are used for Total Nitrogen, Phosphate and Potash manure nutrient content and no Ammonium Nitrogen value is available, leave the Ammonium Nitrogen entry blank.

Total Organic N

The spreadsheet version automatically calculates the amount of total organic nitrogen from the other nitrogen manure analysis values entered on the inventory method data entry screen. No data entry is required. If book values are being used for manure nutrient content and no Ammonium Nitrogen value is entered into Appendix 3, the Total Organic N entry will be blank.

Total Phosphate (P₂O₅)

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. Enter the analysis results from the manure report(s).

Total Potash (K₂O)

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. Enter the analysis results from the manure report(s).

Percent Solids

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. Enter the analysis results from the manure report(s).

PSC Value (if used in the P Index)

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button. The default PSC Value is 1.0 and will automatically appear in the data entry screen. Use the default PSC Value or enter the analysis results from the manure report(s). If analysis values are not available, enter the appropriate book value from Appendix 5 or “The Pennsylvania Phosphorus Index: Version 2” (<http://pubs.cas.psu.edu/freepubs/pdfs/UC180.pdf>). Because there is only one source of PSC Book Values, using a book value for the PSC Value does not need to be documented in the Manure Analysis Date or Laboratory Name as described above for Total Nitrogen, Phosphate and Potash book values.

Inventory Method

This will be completed when the “Calculated” or “Records” button is selected when beginning the process of entering a manure group. See “Manure Group Information” above.

The inventory method can be modified or entered directly in the inventory method entry by using a drop down menu. The entry options are limited to “Calculated” or “Records”.

Manure Group Identification

This will be completed when the Manure Group Identification is entered initially on the data entry screen which is available after selecting either the “Calculated” or “Records” button.

Note: There are two columns in the NMP Spreadsheet for each manure group. The manure group name will appear in the left column. If there is uncollected manure associated with a manure group, the identification of the uncollected manure will be entered in the right column based on the manure group name. For example, “Cow Spring – Uncollected”.

Description: Site & Season Applied

This information is entered into Appendix 3 of the NMP Spreadsheet using the data entry screen which is available after selecting either the “Calculated” or “Records” button.

Integral to manure group identification is the storage location and season of application. These two aspects of the manure group have already been determined in the process of determining the manure groups on the operation. The storage site/identification and specific manure application season need to be entered in this row for each manure group.

CALCULATED: Total Manure Collected Per Manure Group

If the “Calculated” inventory method was selected, the total amount of manure collected in the manure group is automatically calculated and entered in this row. The right column will record the amount of uncollected manure associated with this manure group. No data entry is required.

Unit

The units (lbs/ton or lbs/1000 gallons) for the manure group is from the Manure Unit entry of the inventory method data entry screen.

RECORDS: Total Manure Collected Per Manure Group

If the “Records” inventory method was selected, the total amount of collected manure will be entered from the inventory method data entry screen. Total Manure Collected Per Manure Group can also be entered or changed here. This is the total amount of manure from operation records for this manure group. Do not include units with the entry.

Unit

The units (lbs/ton or lbs/1000 gallons) for the manure group is from the Manure Unit entry of the inventory method data entry screen.

Manure Used On-Farm

As manure is allocated in Appendix 4: Crop and Manure Management Information, the spreadsheet calculates the total amount of manure, both collected and uncollected, from the manure group that has been allocated.

Unit

The units (lbs/ton or lbs/1000 gallons) for the manure group is from the Manure Unit entry of the inventory method data entry screen.

Manure Allocation Manure Balance

As manure is allocated in Appendix 4: Crop and Manure Management Information, the spreadsheet provides a running balance of manure, both collected and uncollected, that has not been allocated.

The amount of manure listed in the “Total Manure Collected Per Manure Group” row must be allocated to CMUs or fields on the operation or exported off of the operation. The amount of unallocated manure must not exceed 5% of the total amount of manure collected in the manure group. This limit does not apply to manure groups with small quantities of collected manure:

- 5 tons of poultry manure
- 25 tons of non-poultry manure
- 10,000 of liquid manure

Over allocation of the manure in one or more manure groups in a nutrient management plan is permitted as long as the following conditions are met:

- Planned application rates on any one field/CMU from two or more manure groups must be planned as multiple applications so as to ensure that those multiple applications do not exceed the appropriate (nitrogen or phosphorus) balanced rates for that field/CMU.
- Planning different application scenarios for a particular field/CMU is not permitted in the approved plan. For example:

- Including planned applications rates for multiple manure groups in the plan to allow the operator to choose between them is not allowed. Notes to the operator such as, *“Application planned on corn fields for the fall may be moved to the spring and application planned for the spring may be moved to the fall.”* are not permitted.
- Including rates of 4,500 gallons, 6,000 gallons, and 7,500 gallons from one manure group in the plan to allow the operator to choose between them is not allowed. The planned application rate should be what the operator realistically plans to utilize.
- The standard whole farm note in the NMP Summary must be included in every NMP. The purpose of this note is explained in the Nutrient Management Plan Whole Farm Notes section of the NMP Summary Section of this Technical Manual.

Planners may plan additional options for fields/CMUs beyond what is in the submitted plan. If the operator decides to utilize one of the additional planned options in place of the planned application rate in the approved plan, the operator should have the plan writer make the substitution(s) in the already submitted/approved plan and submit this as a plan update.

Note that plan updates are also required if the operator applies the planned manure group at a rate greater than the planned application rate. However, plan updates are not required if an operator applies the planned manure group at a rate less the planned application rate. If lower rates are applied, additional nutrients (particularly nitrogen) will most likely be required to achieve the expected yield.

Unit

The units (lbs/ton or lbs/1000 gallons) for the manure group is from the Manure Unit entry of the inventory method data entry screen.

Manure Exported

If manure from a manure group is exported off the operation, list the amount of manure in each manure group that is exported off the operation.

Unit

The units (lbs/ton or lbs/1000 gallons) for the manure group is from the Manure Unit entry of the inventory method data entry screen.

Total Rainfall and Runoff

If the “Calculated” inventory method was selected, use the Rainfall/Runoff Worksheet data entry screen to determine the total amount of rainfall and runoff water added to the manure group. The amount of rainfall and runoff will be entered from the Rainfall/Runoff Worksheet data entry screen. The Rainfall/Runoff Worksheet information can be reviewed or modified directly by going to the Rainfall/Runoff Worksheet in the NMP Spreadsheet. Selecting the “Total Rainfall and Runoff” row heading here will take you to the “Rainfall/Runoff Worksheet” where you can enter or change inputs.


See Supplement 7: Rainfall, Runoff and Evaporation Data for detailed information on completing the “Rainfall/Runoff Worksheet”.

If the “Records” inventory method was selected, the “Rainfall/Runoff Worksheet” will not be used and no information will be entered in the Rainfall/Runoff entry cell.

Animal Group

The required information for each animal group that contributes to a manure group must be entered. The spreadsheet provides for up to six animal groups per manure group. This name should have clear meaning to the farmer. Enter the name of the animal group. Pastured animal groups whose grazing season spans more than one manure group collection time frame must be given unique animal group names. For example, Dry Cows Spring and Dry Cows Fall.

Animal Type

Select the appropriate animal type from the pull down menu. This allows the spreadsheet to pull the appropriate numbers to be used in the internal calculations. Because the “Animal Type” is used to lookup information from tables, it is important that this be exactly what is in the tables. Therefore, use the drop down tab  to select the “Animal Type” rather than typing in an “Animal Type”.

For livestock and poultry species **not** included in the Penn State Agronomy Guide, Table 1.2-13, contact Act 38 program staff contact program staff for guidance and technical assistance in entering this value.

Animal Number

In this row include the average number of animals in each animal group on **a typical production day** for the agricultural operation.

Animal Weight

In this row enter the average animal weight for this animal group taking into account weight variations during the production cycle. For mature animals (ex. dairy cows) this weight will not change significantly over the production cycle. For growing animals the average weight should account for weight variations during the production cycle (see Section I: Identification of CAOs). The average weight per animal should be the same weight used for the CAO calculation. If the weight used is different than those found in the table of standard animal weights (Supplement 5: Standard Animal Weights), the method of determining the alternative weights should be explained in Appendix 10: Supporting Information and Documentation and supporting documentation is required to be maintained on-site and shall be furnished upon request.

Animal Group AUs

This value is calculated and entered automatically by the spreadsheet. It is used to calculate the amount of manure generated by this animal group.

Animal Group AEUs

This value is calculated and entered automatically by the spreadsheet. This value does not directly concern manure generation. It is used to calculate the total AEUs on the operation for the CAO calculation documented in Appendix 2: Operation Information.

Daily Manure Production Per AU

This information is entered automatically by the spreadsheet version using the information provided above. The number is obtained from the Penn State Agronomy Guide, Table 1.2-13.

For livestock and poultry species not included in the Penn State Agronomy Guide, Table 1.2-13, contact Act 38 program staff for guidance and technical assistance in entering this value.

Total Days Manure Produced

The number of days that this animal group contributes manure to this manure group is entered in this row. Following are some typical examples:

- A broiler house, emptied yearly, runs six flocks a year at 50 days per flock; the total number of days for this manure group is 300 days.
- A liquid dairy storage is emptied every six months; the number of days for both manure groups is 180 days.

Total Manure Produced

This value is calculated and entered automatically by the spreadsheet. This is the amount of raw manure generated by the animal group before subtracting uncollected manure or adding any additions to the manure.

Days On Pasture

If the animals contributing to a particular manure group are on pasture **during the time frame of that manure group**, the number of days on pasture during that period is entered in this row.

Hours Per Day On Pasture

If the animals contributing to a particular manure group are on pasture during the time frame of that manure group, the average number of hours per day on pasture during that period is entered in this row.

For animals that have unrestricted access, 24 hours per day, to a pasture the following guidance should be followed to estimate hours per day on pasture. This guidance is based on considering whether the animals are fed and/or watered at the barn.

- If the animals are both fed and watered at the barn use 12 hours per day on pasture instead of 24 hours.
- If animals are fed at the barn but water is provided in the pasture use 18 hours per day on pasture instead of 24 hours.

Total Bedding

The amount of bedding used for each animal group in the manure group during the timeframe for this manure group is entered in this row. The amount of bedding used is obtained from operation records and information.

For some manure types the amount of bedding is included in Daily Manure Production values found in the Penn State Agronomy Guide, Table 1.2-13 (refer to comments column). If bedding is included in the Daily Manure Production values leave this row blank.

For solid manure, calculate the amount of bedding by using the following equation:

- $\text{Pounds of bedding used per period (day, week, month)} \times \text{Number of periods (days, weeks, months) that manure is accumulated in this manure group} \div 2,000 = \text{Tons of Bedding}$

For liquid manure, calculate the amount of bedding by using the following equations:

- $\text{Pounds of bedding used per period (day, week, month)} \times \text{Number of periods (days, weeks, months) that manure is accumulated in this manure group} = \text{Pounds of Bedding Per Manure Group Period}$
- Use Supplement 6: Density of Bedding Materials to determine the density (pounds per cubic foot) of the type of bedding material used.
- $\text{Pounds of Bedding Per Manure Group Period} \div \text{Density (pounds per cubic foot)} = \text{Cubic Feet of Bedding Per Manure Group Period}$
- $\text{Cubic Feet of Bedding Per Manure Group Period} \div 2 \text{ (bedding volume is reduced by one-half during use)} \times 7.48 \text{ gallons per cubic foot} = \text{Gallons of Bedding Per Manure Group Period (round to the nearest hundred gallons)}$

Calculations for bedding used are to be shown in Appendix 10: Supporting Information and Documentation of the Nutrient Management Plan.

If the “Records” inventory method was selected, do not enter information in the Total Bedding entry cell.

Total Washwater

The amount of washwater or wastewater added to each manure group is entered in this row. Calculate the amount of washwater added by using the following equation:

- $\text{Gallons of washwater added per period (day, week) to the manure} \times \text{Number of periods (days, weeks) in the manure group}$
- Note: Gallons can be converted to tons by dividing by 240 gallons/ton.

For some manure types the amount of washwater is included in Daily Manure Production values found in the Penn State Agronomy Guide, Table 1.2-13 (refer to comments column). If washwater is included in the Daily Manure Production values leave this row blank.

If the “Records” inventory method was selected, do not enter information in the Total Washwater entry cell.

CALCULATED - Total Uncollected Manure

This value is calculated and entered automatically by the spreadsheet.

Total Manure Collected Per Animal Group

This value is calculated and entered automatically by the spreadsheet.

Calculations Used By the Spreadsheet

Following are some of the calculations used internally by the spreadsheet:

Animal Group AUs

An Animal Unit (AU) is 1000 pounds of live animal weight. Calculate the number of AUs for each animal group by using the following equation:

- $\text{Animal Number} \times \text{Animal Weight} \div 1000 = \text{AUs}$

Total Manure Produced

Calculate the amount of raw manure produced by using the following equation:

- $\text{Number of AUs} \times \text{Daily Manure/Day /AU (pounds or gallons)} \times \text{Total Days}$
 $\text{Manure Produced} (\div 2000 \text{ for solid manure to convert to tons}) = \text{Total Manure Produced}$

Total Uncollected Manure

For solid manure groups, the amount of uncollected manure is calculated using the following equation:

- $\text{Manure Group AUs} \times \text{Daily Manure Production (pounds)} \times \text{Days On Pasture} \times \text{Hours Per Day On Pasture} \div 24 \div 2000 = \text{Tons of Uncollected Manure}$

For liquid manure groups, the amount of uncollected manure is calculated using the following equation:

- $\text{Manure Group AUs} \times \text{Daily Manure Production (gallons)} \times \text{Days On Pasture} \times \text{Hours Per Day On Pasture} \div 24 = \text{Gallons of Uncollected Manure}$
- For liquid manure groups the uncollected manure is calculated in gallons so that it can be subtracted from the total manure produced. However, this must be converted to tons to use the book analysis values as required for uncollected manure. To do this conversion use the actual manure density (lb/gallon) if known or use the conversion factor: 240 gallons of manure per ton of manure.

Total Manure Collected Per Animal Group

This amount is calculated using the following equation:

- $\text{Total Manure Produced} + \text{Total Bedding} + \text{Total Rainfall and Runoff} + \text{Total Washwater} - \text{Total Uncollected Manure} = \text{Total Manure Collected Per Animal Group}$

Total Rainfall and Runoff

The Rainfall Additions Worksheet should be used to calculate this addition to the manure group volume. Monthly rainfall values from Supplement 7: Rainfall, Runoff and Evaporation Data for Pennsylvania Counties” should be used to complete the Rainfall

Additions Worksheet. Follow the instructions provided on the cover page of Supplement 7 to determine which rainfall values to use for each manure group.

Appendix 4

Crop and Manure Management Information

Appendix 4 is used to determine a planned manure rate for each crop management unit or field (CMU/Field) included in the nutrient management plan. It includes a record of the required soil test analysis results, soil test recommendations, planned crop information, adjustments to soil test recommendations, net nutrient requirements, balanced and planned manure rates, and a final nutrient balance which accounts for all nutrients applied to each CMU/Field.

Regulatory Requirements

For the specific regulatory requirements regarding the soil analysis, refer to “Section 83.292 – Determination of Nutrients Needed for Crop Production” of the Act 38 regulations. All soil tests used in the nutrient management plan must be current within three years.

For the specific regulatory requirements regarding the nutrient application calculations, refer to “Section 83.292 – Determination of Nutrients Needed For Crop Production”, “Section 83.293 – Determination of Nutrient Application Rates”, and “Section 83.294 – Nutrient Application Procedures” of the Act 38 regulations.

Crop Management Units/Field (CMU/Field)

A CMU is defined in the regulations as “The portion of cropland, hayland and pasture, including a field, a portion of a field, or group of fields, on an agricultural operation that has a unique management history (same rotation and manure history), similar production capability, and that will be managed uniformly as a distinct unit.”

The CMU/Field IDs used in Appendix 4 are also used by the spreadsheet in Appendix 5: Phosphorus Index. Therefore, the CMU/Field identification or labeling must be consistent with the field identification on the operation maps. Preparation of the Operation Map to be included in the nutrient management plan should be completed before beginning the Appendix 4 planning component.

Field identification on the farm map should be at the individual mono-crop field strip level. A field should have a single crop management – crop, manure, fertilizer, etc. – during each crop year. In addition, it is important that this identification be meaningful to the farmer. Using the operator’s established field identification system is recommended.

Fields may be divided into sub-fields (portions) if the crop management is not completely the same during each crop year. For example, a field along a stream could be divided into two strips with the near stream strip receiving no phosphorus while the other strip receives manure and fertilizer phosphorus.

It is recommended that the nutrient management plan be developed on a field-by-field basis. Grouping of fields is permitted in a nutrient management plan only if the regulatory requirement above is met. If several fields are grouped into a CMU in

Appendix 4, each of those fields must have an identical cropping history, i.e., same crop, same fertilizer applications (rate and analysis), same manure applications (type, rate, and analysis), and the same overall management through each crop year of the crop rotation on the operation. In summary, these fields “will be managed uniformly as a distinct unit.”

Soil Sampling Procedures

Representative soil samples should be obtained using accepted soil sampling methods as outlined in Part 1, Section 2, “Soil Testing” in the Penn State Agronomy Guide.

It is recommended that a single soil test sample not represent more than 20 acres. If a single field is larger than 20 acres, a single soil test sample may be used to represent this field. One soil test sample can represent multiple fields grouped in a CMU as long as the sample does not represent more than 20 acres and that the criteria for grouping of fields into a CMU outlined above are met.

Crop Year(s)

The crop year is entered in the Nutrient Management Plan Summary. Specific guidance on crop years is provided in the NMP Submission section of this manual.

Nutrient Management Plan Format

Act 38 regulations require that all nutrient management plans use a standard format for organizing and presenting the required plan elements. The Nutrient Management Program has developed a spreadsheet which includes all the required plan elements and performs most of the necessary calculations using the data entered. All plans developed and submitted for approval must use the current version of the NMP spreadsheet. The current version is the one posted on the Nutrient Management Program website (<http://panutrientmgmt.cas.psu.edu/>).

Appendix 4 Special Features

Several special features are provided in Appendix 4 to facilitate planning. These tabs are located at the top left hand corner of the spreadsheet:

- Multiple/Split Application
- Copy
- Paste

To copy and paste CMU/Field information use the “Copy” and “Paste” buttons. Select the CMU/Field ID cell for the CMU to be copied and then click the “Copy” button. Select the CMU/Field ID cell where the information is to be pasted and click on the “Paste” button.

For multiple or split nutrient applications on a CMU, all CMU/Field IDs must be the same. A unique identifier for some or all of the applications may be included by using a hyphen to separate the CMU/Field ID and the unique identifier. For example, for a spring and fall nutrient application on CMU/Field ID 23, any of the following approaches can be used:

- "23-Spring" and "23-Fall"

- "23" and "23-Fall"
- "23-Spring" and "23"
- "23" for both applications

By using this method, the P Index information for all applications will be entered into the P Index. In Appendix 4, this can be completed by using the "Multiple/Split Application" button. When using this Multiple/Split feature:

1. Select the CMU/Field ID with the initial application.
2. Click on the "Multiple/Split Application" button.
3. In the dialog box, select "Multiple" or "Split" application.
4. Enter the CMU/Field ID for the field receiving the multiple or split application. In the dialog box the CMU/Field ID for the initial application will be presented with a hyphen, after which additional ID information can be added. Refer to the directions above regarding CMU/Field ID naming conventions.
5. **VERY IMPORTANT!** Select the CMU/Field ID cell in the spreadsheet where the next manure application will be entered **before** clicking the OK button to close the dialog box.
6. Click the OK button.

The Multiple Application feature is not a "live" link in the NMP Spreadsheet. Therefore, if a planned manure application rate is changed in a Multiple Application scenario, steps 1 to 5 listed above will need to be repeated. In step 4, do not select a blank CMU/Field ID. Instead select the existing CMU/Field ID for the multiple applications.

At the bottom left hand corner of the spreadsheet are:

- Reset CMU Information
- Delete Multiple Application
- Manure Balance

To delete or reset CMU/Field information, select the CMU/Field ID cell and click the Reset button.

To delete a multiple manure application, select the CMU/Field ID for the field where the Multiple Application is to be removed and click the "Delete Multiple App." button.

To see a table with the current balance of unallocated manure for each manure group in Appendix 3: Manure Group Information, click on the manure balance button.

Completing NMP Spreadsheet: Appendix 4

The row titles from Appendix 4 in the Standard Format NMP Spreadsheet are used as the outline below to provide guidance for completing Appendix 4. The focus will be on the information entry points. The information entry points are identified in the NMP Spreadsheet with yellow shading. Most of the calculations are completed internally within the spreadsheet. Several of the rows are populated from these calculations. This will be noted below where applicable.

For the remainder of this section the term “field” will be used to refer to fields or CMUs.

CMU/Field ID

Appendix 4 uses a column for each field. Guidance on field identification is provided in the crop management unit section above.

Acres

The plan shall include the acreage for each field.

Soil Test Report Date

The date listed on the report for each field is entered in this row.

Laboratory Name

The name of the laboratory performing the soil analysis must be listed for each report. There is no requirement to use only the Penn State Agricultural Analytical Services Laboratory (AASL) for soil analysis. However, the laboratory used must follow recommended procedures for Pennsylvania soils. The recommended soil testing methods for PA are: Water for pH, Mehlich Buffer for Lime Requirement, and Mehlich-3 for P, K, Ca, and Mg. **All soil tests must use the Mehlich 3 test for phosphorus.**

In addition, the laboratory must follow recommended procedures outlined in “The Recommended Soil Testing Procedures for the Northeastern United States”, Bulletin #493, published by the University of Delaware, or other Commission approved procedures.

While soil testing labs that do business in Pennsylvania use the appropriate methods and do high quality analyses, there are often significant differences in recommendations from these labs compared to Penn State recommendations. See guidance below for developing appropriate recommendations for Act 38 nutrient management plans.

Soil Test Levels (Mehlich-3 P & K)

Soil analysis levels must be reported for ppm Mehlich-3 P, and ppm K and pH. If the laboratory used does not report P & K in ppm the reported levels must be converted to ppm. Use the following factors to convert other units to ppm for P and K:

- $\text{lbs P}_2\text{O}_5/\text{A} \div 4.6 = \text{ppm P}$
- $\text{ppm P}_2\text{O}_5 \div 2.3 = \text{ppm P}$
- $\text{lbs P}/\text{A} \div 2 = \text{ppm P}$
- $\text{lbs K}_2\text{O}/\text{A} \div 2.4 = \text{ppm K}$
- $\text{ppm K}_2\text{O} \div 1.2 = \text{ppm K}$
- $\text{lbs K}/\text{A} \div 2 = \text{ppm K}$

Important Note: This only applies to the soil test level. The recommendations are always given as pounds of P_2O_5 and K_2O per acre so no conversions are necessary for the recommendations.

Record conversion calculations in Appendix 10: Supporting Information and Documentation.

P Index Part A

The five P Index, Part A questions that trigger the completion of Part B of the P Index must be answered for each field. Use the drop-down menu to select the specific description to reflect the answers to the five questions.

- If all of the P Index Part A questions for a field are answered “No”, select **“No to all Part A ques.”**. **“N-Based”** will be entered in the field below.
- If any of the P Index Part A questions for a field are answered “Yes”, select the appropriate individual question or combination of questions.
 - Spec. Prot. Watershed
 - Sig. mgmt. change
 - <150 feet from water
 - Spec. Prot. & Sig. mgmt. change
 - Spec. Prot. & <150 feet from water
 - Sig. mgmt. & <150 feet from water
 - Run P Index Part B

“Run P Index Part B” must be selected for fields where a winter manure application is planned. “Run P Index Part B” can also be selected if the planner chooses run the P Index Part B on a field even though all five questions were answered “No”.

“Part B” will be entered in the field below.

There is an alternative for a field that would require Part B of the P Index based on the questions. A management decision can be made to apply no phosphorus (fertilizer and/or manure) to this field. In that case **“No P Applied”** should be selected. **“No P Applied”** will be entered in the field below and Part B of the P Index will not be completed.

All fields noted as **“Part B”** will be included in Appendix 5: Phosphorus Index and the CMU/Field ID, all Part A criteria, and Part B source factors will be automatically entered into the Appendix 5. The Part B Transport factors will have to be entered in Appendix 5 for any fields noted as “Part B”.

Specific guidance on the P Index Part A Screening Tool is provided in the Appendix 5: Phosphorus Index section of this manual.

Crop

The plan must list the crop planned for each field for the specific crop year. While the yellow “Select Crop” cell is selected, click on the adjacent “Select” button for the list of crops that can be entered. Because the “Crop” name is used to lookup information from tables, it is important that this be exactly what is in the tables. Therefore, use the select

button and the provided list to select the “Crop” rather than typing in a “Crop”. If a needed crop does not appear in the default NMP Spreadsheet crop options, a crop can be entered into the spreadsheet by completing the following steps:

1. Go to the “Crop List Options” worksheet (green tab) and enter the crop name.
2. Go to Table 1 (light blue tab to the right of “Crop List Options” tab) and enter the nitrogen recommendation per unit of yield unit and the crop. For legume crops not receiving manure enter zero.
3. Go to Table 3 (light blue tab to the right of “Crop List Options” tab) and enter the phosphorus and potash removal per unit of yield and the crop yield unit.

The crop name entered will now appear as a crop selection option in Appendix 4.

Double crops should be planned as two separate crops in the crop year. When selecting a crop for a CMU/Field that will be double cropped, at the top of the crop selection dialog box click on the appropriate double crop designation “Winter Crop in a Double Crop” or “Summer Crop in a Double Crop”. Manure and fertilizer should be applied to meet the nutrient requirements of each individual crop. By selecting the appropriate double crop designation, the spreadsheet will automate nutrient considerations of the double crop in one crop year. These include:

- A 15% (poultry) to 20% (other manures) nitrogen carryover to the summer crop from manure applied to the winter crop. This carryover will adjust the net nutrient requirement for the summer crop.
- The final P_2O_5 and K_2O balances for the winter crop will be carried over to summer crop and subtracted from that crop’s net P_2O_5 and K_2O nutrient requirements.

Planned Yield

The plan shall include the realistic expected crop yields for each field. Based on the crop selected the appropriate units, bu/A or tons/A, will be entered by the spreadsheet.

If actual yield records are available during the development of the initial plan, it is recommended that the expected crop yields be based on these records. At the time of the required three-year reviews of approved nutrient management plans, yield goals for the updated or amended plans are required to be based on yield records.

For the development of the initial plan where actual yield records are not available, realistic expected crop yields are determined by the operator and the specialist, and approved by the Commission or delegated conservation district. These yields should be consistent with soil type and climate production capabilities. Pennsylvania soil capability and productivity guidance is available in the Penn State Agronomy Guide, Table 1.1-1.

Yields significantly higher than those generally acceptable for the given soil type will need to be documented and justified through the use of various records such as yield records or an acceptable explanation of the particular management practices that will be implemented on the farm to increase yields over those generally expected. Various management practices, such as plant populations, crop variety selection, irrigation, subsurface drainage, pest and disease scouting, etc. can have an impact on the crop

yields for a given operation or field. Therefore, it may be appropriate to set expected yield goals at a level different than the book values found in the Penn State Agronomy Guide and county Soil Surveys. Professional judgment should be used in determining if a particular yield goal is realistic for an individual operation in a given location.

Pastures provide a unique challenge in determining yields. While it is difficult to measure the amount of dry matter removed by grazing animals, there is a substantial amount of research that has documented yield potential based on soil fertility, forage species, and management. This information has been summarized in a one-page factsheet. Planners should use Estimating Forage Yields For Pastures when determining pasture yields to be used in nutrient management plans. This factsheet is available at: <http://extension.psu.edu/plants/nutrient-management/planning-resources/other-planning-resources/estimating-forage-yields-for-pastures>.

Again it should be stressed that after the first 3-year time frame, yield goals used in the plan are to be based on the yield records that are required to be maintained for the operation. After three years of implementing the nutrient management plan, if yields do not average at least 80% of the planned yield, the plan must be amended to be consistent with the documented yield levels.

Soil Test Recommendation (lb/A)

The nutrient recommendations for nitrogen, phosphorus, and potassium must be based on the current soil test results recorded in Appendix 4 for each field. Typical crop nutrient removal rates are not to be substituted for soil test nutrient recommendations. An exception is the nitrogen recommendation when manure is being applied to legume crops.

Labs other than the Penn State Agricultural Analytical Services Laboratory (AASL) may be used for soil analysis. While soil testing labs that do business in Pennsylvania use the appropriate methods and do high quality analyses, there are often significant differences in recommendations from these labs compared to Penn State recommendations. Because Penn State recommendations are based on research done under Pennsylvania soil and climate conditions and management systems, **the recommendations used for the development of Act 38 plans must be consistent with the AASL recommendations.**

The AASL Soil Test Recommendations Handbooks are available at: <http://agsci.psu.edu/aasl/soil-testing/soil-fertility-testing/handbooks>. Use the "Soil Test Recommendations Handbook for Agronomic Crops" to develop recommendations for crops not listed on the soil test report, changes in yield levels, or to adjust recommendations from labs whose recommendations are not consistent with Pennsylvania conditions. To determine a Penn State recommendation using soil test results from another lab all that is needed are the soil test levels in ppm, the crop to be grown, and the expected yield level. With this information it is simple to look up the Penn State recommendation for any crop based on results from any reputable lab that uses the recommended soil test methods for Pennsylvania.

Nitrogen recommendations developed from the Penn State Agronomy Guide “Nitrogen Recommendations for Agronomic Crops” table are permitted for Act 38 nutrient management plans, but recommendations from the “Soil Test Recommendations Handbook for Agronomic Crops” are preferred. Phosphorus and potassium recommendations must always be based on the “Soil Test Recommendations Handbook for Agronomic Crops”.

One aspect that is not clear when using the tables is what values to use when expected yields fall between the yield goals listed or when ppm P or K values fall between the values listed. The following guidelines are based on how the lab makes recommendations in these cases. For yield goals that fall between those listed use the next highest yield column. For ppm P or K values that fall between those listed use the next higher value on the respective table.

Recommendation tables are provided for Conservation Reserve Program (CRP) cool and warm season grasses. AASL recommendation tables for CRP grasses can be used for Conservation Reserve Enhancement Program (CREP) recommendations.

All CRP cool season plantings must include a legume. A one-time manure application may be used to meet part or all of the recommended nutrient requirements before or at planting. Additional nitrogen is not recommended after the establishment year. No manure or nutrients may be applied before or at planting of CRP warm season plantings. Any recommended nutrients may be applied during the second growing season following germination. Manure may be applied at the rate limited by phosphorus or potassium recommended rate. Manure applications may not be made to meet nitrogen uptake rate. CRP grasses should be evaluated every 5-10 years for acceptable plant cover. At that time the soil should be retested to determine if pH and nutrient levels are still adequate to maintain cover.

The AASL “Soil Test Recommendations Handbook for Commercial Vegetables” should be used for vegetable crops. Soil test levels (ppm) that are above optimum for P and K should use a soil test recommendation of zero for P_2O_5 and K_2O . Phosphorus removal for vegetable crops is not related to yield as with agronomic crops. For vegetable crops, the lowest soil test recommendation from the AASL tables is to be used for the phosphorus removal value.

Mixed vegetable fields of less than 10 acres should use the Mixed Vegetable Crop table. Mixed vegetable fields that are 10 acres or greater should be subdivided to plan for each specific vegetable crop in the field.

Soil test recommendation handbooks are also available for small fruits, tree fruits, and turf.

Other Nutrients Applied (lb/A)

Planned fertilizer applications are those applications, such as starter and liquid N fertilizer that may be applied as a pesticide carrier, that will occur regardless of the amount of manure applied. It does not include supplemental fertilizer applied to meet

crop requirements not met by planned manure applications. This is a farmer management decision that must be determined during data collection for plan development.

P Index Application Method

Use the drop down menu to select the appropriate application method. This information indicates how any P containing fertilizer included in “Other Nutrients Applied” above will be applied. This is required in the spreadsheet to complete the Phosphorus Index. This input will only be available for fields that require Part B of the P Index.

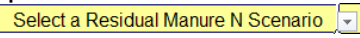
Manure History Description & Residual Manure N (lb/A)

A significant amount of manure nitrogen is organic nitrogen and not available for crop production in the year it is applied. This organic nitrogen becomes available for crop production over a period of years. The accumulated organic nitrogen from past manure applications can contribute a considerable amount of nitrogen to the current crop.

For double crops the residual manure N is split between the two crops. The appropriate value is selected in the spreadsheet.

There are two ways to determine the amount of residual manure nitrogen. These options are outlined in the Penn State Agronomy Guide. Both options rely on the manure application history, particularly the frequency of manure application, provided by the operator for each field. This is noted as the number of years out of the past five years that a field has received manure. In addition, option 2 requires the type of manure, the manure analysis and the application rates for each year in the past 5 that manure was applied to a field.

- Option 1 uses the Penn State Agronomy Guide, Table 1.2-14B. This method is commonly called the “Total N Method”. Based on the frequency of manure application over the past five years the appropriate residual nitrogen value is determined. This option can be used for both typical and atypical manures. Manure that has been treated in some way, in which the typical analysis has been altered, is considered atypical manure. Common examples are separated and composted manure.

Use the drop down menu to select the manure history description. Based on the history selected, the appropriate residual manure N value will be entered in the row below. Because the “Manure History” is used to lookup information from tables, it is important that this be exactly what is in the tables. Therefore, use the drop down tab  to select the “Manure History” rather than typing in a “Manure History”.

- Option 2 uses the Penn State Agronomy Guide, Table 1.2-15. This method provides a more refined estimate of residual manure nitrogen that utilizes the chemical manure analysis that provides the amount of ammonium N and organic N in the manure to calculate the amount of residual nitrogen. This method is commonly called the “N Fractions Method”.

To calculate Manure N Residual using Agronomy Guide Table 1.2-15, go to the Manure N Residual Calculator worksheet (green tab). On this worksheet, all Manure N Residual scenarios calculated using Agronomy Guide Table 1.2-15 can be entered. These scenarios must be entered into the Manure N Residual Calculator worksheet before Appendix 4 can be completed. For each scenario entered, the Residual N ID used for that scenario will be available in the Manure History Description drop-down list in Appendix 4 and based on this selection, the overall Manure N Residual Value will be entered into Appendix 4.

The Manure N Residual Calculator must be included in Appendix 10: Supporting Information and Documentation.

If a manure group that is not part of the current NMP is being used to calculate the Residual N using Table 1.2-15, create a manure group in Appendix 3: Manure Group Information, enter only the Manure Nutrient Information and indicate in the Manure Group Description that this Manure Group is for the Residual N Table 1.2-15 calculation only. Do not enter manure generation or animal group information for this manure group.

IMPORTANT NOTE ON RESIDUAL MANURE N FOR LEGUME CROPS: For legume crops that are not receiving manure, no manure residual nitrogen value is listed in the plan. However, if a manure application is planned for legume crops, manure residual nitrogen must be accounted for in the plan. This distinction is made when you choose the crop above. If manure will be applied to a legume crop choose the legume (Alfalfa, Red Clover, Trefoil, or Soybeans) “with manure” as the crop.

Legume History Description & Residual Legume N (lb/A)

As legume crop fields are converted to non-legume crop production, nitrogen fixed in the soil by the legume crop can provide a significant amount of nitrogen for the next crop. The base nutrient recommendations from the soil test report for each field on the operation must be adjusted for residual nitrogen from a previous legume crop.

The amount of residual legume nitrogen contributed by forage legumes is dependent on the type of legume crop, soil productivity group and the percent of stand and by yield for soybeans. Determining the amount of residual legume nitrogen that each rotated legume crop will contribute to the next crop is based on the information provided by the operator and the Penn State Agronomy Guide, Table 1.2-7.

If complete information was provided with the soil sample, the legume N credit will be listed on the Penn State soil test report and can be deducted from the recommendation.

In the spreadsheet, with the “Legume History Description” cell selected, click on the adjacent “Select” button to bring up a list of legume histories and then select the appropriate legume history for each field. Based on the history selected, the appropriate residual legume N value will be entered in the box to the right. If a needed legume history is not a default selection in the spreadsheet, a legume history can be entered by completing the following steps:

1. Go to the Table 4 worksheet (light blue tab).
2. Enter a legume history ID under the “Management Conditions” heading and associated residual legume N value under the “Nitrogen Credit (lb N/A)” heading.

Once the above steps have been completed, the legume history will be a selection option when you click on the “Select” button in the “Legume History Description” cell in Appendix 4.

For double crops the residual legume N must be allocated to the summer crop.

Many crop production systems in Pennsylvania will have fields or crop groups that have both a manure and legume history. In these cases, the nitrogen recommendation should be adjusted for both manure and legume N residuals.

Net Nutrients Required (lb/A)

Before a manure rate can be determined, the net amount of nutrients required for each crop must be calculated. The amount of nutrients from planned fertilizer applications, residual manure nitrogen, and residual legume nitrogen are subtracted from the soil test recommendations to determine the net nutrients required.

These values are calculated and entered automatically by the spreadsheet.

Note: The amount of net nutrients required can also be used to determine fertilizer needs if the planned manure is not applied to the field. Specific guidance is provided in the NMP Summary section of this manual.

Manure Group

The first step in calculating a balanced manure rate for nitrogen is the selection of the manure group that will be applied to meet the nutrient needs on a particular field. See Appendix 3 for a more detailed explanation of manure groups.

Use the “Select” button in the “Manure Group” cell to select the desired manure group for this field. This list is created from the manure groups from Appendix 3: Manure Group Information. The running balances for each manure group are displayed in the manure group selection screen. When selecting a manure group make sure that there is manure available in that manure group that has not yet been allocated. As manure is allocated to a field the spreadsheet calculates the total amount allocated and subtracts this amount from the previous balance.

Specific guidance on the amount of unallocated and over allocated manure is provided in the Appendix 3: Manure Group Information section of this manual.

Application Season & Application Management

Each manure group by definition has a season of application. In addition, it must be determined if the manure will be incorporated or not, and if so, how quickly will it be incorporated.

Use the “Select” button in the “Application Season/Application Management” cell to select the “Manure Application Timing” or season and the “Manure Application Method” from the list that will be displayed.

Nutrients must be applied to fields during times and conditions that will hold the nutrients in place for crop growth, and protect surface water and groundwater in accordance with the approved manure management practices as described in the plan. The longer manure is in or on the soil before crops use the nutrients, the more those nutrients, especially nitrogen, have the potential to be lost through volatilization, denitrification, leaching, and erosion. The season in which manure is applied will also affect the nutrient availability for crops.

Supplement 10: Winter Manure Application Matrix must be used to assess all fields being proposed for winter manure application. The completed Winter Application Matrix, addressing each of the fields proposed for winter application of manure must be included in Appendix 10: Supporting Information and Documentation.

Availability Factors

Only a portion of total manure nitrogen is available to the crop during the season of application. A significant amount of manure nitrogen is in the organic form and not available during the first growing season. Under even the best of conditions only about 50% (75% for poultry manure) of the nitrogen in the manure is available to the crop in the year it is spread. In addition, varying amounts of nitrogen are lost due to volatilization. The incorporation of applied manure and the timing of incorporation control the amount of nitrogen loss due to volatilization after application. Surface-applied manure can potentially lose large amounts of nitrogen to the air if it is not incorporated mechanically or by at least ½ inch of rain or other added water soon after application.

The planned manure incorporation time provided by the farmer, the type of manure, the season of manure application, and the expected time of crop utilization of the nitrogen are used to determine the appropriate nitrogen availability factor.

There are two options which can be used to determine availability factors and to calculate the amount of available nitrogen in the manure.

- Option 1, the “Total N Method”, is the most common method and uses the Penn State Agronomy Guide, Table 1.2-14A. **This option cannot be used for atypical or treated manures.**
- Option 2, called the “N Fractions Method”, provides a more refined estimate of available manure nitrogen that utilizes the amount of ammonium N and organic N in the manure determined by chemical analysis and uses the Penn State Agronomy Guide, Table 1.2-15. **This option must be used for atypical or treated manures.**

For typical manures only, values for manure N availability and residual manure N from Tables 1.2-14 and 1.2-15 may be used interchangeably throughout one nutrient management plan or within one field.

Based on the “Manure Group”, “Application Season” and “Application Management” options selected the appropriate Total N or Ammonium N and Organic N values will be entered automatically by the spreadsheet. When using Option 2 select the appropriate season from the Manure Application Timing list which has “1.2-15” appended onto the season name.

P Index Application Method

Use the drop down menu to select the appropriate application method. This is required in the spreadsheet to complete the Phosphorus Index. This input will only be available for fields that require Part B of the P Index.

N Balanced & P Removal Balanced Manure Rates (ton or gal/A)

The spreadsheet calculates and automatically enters balance manure rates for both net nitrogen required and phosphorus removal. In addition, the spreadsheet calculates and automatically enters the amount of net P removal.

The P Removal Balance Manure Rate would maintain but not increase soil P levels thus reducing the probability that high P levels will become an environmental issue over time. This rate will usually not meet the N requirement of the crop and thus will have to be supplemented with fertilizer N. This P Removal Balance Manure Rate must be used for fields on the operation that require a P removal manure rate as determined by the Part B of the P Index.

P Index Value

This value is calculated in Appendix 5: Phosphorus Index for fields that require Part B of the P Index and entered here automatically by the spreadsheet after the planned manure rate has been entered below and all P Index information has been completed in Appendix 5. For fields that require Part B of the P Index this cell will indicate “PI Incomplete” until the transport factors have been entered in Appendix 5 of the spreadsheet. This box remains blank and shaded gray for “N-Based” fields.

Planned Manure Rate (ton or gal/A)

The planned manure rate will be based on either nitrogen or phosphorus as determined by the P Index.

1. If the P Index, Part A above is “N-Based” any rate less than or equal to the calculated N balanced manure rate is acceptable. The desired planned rate is entered in this box. Selection of an actual planned rate is discussed in more detail below under **“Considerations for Selecting a Planned Manure Rate.”**
2. For fields that require the P Index, Part B a desired rate less than or equal to the calculated N balanced rate should be entered in the planned rate cell. This is a “proposed rate” because the rate must be evaluated by the P Index. The proposed

rate is often the N based rate that would be used if there were no P Index considerations. If the P Index Value is less than 80, this planned rate based on nitrogen is acceptable and may be used for this field.

However, if the P Index Value is greater than 80, two options are available. One option is to reduce the planned manure rate until the P Index Value is less than 80. Another option is to select and enter a planned manure rate less than the P Removal Balanced Manure Rate. See the section below on “**Considerations for Selecting a Planned Manure Rate.**”

Considerations for Selecting a Planned Manure Rate

The specific planned manure application rates must be based on the calibration of the manure application equipment used on the operation to ensure that the planned application rate is attainable. The specific calibration information for each manure application rate used in the nutrient management plan must be summarized in the NMP Summary – Manure Spreader Calibration Notes. Specific guidance on spreader calibration is provided in the NMP Summary and Appendix 2: Operation Information sections of this manual. Specific guidance on rounding calibrated and planned rates is provided in the NMP Summary section of this manual.

In some cases a P Removal Balanced Rate may be very low and not allow for planning a rate that is practical for the operation’s application equipment. **A phosphorus banking rate for up to three years may be allowed contingent on obtaining approval from the State Conservation Commission.** If permission is granted, the rate must not exceed the net nitrogen requirement in the year of application and may not elevate the P Index Value into the Very High management guidance category. In addition, a statement should be included in Appendix 10: Supporting Information and Documentation noting the name of the Commission staff person granting the approval and the date that the approval was granted.

However, it is critical to understand that the calculated balanced manure application rate is not an exact number but an estimate. This is particularly due to the fact that each of the factors used in all of the calculations above contain a significant degree of variation. Variations occur in the soils on individual fields; manure nutrient content from load to load; spreading equipment limitations; weather variations from year to year, etc. In addition, book values are, at best, good averages based on research but do not necessarily reflect the management and conditions on a specific operation.

The purpose of the balanced manure application rate is to provide a target for determining a practical planned application rate for the field. The planner should utilize their professional judgment in determining a practical planned manure application rate that meets the management needs of the operator without exceeding the balanced manure application rate.

Where only portions of a field are planned to receive manure or other nutrients, these fields should be broken down into sub-fields for the purpose of planning and record keeping. For example, where it is planned to apply manure to only part of a field, the

field should be broken down into sub-fields (possibly A and B) in the plan and in the records. The fertilizer or other manure source of nutrients required on the part of the field where the original manure is not applied must be determined and included in the plan. This will assure that the planner properly balances the nutrient needs of these separate portions of the field.

It is recommended that fields not be split into sub-fields when planning calculations show that there is not enough manure to cover the whole field. It is difficult in planning to know on which field the operator may run out of manure from a particular manure group and how much of the field will be covered or not covered. In this situation, it is recommended that for that field, manure be over allocated to a whole field even if the manure balance indicates that there is not enough manure available to cover the whole field. Specific guidance on the amount of unallocated and over allocated manure is provided in the Appendix 3: Manure Group Information section of this manual.

The operator should be made familiar with the required standard note in the “Whole Farm Notes” section of the NMP Summary which provides guidance on how to determine fertilizer requirements on any field that does not received the planned amount of manure. Specific guidance on the required standard note is provided in the NMP Summary section of this manual.

In the spreadsheet there is a button for “Multiple/Split Applications”. Selecting “Split Application” will copy the basic information for the field to the neighboring column in the spreadsheet to facilitate calculation of the nutrient need for the other part of the field without reentering all of the data. The acreage for each section of a split field should be listed and add up to the total acres in the field.

Depending on the rate determined, multiple applications may be necessary in order to minimize possible nutrient pollution or other difficulties that may occur in managing the land to grow the particular crop (i.e. too much manure applied to drive the equipment over, too much manure to allow for the proper establishment of a seedbed, or too much manure to keep in place when it is applied). **Single applications of liquid or semisolid manure applications may not exceed rates of 9,000 gallons per acre.** If the planned manure rate exceeds 9,000 gallons per acre, the plan must designate separate applications each less than 9,000 gallons. Application rates greater than 9000 gallons per acre may be used if based on the calculation of infiltration rate and water holding capacity of the application sites contingent **on obtaining approval from the State Conservation Commission.** In addition, a statement should be included in Appendix 10: Supporting Information and Documentation noting the name of the Commission staff person granting the approval and the date that the approval was granted.

In the spreadsheet there is a button for “Multiple/Split Applications”. Selecting “Multiple Application” will copy the basic information for the field to the neighboring column in the spreadsheet to facilitate calculation of the remaining nutrient need and additional allowable manure application after the first application without reentering all of the data. This feature will also enter the nutrient balance after the first manure application as the

net nutrients required for the next manure application. This enables the calculation of a total nutrient balance of all nutrients.

For irrigation of manure, the planned rate must be based on the maximum total quantity of manure that can be applied based on nitrogen or phosphorus, as for all manure applications. In addition however, the rate of application in terms of inches of manure applied per hour must also be considered. The speed that the manure can be irrigated onto a field or the maximum amount of manure that can be applied per hour is limited by the soil infiltration rate and other soil characteristics such as the soil texture, whether the soil is covered or bare, the slope, and the soil moisture at the beginning of irrigation.

The following factsheets should be used to determine appropriate manure irrigation rates:

- Irrigation of Liquid Manures (F254)
- Irrigation of Liquid Manures with a Traveling Gun (F255)
- Irrigation of Liquid Manures with Center-Pivot Irrigation Systems (F256)
- Irrigation of Liquid Manures with Solid Set Systems (F257)

These calculations must be included in Appendix 10: Supporting Information and Documentation to document the planned irrigation application rate. Details of how the irrigation equipment will be operated to achieve this rate must be included the "Manure Spreader Calibration Notes" section of the "Nutrient Management Plan Summary".

Nutrient Balance After Manure (lb/A)

The spreadsheet calculates, but does not show, the amount of nutrients applied at the planned manure rate. The "Nutrient Balance After Manure" is entered automatically by the spreadsheet after subtracting the amount of manure nutrients from the net nutrients required.

Supplemental Fertilizer (lb/A)

The need for supplemental fertilizers must be addressed in the plan. If the planned manure rate is less than the balanced rate, it may be necessary to supplement with other fertilizer nutrients to meet the total nutrient requirements of the crop.

The amount of supplemental fertilizer can best be estimated from the "Nutrient Balance After Manure" values. The supplemental fertilizer amount cannot exceed the amount of N recorded in "Nutrient Balance After Manure". If the P Index, Part B evaluation limits the P application to crop P removal, the supplemental fertilizer P cannot result in total P application greater than the crop P removal.

In many cases the planner will simply include any net nutrient need as supplemental fertilizer. This will tell the operator the maximum amount of supplemental nutrients that can be applied. The farmer can then decide what if any supplemental fertilizer will be actually applied. In some cases the farmer may request specific practical supplemental fertilizer application rates be provided in the plan. This is a farmer preference.

Supplemental fertilizer nutrient amounts are entered in the Supplemental Fertilizer row.

For corn crops, the use of the pre-sidedress nitrogen or chlorophyll meter tests for corn can be recommended to determine supplemental nitrogen fertilizer needs for those instances where manure applications may not meet the total nitrogen needs of the corn crop. If these tests are used, supplemental nitrogen may be applied at rates determined by the tests regardless of the calculated nitrogen balance.

P Index Application Method

Use the drop down menu to select the appropriate application method. This is required in the spreadsheet to complete the Phosphorus Index. This input will only be available for fields that require Part B of the P Index.

Final Nutrient Balance (lb/A)

The final nutrient balance for each field is determined after all nutrient sources have been considered. This value is calculated and automatically entered by the spreadsheet.

Manure Utilized On CMU (tons or gallons)

The total amount of manure to be applied to the field at the planned manure rate from this manure group is calculated and automatically entered by the spreadsheet.

Calculations Used By the Spreadsheet

Following are some of the calculations used internally by the spreadsheet:

Residual Manure N (Option 2 – Table 1.2-15)

The following calculation is provided to illustrate how to use Option 2 to calculate the residual nitrogen coming from past manure applications. (Option 1 is to use the values in Table 1.2-14B)

<u>“Residual Manure Nitrogen” Calculation</u>			
<u>manure application rate 1 year ago</u>	x	<u>organic N content</u>	x <u>residual N factor 1 year ago</u> +
<u>manure application rate 2 years ago</u>	x	<u>organic N content</u>	x <u>residual N factor 2 years ago</u> +
<u>manure application rate 3 years ago</u>	x	<u>organic N content</u>	x <u>residual N factor 3 years ago</u> +
<u>manure application rate 4 years ago</u>	x	<u>organic N content</u>	x <u>residual N factor 4 years ago</u> +
<u>manure application rate 5 years ago</u>	x	<u>organic N content</u>	x <u>residual N factor 5 years ago</u>
(a)		(b)	(c)
= <u>N from past applications available in the current year</u>			
(d)			

Description of “Residual Manure Nitrogen” Calculation (Option 2)

(a) manure application rates for each year manure was applied to the field in the past 5 years

(b) **organic nitrogen content for the manure applied in a given year in (a)** = a manure analysis with total nitrogen and ammonium nitrogen is required for this option. Organic nitrogen is the difference between total and ammonium nitrogen

(c) **residual N factor** = the residual nitrogen factor is determined by the type of manure and how long ago the manure was applied. Agronomy Guide Table 1.2-15 provides factors for 5 prior years. The five results are added together.

(d) **residual N from past manure applications available in the current year** = the pounds of residual nitrogen available this season per acre from past manure applications (the sum of the 5 years) (*calculated*)

Net Nutrients Required

<u>“Net Nutrient Required” Calculation</u>				
(for each nutrient)				
<u>soil test recommendation</u>	–	<u>other nutrients</u>	–	<u>residual manure N</u> – <u>residual legume N</u> =
(a)		(b)		(c) (d)
<u>net nutrient need</u>				
(e)				

Description of “Net Nutrients Required” Calculation

(a) **soil test recommendations** = total nutrient need per acre for the field (calculate nitrogen, phosphorous, and potassium needs separately) (*recommendations based on soil analysis results*)

(b) **other nutrients** = the amount of the particular nutrient supplied per acre by all planned fertilizer applications to be made **regardless of manure application** for the field (*from the farmer*)

(c) **residual manure N** = the pounds of residual manure nitrogen contributed per acre from past manure applications for the field (*calculated as described above*)

(d) **residual legume N** = the pounds of residual legume nitrogen contributed per acre for the field being rotated from a legume crop to a non-legume crop (*determined as described earlier*)

(e) **net nutrient need** = the net pounds per acre of the particular nutrient needed for the field (*calculated*)

Available Nitrogen From Manure

The amount of nitrogen in the manure and the nitrogen availability factor are used to determine the amount of nitrogen available to the crop in the season of application. The amount of nitrogen in the manure is determined by manure analysis results listed in

Appendix 3: Manure Group Information.

“Available Nitrogen From Manure” Calculations (2 options)

Option 1

$$1) \frac{\text{total N in the manure}}{(a)} \times \frac{\text{nitrogen availability factor}}{(b)} = \frac{\text{N available from the manure}}{(c)}$$

Option 2

$$2) \frac{\text{total ammonium N in the manure}}{(d)} \times \frac{\text{ammonium nitrogen availability factor}}{(e)} + \frac{\text{total organic N in the manure}}{(f)} \times \frac{\text{organic nitrogen availability factor}}{(g)} = \frac{\text{N available from the manure}}{(h)}$$

Description of “Available Nitrogen From Manure” Calculation

Option 1

(a) **total N in the manure** = the amount of total nitrogen (either in pounds per ton or pounds per 1000 gallons) in the manure (*from a manure analysis or from the Penn State Agronomy Guide book values, Table 1.2-13 when allowed (see discussion of manure analysis requirements in Appendix 3: Manure Group Information)*)

(b) **nitrogen availability factor** = the nitrogen availability factor for the current manure application based on the type of manure, the season of application, the season of crop utilization, and the days until incorporation (*Penn State Agronomy Guide, Table 1.2-14A*)

(c) **N available from the manure** = the pounds of immediately available nitrogen (per ton or 1000 gallons) from the manure application (*calculated*)

Option 2

(d,f) **ammonium N in the manure (d) & organic N in the manure (f)** = the amount of ammonium nitrogen and organic nitrogen (either in pounds per ton or pounds per 1000 gallons) in the manure (*from a manure analysis*) Note: Using the manure analysis report, organic nitrogen is calculated by subtracting ammonium nitrogen from total nitrogen.

(e,g) **nitrogen availability factors** = the ammonium and organic nitrogen availability factors for the current manure application based on the type of manure, the season of application, and the days until incorporation (*Penn State Agronomy Guide, Table 1.2-15*)

(h) **N available from the manure** = the pounds of immediately available nitrogen (per ton or 1000 gallons) from the manure application (*calculated as the sum of the available*

ammonium and organic N in the manure)

Nitrogen Balanced Manure Rate

Nitrogen balanced manure application rates are calculated using the following equation.

<u>“Nitrogen Balanced Manure Rate” Calculation</u>		
$\frac{\text{net crop nitrogen need}}{(a)} \div \frac{\text{N available from the manure}}{(b)} = \frac{\text{balanced manure rate}}{(c)}$		

Description of “Nitrogen Balanced Manure Rate” Calculation

(a) **net nitrogen need** = the net pounds per acre of nitrogen needed for the field
(*calculated – see “Net Nutrients Required” Calculation above*)

(b) **N available from the manure** = the pounds of immediately available nitrogen (per ton or 1000 gallons) from the manure application (*calculated - see “Available Nitrogen from Manure” Calculation above*)

(c) **balanced manure rate** = the manure application rate that would exactly meet the nitrogen needs of the crop (*calculated*)

P Applied at a proposed manure application rate

When Part B of the P Index is required the amount of P that would be applied at a proposed planned manure application rate must be determined and used in the P Index evaluation.

<u>“P Applied At Proposed Rate” Calculation</u>		
$\frac{\text{proposed manure application rate}}{(a)} \times \frac{\text{P}_2\text{O}_5 \text{ from manure}}{(b)} = \frac{\text{total amount of manure P}_2\text{O}_5}{(c)}$		

Description of the “P Applied At Proposed Rate” Calculation

Calculate the phosphorus supplied by manure:

(a) **proposed manure application rate** = the proposed manure application rate (tons or gallons) per acre. Generally, this would be the manure application rate that would be planned if there were no P restrictions (*based on calculated N-balanced rate*).

(b) **phosphorus from manure** = the pounds (per ton or 1000 gallons) from the manure analysis or book values for the proposed manure group

(c) **total amount of phosphorus supplied by manure** = the pounds of phosphorus supplied per acre by the proposed manure application rate (*calculated*)

This amount of phosphorus per acre is entered into the P Index. **At this point, the P Index assessment for the field must be completed (see Appendix 5: Phosphorus**

Index).

- **If the field P Index rating is Low or Medium**, the proposed rate can be used as the actual planned rate.
- **If the P Index rating is High or Very High**, a P Removal Balanced Rate must be calculated. For fields that require rates based on phosphorus removal a planned manure rate that is less than or equal to the P Removal Balanced Manure Rate must be used.

Phosphorus Removal Balanced Manure Rate

The following series of calculations are required to determine a P Removal Balanced Manure Rate and are required only for fields requiring Part B of the P Index.

The first step is to determine the Net Crop P Removal.

<u>“Net Crop P Removal” Calculation</u>					
<u>planned yield</u>	x	<u>P₂O₅ removal per unit yield</u>	–	<u>P₂O₅ in any planned “other nutrients applied”</u>	=
(a)		(b)		(c)	
<u>net crop P removal</u>					
(d)					

Description of “Net Crop P Removal” Calculation

(a) **planned yield** = planned yield for the crop planned

(b) **P₂O₅ removal per unit yield** = the pounds of P₂O₅ (per bushel or ton) from the Penn State Agronomy Guide, Table 1.2-9

(c) P₂O₅ in any planned “other nutrients applied” equal the amount of P₂O₅ in the planned rate of other nutrients that might be applied regardless of manure. A common example here would be the P applied in a starter fertilizer if any.

(d) **balanced P removal manure rate** = the manure application rate that would exactly meet the net P₂O₅ needs of the crop (*calculated*)

The second step is to calculate the P Removal Balanced Manure Rate. The P Removal Manure Rate is the balanced or maximum rate of manure that would meet the net crop phosphorus removal which would fulfill the requirements for a High P Index rating between 80 and 99.

“P Removal Balanced Manure Rate” Calculation

$$\frac{\text{net crop P}_2\text{O}_5 \text{ removal need}}{(a)} \div \frac{\text{P}_2\text{O}_5 \text{ available from the manure}}{(b)} = \frac{\text{balanced P removal manure rate}}{(c)}$$

Description of “P Removal Balanced Manure Rate” Calculation

(a) **net crop P₂O₅ removal need** = the net pounds per acre of P₂O₅ needed for the field (*calculated – see above*)

(b) **P₂O₅ available from the manure** = the pounds of P₂O₅ (per ton or 1000 gallons) from the manure application (*from a manure analysis or from the Penn State Agronomy Guide book values, Table 1.2-13 when allowed (see discussion of manure analysis requirements in Appendix 3: Manure Group Information)*)

(c) **balanced net P removal manure rate** = the manure application rate that would exactly meet the net P₂O₅ needs of the crop (*calculated*). A planned manure application rate less than or equal to this rate would be selected. The P Index would be recalculated using this P removal based planned rate.

Manure Nutrients Applied at Planned Rate & Nutrient Balance After Manure

In order to calculate the nutrient balance after manure application for each field, the amount of nutrients supplied by the planned manure application must be calculated.

“Nutrient Balance After Manure” Calculations

Step 1: calculate the nutrients supplied by manure

planned manure application rate x **N available** from manure = total amount of available N from manure

planned manure application rate x P₂O₅ from manure = total amount of P₂O₅ from manure

planned manure application rate x K₂O from manure = total amount of K₂O from manure
(a) (b) (c)

Step 2: calculate the nutrient balance after manure

net N need – N from manure = N balance after manure

net P₂O₅ need – P₂O₅ from = P₂O₅ balance after manure

net K₂O need – K₂O from manure = K₂O balance
(d) (e, from c above) (f)

Description of the “Nutrient Balance” Calculations

Step 1: Calculate the nutrients supplied by manure:

(a) **planned manure application rate** = the planned manure application rate (tons or gallons) per acre *(as determined based on N or P)*

(b) **nutrients from manure** = for nitrogen the pounds (per ton or 1000 gallons) of **available** nitrogen *(calculated in the “Amount of Nitrogen Available From Manure” above; for phosphorus and potassium the pounds (per ton or 1000 gallons) from the manure analysis or book values, as allowed, for the planned manure group)*

(c) **total amount of nutrients supplied by manure** = the pounds of each nutrient supplied per acre by the planned manure application rate *(calculated)*

Step 2: Calculate the nutrient balance after manure:

(d) **net nutrients required** = the net pounds of each nutrient per acre as calculated in the “Net Nutrients Required” Calculation *(calculated)*

(e) **nutrients supplied by manure** = the pounds of each nutrient supplied per acre by the planned manure application rate *(from c above)*

(f) **nutrient balance after manure** = the pounds per acre of the particular nutrient that are still needed in order to meet the total nutrient needs for the particular field or crop group (or in excess if it is a negative number) *(calculated)*

Supplemental Fertilizer

Typically, this will be entered as pounds of nutrient (N, P₂O₅, K₂O) per acre. If an actual supplemental fertilizer analysis and rate are known the nutrient amounts in the fertilizer rate can be calculated as shown below.

“Supplemental Fertilizer” Calculations

planned supplemental fertilizer rate x N fertilizer analysis = total amount of N from fertilizer

planned supplemental fertilizer rate x P₂O₅ fertilizer analysis = total amount of P₂O₅ from fertilizer

planned supplemental fertilizer rate x K₂O fertilizer analysis = total amount of K₂O from fertilizer

(a)

(b)

(c)

Description of the “Supplemental Fertilizer” Calculations

(a) **planned supplemental fertilizer rate** = the pounds of supplemental fertilizer to be applied per acre *(calculated)*

(b) **fertilizer analysis** = the N-P-K analysis of the fertilizer to be applied

(c) **total amount of nutrients supplied by fertilizer** = the pounds of each nutrient supplied per acre by the planned supplemental fertilizer rate (*calculated*)

Final Nutrient Balance

To calculate the final nutrient balance, subtract the amount of nutrients supplied by the supplemental fertilizer from the nutrient balance after manure for each field.

“Final Nutrient Balance” Calculations

N balance after manure – N from supplemental fertilizer = final N balance

P₂O₅ balance after manure – P₂O₅ from supplemental fertilizer = final P₂O₅ balance

K₂O balance after manure – K₂O from supplemental fertilizer = final K₂O balance
(d) (e, from c above) (f)

Description of the “Final Nutrient Balance” Calculations

(d) **nutrient balance after manure** = the net pounds of each nutrient per acre as calculated in the “Nutrient Balance After Manure at Planned Rate” Calculation (*calculated*)

(e) **nutrients supplied by supplemental fertilizer** = the pounds of each nutrient supplied per acre by the planned supplemental fertilizer rate (*from f above*)

(f) **final nutrient balance** = the pounds per acre of the particular nutrient that are still needed in order to meet the total nutrient needs for the particular field (or in excess if it is a negative number) (*calculated*). No excess N is allowed and excess P is only allowed if the P Index is Low or Medium.

Appendix 5

Phosphorus Index

Appendix 5 provides background information and direction in the evaluation of crop management units using Pennsylvania's Phosphorus Index: Version 2. The User's Guide also includes examples detailing the integration of a P Index evaluation into a nutrient management plan developed using Pennsylvania's Standard Plan format.

The development of the User's Guide was and continues to be a collaborative effort between The Pennsylvania State University, College of Agricultural Sciences, USDA-ARS, Pasture Systems and Watershed Management Research Unit.

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Introduction to the Pennsylvania Phosphorus Index

Phosphorus (P) continues to be concern to farmers and other water quality stakeholders. Excess nutrients, particularly P in freshwater, increases biological activity in water systems, thereby accelerating the process called eutrophication. Eutrophication is the most common reason for impairment of surface waters for fishing, recreation, industrial and domestic water uses.

While concerns about eutrophication and the potential environmental impact of P have existed and been part of management recommendations for some time, more attention was focused on nitrogen (N) concerns. As scientific evidence clarifying the importance of P in water quality protection grew and concerns about impaired uses of surface water increased, public policy makers turned more attention to P management.

In early 2003, the U.S. Environmental Protection Agency (USEPA) adopted new regulations for Concentrated Animal Feeding Operations (CAFOs) that required nutrient management plans to address both N and P. Regulations to implement these federal requirements have been developed for Pennsylvania by The Department of Environmental Protection (DEP). Also in 2003, Pennsylvania's U.S. Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) implemented their 590 Practice Standard for Nutrient Management which consistent with the USDA-NRCS national practice standard for nutrient management. This national practice standard requires nutrient management plans that address both N and P for farmers receiving USDA-NRCS financial or technical assistance. In 2004, the Pennsylvania State Conservation Commission (SCC) proposed revised regulations for the Pennsylvania Nutrient Management Program (Act 38) that included a P component. On October 1, 2006, the revised Act 38 regulations became effective. Currently, nutrient management plans developed to meet Act 38 requirements must include a P component. The one approach that is used in all of these Pennsylvania programs is the Phosphorus Index (P Index).

The Phosphorus Index

The P Index is a field evaluation tool developed to identify areas with a high vulnerability or risk of P loss to surface water bodies. Consideration of critical P source and transport factors allows for effective evaluation of P loss potential from nutrient land applications. This tool identifies fields vulnerable to soluble and insoluble P loss and limits nutrient application rates or directs the implementation of management practices on these fields.

Phosphorus source factors considered in the Pennsylvania P Index are Mehlich 3 soil test P, fertilizer P application rate and method, and manure P application rate, method, and P source coefficient. The transport factors considered are soil erosion, runoff potential, subsurface drainage, distance to a receiving water body, and an evaluation of management practices impacting P transport. These factors are combined in a simple calculation to arrive at a P Index Value for the field. The P Index Value indicates whether the nutrient application rate may be limited and/or other management practices may be required to address P concerns. Management practice recommendations may include installation of best management practices to reduce transport potential, such as

common erosion control practices or buffers. Alternatively, changes in the timing or method of P application may reduce risk of P loss allowing for N-based nutrient application.

The Pennsylvania P Index was developed by scientists at the USDA-ARS Pasture Systems and Watershed Management Research Unit at University Park, PA and The Pennsylvania State University College of Agricultural Sciences. It is the outcome of a major state and regional effort as part of an international research and development endeavor to produce a management approach that protects water quality from P pollution and enables sustainable and economic animal agricultural production.

Where to Get a Copy of the Phosphorus Index

The Pennsylvania Phosphorus Index Version 2 [factsheet](#) and [Excel spreadsheet](#) are available on the Pennsylvania Nutrient Management Program website (<http://panutrientmgmt.cas.psu.edu>).

Using the Phosphorus Index

A nutrient management plan that addresses both N and P, using the P Index, generally begins with the development of an N-based nutrient management plan required for the previously listed state and federal programs. Manure rates and management recommended in the N-based plan are evaluated by the P Index to determine if they pose a risk of environmental P loss. The P Index evaluation and inputs can then be used to select management alternatives to address identified concerns. For more information, refer to the Example section of this document.

Phosphorus Index Information Required for Each Crop Management Unit

Table 1 below provides a list of information required to complete a P Index evaluation on a crop management unit (CMU). The N-based plan provides most required information with the remainder coming from existing on-farm sources. Details on these items are given in following sections of this document.

Table 1. Information Required for the PA Phosphorus Index

Information	Source of information
Field map of the land for the plan	Taken directly from the N-based plan
Mehlich 3 P soil test values (ppm P)	Taken directly from the soil test reports
Distance to water	Estimated from maps or measured in the field
Fertilizer P to be applied (lb P ₂ O ₅ /A)	Taken directly from the N-based plan
Method of fertilizer P application	Taken directly from the N-based plan
Manure P to be applied (lb P ₂ O ₅ /A)	Taken directly from the N-based plan
Method of manure P application	Taken directly from the N-based plan
P source coefficient	Water soluble P test results OR User's Guide (Table 1: P Index Factsheet)
Erosion (ton soil loss/A)	Taken from the farm conservation plan or calculated using the Revised Universal Soil Loss Equation (RUSLE)
Runoff Potential	Based on soil type and PA County Drainage Class Tables (http://extension.psu.edu/plants/nutrient-management/planning-resources/other-planning-resources/pennsylvania-county-drainage-class-tables)
Subsurface Drainage	Determined from the farmer interview or farm conservation plan
Modified Connectivity	Determined from the farmer interview and/or field inspection

Crop Management Units

Determining land area to be included in each crop management unit (CMU) is a critical step in developing a nutrient management plan using the P Index because field location and topography are important considerations in the P Index. Factors such as: distance to receiving water, erosion, runoff potential, and modified connectivity may be very different for fields and must be considered in establishing a CMU. If multiple fields are combined into a single CMU, all P Index source and transport factors must be the same for all individual fields in a CMU. **If all P Index factors are not the same for the individual fields in a CMU, then the worst case scenario values must be used for the entire CMU.**

For example, if one field in a CMU is close to receiving water and has a high erosion rate then **all** fields in that CMU must be considered close to receiving water and to have a high erosion rate in the P Index. This applies regardless of the actual individual field properties. Therefore, collect information on a field-by-field basis and then determine if CMUs can be formed using fields with the same P Index factors.

Often there is considerable variability within fields; therefore, the same approach detailed above is used to address within field variability. Part of a field may be at high risk for P loss while another part of the field may be at low risk. For the P Index, the worst case part of the field must be used to determine its P Index Rating and Value. There may be situations where splitting a field into subfields for P Index evaluation is advantageous. For example, a field may have a relatively small steep sloping area close to a stream. For the P Index, the whole field would be considered to be steep sloping and close to the stream. Splitting off this small, steep sloping area and managing it differently (e.g. applying less manure or applying manure at a different time or in a different way) may remove P-based restrictions on the remainder of the field.

Frequency of Phosphorus Index Evaluation

Generally, nutrient management plans are written for multiple years. For example, Act 38 nutrient management plans are written for a three year period. The P Index can be applied to multiple years as long as all P Index factors remain the same for all years in the planning cycle. If management changes occur during the planning cycle, it must be determined if these changes impact the P Index. For example, if the crop changes in a field, the N-based manure rate or method of application may change. These management changes in turn may impact the P Index evaluation of the field. Therefore, several P Index evaluations and differing field management may be required in a planning cycle.

Fortunately, many of the factors in the P Index are constant, i.e. distance to receiving water, runoff potential, subsurface drainage, modified connectivity and erosion unless there are significant BMP changes. Act 38 requires soils tests at the same frequency as planning (every three years); therefore, soil test value changes are generally not needed during a planning cycle. Developing annual P Index evaluations will generally only require changes to the fertilizer and/or manure P management information.

Phosphorus Index Evaluation for No Phosphorus Application Areas

In a farm management system where a management decision has been made to not apply manure P, P from other organic nutrient sources, or fertilizer P, including starter fertilizer, to a field or fields for the life of a nutrient management plan, a P Index evaluation is not required for those fields.

When the management scenario described above occurs, a P Index evaluation is not required. However, documentation in Appendix 4: Crop and Manure Management Information (Appendix 4) that no P will be applied is required. Documentation requires that “No P Applied” be entered into the P Index Part A section of Appendix 4.

If at any time there is a change in management and manure P, P from other organic sources, or fertilizer P, including starter fertilizer, will be applied (such as when the field is rotated to a crop that will receive manure), the field or fields must be evaluated with the P Index and the nutrient management plan updated or amended accordingly before this application can occur.

Phosphorus Index Guidance for Pastures Receiving Less Than or Equal to Nitrogen Balanced Nutrient Application Rates

The Act 38 nutrient management regulations have established guidance for pastures receiving less than or equal to N balanced nutrient application rates and a Very High P Index Rating. According to §83.294(j) of the Act 38 regulations, if the following four conditions, taken directly from the regulations, are met these pastures may continue to be grazed.

1. Grazing may not be conducted within 50 feet of a perennial or intermittent stream, a lake or a pond.
2. A prescribed grazing system shall be used to maintain an established stand of forage on the pasture area.
3. The stocking rate shall be limited to ensure that the level of phosphorus deposited by the animals does not exceed the level of phosphorus removal from the soil by vegetation in the pasture.
4. BMPs contained in the Pennsylvania Technical Guide may be used to meet the requirements in paragraphs (1) and (2). Other BMPs shall be approved by the Commission.

For additional information see [Pennsylvania's Field Office Technical Guide](http://extension.psu.edu/plants/nutrient-management/planning-resources/pa-technical-guide) at: <http://extension.psu.edu/plants/nutrient-management/planning-resources/pa-technical-guide>.

Phosphorus Index Phase-In Guidance for Crop Management Units or Fields Receiving a Very High P Index Rating

The Act 38 nutrient management regulations have established a phase-in period for CMUs or fields receiving a Very High P Index Rating. This phase-in period applies to operations existing on October 1, 2006 and applies to CAOs, VAOs, and importing operations listed in their nutrient management plan. Specifically, qualifying operations with CMUs or fields with a calculated P Index Value of 80 to 150 may apply P at crop

removal rates until December 31, 2010. After December 31, 2010, CMUs or fields with a calculated P Index Value of 80 to 99 may apply P at crop removal rates and CMUs or fields with a calculated P Index Value of 100 to greater may not apply P (see Table 2). This phase-in period and its requirements are detailed in §83.293(c)(3) of the Act 38 nutrient management regulations.

Following is a detailed description of each Pennsylvania P Index factor. At the beginning of each section the relevant P Index section is shown in a shaded box.

Part A: Screening Tool

Part A of the P Index is a Screening Tool used to determine if a more detailed analysis using Part B of the P Index is needed. The Part A approach is to evaluate several simple criteria including watershed classification, distance from receiving water and soil test P level. Soil test P level is a key factor in Part A because it reflects P management history. In stable management systems, past and current planned nutrient management practices are similar and soil test P level is a valid indicator of P sources. However, when the current planned practices are not consistent with historical practices soil test level P is not a valid indicator. Therefore when there is a significant management change soil test P is not a good indicator of sources on the farm because of the management change. Typically in these situations, planned manure application rates are significantly higher than historical rates. Management changes resulting in this discrepancy are generally obvious and can include addition of new lands to or expansion of an agricultural operation, manure storage structure installation, a change in P nutrient sources, or a change in animal type. Distance to water is a good general indicator of the potential for P transport to that water. The watershed classification provides an indication of the sensitivity of the receiving waters to potential nutrient pollution. Every CMU or field must be evaluated by P Index Part A using the following criteria.

PART A: SCREENING TOOL	CMU/Field ID	
Is the CMU/field in a Special Protection Watershed?	If the answer is yes to any of these questions, Part B must be used	
Is there a significant farm management change as defined by Act 38?		
Is the Soil Test Mehlich 3 P greater than 200 ppm P? (enter soil test value in ppm P)		
Is the Contributing Distance from this CMU/field to receiving water less than 150 ft.?		

If any Part A questions are answered "Yes", Part B must be used. More information to assist in answering the Part A questions is given below.

1. Is the CMU/field in a Special Protection Watershed?

County Conservation Districts or The Pennsylvania Department of Environmental Protection (DEP) can provide Special Protection Watershed listings. Part A designations must be consistent with PA Nutrient Management web site guidance and Standard Nutrient Management Plan Appendix 2: Operation Information; Notation of Special Protection Waters.

Information on special protection waters can also be found on the web in an interactive map format called eMapPA at:

<http://www.emappa.dep.state.pa.us/emappa/viewer.htm>.

To use this site, turn on the “Streams Designated Use” feature and zoom in on the farm location on the map. For additional information on using this website tool refer to “[Using eMap to Identify Special Protection Watersheds](http://extension.psu.edu/plants/nutrient-management/planning-resources/other-planning-resources/using-emap)” at: <http://extension.psu.edu/plants/nutrient-management/planning-resources/other-planning-resources/using-emap>.

2. Is there a significant farm management change defined by the following four Act 38 criteria?
 - net increase of greater than 10% in AEUs per acre
 - change in crop management that results in a farmwide reduction of greater than 20% in nitrogen necessary for realistic expected crop yields
 - alternative organic sources will replace all or some of the nutrient sources listed in the plan
 - additional lands are brought into the operation (purchased or rented)
3. Is the soil test Mehlich 3 P greater than 200 ppm P?
See the **Soil Test** section under Part B for more details.
4. Is the Contributing Distance from this CMU/field to receiving water less than 150 feet? See **Contributing Distance** section under Part B for more details.
5. Is the CMU/Field receiving winter manure applications?

If all Part A questions are answered “No”, the N-based plan for the CMU is acceptable as written and no further P Index analysis, using Part B, is required. Completion of Part A with all “No” answers meets the regulatory requirement for running the P Index on all fields as part of a nutrient management plan.

Part B: Source Factors

Soil Test

SOIL TEST	Mehlich 3 Soil Test P (ppm P)
Soil Test Rating = 0.20 * Mehlich 3 Soil Test P (ppm P)	

Soil Test

The soil test level is Mehlich 3 extractable P in parts per million (ppm). It is taken directly from a soil test report. See the example below from the Penn State soil test report. This is the same soil test value used in P Index Part A.

Penn State Soil Test Report P Results

SOIL NUTRIENT LEVELS		Below Optimum	Optimum	Above Optimum
¹ Soil pH	6.3			
² Phosphorus (P)	20 ppm			
³ Potassium (K)	80 ppm			
² Magnesium (Mg)	60 ppm			

All commercial soil testing labs conducting significant business in Pennsylvania offer the Mehlich 3 soil test as a standard test or as an alternative test upon request. Additionally, these labs report soil test P values in ppm or mg/kg. However, if needed,

the following factors convert Mehlich 3 results in units other than ppm P to Mehlich 3 results in ppm P:

- $\text{mg P/kg} = \text{ppm P}$
- $\text{lb P/A} \div 2 = \text{ppm P}$
- $\text{lb P}_2\text{O}_5/\text{A} \div 4.6 = \text{ppm P}$

Note that these conversions are only unit conversions and require that the test results, regardless of the reporting units, are from the Mehlich 3 soil test. There are no acceptable conversions for converting the soil test result from another extractant to Mehlich 3 P.

Soil Test Rating

Soil Test P Rating is calculated by multiplying Mehlich 3 soil test P in ppm P by 0.2. This calculation appropriately weighs soil test P relative to the other source factors.

Fertilizer

FERTILIZER P RATE	Fertilizer P (lb P₂O₅/acre)				
FERTILIZER APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April - October	0.8 Incorporated >1 week or not incorporated following application in November - March	1.0 Surface applied to frozen or snow covered soil
Fertilizer Rating = Fertilizer Rate x Fertilizer Application Method					

Fertilizer Rate

This factor is the fertilizer P rate, in lb P₂O₅/A, that will be applied to the field.) It can be determined directly from the N-based nutrient management plan or by multiplying the fertilizer P₂O₅ analysis (middle fertilizer analysis value) expressed as a decimal or fraction by the applied amount of fertilizer. (See the note below about handling multiple P fertilizer applications on a CMU.)

For example: If a farmer plans to apply 150 lb/A of 10-20-10 starter fertilizer, calculate the P₂O₅ fertilizer rate as follows:

- Step 1. Divide the fertilizer analysis by 100: $(20\% \text{ P}_2\text{O}_5 \div 100) = 0.20$
- Step 2. Calculate P fertilizer rate: $150 \text{ lb/A} \times 0.20 = 30 \text{ lb P}_2\text{O}_5/\text{A}$

For liquid fertilizer applications given as gallons of fertilizer applied per acre, the calculation must also include a volume (gallons) to weight (pounds) conversion. To make this conversion, the weight per gallon of fertilizer must be known. Fertilizer dealers should be able to provide this information. Additionally, P fertilizer application rate information is available in the N-based nutrient management plan.

For example: If a farmer plans to apply 5 gal/A of 10-34-0 liquid starter fertilizer, calculate the P₂O₅ fertilizer rate as follows:

- Step 1. Determine fertilizer weight per gallon: Weight = 11.68 lb/gal
- Step 2. Divide the fertilizer analysis by 100: (34% P₂O₅ ÷ 100) = 0.34
- Step 3. Calculate P fertilizer rate: 5 gal/A x 11.68 lb/gal x 0.34 = 20 lb P₂O₅ /A

Fertilizer Application Method

Select the Fertilizer Application Method category closest to the planned fertilizer application method (see below). Enter the associated weighting factor into the P Index.

FERTILIZER APPLICATION METHOD

0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April – October	0.8 Incorporated >1 week or not incorporated following application in November - March	1.0 Surface applied to frozen or snow covered soil
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Following is additional information on these categories:

Placed or injected 2" or more deep	– The category applies to starter fertilizer P placed several inches deep in the soil with the planter or to immediate injection. The next category applies to application followed by mechanical incorporation as a separate operation.
Incorporated <1 week following application	– The category applies to <u>mechanical</u> fertilizer incorporation with primary or secondary tillage within 1 week following application. This includes same day incorporation. This <u>does not</u> include incorporation by rainfall.
Incorporated > 1 week or not incorporated following application in April – October	– The category applies to <u>mechanical</u> fertilizer incorporation more than 1 week after application or no fertilizer incorporation from April to October.
Incorporated >1 week or not incorporated following application in Nov. – March	– The category applies to <u>mechanical</u> fertilizer incorporation more than 1 week after application or no fertilizer incorporation from November to March.
Surface applied to frozen or snow covered soil	– The category applies to fertilizer application on frozen or snow covered soil.

Fertilizer Rating

The Fertilizer Rating is calculated by multiplying the *Fertilizer Rate* by the *Fertilizer Application Method* factor.

Multiple Fertilizer P Applications

If more than one fertilizer application is made to a given field, calculate the *Fertilizer Rating* with the rate and application method factor for each individual fertilizer application. Add these *Fertilizer Ratings* together to determine the final *Fertilizer Rating*.

The Multiple P Applications worksheet in the P Index Version 2 spreadsheet can be used to determine a *Fertilizer Rating* for a CMU or field receiving multiple P applications.

Manure

The following section provides instruction for evaluating manure P applications and P applications from other organic nutrient sources in the P Index. The Manure section of the P Index must be used to evaluate all organic P applications to a CMU or field. Fertilizer or inorganic P applications are evaluated in the Fertilizer section of the P Index.

MANURE P RATE	Manure P (lb P ₂ O ₅ /acre)				
MANURE APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April - October	0.8 Incorporated >1 week or not incorporated following application in November - March	1.0 Surface applied to frozen or snow covered soil
P SOURCE COEFFICIENT	Refer to: Test results for P Source Coefficient OR Book values from P Index Fact Sheet Table 1				
Manure Rating = Manure Rate x Manure Application Method x P Source Coefficient					

Manure Rate

This factor is the manure P rate, reported in lb P₂O₅/A, that will be applied to the field. This can be determined by multiplying the manure P analysis, directly from the manure analysis report and as recorded in Appendix 3: Manure Group Information, by the amount of manure that will be applied which is the "Planned Manure Rate" found in Appendix 4. Typically, this will be based on the actual planned manure P rate based on balancing N. (See the note below about handling multiple P fertilizer applications on a CMU.)

Be careful with units, as laboratories report manure analyses in different units. The most common units for manure analysis are lb/1000 gal, lb/100 gal, and lb/ton; all are reported on an as sampled basis.

Example Calculation: If a farmer applies 7000 gal/A of dairy manure with an analysis of 13 lb P₂O₅ /1000 gal, the calculation is as follows: 7000 gal/A x 13 lb P₂O₅ /1000 gal = 91 lb P₂O₅ /A.

Manure P application rate information should be available directly from the N-based nutrient management plan (Appendix 4, "Planned Manure Rate").

Manure Application Method

Select the Manure Application Method category closest to the planned manure application method (see below). Enter the associated weighting factor into the P Index.

MANURE APPLICATION METHOD

0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April - October	0.8 Incorporated >1 week or not incorporated following application in November - March	1.0 Surface applied to frozen or snow covered soil
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Following is additional information on these categories:

Placed or injected 2" or more deep	– The category applies only to <u>directly injected</u> manure such as with a chisel or disk injector. The next category applies to application of manure followed by separate mechanical incorporation.
Incorporated <1 week following application	– The category applies to <u>mechanical</u> manure incorporation with primary or secondary tillage within 1 week following application. This includes same day incorporation. This <u>does not</u> include incorporation by rainfall.
Incorporated > 1 week or not incorporated following application in April – October	– The category applies to <u>mechanical</u> manure incorporation more than 1 week after application or no manure incorporation from April to October.
Incorporated >1 week or not incorporated following application in November – March	– The category applies to <u>mechanical</u> manure incorporation more than 1 week after application or no manure incorporation from November to March.
Surface applied to frozen or snow covered soil	– The category applies to manure application on frozen or snow covered soil.

As an interim recommendation, when using:

- A shallow disk injector, select *Placed or injected 2" or more deep* and enter a 0.2 weighting factor into the P Index.
- A spike aerator or a straight disk vertical tillage tool, select *Incorporated <1 week following application* category and enter a 0.4 weighting factor into the P Index.
- A rotary harrow, select either *Incorporated > 1 week or not incorporated following application in April – October* or *November – March* and enter a *either 0.6 or 0.8 weighting factor depending on time of application* in the P Index.

Phosphorus Source Coefficient

The P source coefficient (PSC) accounts for P available for loss directly from organic P sources to surface runoff. It is not related to P crop availability. The appropriate PSC value can be selected two ways. The first option is to have the organic P source analyzed using a now commercially available manure test for water soluble P. This test provides a PSC for a specific organic P source and can be performed at the same time as an standard agronomic manure analysis. The PSC is a calculated value based on the water soluble P manure test. The minimum PSC analytical value is 0.10 and the maximum PSC analytical value is 1.0. Make sure your testing lab is using the correct formula to calculate the PSC. More information about the water soluble P test is

available through the Penn State Agricultural Analytical Services Laboratory at: <http://agsci.psu.edu/aasl/manure-testing/standard-manure-test/obtaining-a-p-source-coefficient-for-the-pennsylvania-phosphorus-index>. The second option is to select a PSC book value from the table below. For all organic P sources not listed, a water soluble P analysis should be conducted. If the analytical results are not available and the organic P source is not listed below, use a default PSC value of 1.0 in the P Index.

Phosphorus source coefficients (PSC) book values ¹

Manure	
Swine manure	1.0
Broiler	0.8
Layer	0.8
Turkey	0.8
Duck	0.8
Dairy – Liquid	0.8
Dairy – Bedded Pack	0.8
Beef	0.8
Horse	0.8
Biosolids	
BPR Biosolids	0.8
All biosolids (except BPR)	0.4

¹ Coale, F., T. Basden, D. B. Beegle, R. C. Brandt, H. A. Elliott, D. J. Hansen, P. Kleinman, G. Mullins, and J. T. Sims. 2005. Development of Regionally-Consistent Phosphorus Source Coefficients for Use in Phosphorus Index Evaluations in the Mid-Atlantic Region. USDA-CSREES, The Mid-Atlantic Regional Water Program, MAWQP# 05-04. Available at http://www.usawaterquality.org/conferences/2005/Posters/Poster_Abstracts/Pest_Poster_Abstracts/Coale.pdf

Manure Rating

The Manure Rating is calculated by multiplying the *Manure P Rate* by the *Manure Application Method* factor by the *P Source Coefficient*.

Multiple Manure Applications to a CMU

If more than one manure application is made to a given field, calculate the *Manure Rating* with the rate, method and PSC for each individual manure application. Add these *Manure Ratings* together to arrive at the final *Manure Rating*.

The Multiple P Applications worksheet in the P Index Version 2 spreadsheet can be used to determine a *Manure Rating* for a CMU or field receiving multiple P applications.

Source Factor

$$\text{Source Factor} = \text{Soil Test Rating} + \text{Fertilizer Rating} + \text{Manure Rating}$$

The overall Source Factor is calculated by adding the *Soil Test Rating* to the *Fertilizer Rating* to the *Manure Rating*. These values are the shaded lines in the P Index.

Part B: Transport Factors

Erosion

EROSION	Soil Loss (ton/acre/yr)
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The erosion rate estimates soil loss based on crop management, tillage practices, regional location, and best management practices. The erosion value for the P Index is calculated using the Revised Universal Soil Loss Equation (RUSLE) and is reported in tons/acre/year. This is usually determined by Pennsylvania USDA-NRCS as a part of the conservation plan development process. For operations that do not have a Conservation Plan, the PAOneStop Farm Mapping and E&S Planning System (<https://www.paonestop.org/>) can be used to determine soil loss values for use in the P Index.

For the P Index, the actual (A) erosion value should be used and not the tolerable (T) soil loss value. However, if the conservation plan is fully implemented to meet T then the T soil loss value can be used in the P Index.

Runoff Potential

RUNOFF POTENTIAL	0 <i>Drainage Class is Excessively</i>	2 <i>Drainage Class is Somewhat Excessively</i>	4 <i>Drainage Class is Well/Moderately Well</i>	6 <i>Drainage Class is Somewhat Poorly</i>	8 <i>Drainage Class is Poorly/Very Poorly</i>
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Surface runoff potential is based on the USDA-NRCS Drainage Class. Based on soil properties, Drainage Class values are classified into Very Poorly, Poorly, Somewhat Poorly, Moderately Well, Well, Somewhat Excessively, and Excessively. To facilitate the incorporation of this factor into the P Index, the Pennsylvania USDA-NRCS has developed tables that list the Drainage Class by soil mapping unit for each Pennsylvania county. These tables are available at:

<http://extension.psu.edu/plants/nutrient-management/planning-resources/other-planning-resources/pennsylvania-county-drainage-class-tables>.

Note: In P Index Version 2, a different Runoff Potential indicator is being used than in Version 1. However, the same reference tables are used. The Drainage Class is listed as “Drainage” in the fourth column of the Index Surface Runoff Class tables used with P Index Version 1.

When determining the appropriate Runoff Potential category for a field, first determine the predominate soil type in the field. Then use the “County Runoff Potential Tables: Drainage Class Determination for the P Index” table for the county in which you are working, find the predominate soil type on the table, and select the Drainage Class

value. Finally, choose the corresponding P Index category and enter the associated weighting factor into the P Index.

Subsurface Drainage

SUBSURFACE DRAINAGE	0 None or No direct outlet to receiving water		1 Random – Outlets directly to receiving water		2* Patterned – Outlets directly to receiving water
* OR rapid permeability soil near a stream					

Subsurface drainage accounts for the presence of artificial drainage in a field. There are three options provided in the P Index: *None*, *Random*, and *Patterned*.

None refers to a field that has no artificial drainage. It also refers to a field with subsurface drainage that does not outlet directly to receiving water bodies.

Random applies to fields with one or more drains that address wet conditions in a section(s) of a field. Generally, field drainage qualifying as *Random* will be spaced more than 75 feet apart. Subsurface drainage in this category outlet directly to receiving water bodies.

Patterned applies to fields that have multiple connected drains designed to address wet conditions across an entire field. Patterned drainage is most commonly found in northwestern Pennsylvania, specifically in Crawford, Erie, Lawrence, Mercer, Warren, Butler, and Beaver counties. Generally, these systems have tile drain lines spaced 35 to 50 feet apart. When the tile drain line spacing equals or exceeds 75 feet the system is considered *Random*. Subsurface drainage in this category outlet directly to receiving water bodies.

In assigning the appropriate category, the type of subsurface drainage needs to be determined using farm maps, farm records, or information from the farmer interview. Once it has been determined that a field has *Random* or *Patterned* drainage, the presence of the tile drain and the location of its outlet are not considered as a part of the Modified Connectivity determination. Therefore, tile drains are only considered and accounted for in the *Subsurface Drainage* category.

An additional consideration in the Subsurface Drainage category determination is whether a rapidly permeable soil exists within 100 feet of a receiving water body. Information for determining whether a soil is rapidly permeable is found in the county soil survey report or by using the USDA-NRCS Web Soil Survey at: <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>. For the P Index, a rapidly permeable soil is defined as having a Permeability greater than 6 in/hr and includes soil types with both Rapid and Very Rapid Soil Permeability Class designations. If a field has soils 1) identified in the soil survey as having a permeability greater than 6 in/hr and

2) within 100 feet of a receiving stream then the *Patterned Subsurface Drainage* category must be selected and the associated weighting factor entered into the P Index.

Contributing Distance

CONTRIBUTING DISTANCE	0 > 500 ft.	2 350 to 500 ft.	4 200 to 349 ft.	6 100 to 199 ft. OR <100 ft. with 35 ft. buffer	9 [‡] < 100 ft.
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[‡] A “9” Contributing Distance factor does not apply to fields with a 35 ft. buffer receiving manure. For these fields, a “6” Contributing Distance factor must be used. Specific guidance for assigning a Contributing Distance factor for these fields is described in this section under the heading 35 ft. Wide Buffer.

Contributing distance assesses the distance of a field from a receiving body of water. In the Contributing Distance determination, a receiving water body can include: ponds, lakes, and perennial and intermittent streams with channels (bed and bank). Other conveyances such as ditches are accounted for in the Modified Connectivity section of the P Index (see below). The distance categories were developed using landscape properties in combination with the potential occurrence of storms with varying intensities. The closer a field is to a receiving body of water, the more likely it is that P leaving the field will reach the body of water.

To determine the contributing distance for a field, the lower edge or edges of the field in the direction of water flow to the receiving water body must be used. It is necessary to determine how the P Index distance categories correspond with the farm field boundaries. This is most easily done by plotting distance lines at 100, 200, 350, and 500 feet on a farm map with field boundaries and receiving water bodies delineated. Then determine which Contributing Distance category accounts for a majority (50% or more) of the lower edge or edges of the field in the direction of water flow to the receiving water body. This is method of determining Contributing Distance and the same lower field edge or edges in the direction of water flow to the receiving water body must be used in Part A and Part B. Therefore, all distance determinations and methods must be consistent between P Index Parts A and B.

Depending on the landscape, when determining the lower edge of a field in the direction of water flow, two or more field edges or boundaries may need to be evaluated. In these cases, the total length of all of the field edges or boundaries are considered when determining which Contributing Distance category accounts for 50% or more of the lower edges in the direction of water flow.

The figure below illustrates how to determine the distance category for fields.

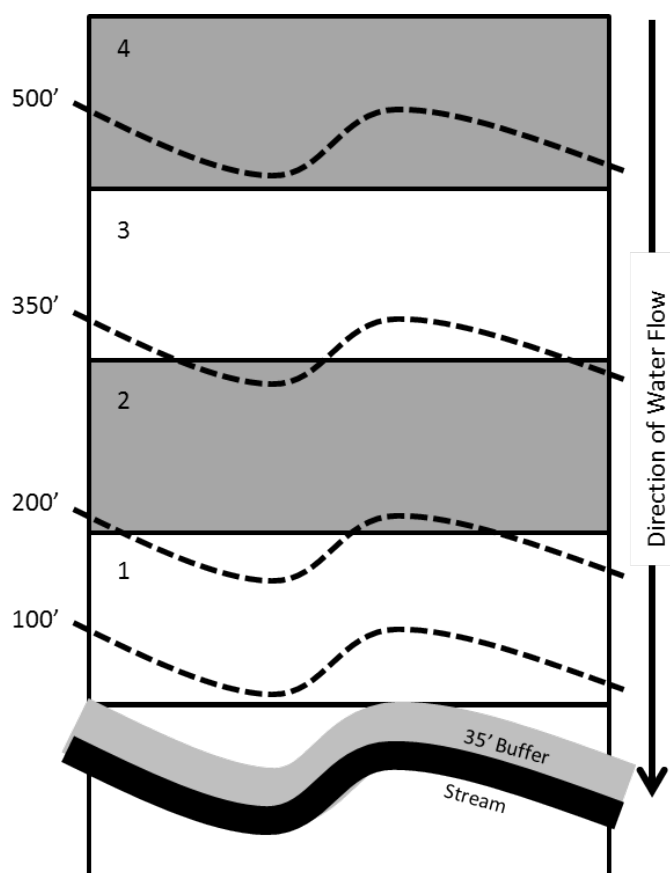
1. Distance factor = 6
 $< 100'$ with 35 ft. buffer

 All of the lower boundary in the direction of water flow is within 100 feet of the stream **but** with a 35 ft. vegetative buffer
2. Distance factor = 4
 $200 - 349'$

 Less than $\frac{1}{2}$ of the lower field boundary is inside the 200' line and all of the lower boundary in the direction of water flow is within the 350' line.
3. Distance factor = 4
 $200 - 349'$

 More than $\frac{1}{2}$ of the lower field boundary is inside the 350' line, but outside the 200' line. Even though most of the field is outside the 350' line, the determination is based on the lower boundary.
4. Distance Category = 2
 $350 - 500'$

 All of the lower boundary is between the 350' line and the 500' line.



Determining the Contributing Distance Category

Near stream areas require special considerations which must be evaluated and addressed prior to completing the P Index Contributing Distance evaluation. Refer to the Nutrient Management Plan Summary for specific requirements.

A category of $9 < 100 \text{ ft.}$ is assigned to a field when the field has been determined to be less than 100 feet of a receiving water body and when either of the two conditions are met:

1. phosphorus is applied to the field only as inorganic fertilizer.
2. animals are grazed in this field and the buffer pasture criteria are not met. Refer to the Nutrient Management Plan Summary for the specific buffer pasture criteria.

A category of $6 \text{ } 100 \text{ to } 199 \text{ ft. OR } < 100 \text{ ft. with } 35 \text{ ft. buffer}$ is assigned to a field when either of the following conditions are met:

1. the field has been determined to be between 100 and 199 ft. of a receiving water body, and

2. the field distance has been determined to be less than 100 ft. and the 35 ft. buffer criteria for cropland or pastures have been met. Refer to the Nutrient Management Plan Summary for the specific 35 ft. cropland buffer and 35 ft. pasture buffer criteria.

A category of *4 200 to 349 ft.* is assigned to a field when the field has been determined to be between 200 and 349 ft. of a receiving water body.

A category of *2 350 to 500 ft.* is assigned to a field when the field has been determined to be between 350 and 500 ft. of a receiving water body.

A category of *0 > 500 ft.* is assigned to a field when the field has been determined to be greater than 500 ft. from of a receiving water body.

Transport Sum

Transport Sum = Erosion + Runoff Potential + Subsurface Drainage + Contributing Distance

The Transport Sum is calculated by summing the *Erosion, Surface Runoff Potential, Subsurface Drainage, and Contributing Distance* factors. These values are represented by a shaded line in the P Index.

Modified Connectivity

MODIFIED CONNECTIVITY	0.85 50 ft. Riparian Buffer APPLIES TO DIST. < 100 FT		1.0 Grassed Waterway or None		1.1 Direct Connection APPLIES TO DIST. > 100 FT
----------------------------------	---	--	---------------------------------------	--	---

The previous transport factors account for the landscape or inherent properties of a field that influence P transport and with the exception of erosion cannot be changed.

However, the Modified Connectivity factor accounts for management practices that can change, inhibiting or facilitating, how P moves from a field to receiving water.

Modified Connections for fields less than 100 feet from water

In the Modified Connectivity evaluation described below, field distance from receiving water must be determined. There are two possible modified connectivity situations for fields that are within the <100 feet from water category. First, the regulations require that manure cannot be applied within 100 feet of a water body unless there is a 35 foot vegetative buffer established. This buffer or the 100 ft manure application set back modify the connection between a near-stream field and the water. This is accounted for by selecting the “6” distance factor for these situations. No further adjustment for a modified connection is taken in this case. However, a further reduction in the risk of P loss can be obtained if a buffer is designed and managed to meet NRCS standards

which includes a minimum width of 50 feet. In this situation, the additional modified connectivity factor is used. This factor is 0.85 which is multiplied times the transport sum effectively reducing the transport sum reflecting the lower potential for transport of P to water with the designed riparian buffer compared to the simple 35 vegetative buffer. Below is a detailed description of the 50 foot buffer that would meet the NRCS standards.

50 ft. Wide Buffers: Fields within 100 feet of receiving water with 50 ft. wide buffers designed to meet the sediment and dissolved nutrient control criteria of either Pennsylvania USDA-NRCS Practice Standards 390 (Herbaceous Riparian Cover), 391(Forested Riparian Buffer), or 393 (Filter Strip), should receive BOTH a Contributing Distance factor of 6 and the Modified Connectivity factor of 0.85.

If a buffer has not been designed by Pennsylvania USDA-NRCS, but appears to be functioning as if it were, it MUST be certified by Pennsylvania USDA-NRCS to receive credit in the P Index.

Modified Connections for fields more than 100 feet from water

If a field is outside of 100 feet from receiving water, it is necessary to determine if a direct connection conveys surface runoff and erosion leaving a field and discharges into or near receiving water. Direct connections can include: pipe outlets and ditches not meeting the definition of a perennial or intermittent stream (see Act 38 regulations §83.201). Subsurface tile drainage is accounted for in the Subsurface Drainage category and are not direct connections in the P Index.

The location of the direct connection outlet is important. If the outlet discharges into a grassed or vegetated area, it is not a direct connection. However, if the outlet discharges directly into receiving water or an area with no vegetation, it is a direct connection. For fields with a qualifying direct connection and a Contributing Distance greater than 100 feet from receiving water select a *Modified Connectivity* factor of 1.1.

A grass waterway is considered a special case direct connection. Even though it is a type of direct connection, if properly designed and maintained, a grass waterway should reduce sediment and P transport. Therefore, properly designed and maintained grass waterways do not qualify as direct connections for the P Index.

Tile drains are evaluated and accounted for in the Subsurface Drainage section of the P Index. Therefore, tile drains and their outlets should not be considered direct connections in the Modified Connectivity section. Tile drains can transport P; however, this P loss is properly accounted for in the Subsurface Drainage category.

For fields at any distance from receiving water determined to have a grass waterway or no buffers or direct connections select a Modified Connectivity factor of 1.0.

Transport Factor

$$\text{Transport Sum} \times \text{Modified Connectivity} \div 24$$

The *Transport Sum* is multiplied by the *Modified Connectivity* value and this product is divided by 24. Twenty-four is the maximum *Transport Sum* value and dividing by this value allows the *Transport Factor* to generally vary between 0 and 1.0. A *Transport Factor* value of 1.0 is the value at which the full (100%) field transport potential is reached. Other *Transport Factor* values represent a percentage of the field's full transport potential. The *Transport Factor* only exceeds 1.0 when erosion losses are exceptionally high.

Phosphorus Index Calculation and Interpretation

$$\text{P Index Value} = 2 \times \text{Source} \times \text{Transport}$$

The final P Index Value for a field is calculated by multiplying the *Source Factor* x *Transport Factor* x 2. The factor of "2" allows P Index Values over 100 to receive a Very High P Index Rating consistent with other Mid-Atlantic states. The P Index Rating is a relative description of the vulnerability or risk of P loss to surface water bodies. The nutrient management recommendation for the calculated P Index Value and associated P Index Rating can be interpreted using Pennsylvania P Index Table 2 (see below).

In addition to providing an indication of the relative risk of P loss, the P Index Ratings determine recommendations for nutrient application. At Low or Medium P Index Ratings, the maximum nutrient applications are based on N balance. The amount of available N from all nutrient sources cannot exceed the N crop requirement. For Low and Medium P Index Ratings, standard best management practices for manure management should be followed. Although the nutrient application recommendation is the same for Low and Medium Ratings, the Medium range indicates a higher risk of adverse impact on surface water and warns to evaluate management practices to ensure P loss risk does not increase. Practices to consider include the manure application rate, timing and method of manure application and the adequacy and function of conservation practices.

For the High P Index Rating, nutrient applications are limited to the lower of the N or P balanced rate. The total of all P applications must be reduced so that no more P is applied than will be removed by the current crop. This will significantly reduce the amount of P applied compared to an N balanced rate and should not result in further buildup of soil P. Other management practices such as timing and method of manure application and conservation practices should also be considered. In some cases, changes in other management may lower the risk of P loss, and thus the P Index Value and Rating, so that the nutrient application rate is not restricted to crop P removal. As nutrient application rates based on P balance can be very low and sometimes not

practical for manure application equipment, up to three years of crop P removal may be applied in one application with no manure or P applied in the following 2 years. However, there are several important limitations. First, the multi-year manure rate cannot exceed N balance for the current crop. Second, the multi-year manure rate must be evaluated in the P Index. If the multi-year rate results in a Very High P Index Rating for the current year, this rate cannot be applied. In this case, the maximum multi-year rate must be the manure rate receiving a P Index Value below 100.

A Very High P Index Rating indicates a very high risk of P loss and no P from any source can be applied. Even if P is not applied, management practices, such as soil conservation practices, should be evaluated to ensure P is not lost from the field. As with the High category, changing management practices such as manure rate, timing or method of application may reduce the P Index Value allowing some P application.

At a High or Very High P Index Rating, the planner should go back to the individual P Index factors to determine why the field received a High or Very High Rating. This information can be used to guide management changes that may reduce P loss risk to surface water. For example, a High Manure Rating may be reduced by changing the time or method of manure application. A high erosion factor may be reduced by implementing conservation practices. Thus, the final plan for a field with a High or Very High P Index Rating will likely result from an iterative process of changing planned management and re-evaluating the field with P Index to ensure final planned management is within limitations specified in Table 2.

Table 2. Phosphorus index management guidance.

Value	Rating	Management Guidance
0 to 59	Low	Nutrients can be applied to meet the Nitrogen crop requirement. <i>Low</i> potential for P loss. Maintenance of current farming practices is recommended to minimize the risk of adverse impacts on surface waters.
60 to 79	Medium	Nutrients can be applied to meet the Nitrogen crop requirement. <i>Medium</i> potential for P loss. The chance for adverse impacts on surface waters exists. An assessment of current farm nutrient management and conservation practices is recommended to minimize the risk of future P losses.
80 to 99	High	Nutrients can be applied to meet the Phosphorus crop removal. <i>High</i> potential for P loss and adverse impacts on surface waters. Soil and water conservation measures and P-balanced management plans are needed to minimize the risk of P loss.
100 or greater*	Very High	<ul style="list-style-type: none"> • No Phosphorus can be applied. <i>Very high</i> potential for P loss and adverse impacts on surface waters. Conservation measures and management plan not allowing any phosphorus to be applied on these fields must be implemented to minimize the P loss. • For pastures - Nutrients can be applied to meet the Phosphorus crop removal. To allow this application to occur specific BMPs must be installed and other criteria must be met under the Act 38 regulations. See the Pasture Guidance section at the beginning this document and §83.294(j) of the Act 38 regulations.

* Refer to the section **Phosphorus Index transition guidance for crop management units or fields receiving a Very High P Index Rating** of this document to review phase-in nutrient management guidance for CMUs or fields receiving a Very High P Index Rating. This phase-in guidance was established through the Act 38 regulations and is effective until December 31, 2010.

To meet Pennsylvania nutrient management plan requirements, the P Index calculation for the final planned management on a CMU/field must be included as a part of the submitted nutrient management plan. The management reported in the plan must be consistent with the final P Index Value, associated P Index Rating and nutrient management recommendations. For example, if the final P Index Value has a High P Index Rating, the P applied in the plan must not exceed crop P removal. The initial and interim P Index calculations performed as part of the planning process are not required for plan submission and should not be included with the submitted nutrient management plan, as they may cause confusion for the farmer or the plan reviewer.

Example: Integrating the Phosphorus Index into a Nutrient Management Plan Using Pennsylvania's Standard Plan Format

For the following examples and associated scenarios, Pennsylvania's Standard Nutrient Management Plan is used. This Standard Plan format is available at <http://panutrientmgmt.cas.psu.edu> under Planning Tools and Resources.

Following is a step by step summary of the process for using the *Phosphorus Index* with the *Pennsylvania Standard Nutrient Management Plan format*. This is followed by three examples illustrating the process. When using the Nutrient Management Plan Spreadsheet Version 2.0 many of the calculations are automatically completed.

Step 1: Appendix 4. Field Information and P Index Part A

Using Standard Plan Format Appendix 4, the first step of the planning process is to determine which fields will need to be evaluated using P Index Part B. This determination is made using Part A or the screening tool of the P Index and Appendix 4. Part A requires the user to determine if the field is in a special protection watershed, if there have been significant farm management changes, if the soil test P level for the field is greater than 200 ppm Mehlich 3 P or if the field is within 150 feet from receiving water. If any of these criteria are met, the field may be a risk for P loss and may require management changes. Therefore, the field must be evaluated using P Index Part B. For additional information on P Index Part A, see the Part A: Screening Tool section of this document. In the following scenarios, the results of the Part A evaluation are included as "P Index Part A" in Appendix 4. Once the Part A evaluation is complete, begin N-based manure allocation.

Step 2: Appendix 4. Determining Other Nutrient Contributions and Appendix 4. Calculating N-Balanced Manure Rate

During N-based manure allocation, fields identified as requiring P Index Part B evaluation must be carefully considered. Typically, a preliminary N-based manure allocation is made and this proposed allocation is evaluated by completing P Index Part B using the associated field information. If the Part B evaluation, results in a P Index Rating of Low or Medium, no changes are required and the proposed N-based management can be used on this field. However, if the P Index Rating is High or Very High the manure allocation, application rate, and/or application management must be modified according to P Index management guidance. All P Index Part B evaluations required by Part A, including all inputs, must be submitted as Appendix 5.

Step 3: Appendix 4. Calculating P-Based Manure Rate for Fields Requiring Part B of the P Index

Before conducting the P Index Part B evaluation, the proposed manure application rate is entered into Appendix 4 and the associated amount of P applied in that manure application needs to be calculated in lb P₂O₅/A.

Step 4: Pennsylvania P Index Version 2, Part B Evaluation

After determining the proposed amount of P applied (lb P₂O₅/A), the lb P₂O₅/A and the associated field information are evaluated using P Index Part B.

Step 5: Completing Appendix 4. Calculating P-Based Manure Rate for Fields Requiring Part B of the P Index

After determining the P Index Value and Rating and nutrient management recommendation for a field, Appendix 4 needs be completed for fields with High or Very High P Index Rating. For fields receiving a Low or Medium P Index Rating, Appendix 4 is complete with the information entered in Step 3 and no further calculations are needed in Appendix 4. Any field receiving a High P Index Rating is limited to nutrient applications from all sources based on crop P removal. On these fields, additional calculations must be performed to complete Appendix 4 because a P-based manure rate needs to be determined to satisfy the P Index recommendation and to determine the planned manure rate for the field.

Step 6: Appendix 4. Nutrients Applied in Manure and Balance and Supplemental Fertilizer and Final Nutrient Balance

This section of Appendix 4 summarizes the planned manure rates, additional fertilizer requirements and final nutrient balances. Note that in Appendix 4, there is a P Index Value category for each field requiring a P Index Part B evaluation. In addition to reporting the P Index Value in this category, the full Part B evaluation with all inputs must be submitted as Appendix 5.

Step 7: Appendix 5. Phosphorus Index

All P Index Part B evaluations must be included as Appendix 5. All source and transport factors as well as the final P Index Value must be reported.

Examples

The following examples illustrate how to integrate the P Index into nutrient management plan development. The example, consisting of three scenarios and a summary section, will work through the Standard Plan Format: Appendix 4 and Appendix 5. In the three scenarios, information required for Appendix 4 and P Index Part B evaluations is provided. The appendices provided in the scenario section are viewed as “working” versions as there is information included that would not be submitted with the final nutrient management plan. In the scenario summary section, a final or “submitted” version of Appendix 4 and Appendix 5 is provided. The summary scenario information would be submitted as part of a nutrient management plan developed using the Standard Plan Format.

In *Scenario 1*, the Part B evaluation will show that the N-based plan is acceptable and only proper documentation is required. In *Scenario 2*, the Part B evaluation using an N-based rate results in a High P Index Rating. However, modifying the manure management by changing the timing of application lowers the P Index Value and Rating allowing for the application of nutrients at an N-based rate. Finally in *Scenario 3*, the Part B evaluation using an N-based rate results in a Very High P Index Rating. In this case, the only practical management option is to reduce the planned manure rate.

Scenario 1: Field 13 - Appendix 4. N Based Rate Acceptable (See step by step instructions below)

Crop Year(s)	2009	CMU/Field ID	13
Acres	2.9		
Soil Test Report Date	5/1/2008		
Laboratory Name	AASL		
Soil Test Levels (Mehlich-3 P & K) (If soil test results are not in ppm show conversions in Appendix 10)	ppm P	ppm K	pH
	256	100	6.2
P Index Part A <ul style="list-style-type: none"> No P Applied N-Based ("No" to all Part A Questions) Part B ("Yes" to any Part A Question) 	Part B		
Crop	Corn Silage		
Planned Yield	21 ton/A		
Soil Test Recommendation (lb/A)	N	P₂O₅	K₂O
	150	0	230
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	10	20	10
Manure History Description	Manure applied 3 out last 5 years		
Residual Manure N (lb/A)	20		
Legume History Description	None		
Residual Legume N (lb/A)	0		
Net Nutrients Required (lb/A)	120	(20)	220
Manure Group & Application Season	Spring Dairy	Spring	
Application Management (Incorporation, cover crops, etc.)	None; Rain 5 to 7 days		
Availability Factors (Total N or NH ₄ -N & Organic N)	Total N	NH₄-N	Org. N
	0.30	N/A	N/A
Available N (lb/ton or lb/1000 gal)	8.4		
N Balanced Manure Rate (ton or gal/A)	14,286 gal/A		
P Removal Balanced Manure Rate (ton or gal/A) (If required by P Index)	Net Crop P Removal (lb/A)	P Removal Balanced Manure Rate	
	N/A	N/A	
Planned Manure Rate (ton or gal/A)	9000 gal/A		
Manure Nutrients Applied at Planned Rate	76	117	225
Nutrient Balance After Manure (lb/A)	44	(137)	(5)
Supplemental Fertilizer (lb/A)	40	0	0
Final Nutrient Balance (lb/A)	4	(137)	(5)
Manure Utilized on CMU (tons or gallons)	26,100 gallons		
Notes			

← STEP 1

← STEP 2

← STEP 3

← STEP 4

Step by Step Instructions for Completing Appendix 4 for Fields Requiring Part B of the P Index

Labels in the example above refer to the following steps.

Step 1: Appendix 4. Field Information and P Index Part A of the Standard Nutrient Management Plan Format

The Part A evaluation of Field 13, shown below in the Standard Nutrient Management Plan format, directed the planner to complete a Part B evaluation because the Mehlich 3 soil test exceeded 200 ppm P.

Step 2: Appendix 4. Determining Other Nutrient Contributions and Calculating N-Balanced Manure Rate of the Standard Nutrient Management Plan Format

Proposed N-based manure allocation information for Field 13 is shown in Appendix 4 below. Completion of this Appendix follows the standard procedure for determining a maximum N-based manure application rate for a field in a nutrient management plan. This is consistent with the information and reference materials provided in the Nutrient Plan Writing workshop and the Nutrient Management Program Technical Manual.

Step 3: Appendix 4. Determining a Proposed Planned Manure Rate

The next step is to select a proposed manure rate based on the N calculations in Appendix 4. In this example, 9000 gal/A is selected. A higher rate could be selected, but the nutrient management regulations require split manure applications above 9000 gal/A.

Step 4: Appendix 4. Calculating P Applied At the Proposed Application Rate

The proposed manure application rate of 9000 gal/A is then entered into Appendix 4 as shown above. Using the proposed manure application rate and the manure analysis value in lb P₂O₅/1000 gal., a proposed rate of P applied is calculated. For Field 13, based on the proposed manure rate of 9000 gal/A and a manure analysis of 13 lb P₂O₅/1000 gal., 117 lb P₂O₅/A will be applied. For more information on calculating P manure application rates, refer to the Manure Rate section

All of the information calculated up to this point is found in a typical N-based nutrient management plan. However, because Part A of the P Index directed the completion of a Part B evaluation, the proposed manure application rate must be evaluated using Part B of the Pennsylvania P Index.

Pennsylvania P Index Version 2, Part B Evaluation. Reported in Appendix 5 of the Standard Nutrient Management Plan Format

PART B: SOURCE FACTORS						CMU/Field ID	13
SOIL TEST	Mehlich 3 Soil Test P (ppm P)					256	
Soil Test Rating = 0.20 * Mehlich 3 Soil Test P (ppm P)						51	
FERTILIZER P RATE	Fertilizer P (lb P ₂ O ₅ /acre)					20	
FERTILIZER APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April to October	0.8 Incorporated >1 week or not incorporated following application in November to March	1.0 Surface applied to frozen or snow covered soil	0.2	
Fertilizer Rating = Fertilizer Rate x Fertilizer Application Method						4	
MANURE P RATE	Manure P (lb P ₂ O ₅ /acre)					117	
MANURE APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April to October	0.8 Incorporated >1 week or not incorporated following application in November to March	1.0 Surface applied to frozen or snow covered soil	0.6	
P SOURCE COEFFICIENT	Refer to: Test results for P Source Coefficient OR Book values from P Index Fact Sheet Table 1					0.8	
Manure Rating = Manure Rate x Manure Application Method x P Source Coefficient						56	
		Source Factor = Soil Test Rating + Fertilizer Rating + Manure Rating				111	

PART B: TRANSPORT FACTORS						CMU/Field ID	13
EROSION	Soil Loss (ton/acre/yr)						2
RUNOFF POTENTIAL	0 Drainage Class is Excessively	2 Drainage Class is Somewhat Excessively	4 Drainage Class is Well/Moderately Well	6 Drainage Class is Somewhat Poorly	8 Drainage Class is Poorly/Very Poorly	2	Step 7 Enter the Transport factors and calculate the final P Index value
SUBSURFACE DRAINAGE	0 None		1 Random		2* Patterned	0	
CONTRIBUTING DISTANCE	0 > 500 ft.	2 350 to 500 ft.	4 200 to 349 ft.	6 100 to 199 ft. OR <100 ft. with 35 ft. buffer	g [‡] < 100 ft.	2	
Transport Sum = Erosion + Runoff Potential + Subsurface Drainage + Contributing Distance						6	
MODIFIED CONNECTIVITY	0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT		1.0 Grassed Waterway OR None		1.1 Direct Connection APPLIES TO DIST > 100 FT	1.0	
Transport Sum x Modified Connectivity/24						0.25	
P Index Value = $2 \times \text{Source} \times \text{Transport}$						56	

* OR rapid permeability soil near a stream

‡ "g" factor does not apply to fields receiving manure with a qualifying 35 ft. buffer.

Step 5

Fertilizer information from the N-based plan is entered into the P Index. Any planned P fertilizer from the “Other Nutrients Applied” line in Appendix 4 is entered in the “Fertilizer P rate” line in the P Index. The method of application, which in this example is a starter fertilizer is selected from the choices in the “Fertilizer Application Method” line in the P Index. In this example this would be a “2”

Step 6

Manure information from the N-based plan is entered into the P Index. Any planned P Manure from the “P applied at the planned rate” line in Appendix 4 is entered in the “Manure P rate” line in the P Index. The method of application, which in this example is a late spring application that is not incorporated is selected from the choices in the “Manure Application Method” line in the P Index. In this example this would be a “6”. The P source coefficient is also entered for the manure type.

Step 7

The transport factors for the field are entered into the P Index and the final P Index value is calculated.

In this example, the evaluation resulted in a P Index Value of 56 which is a Low P Index Rating. The associated nutrient management guidance is “Nutrients can be applied to meet the Nitrogen crop requirement”. No change in the proposed manure rate for Field 13 is required; however, this determination must be properly documented. Proper documentation requires that the P Index Part B on the previous page with all inputs and final P Index Value be included as Appendix 5 of the Standard Nutrient Management Plan format.

The P Index Rating for Field 13 is Low and nutrients can be applied to the field using N-based rates. Therefore, it is not necessary to calculate a P-based manure application rate. For Field 13 and any other field receiving a Low or Medium P Index Rating, Appendix 4 is complete once the Manure Nutrients Applied at Planned Rate calculation is complete. Scenario 3 will provide an example of completing Appendix 4 when P-based rates need to be calculated.

After the planned manure rate has been selected and evaluated as needed in P Index Part B, Appendix 4 can be completed. This information is used to determine additional fertilizer need and calculate final nutrient balances. Note: Although the final planned manure application rate for Field 13 is N-based, a Part B evaluation was required. Therefore, P Index Part A and Part B inputs and the final P Index value must be submitted with Appendix 5.

Scenario 2: Field 17- Appendix 4. Modifying Management Based On P Index Outcome. (see step by step instructions below)
- Proposed Management

Crop Year(s)	2009	CMU/Field ID	17 (Proposed)		
Acres	6.8				
Soil Test Report Date	5/1/2008				
Laboratory Name	AASL				
Soil Test Levels (Mehlich-3 P & K) (If soil test results are not in ppm show conversions in Appendix 10)	ppm P	ppm K	pH		
	211	95	6.1		
P Index Part A <ul style="list-style-type: none"> No P Applied N-Based ("No" to all Part A Questions) Part B ("Yes" to any Part A Question) 	Part B				
Crop	Corn Grain				
Planned Yield	125 bu/A				
Soil Test Recommendation (lb/A)	N	P₂O₅	K₂O		
	130	0	40		
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	10	20	10		
Manure History Description	Manure applied 3 out last 5 years				
Residual Manure N (lb/A)	20				
Legume History Description	None				
Residual Legume N (lb/A)	0				
Net Nutrients Required (lb/A)	120	(20)	30		
Manure Group & Application Season	Fall Dairy	Late Fall			
Application Management (Incorporation, cover crops, etc.)	None				
Availability Factors (Total N or NH ₄ -N & Organic N)	Total N	NH₄-N	Org. N		
	0.20	N/A	N/A		
Available N (lb/ton or lb/1000 gal)	5.6				
N Balanced Manure Rate (ton or gal/A)	21,429				
P Removal Balanced Manure Rate (ton or gal/A) (If required by P Index)	Net Crop P Removal (lb/A)	P Removal Manure Rate			
	N/A	N/A			
Planned Manure Rate (ton or gal/A)	9000 gal/A				
Manure Nutrients Applied at Planned Rate	76	117	225		
Nutrient Balance After Manure (lb/A)					
Supplemental Fertilizer (lb/A)					
Final Nutrient Balance (lb/A)					
Manure Utilized on CMU (tons or gallons)					
Notes	Proposed Management				

← STEP 1

← STEP 2

← STEP 3

← STEP 4

Step By Step Instructions for Completing Appendix 4 for Fields Requiring Part B of the P Index

Labels in the example above refer to the following steps.

Step 1: Appendix 4. Field Information and P Index Part A of the Standard Nutrient Management Plan Format

The Part A evaluation of Field 17, shown below in the Standard Nutrient Management Plan format, directed the planner to complete a Part B evaluation because the Mehlich 3 soil test exceeded 200 ppm P.

Step 2: Appendix 4. Determining Other Nutrient Contributions and Calculating N-Balanced Manure Rate of the Standard Nutrient Management Plan Format

Proposed N-based manure allocation information for Field 17 is shown in Appendix 4. Completion of this Appendix follows the standard procedure for determining a maximum N-based manure application rate for a field in a nutrient management plan. This is consistent with the information and reference materials provided in the Nutrient Plan Writing workshop and the Nutrient Management Program Technical Manual.

Step 3: Appendix 4. Determining a Proposed Planned Manure Rate

The next step is to select a proposed manure rate based on the N calculations in Appendix 4. In this example, 9000 gal/A is selected. A higher rate could be selected, but the nutrient management regulations require split manure applications above 9000 gal/A.

Step 4: Appendix 4. Calculating P Applied at the Proposed Application Rate

The proposed manure application rate of 9000 gal/A is then entered into Appendix 4 as shown above. Using the proposed manure application rate and the manure analysis value in lb P₂O₅/1000 gal., a proposed rate of P applied is calculated. For Field 17, based on the proposed manure rate of 9000 gal/A and a manure analysis of 13 lb P₂O₅/1000 gal., 117 lb P₂O₅/A will be applied. For more information on calculating P manure application rates, refer to the Manure Rate section of this document.

All of the information calculated up to this point is found in a typical N-based nutrient management plan. However, because Part A of the P Index directed the completion of a Part B evaluation, the proposed manure application rate must be evaluated using Part B of the Pennsylvania P Index.

Pennsylvania P Index Version 2, Part B Evaluation. Reported in Appendix 5 of the Standard Nutrient Management Plan Format

PART B: SOURCE FACTORS						CMU/Field ID	17 Proposed [†]	17 Final
SOIL TEST	Mehlich 3 Soil Test P (ppm P)						211	211
Soil Test Rating = 0.20 * Mehlich 3 Soil Test P (ppm P)							42	42
FERTILIZER P RATE	Fertilizer P (lb P ₂ O ₅ /acre)						20	20
FERTILIZER APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April to October	0.8 Incorporated >1 week or not incorporated following application in November to March	1.0 Surface applied to frozen or snow covered soil		0.2	0.2
Fertilizer Rating = Fertilizer Rate x Fertilizer Application Method							4	4
MANURE P RATE	Manure P (lb P ₂ O ₅ /acre)						117	117
MANURE APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April to October	0.8 Incorporated >1 week or not incorporated following application in November to March	1.0 Surface applied to frozen or snow covered soil		0.8	0.6
P SOURCE COEFFICIENT	Refer to: Test results for P Source Coefficient OR Book values from P Index Fact Sheet Table 1						0.8	0.8
Manure Rating = Manure Rate x Manure Application Method x P Source Coefficient							75	56
Source Factor = Soil Test Rating + Fertilizer Rating + Manure Rating							121	102
PART B: TRANSPORT FACTORS						CMU/Field ID	17 – Prop.	17
EROSION	Soil Loss (ton/acre/yr)						3	3
RUNOFF POTENTIAL	0 Drainage Class is Excessively	2 Drainage Class is Somewhat Excessively	4 Drainage Class is Well/Moderately Well	6 Drainage Class is Somewhat Poorly	8 Drainage Class is Poorly/Very Poorly		4	4
SUBSURFACE DRAINAGE	0 None		1 Random		2* Patterned		0	0
CONTRIBUTING DISTANCE	0 > 500 ft.	2 350 to 500 ft.	4 200 to 349 ft.	6 100 to 199 ft. OR <100 ft. with 35 ft. buffer	9 [‡] < 100 ft.		2	2
Transport Sum = Erosion + Runoff Potential + Subsurface Drainage + Contributing Distance							9	9
MODIFIED CONNECTIVITY	0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT		1.0 Grassed Waterway OR None		1.1 Direct Connection APPLIES TO DIST > 100 FT		1.0	1.0
Transport Sum x Modified Connectivity/24							0.38	0.38
P Index Value = 2 x Source x Transport							92	78

[†] This column will not appear in the final plan.

^{*} OR rapid permeability soil near a stream

[‡] "9" factor does not apply to fields receiving manure with a qualifying 35 ft. buffer.

[†] This column would not appear in the final plan.

* OR rapid permeability soil near a stream

[‡] "9" factor does not apply to fields receiving manure with a qualifying 35 ft. buffer.

In this example, the original plan information is entered in the column labeled “17 Proposed” above.

Step 5

Fertilizer information from the N-based plan is entered into the P Index. Any planned P fertilizer from the “Other Nutrients Applied” line in Appendix 4 is entered in the “Fertilizer P rate” line in the P Index. The method of application, which in this example is a starter fertilizer is selected from the choices in the “Fertilizer Application Method” line in the P Index. In this example this would be a “2”

Step 6

Manure information from the proposed N-based plan is entered into the P Index. Any planned P Manure from the “P applied at the planned rate” line in Appendix 4 is entered in the “Manure P rate” line in the P Index. The method of application, which in this example is a Late Fall application that is not incorporated is selected from the choices in the “Manure Application Method” line in the P Index. In this example this would be a “8”. The P source coefficient is also entered for the manure type.

Step 7

The transport factors for the field are entered into the P Index and the final P Index value is calculated.

In this example, the evaluation resulted in a P Index Value of 92 which is a High P Index Rating. The associated nutrient management guidance is “Nutrients can be applied to meet the Phosphorus crop removal.”. Therefore, the N based rate cannot be used as planned and a management change is required for this field.

Modifying the Plan Based on the P Index Outcome

In this example, the modified plan is shown in the column labeled “17 (Final)” above. In a real plan only the final modified plan information would be shown in Appendix 4 and Appendix 5.

The planner noted a planned late fall application of liquid dairy manure. A possible management option is to change the season of application and apply the manure in the spring. The second column in the Part B evaluation on the previous page, labeled Field 17 (Final), reflects this change. By changing the manure application to the spring, the factor for *Manure Application Method* is reduced from 0.8 to 0.6. Subsequently, the P Index Value is reduced to 78 (from the initial P Index Value of 92). A P Index Value of 78 has an associated Medium P Index Rating and allows for nutrient application at an N-based rate.

This management change would be need to be included in all appropriate appendices of the Standard Plan format including Appendix 4 as the season of manure application has changed. In this case, because of the change in spreading season, the Available N and the N Balanced Manure Rate have changed. Changes are shown in **bold** below. In making changes to manure application method and timing, the Incorporation Factors and associated calculations may change and should be reviewed

before finalizing the plan. In the submitted plan, only the final version of Appendix 4 for “Field 17 (Final)” below is included. In the submitted plan, do not include the proposed version of Appendix 4 shown earlier or any other interim calculations. Several approaches may be evaluated until a workable and practical option is found. Once finalized, the planned management must match the nutrient management plan, P Index inputs, calculated P Index Value, and P Index guidance provided for the field.

**Scenario 2: Field 17- Appendix 4. Modifying Management Based on P Index Outcome.
- Final Management**

Crop Year(s)	2009	CMU/Field ID	17 (Proposed)			17 (final)		
Acres			6.8			6.8		
Soil Test Report Date			5/1/2008			5/1/2008		
Laboratory Name			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (If soil test results are not in ppm show conversions in Appendix 10)			ppm P	ppm K	pH	ppm P	ppm K	pH
			211	95	6.1	211	95	6.1
P Index Part A <ul style="list-style-type: none">No P AppliedN-Based ("No" to all Part A Questions)Part B ("Yes" to any Part A Question)			Part B			Part B		
Crop			Corn Grain			Corn Grain		
Planned Yield			125 bu/A			125 bu/A		
Soil Test Recommendation (lb/A)			N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
			130	0	40	130	0	40
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)			10	20	10	10	20	10
Manure History Description			Manure applied 3 out last 5 years			Manure applied 3 out last 5 years		
Residual Manure N (lb/A)			20			20		
Legume History Description			None			None		
Residual Legume N (lb/A)			0			0		
Net Nutrients Required (lb/A)			120	(20)	30	120	(20)	30
Manure Group & Application Season			Fall Dairy	Late Fall		Spring Dairy	Spring	
Application Management (Incorporation, cover crops, etc.)			None			None; Rain 5 to 7 days		
Availability Factors (Total N or NH ₄ -N & Organic N)			Total N	NH ₄ -N	Org. N	Total N	NH ₄ -N	Org. N
			0.20	N/A	N/A	0.30	N/A	N/A
Available N (lb/ton or lb/1000 gal)			5.6			8.4		
N Balanced Manure Rate (ton or gal/A)			21,429 gal/A			14,286 gal/A		
P Removal Balanced Manure Rate (ton or gal/A) (If required by P Index)			Net Crop P Removal (lb/A)		P Removal Balanced Manure Rate	Net Crop P Removal (lb/A)		P Removal Manure Rate
			N/A		N/A	N/A		N/A
Planned Manure Rate (ton or gal/A)			9000 gal/A			9000 gal/A		
Manure Nutrients Applied at Planned Rate			76	117	225	76	117	225
Nutrient Balance After Manure (lb/A)						24	(137)	(195)
Supplemental Fertilizer (lb/A)						20	0	0
Final Nutrient Balance (lb/A)						4	(137)	(195)
Manure Utilized on CMU (tons or gallons)						61,200 gallons		
Notes			This was the proposed management. Not shown in final plan.			PI Value near 80. Future NMP may need P-based rates.		

Scenario 3: Field 21- Appendix 4. Modifying Manure Rate Based on P Index Outcome. (See step by step instructions below)

Crop Year(s)	2009	CMU/Field ID	21 (Proposed)
Acres	8		
Soil Test Report Date	5/1/2008		
Laboratory Name	AASL		
Soil Test Levels (Mehlich-3 P & K) (If soil test results are not in ppm show conversions in Appendix 10)	ppm P	ppm K	pH
	195	105	6.0
P Index Part A <ul style="list-style-type: none"> No P Applied N-Based ("No" to all Part A Questions) Part B ("Yes" to any Part A Question) 	Part B		
Crop	Corn Grain		
Planned Yield	125 bu/A		
Soil Test Recommendation (lb/A)	N	P ₂ O ₅	K ₂ O
	130	0	30
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	10	20	10
Manure History Description	Manure applied 3 out last 5 years		
Residual Manure N (lb/A)	20		
Legume History Description	None		
Residual Legume N (lb/A)	0		
Net Nutrients Required (lb/A)	100	(20)	20
Manure Group & Application Season	Spring Dairy	Spring	
Application Management (Incorporation, cover crops, etc.)	None; Rain 5 to 7 days		
Availability Factors (Total N or NH ₄ -N & Organic N)	Total N	NH ₄ -N	Org. N
	0.30	N/A	N/A
Available N (lb/ton or lb/1000 gal)	8.4		
N Balanced Manure Rate (ton or gal/A)	11,905		
P Removal Balanced Manure Rate (ton or gal/A) (If required by P Index)	Net Crop P Removal (lb/A)	P Removal Manure Rate	
	N/A	N/A	
Planned Manure Rate (ton or gal/A)	9000 gal/A		
Manure Nutrients Applied at Planned Rate	76	117	225
Nutrient Balance After Manure (lb/A)			
Supplemental Fertilizer (lb/A)			
Final Nutrient Balance (lb/A)			
Manure Utilized on CMU (tons or gallons)			
Notes	Proposed Management		

← STEP 1

← STEP 2

← STEP 3

← STEP 4

Step By Step Instructions for Completing Appendix 4 for Fields Requiring Part B of the P Index

Labels in the example above refer to the following steps.

Step 1: Appendix 4. Field Information and P Index Part A of the Standard Nutrient Management Plan Format

The Part A evaluation of Field 21, shown below in the Standard Nutrient Management Plan format, directed the planner to complete a Part B evaluation because the Mehlich 3 soil test exceeded 200 ppm P.

Step 2: Appendix 4. Determining Other Nutrient Contributions and Calculating N-Balanced Manure Rate of the Standard Nutrient Management Plan Format

Proposed N-based manure allocation information for Field 21 is shown in Appendix 4. Completion of this Appendix follows the standard procedure for determining a maximum N-based manure application rate for a field in a nutrient management plan. This is consistent with the information and reference materials provided in the Nutrient Plan Writing workshop and the Nutrient Management Program Technical Manual.

Step 3: Appendix 4. Determining a Proposed Planned Manure Rate

The next step is to select a proposed manure rate based on the N calculations in Appendix 4. In this example, 9000 gal/A is selected. A higher rate could be selected, but the nutrient management regulations require split manure applications above 9000 gal/A.

Step 4: Appendix 4. Calculating P Applied at the Proposed Application Rate

The proposed manure application rate of 9000 gal/A is then entered into Appendix 4 as shown above. Using the proposed manure application rate and the manure analysis value in lb P₂O₅/1000 gal., a proposed rate of P applied is calculated. For Field 21, based on the proposed manure rate of 9000 gal/A and a manure analysis of 13 lb P₂O₅/1000 gal., 117 lb P₂O₅/A will be applied. For more information on calculating P manure application rates, refer to the Manure Rate section of this document.

All of the information calculated up to this point is found in a typical N-based nutrient management plan. However, because Part A of the P Index directed the completion of a Part B evaluation, the proposed manure application rate must be evaluated using Part B of the Pennsylvania P Index.

Pennsylvania P Index Version 2, Part B Evaluation. Reported in Appendix 5 of the Standard Nutrient Management Plan Format

PART B: SOURCE FACTORS						CMU/Field ID	21-1 [†]	21-2 [†]	21-3
SOIL TEST	Mehlich 3 Soil Test P (ppm P)						195	195	195
Soil Test Rating = 0.20 * Mehlich 3 Soil Test P (ppm P)							39	39	39
FERTILIZER P RATE	Fertilizer P (lb P ₂ O ₅ /acre)						20	20	0
FERTILIZER APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April to October	0.8 Incorporated >1 week or not incorporated following application in November to March	1.0 Surface applied to frozen or snow covered soil		0.2	0.2	0
Fertilizer Rating = Fertilizer Rate x Fertilizer Application Method							4	4	0
MANURE P RATE	Manure P (lb P ₂ O ₅ /acre)						117	26	46
MANURE APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April to October	0.8 Incorporated >1 week or not incorporated following application in November to March	1.0 Surface applied to frozen or snow covered soil		0.6	0.6	0.6
P SOURCE COEFFICIENT	Refer to: Test results for P Source Coefficient OR Book values from P Index Fact Sheet Table 1						0.8	0.8	0.8
Manure Rating = Manure Rate x Manure Application Method x P Source Coefficient							56	13	22
Source Factor = Soil Test Rating + Fertilizer Rating + Manure Rating							99	56	61
PART B: TRANSPORT FACTORS						CMU/Field ID	21-1 [†]	21-2 [†]	21-3
EROSION	Soil Loss (ton/acre/yr)						4	4	4
RUNOFF POTENTIAL	0 <i>Drainage Class is Excessively</i>	2 <i>Drainage Class is Somewhat Excessively</i>	4 <i>Drainage Class is Well/Moderately Well</i>	6 <i>Drainage Class is Somewhat Poorly</i>	8 <i>Drainage Class is Poorly/Very Poorly</i>		6	6	6
SUBSURFACE DRAINAGE	0 None		1 Random		2* Patterned		0	0	0
CONTRIBUTING DISTANCE	0 > 500 ft.	2 350 to 500 ft.	4 200 to 349 ft.	6 100 to 199 ft. OR <100 ft. with 35 ft. buffer	9 [‡] < 100 ft.		6	6	6
Transport Sum = Erosion + Runoff Potential + Subsurface Drainage + Contributing Distance							16	16	16
MODIFIED CONNECTIVITY	0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT		1.0 Grassed Waterway OR None		1.1 Direct Connection APPLIES TO DIST > 100 FT		1.0	1.0	1.0
Transport Sum x Modified Connectivity/24							0.67	0.67	0.67
P Index Value = 2 x Source x Transport							133	75	82

[†] This column would not appear in the final plan
^{*} OR rapid permeability soil near a stream
[‡] "9" factor does not apply to fields receiving manure with a qualifying 35 ft. buffer.

In this example, the original plan information is entered in the column labeled “2-1” above.

Step 5

Fertilizer information from the N-based plan is entered into the P Index. Any planned P fertilizer from the “Other Nutrients Applied” line in Appendix 4 is entered in the “Fertilizer P rate” line in the P Index. The method of application, which in this example is a starter fertilizer, is selected from the choices in the “Fertilizer Application Method” line in the P Index. In this example this would be a “2”

Step 6

Manure information from the proposed N-based plan is entered into the P Index. Any planned P Manure from the “P applied at the planned rate” line in Appendix 4 is entered in the “Manure P rate” line in the P Index. The method of application, which in this example is a Spring application that is not incorporated, is selected from the choices in the “Manure Application Method” line in the P Index. In this example this would be a “6”. The P source coefficient is also entered for the manure type.

Step 7

The transport factors for the field are entered into the P Index and the final P Index value is calculated.

In this example, the evaluation resulted in a P Index Value of 133 which is a Very High P Index Rating. The associated nutrient management guidance is “No Phosphorus can be applied.”. Therefore, the N based rate cannot be used as planned and a management change is required for this field. In this case, the only practical management option is a reduction in the manure application rate. Other possible management changes that may have lowered the P Index Value and corresponding P Index Rating such as injecting or immediately incorporating the manure were not practical for this farmer.

Modifying the Plan Based on the P Index Outcome

All P must be included in the calculation of the crop P removal rate. This includes the manure P and any fertilizer P that is applied. The crop P removal is determined by multiplying the expected crop yield (125 bu/A in this example) and the removal per unit of yield (0.4 lb P₂O₅/bu from the Agronomy Guide Table 1.2-9 in this example). The total crop P removal in this example is 50 lb P₂O₅/A (125 bu/A x 0.4 lb P₂O₅/bu).

Starter Fertilizer In Appendix 4 the line labeled “Other Nutrients Applied” indicates that a starter fertilizer application containing 20 lb P₂O₅/A is planned for this field. This starter fertilizer P must be deducted from the total crop P removal (50 lb P₂O₅/A). This results in a net crop P removal of 30 lb P₂O₅/A (50 lb P₂O₅/A - 20 lb P₂O₅/A) that can be supplied by manure.

P Removal Manure Rate

The manure analysis is 13 lb P₂O₅/1000 gal and the P balanced manure rate is 2308 gal/A (30 lb P₂O₅/A ÷ 13 lb P₂O₅/1000 gal = 2308 gal/A). Based on this calculation a new planned rate is selected. In this example, 2000 gal/A is selected as the planned rate. At this rate of manure application, 26 lb P₂O₅/A (2000 gal/A x 13 lb P₂O₅/1000 gal) is supplied by the manure.

Rerun the P Index with the Change in Management

The amount of manure P calculated above (26 lb P₂O₅/A) must now be entered into the P Index for a new evaluation. This is the column labeled 21-2 in the P Index above. The new P Index Value calculated using this P-based rate is 75 which corresponds to a Medium P Index Rating. This would be an acceptable management plan.

A concern is that the 2000 gal/A rate is very low and may not be practical. An alternative may be eliminating the starter fertilizer P. This would increase the amount of manure applied at the crop P removal rate. Appendix 4 below was revised to reflect this change. Now the P Removal Manure rate is 3846 gal/A. The planner chose a planned manure rate of 3500 gal/A which will apply 46 lb P₂O₅/A.

This change must now be made in the P Index. The starter P needs to be eliminated and the Manure P Rate changed to 46 lb P₂O₅/A. This is the column labeled 21-3 in the P Index above. The resulting P Index Value is 82 which corresponds to a High P Index Rating. However, because the planned rate of 3500 gal/A is less than the crop P removal rate without starter of 3846 gal/A, this is acceptable management and is more practical than the 2000 gal/A rate. The soil test level is very high; therefore, there is minimal agronomic risk associated with the elimination of the starter fertilizer P application.

Scenario 3: Field 21- Appendix 4. Modifying Management Based on P Index Outcome. (See step by step instructions below)

Crop Year(s)	2009	CMU/Field ID	21-2			21-3		
Acres			8			6.8		
Soil Test Report Date			5/1/2008			5/1/2008		
Laboratory Name			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (If soil test results are not in ppm show conversions in Appendix 10)			ppm P	ppm K	pH	ppm P	ppm K	pH
			195	105	6.0	195	105	6.0
P Index Part A <ul style="list-style-type: none">No P AppliedN-Based ("No" to all Part A Questions)Part B ("Yes" to any Part A Question)			Part B			Part B		
Crop			Corn Grain			Corn Grain		
Planned Yield			125 bu/A			125 bu/A		
Soil Test Recommendation (lb/A)			N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
			130	0	30	130	0	30
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)			10	20	10			
Manure History Description			Manure applied 3 out last 5 years			Manure applied 3 out last 5 years		
Residual Manure N (lb/A)			20			20		
Legume History Description			None			None		
Residual Legume N (lb/A)			0			0		
Net Nutrients Required (lb/A)			100	(20)	20	110	0	30
Manure Group & Application Season			Spring Dairy		Spring	Spring Dairy		Spring
Application Management (Incorporation, cover crops, etc.)			None; Rain 5 to 7 days			None; Rain 5 to 7 days		
Availability Factors (Total N or NH ₄ -N & Organic N)			Total N	NH ₄ -N	Org. N	Total N	NH ₄ -N	Org. N
			0.30	N/A	N/A	0.30	N/A	N/A
Available N (lb/ton or lb/1000 gal)			8.4			8.4		
N Balanced Manure Rate (ton or gal/A)			11,905 gal/A			13,095 gal/A		
P Removal Balanced Manure Rate (ton or gal/A) (If required by P Index)			Net Crop P Removal (lb/A)		P Removal Balanced Manure Rate	Net Crop P Removal (lb/A)		P Removal Manure Rate
			30		2,308 gal/A	50		3,846 gal/A
Planned Manure Rate (ton or gal/A)			2000 gal/A			3500 gal/A		
Manure Nutrients Applied at Planned Rate			17	26	50	29	46	88
Nutrient Balance After Manure (lb/A)						81	(46)	(58)
Supplemental Fertilizer (lb/A)						80	0	0
Final Nutrient Balance (lb/A)						1	(46)	(58)
Manure Utilized on CMU (tons or gallons)						28,000 gallons		
Notes			This was rejected because the rate of 2000 gal/A was not practical			With the starter removed a more practical rate of 3500 gal/A was planned.		

Modifying the Plan
← Remove Starter P

Modifying the Plan
← P Removal Rate Calculation

Modifying the Plan
← Revised P based planned rate

Calculating Maximum P-Based Manure Rate for Fields Requiring Part B of the P Index

If the farmer did not want to eliminate starter fertilizer, there is an option that may allow a higher manure application rate than 2308 gal/A (the maximum crop P removal manure rate with starter fertilizer application). Since the P Index Value at the planned rate of 2000 gal/A was 75, this would indicate that a manure rate greater than crop P removal could be applied as long as the resulting P Index Value did not equal or exceed 80. Once the P Index Value equals or exceeds 80, the manure rate is limited to crop P removal. To determine this manure rate, calculate a manure rate resulting in a P Index Value of 79. This manure rate would be greater than the crop P removal manure rate, but would be acceptable management. In the P Index spreadsheet version, this calculation is provided. In this example with the starter fertilizer application, the manure rate that would result in a P Index Value of 79 is 2604 gal/A. This is not a large increase over the crop P removal manure rate, but it does allow a slightly higher manure rate to be used with a starter fertilizer application. The manure rate increase using this approach will vary and can be much greater than in this example.

The final management decisions need to be included in all appropriate appendices of the Standard Plan format including Appendices 6 II and 6 III. In this example, changing the manure rate would require adding the P removal rate calculation and changing the planned rate accordingly. If the starter fertilizer application was eliminated, Appendix 4 would need to be revised to reflect the change in net nutrients required and the N balanced rate. Even though the N based rate is not used for this field the correct N balanced rate for the scenario must be calculated and included in Appendix 4 to document that there would be no excess N applied. In the submitted plan, only include the version of Appendix 4 that matches the final planned management. Both final and interim versions of Appendix 4 are included here to illustrate the impact of management changes.

Scenario Summary: Fields 13, 17, and 21

Based on the three scenarios and the final management decisions, the following represents Appendix 4 and Appendix 5 submitted with the nutrient management plan using the Standard Plan format.

Appendix 4. Fields 13, 17, and 21 Final Appendix 4 as would be submitted

Crop Year(s)	2009	CMU/Field ID	13	17	21
Acres			2.9	6.8	8
Soil Test Report Date			5/1/2008	5/1/2008	5/1/2008
Laboratory Name			AASL	AASL	AASL
Soil Test Levels (Mehlich-3 P & K) (If soil test results are not in ppm show conversions in Appendix 10)			ppm P ppm K pH	ppm P ppm K pH	ppm P ppm K pH
			256 100 6.2	211 95 6.1	195 105 6.0
P Index Part A • No P Applied • N-Based ("No" to all Part A Questions) • Part B ("Yes" to any Part A Question)			Part B	Part B	Part B
Crop			Corn Silage	Corn	Corn
Planned Yield			21 ton/A	125 bu/A	125 bu/A
Soil Test Recommendation (lb/A)			N P ₂ O ₅ K ₂ O	N P ₂ O ₅ K ₂ O	N P ₂ O ₅ K ₂ O
			150 0 230	130 0 40	130 0 30
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)			10 20 10	10 20 10	0 0 0
Manure History Description			Manure applied 3 out last 5 years	Manure applied 3 out last 5 years	Manure applied 3 out last 5 years
Residual Manure N (lb/A)			20	20	20
Legume History Description			None	None	None
Residual Legume N (lb/A)			0	0	0
Net Nutrients Required (lb/A)			120 (20) 220	120 (20) 30	110 0 30
Manure Group & Application Season			Spring Dairy Spring	Spring Dairy Spring	Spring Dairy Spring
Application Management (Incorporation, cover crops, etc.)			None; Rain 5 to 7 days	None; Rain 5 to 7 days	None; Rain 5 to 7 days
Availability Factors (Total N or NH ₄ -N & Organic N)			Total N NH ₄ -N Org. N	Total N NH ₄ -N Org. N	Total N NH ₄ -N Org. N
			0.30 N/A N/A	0.30 N/A N/A	0.30 N/A N/A
Available N (lb/ton or lb/1000 gal)			8.4	8.4	8.4
N Balanced Manure Rate (ton or gal/A)			14,286 gal/A	17,857 gal/A	13,095 gal/A
P Removal Balanced Manure Rate (ton or gal/A) (If required by P Index)			Net Crop P Removal (lb/A) P Removal Balanced Manure Rate	Net Crop P Removal (lb/A) P Removal Manure Rate	Net Crop P Removal (lb/A) P Removal Manure Rate
			N/A N/A	N/A N/A	N/A N/A
Planned Manure Rate (ton or gal/A)			9000 gal/A	9000 gal/A	3500 gal/A
Manure Nutrients Applied at Planned Rate			76 117 225	76 117 225	29 46 88
Nutrient Balance After Manure (lb/A)			44 (137) (5)	24 (137) (195)	81 (46) (58)
Supplemental Fertilizer (lb/A)			40 0 0	20 0 0	80 0 0
Final Nutrient Balance (lb/A)			4 (137) (5)	4 (137) (195)	1 (46) (58)
Manure Utilized on CMU (tons or gallons)			26,100 gallons	61,200 gallons	28,000 gal
Notes				PI Value near 80. Future NMP may need P-based rates.	Manure rate restricted due to P concerns.

Appendix 5. Fields 13, 17, and 21 Final P Index as would be submitted

PART B: SOURCE FACTORS						CMU/Field ID	13	17	21
SOIL TEST	Mehlich 3 Soil Test P (ppm P)						256	211	195
Soil Test Rating = 0.20 * Mehlich 3 Soil Test P (ppm P)							51	42	39
FERTILIZER P RATE	Fertilizer P (lb P ₂ O ₅ /acre)						20	20	0
FERTILIZER APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April to October	0.8 Incorporated >1 week or not incorporated following application in November to March	1.0 Surface applied to frozen or snow covered soil		0.2	0.2	0
Fertilizer Rating = Fertilizer Rate x Fertilizer Application Method							4	4	0
MANURE P RATE	Manure P (lb P ₂ O ₅ /acre)						117	117	46
MANURE APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April to October	0.8 Incorporated >1 week or not incorporated following application in November to March	1.0 Surface applied to frozen or snow covered soil		0.6	0.6	0.6
P SOURCE COEFFICIENT	Refer to: Test results for P Source Coefficient OR Book values from P Index Fact Sheet Table 1						0.8	0.8	0.8
Manure Rating = Manure Rate x Manure Application Method x P Source Coefficient							56	56	22
Source Factor = Soil Test Rating + Fertilizer Rating + Manure Rating							111	102	61
PART B: TRANSPORT FACTORS						CMU/Field ID	13	17	21
EROSION	Soil Loss (ton/acre/yr)						2	3	4
RUNOFF POTENTIAL	0 <i>Drainage Class is Excessively</i>	2 <i>Drainage Class is Somewhat Excessively</i>	4 <i>Drainage Class is Well/Moderately Well</i>	6 <i>Drainage Class is Somewhat Poorly</i>	8 <i>Drainage Class is Poorly/Very Poorly</i>		2	4	6
SUBSURFACE DRAINAGE	0 None		1 Random		2* Patterned		0	0	0
CONTRIBUTING DISTANCE	0 > 500 ft.	2 350 to 500 ft.	4 200 to 349 ft.	6 100 to 199 ft. OR <100 ft. with 35 ft. buffer	9 [†] < 100 ft.		2	2	6
Transport Sum = Erosion + Runoff Potential + Subsurface Drainage + Contributing Distance							6	9	16
MODIFIED CONNECTIVITY	0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT		1.0 Grassed Waterway OR None		1.1 Direct Connection APPLIES TO DIST > 100 FT		1.0	1.0	1.0
Transport Sum x Modified Connectivity/24							0.25	0.38	0.67
P Index Value = 2 x Source x Transport							56	78	82

* OR rapid permeability soil near a stream

† "9" factor does not apply to fields receiving manure with a qualifying 35 ft. buffer.

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Appendix 6

Manure Management

Appendix 6 addresses the requirements set forth in “Section 83.311 – Manure Management” which requires the nutrient management planner to conduct an on-site review of existing manure management practices on the agricultural operation. The purpose of this on-site review is to evaluate and document the adequacy of manure management areas, conditions and practices to prevent surface or groundwater pollution from storm events up to and including a 25-year, 24-hour storm intensity.

Involve Local Expertise

The nutrient management planner should conduct this review in conjunction with individuals who have nutrient runoff control expertise such as the local NRCS, conservation staff or specialized and qualified consultants. **It is recommended that the commercial planner inform local conservation district staff immediately upon agreement with an operator to develop a nutrient management plan to allow for a joint site visit on the farm.** Involving these technicians as early as possible in the planning process helps the plan writer to meet this obligation of plan development, and will also expedite the plan review and approval process.

Purpose and Scope of On-Site Evaluation

The scope of this portion of the on-site evaluation must encompass the following criteria and considerations:

- Storm events up to and including a 25-year, 24-hour storm. County specific 24-hour storm rainfall in inches information is provided in Supplement 9: Pennsylvania 25-Year 24-Hour Storm Rainfall Data.
- Prevention of surface water pollution. Surface water areas include streams, lakes, and ponds.
- Prevention of groundwater pollution. Areas that are high risk sources of groundwater pollution include wells, springs, open sinkholes, bedrock outcroppings, and sandy soils.
- Potential of stormwater commingled with manure and nutrients to directly runoff into surface water or groundwater without adequate collection or treatment.

In general, the on-site evaluation must consider all manure management practices related to manure handling, manure collection, manure storage and animal concentration area management and runoff control. Specifically, three different categories of sites and practices need to be evaluated. These are outlined below.

Manure Handling & Storage

The on-site evaluation must identify and evaluate the manure management practices related to the following manure storage areas:

- Manure storage facilities
- Permanent manure stacking and composting areas
- Animal mortality composting areas
- In-Field manure stacking areas

- Emergency manure stacking areas

For the Act 38 program, milking center wastewater should be treated like manure. Therefore, the following areas on the operation need to be considered:

- Milking centers and facilities

Animal Concentration Areas

Animal concentration areas are barnyards, feedlots, loafing areas, exercise lots or other similar animal confinement areas that will not maintain a growing crop. Areas that are managed as pasture or other cropland are excluded from this designation.

There may be smaller animal congregation areas in pastures that are non-vegetated. These would include: access lanes, watering areas, feeding areas or shade areas. These areas are not to be designated as animal concentration areas unless they cause a direct flow of nutrients to surface or groundwater. Therefore, all pasture areas on the operation need to be assessed as part of this on-site evaluation for the purpose of determining if these “potential” animal concentration areas do cause a direct flow of manure contaminated water to surface or groundwater.

Silage & Feed Storage Areas

These areas should be addressed in the nutrient management plan **only** if there is observable direct runoff of leachate or feed-laden runoff from these areas into surface or groundwater. These areas include:

- Upright silos
- Bunk or trench silos
- Ag bag stacking areas
- Feed or commodity storage areas
- Feed mixing areas

Completing Appendix 6

Appendix 6 organizes the results of the on-site evaluation under the following headings:

- Date of Site Evaluation
- Statement Documenting Areas Evaluated During Site Evaluation
- Identification of Inadequate Manure Management Practices and Conditions
- BMPs to Address Manure Management Problem Areas

Date of Site Evaluation

The nutrient management planner should list the date(s) of the on-site evaluation.

Statement Documenting Areas Evaluated During Site Evaluation

The first step of the on-site evaluation requires the identification of the sites or areas that need to be evaluated for water quality impacts. In this part of Appendix 6, the nutrient management planner should list each of the specific areas that were assessed as part of the on-site evaluation.

Following is an example of how this section should be completed:

“The following areas were evaluated: concrete exercise lot associated with the free stall barn, bare dry cow exercise lot, and the existing manure storage, located in front of the free-stall barn.”

Identification of Inadequate Manure Management Practices and Conditions

The second step of the on-site evaluation is to assess each of the areas listed above and note the existence of inadequate manure management practices and conditions. According to the regulations, **only those areas, conditions and practices where there is potential for manure or nutrient contaminated stormwater from storm events, up to and including a 25-year, 24-hour storm intensity, to directly runoff or discharge into surface or groundwater without adequate treatment** are to be documented in the nutrient management plan.

Following is an example of how this section should be completed:

“Concrete exercise lot – no problems identified. Bare dry cow lot – runoff from lot outlets directly into the adjacent stream; no roof runoff controls in place. Manure storage – no problems identified.”

Resolution of Disputed Determinations related to Manure Storages

Disputed determinations and evidence of leaking or unstable manure storage facilities will require resolution by a Professional Engineer (Registered in PA). The owner is responsible for retaining the services of a Professional Engineer.

BMPs to Address Manure Management Problem Areas

The nutrient management plan must list the Best Management Practices (BMPs) that will be implemented to address each of the inadequate manure management practices and conditions listed in the section above. There is no one solution or set of solutions for all problems. The BMPs listed in the nutrient management plan must be site and operation specific and must meet all the requirements of the Act 38 regulations. It is important to involve the operator in the selection of the BMPs that will be included in the nutrient management plan. All BMPs must follow the Pennsylvania Technical Guide criteria.

For a list of common BMPs refer to the Pennsylvania Technical Guide website at: <http://www.nrcs.usda.gov/Technical/efotg/>. If a proposed BMP is not included in the Pennsylvania Technical Guide it must be approved by the State Conservation Commission.

The BMPs listed in the nutrient management plan must list the Pennsylvania Technical Guide standard name and number. This will ensure that the operator understands what is expected. In addition, the plan reviewer will be able to determine if the BMPs listed adequately address the problems listed.

The plan will identify and note general locations of the planned BMPs on the nutrient management plan maps.

No design calculations, drawings or specifications need to be included in the plan. Designs must be developed during the implementation of the plan to meet the specifications contained in the Pennsylvania Technical Guide. The BMP designs shall be kept on record by the operator as a supplement to the plan.

The siting, design and installation of permanent manure storage facilities shall meet the requirements relating to minimum standards for the design, construction, location, operation, maintenance and removal from service of manure storage facilities and the Pennsylvania Technical Guide. Manure storage criteria are explained in more detail in Section III: Minimum Standards for Manure Storage Facilities. The installation of manure storage facilities is not required unless necessary to protect surface water and groundwater as part of an integrated nutrient management system. This will be determined by the storage time needed to implement the nutrient management plan, or by a problem identified in the required evaluation described above.

Following is an example of how this section should be completed:

"Bare dry cow lot – a concrete lot (561) will be constructed, roof gutters and downspouts (588) and underground outlets (620) will be installed and all contaminated runoff will be treated by a wastewater treatment strip (635)."

Remember, if you have listed required BMPs in Appendix 6, they must also be carried forward to the list of required BMPs in the NMP Summary.

Considerations for Conducting the On-Site Evaluation

Both nutrient management planners and reviewers should follow the following guidance and considerations when conducting the on-site evaluations.

Evaluating Manure Handling Practices & Storage Areas

The following manure handling and storage practices and conditions must be evaluated:

Design Requirements

For liquid or semi-solid manure storages built after January 22, 2000, the storage must have a Professional Engineering certification to document the design and the integrity of the storage facility construction.

Manure Storage Capacity

The capacity of each manure storage structure or area must be adequate for the planned amount of manure (including wastewater, storm runoff water, and bedding) to be stored based on the expected application periods and management set forth in the nutrient management plan.

The size of storage will, in many cases, dictate the time periods for manure application on the operation. An operation with a storage designed to store two months of manure production will need to assure that land is available every two months for manure application. The size of the storage may also dictate the amount of time the operator needs to turn the animals out onto pasture. Operations with inadequately sized storages may decide to restructure their animal management techniques to provide for a planned intensive grazing system, thus reducing the amount of manure produced in the barn area needing to be stored.

The amount of storage volume available can be documented from the storage design on file or it can be calculated. The manure storage volume is documented in Appendix 2: Operation Information. Supplement 8: Manure Storage Volume Calculations explains how to do this calculation.

Evidence of Manure Storages Overflowing or Maintained Above Design Full Levels

Manure storage structures (made of concrete, timber or steel) must be designed and operated to include capacity to accommodate a 25-year, 24-hour storm and additional six inches of freeboard. Earthen manure storage ponds must be designed and operated to include capacity to accommodate a 25-year, 24-hour storm and additional one foot of freeboard.

Each manure storage facility or site must be evaluated for evidence of current or past management that indicates that storage design capacity has been exceeded. A coating of manure, a debris line, or accumulated manure at an elevation higher than the levels described above are all evidence of storage levels above design full.

Evidence of Leaking or Unstable Manure Storage Facilities

Each manure storage facility or area must be evaluated for evidence of leaking or structural weaknesses that could compromise the ability of the storage to contain the stored manure. This should include an evaluation of both surface and subsurface losses.

The foundation or perimeter drain outlet must be inspected for evidence of manure odor or color of the discharge which may indicate leakage. Such evidence would be cause to test the water quality of the drain discharge and possibly investigate more thoroughly before coming to a conclusion. If the drain is dry and clear no further evaluation is necessary.

The storage facility, walls, embankments, and accessories, shall be inspected for structural defects such as active or leaking cracks, valves, hoppers, or pipes, open joints, displaced walls, severely pitted or perforated steel, lack of or damage to liner material, slope failures, settled walls, lids, or embankments, woody growth or rodent burrows on embankments, exposed structural steel, spawled concrete, and exposed footings are all causes for concern.

Upslope and Roof Stormwater

Each manure storage area must be evaluated for evidence of uncontrolled flow of stormwater into or across the area. This is particularly critical of manure storage areas where there is stormwater runoff from the upslope area. In general, the axiom “Keep Clean Water Clean” applies. This “clean water” includes up-slope and roof runoff water. The intent is to divert clean water away from or around the manure sources. This will minimize the amount of contaminated runoff that must be treated before reaching surface or ground waters.

In some cases, the manure storage is designed to receive stormwater. This is acceptable as long as the manure storage capacity and integrity are not compromised.

Contaminated Runoff Water

Each manure storage area must be evaluated for the existence of direct runoff or discharge of contaminated, inadequately treated water into surface water or groundwater. These conditions, when identified, must be listed as inadequate manure management practices and conditions. When evaluating runoff from these areas, consider the adequacy of storage or treatment facilities, downslope filter areas to control and treat the flow of contaminated runoff water before discharging into surface water or groundwater. Analysis of the treatment of water in filter areas should consider the use of sheet flow and the use of conservative locations of the filter areas.

Evaluating Animal Concentration Areas (ACAs)

In general, the evaluation of the adequacy of ACA practices and conditions should consider the ability of the current practices and management to keep clean water clean and to collect, handle and treat contaminated runoff water before discharging into surface water or groundwater. Following are some factors to consider as part of the evaluation:

Site Characteristics

- Topography in and around the ACA
- Soil type in the ACA
- Soil cover or surfacing of the ACA
- Contributing drainage area up-slope of the ACA
- Roof runoff management
- Downslope of the ACA (impacted or buffer)
- Runoff controls or containment within the ACA
- Practices and facilities used to address runoff

Management and condition of the ACA

- Accumulation of manure on the ACA
- Standing water or muddy conditions
- Gullies or irregular surface
- Stocking rate (ft²/head)

Climatic Conditions

- 25-year, 24-hour storm event (see Supplement 9: Pennsylvania 25-Year 24-Hour Storm Rainfall Data for county rainfall data).

The following practices and conditions related to each identified ACA or “potential ACA” must be evaluated:

Location and Sizing

ACAs must be located and sized appropriately to minimize the impact on surface water and groundwater. These areas should meet the appropriate criteria set forth in PA Technical Guide Standard 561, “Heavy Use Area Protection”, Standard 635, “Wastewater Treatment Strips”, Standard 393, “Filter Strip”, and others.

Manure Collection

Collection of accumulated manure for land application or export from the operation is required on all ACAs. It must be determined if manure collection is practical and feasible based on the condition of the ACA surface. In addition, it must be determined if the operator has the equipment needed to collect manure from the ACA. Finally, the operator must agree to remove accumulated manure. The frequency of this removal must be described in the planned management of the ACA.

Upslope and Roof Stormwater

Each ACA must be evaluated for evidence of uncontrolled flow of stormwater into or across the area. This is particularly critical of ACAs where there is stormwater runoff from the area. In general, the axiom “Keep Clean Water Clean” applies. This “clean water” includes up-slope and roof runoff water. The intent is to divert clean water away from or around the manure sources. This will minimize the amount of contaminated runoff that must be treated before reaching surface or ground waters.

Contaminated Runoff Water

Each ACA must be evaluated for the existence of direct runoff or discharge of contaminated, inadequately treated water into surface water or groundwater. These conditions, when identified, must be listed as inadequate manure management practices and conditions. When evaluating runoff from these areas, consider the adequacy of storage or treatment facilities, downslope filter areas to control and treat the flow of contaminated runoff water before discharging into surface water or groundwater.

Animal Access To Streams

Animal access to surface water in animal concentration areas must be limited to properly installed stream crossings as needed for livestock and equipment.

Emergency Manure Stacking Areas

When emergency manure stacking areas are necessary during the implementation of the plan, the plan shall identify those areas where solid manure can be stored in

emergency situations such as adverse weather conditions or unforeseen circumstances (an emergency situation where the normal manure handling system fails). **This requirement applies only to operations that manage stackable manure as part to their manure handling system and do not have a permanent manure stacking area.**

An emergency manure stacking area is defined as an unimproved area located outside water concentration areas, areas where manure application is restricted or prohibited, and preferably located in a crop field.

The planner is responsible for identifying an appropriate site for a temporary stacking area, and indicating its location on the plan map. The site selection should be based on all-weather access, near a paved road on high ground with soil that is neither poorly nor excessively well drained.

Manure shall be completely removed from temporary stacking areas for utilization on cropland or other acceptable uses as soon as feasible, preferably before or during the upcoming cropping season.

Appendix 7 Stormwater Control

In the preparation of an Act 38 nutrient management plan, the nutrient management planner is required to conduct a review of the **adequacy of existing runoff control practices** on cropland and pasture included in the plan. This requirement is described in **Chapter 83.321**.

It is understood that nutrient management planners have varying levels of experience and expertise in this area; therefore, it is strongly recommended that planners with limited expertise receive assistance from local NRCS field staff or conservation district personnel. That being said, it is the responsibility of all nutrient management planners to acquire the training necessary to develop these planning skills.

Regardless of experience and skill level, it is recommended that the nutrient management planner performs this evaluation concurrently with plan review staff from the appropriate plan approval entity (county conservation district or State Conservation Commission). Involving these technical and plan review specialists as early as possible should expedite the plan review and approval process.

This review shall be documented in Appendix 7 of the plan as described below. Please note that an entry is required in each of the four input areas. In some cases, "None", "Not applicable" or "N/A" may be the appropriate entry (see examples).

Completing Appendix 7

Appendix 7 organizes the results of the on-site evaluation under the following headings:

- Date of Site Evaluation
- Statement Documenting Areas Evaluated During Site Evaluation
- Identification of Critical Runoff Problem Areas (CRPAs)
- BMPs to Address Critical Runoff Problem Areas

Date of Site Evaluation

The nutrient management planner shall list the date(s) of the on-site evaluation.

Statement Documenting Areas Evaluated During Site Evaluation

The nutrient management planner shall describe specific areas of the farm evaluated. It is recommended that the planner also list other personnel involved in the evaluation.

Following is an example of how this section should be completed:

"Clay E. Knobs (NMS, Hometown County Conservation District) and I evaluated cropland and pasture fields adjacent to Little Muddy Run. Specific fields include: HF1, HF4, HF7, HF9 and HFP1."

Identification of CRPAs

The nutrient management planner shall indicate whether or not any CRPAs were observed. Examples of CRPAs requiring identification include:

- Non-vegetated gullies and ditches flowing directly to streams or sinkholes
- Non-vegetated and non-buffered, sloping areas immediately adjacent to streams or sinkholes, where manure is applied after the growing season (late fall or winter)

Following is an example of how this section should be completed when **no CRPAs were identified**:

“None.”

Following is an example of how this section should be completed **when CRPAs were identified**:

“A 12” wide X 12” deep gully leading directly to Little Muddy Run was observed in the southwest corner of field HF4.”

BMPs to Address CRPAs

The nutrient management planner, in consultation with the operator, shall identify and list the Best Management Practices (BMPs) that must be implemented to address any CRPAs identified above. These BMPs cannot be in conflict with other relevant plans, such as a current conservation plan, unless otherwise justified in writing by the nutrient management planner. At this crucial point in the planning process, nutrient management planners with minimal stormwater runoff expertise may find it very advantageous to involve more experienced conservation professionals.

The plan is **not required to include BMP designs** (i.e. depth and width of a waterway, diversion, etc.); however, prior to BMP implementation, the operator is responsible for obtaining the necessary designs. The operator shall keep these designs on-site as a supplement to the nutrient management plan.

For information on commonly used stormwater control BMPs, refer to published information from USDA-NRCS: the Conservation Catalog, Pennsylvania Technical Guide or eFOTG (<http://www.nrcs.usda.gov/technical/efotg/>). BMPs installed to address CRPAs shall be designed, installed, operated and maintained in accordance with the standards and specifications in the Pennsylvania Technical Guide. BMP(s) required to address CRPAs identified in Appendix 7 shall also be identified on the list of BMPs in the Nutrient Management Plan Summary; Additional NMP Requirements section of the plan.

Following is an example of how this section should be completed when **no BMPs are required**:

“N/A”

Following is an example of how this section should be completed when **BMPs are required**:

“Stripcropping (585) – In the spring of 2010, alternating contour strips of corn and mixed hay will be established in field HF4; minimum strip width will be 100 feet.”

Act 38 Interactions with PA-DEP Erosion Control Requirements

As described in great detail above, Appendix 7 of the Act 38 nutrient management plan deals primarily with the identification and treatment of CRPAs. Please know that the treatment of CRPAs, while extremely important in controlling soil erosion and associated nutrient loss, is just a small subset of the operator’s total erosion control requirements under Pennsylvania law.

To help ensure that operators are compliant with their erosion control requirements, which support the nutrient (primarily phosphorus) loss controls incorporated in the NMP, verification of a current Agriculture Erosion and Sedimentation Control Plan (Ag E&S Plan) meeting the requirements of the DEP Chapter 102.4 regulations, or a Conservation Plan meeting the same requirements, is now required prior to Act 38 NMP approval. The details of this **Chapter 83.361(f)** NMP review and approval requirement can be found in Section V: Plan Review and Implementation.

Appendix 8

Importer/Broker Agreement and NBSs

This section of the plan is to detail the use of that portion of manure or mortality compost produced on site **that is not land applied on the operation (owned or rented acres) that produced it**. This includes selling or giving the manure or mortality compost to a broker or exporting the manure to other farms for agronomic land application. It also includes sales to others who use it for purposes other than for agricultural land application, such as mushroom producers, or using it on the farm where it was produced for other than agricultural land application.

It should be noted that the program characterizes manure and mortality compost exporting as changing ownership of the manure or compost. When the importer accepts the material, the importer also accepts responsibility for its proper use on his or her land as required by DEP Chapter 91 regulations and the Pennsylvania Manure Management Manual. Therefore, importers of manure from Act 38 operations are required to have, obtain, or develop a Manure Management Plan (MMP) under DEP's Chapter 91 requirements. A NBS developed under Act 38 can be used for the nutrient application requirements of the MMP. Other sections of the MMP may still be applicable, such as ACA management, manure stacking, etc., and will need to be address in a separate MMP document.

The exporter may retain some responsibility for the application or storage of exported manure or compost, if the exporter is involved in the stacking or application of the material on the importing site, or if the exporter contracts with or hires those involved in the stacking or application of the exported material on the importing site.

Not all manure will be used in raw, unprocessed form. Several alternatives include: composting, bio-digestion, solids separation, or manure processing related to feeding poultry manure to beef cattle.

Listed below is the program planning requirements, based on six possible usage scenarios, for Act 38 participating operations using manure or mortality compost for agronomic land application or purposes other than agronomic land application on their own operation (including owned and rented acres).

Scenario 1: When manure or mortality compost will be exported to known landowners or operators for agricultural land application, the plan shall include:

1. A signed agreement with the importer on the form provided by the Commission. This form is included in Supplement 11: Exporter Agreements. The exporter is to use this agreement form unless there is prior approval by the Commission to use an alternative agreement.
 - The signed agreement has no end date, but can be cancelled by either party given 30 days' notice.
 - Note that there are different agreements for various importing scenarios. There is an importer agreement for situations where manure will be land applied in

Pennsylvania (our most common agreement type), one for situations where manure will be imported for non-land application (such as for mushroom operations or composting operations, this relates more to importing scenario “C” below), and one for exporting to importers that will be receiving the manure on farms outside of Pennsylvania.

2. A completed Nutrient Balance Sheet addressing the fields where exported manure or mortality compost may be applied. You can also use an approved Act 38 nutrient management plan written for the importing operation to address this requirement. If using an Act 38 nutrient management plan, the importer’s plan does not need to be submitted with the exporters plan, but the exporters plan needs to reference that the importer has an approved Act 38 plan on file with the relevant district.
3. Nutrient Balance Sheets (NBS) required under the Program must follow the standardized NBS form and process provided by the Commission. Supplement 3: Nutrient Balance Sheet User Guide provides the format, calculation process, and accepted figures to use when completing a NBS for an importing operation. The Nutrient Management Program Website provides the NBS in a Word format, a pdf format, as well as an Excel spreadsheet format. The Commission recommends that planners use the Excel format to ensure that the NBSs submitted have used the proper calculation figures and process, as used in the Excel form.

Scenario 2: When manure or mortality compost will be transferred from an Act 38 participating operation through a manure broker, the plan shall include:

1. A signed agreement with the broker on the form provided by the Commission. This exporter/broker agreement is included in Supplement 11: Exporter Agreements. The exporter is to use this agreement form unless there is prior approval by the Commission to use an alternative agreement.
 - The signed agreement has no end date, but can be cancelled by either party given 30 days’ notice.
 - The agreement includes the broker’s PDA Broker Certification number so that the certification of the broker can be verified during plan review.

A broker is a person, corporation, or partnership that assumes temporary ownership of manure or compost from a producer and then arranges for a third party receiver of the manure or compost (different from the producer or broker). A broker is an independent entity that does not work for, or under the control of, the agricultural producer providing the manure or compost to the broker. A broker must be able to demonstrate their ability to independently and adequately address the brokerage of the material from the production facility. Brokers hold a significant amount of liability for the proper handling and application of the manure or compost. A broker is responsible to follow the requirements in DEP’s Chapter 91 regulations as they handle and apply manure.

The “broker” designation differs from a “manure hauler”. A “manure hauler” works as a contracted agent for the animal producer or importer, under the direction of either of

these entities.

If a broker accepts manure and applies it to fields that the broker either owns or rents, the broker is serving as a “known landowner importer” (as described in “a” above) and is not a “broker”. For that portion of the manure or compost that is applied by the broker to lands that they own or rent, the program criteria described above (relating to “known landowner importer”) must be followed.

Scenario 3: When manure or mortality compost will be transferred from an Act 38 participating operation to a known importer for use other than agricultural land application, the plan, in the Nutrient Management Plan Summary; Additional Nutrient Management Plan Requirements; Exported Manure Summary, shall include the following information:

1. The name and general location of the importing operation.

The “general location” of the importer should include the “full address” (street, road or route; street number or P.O. box; town and if necessary the distance from a landmark, etc.) of the site receiving the manure. The “full address” should be complete enough to provide adequate information so that the operation can be located on a street or topo map.

2. A brief description of the planned use of the imported manure or compost.

This should be complete enough to adequately explain what the importer is planning to do with the manure.

3. The estimated amount of manure or compost the operation plans to transfer to the importer annually.

The amount of manure or compost that the operation is planning to export to the importer is an agreed upon amount between the exporter and the importer based on the amount of manure that the importer is able to receive and the amount of the material the NMP operation has available for export.

4. The intended season for the manure or compost transfer.

The proposed timing of the manure or compost exporting needs to be indicated by season. The NMP operation may document a more precise time for export but by season (Spring, Summer, Fall, or Winter) is adequate for the plan. If manure is to be transferred for more than one season of the year, the amount of manure planned to be exported for each season shall be listed in the plan.

5. A signed agreement with the importer on the form provided by the Commission.

This form is included in Supplement 11: Exporter Agreements and is titled “Exporter/Importer Agreement, Manure Used For Other Than Agriculture Land

Application". The exporter is to use this agreement form unless there is prior approval by the Commission to use an alternative agreement. The signed agreement has no end date, but can be cancelled by either party given 30 days' notice.

Some examples of uses other than agricultural land applications are: marketing manure to commercial greenhouses and landscape nurseries, golf courses and mine reclamation projects; composting for sale in bulk or packaged for commercial markets; mushroom farming; and as processed feed supplements for production animals.

Scenario 4: Where manure or mortality compost is to be processed or utilized on the Act 38 participating operation in a manner other than for agricultural land application, the plan, in the Nutrient Management Plan Summary; Additional Nutrient Management Plan Requirements; Exported Manure Summary, shall briefly describe:

1. The planned use of the manure.
2. The estimated amount expected to be processed or utilized annually.

This description needs to be complete enough to adequately explain what the operator is planning to do with the manure or compost. The description should also say when the material will be used and how much will be utilized yearly.

Scenario 5: When manure or mortality compost is to be marketed from an Act 38 participating operation in existence as of Oct. 1, 1997, using an open advertising system where the importers cannot be identified at planning time, the plan shall describe, in the Nutrient Management Plan Summary; Additional Nutrient Management Plan Requirements; Exported Manure Summary:

1. The proposed marketing scheme.
2. The estimated amount of manure expected to be marketed annually using an open advertising system.

A description of the marketing scheme should include the amount and the form of the product to be marketed, the prospective consumer markets and general region where the exporter expects to market the manure, and the planned advertising system for the product. The description of the planned advertising system should include how the exporter expects to advertise the product to assure that the potential customers are informed of the product being offered. If the exporter has done this in the past, that should be explained in this description along with how successful the exporter has been in using this alternative method in the past.

It should be noted **that this planning option is not available to newer farms participating in the Act 38 program.** These newer operations need to show in their plan that they have found another method for excess manure distribution or use which

will include a signed agreement with an importer or broker to address all the manure they expect to export. This does not mean that these newer operations cannot distribute their excess manure using an open advertising system; this just means that in their plan they need to show that they have arranged for an established alternative importer or broker for all their excess manure or compost at planning time in case their advertising system does not work.

An exporter using this scenario will be required to be **certified by PDA as a Manure Broker**, prior to being authorized to utilize this exporting method. Also, these exporters will be required to fill out NBSs for the importers that will be accepting more than the minimal amount of manure or compost outlined below under in the “Small Quantity Importers” section.

Scenario 6: When manure or mortality compost is to be exported out of state, for agricultural land application, the plan shall include:

1. A signed agreement with the importer on the form provided by the Commission. This form is included in Supplement 11: Exporter Agreements. The exporter is to use this agreement form unless there is prior approval by the Commission to use an alternative agreement.
 - The signed agreement has no end date, but can be cancelled by either party given 30 days’ notice.
2. In Appendix #3 you will need to show that all the manure is accounted for in the "Manure Allocation Balance". This will show up as exported manure even though it is being transported to acres in another State. This must be explained in the NMP in Appendix 10.
3. Inform the other State's Nutrient Management Program that this farm is transporting XX amount of manure to the address listed on the agreement. Please provide the other states Nutrient Management Program contact information for reviewing entities to use. Please provide this detailed information in Appendix 10 of the NMP
4. Reviewing entities should confirm with the other State that this importing farm has met all of their legal requirements.
5. The Act 38 plan cannot be approved until the other State confirms the farm receiving the manure has met all of their legal obligations. This confirmation should be in writing. It is the plan writer’s responsibility to get this confirmation and the reviewing entities responsibly to review and confirm. Please provide this detailed information in Appendix 10 of the NMP

Using more than one Export Scenario

There may be more than one alternative manure or mortality compost utilization method used for the exported material. Where this is the case, the plan should list separately, the above items for each alternative method that will be used.

Nutrient Balance Sheets (NBSs)

Nutrient Balance Sheets are designed to address entire crop groups, given a particular application scenario, for an importing operation, thus minimizing the number of these that may be necessary for a particular importing operation. For example, one balance sheet may address all corn silage applications across a farms' entire 150 acre operation, with another balance sheet covering all grass hay over that same 150 acres, etc. Another method to show acres under the NBS is, for example, if a farm is composed of fields 1-20 and these fields total 100 acres, there could be a corn NBS covering fields 1-20 with the acreage figure being 60 acres (where generally 60% of the importing lands are in corn) and a hay NBS covering fields 1-20 with an acreage figure of 40 acres (where generally 40% of the importing lands are in hay).

You may need more than one balance sheet to address a particular crop group if the importer may be applying other nutrient sources to some of the lands, but not all the land. For example, one NBS may address all acres for corn silage if starter was used, and another to address the corn silage acres if no starter was used.

Also, an importer may address some of their fields using one option, where using another option of the remainder of their fields (such as using Option 1 for fields more than 150 feet from a stream, and using Option 3 for fields within 150' of a stream).

Nutrient Balance Sheets need to be reassessed once every 3 years. This reassessment needs to evaluate the new soil tests taken over the past three years (soil tests used in NBSs need to be redone once every three years) and the updated manure analysis for the manure being imported. The NBSs would be required to be redone and reauthorized by the district if any of the following are true:

- the new soil tests require a **change in the planning option** (such as when a soil test for a field goes from 180 ppm P to 210 ppm P and the required planning option changes from Option 2 to Option 3), or
- the new soil tests require a **change in the nutrient application rates** used on the NBSs (such as when a farmer is using Option 3 and the soil test level for phosphorus pushes the farmer from a P-Index of value of 75 to a P Index value of 82, requiring phosphorus removal application rates), or
- the average **manure analysis observed over the past 3 years has changed by more than 20%** over the manure test used in the current NBSs.

A complete NBS includes the following:

- Cover Page
- Nutrient Balance Sheet Summary
- Nutrient Balance Sheet Summary Notes
- Nutrient Balance Worksheet (In Excel includes planning columns for each crop group. In Word includes one page Nutrient Balance Worksheets for each crop group.)
- Appendix 1 – Operations Maps

- Appendix 2 – Phosphorus Index (Required only if using Manure Plan Basis – Option 3 P Index.)

The NBS map does **not** need to be to scale, or computer generated. An acceptable NBS map must include the following information:

- Roads and road names for roads adjacent to and within the operation.
- Field (CMU) information for each field included in the NBS where imported manure may be applied: identification, boundaries, and acreage.
- Manure application setback areas or vegetated buffers and the associated landscape features (streams and other surface water bodies, sinkholes, and active water wells or springs).
- Location of in-field manure stacking areas, if applicable, including each site in the stacking area rotation. It is highly recommended that an aerial photography underlay be used for the map.

An importer can select any of the 3 options for completing the NBS(s) for their operation.

1. If **option 1** is selected, the importer is not required to have soil tests to implement this option. However, the planned manure application rate must be based on phosphorus removal which is usually much lower than nitrogen based rates. Option 1 cannot be used for importing fields having a current (within 3 years) soil test with soil phosphorus levels over 200 ppm Mehlich P.

With this option, both the N and P columns need to be completed to show that the application rate does not go over the Nitrogen or Phosphorus crop uptakes.

- NBSs completed using this option would not need to be updated at any time, as long as the yields for the importing site and the book value nutrient uptake values do not change over time.
 - Importers may use this option to implement a “phosphorus banking” scenario for their farm. This means an importer can apply up to 3 years of phosphorus removal for their various crop rotations, without having to run soil tests for the fields being addressed in this fashion. This will only be allowed to the extent that 1) the multiple year application does not exceed the one year nitrogen removal rate, and 2) no other phosphorus sources can be applied to the fields where this has been implemented, until the time frame of the phosphorus bank has elapsed.
2. If **option 2** is selected, the importer will need soil tests to run this option, but it generally provides for larger amounts of manure to be applied to the importing site. This option can only be used for fields with soil test levels of less than 200 ppm P (Mehlich 3 test). When soil test levels equal or exceed 200 ppm P (Mehlich 3 test) Option 3 is used for NBS development. This applies to soil tests taken for initial NBS development and to soil tests taken every three years.
 - Only the N column will need to be completed in order to fill out the NBS using this option.

- The following guidance applies to soil tests taken for use in Option 2. When using Option 2, the soil tests for the importing site need to be run once every 3 years to ensure that the fields used under this option continue to fall within the “< 200 ppm P” range.

Representative soil samples should be obtained using accepted soil sampling methods as outlined in Part 1, Section 2, “Soil Testing” in the Penn State Agronomy Guide.

It is recommended that a single soil test sample not represent more than 20 acres. One soil test sample can represent multiple fields grouped in a crop management unit (must have similar soil capabilities and management histories) as long as the sample does not represent more than 20 acres. If a single field is larger than 20 acres, a single soil test sample may be used to represent this field.

3. If **option 3** is selected, then the NBS for the given operation will need to include the P Index spreadsheet indicating the appropriate rates for the fields falling under this option. Not only will soil tests be needed for these fields, but also the soil loss will need to be calculated, as well as the other factors included in the P Index analysis. This option can be used for all fields with current soil test values for phosphorus, but it is the only option available for fields with a current soil test showing phosphorus levels of greater than or equal to 200 ppm P (Mehlich 3 test) or for fields within 150 feet of a stream, lake, pond, etc.
 - When using this option, the P Index result will indicate if the N and/or P columns need to be completed on the NBS.
 - The P Index will need to be reassessed every 3 years for importing operations using this option based on the most recent soil tests (which are required to be redone once every 3 years for these importers) and the most recent average manure test analysis. If any fields change over that time frame, they will need to be run on a new NBS if the importer wants to continue to use these fields.
 - If soil P testing does not use the Mehlich 3 test, option 3 is not available. Option 1 for NBS would be the only available planning option.

Small Quantity Importers

The detailed documentation (signed agreements and nutrient balance sheets) and setbacks described above are not needed for small quantity manure or mortality compost importers, specifically importers receiving less than the following amounts a year:

- 5 tons of poultry manure or poultry mortality compost
- 25 tons of non-poultry manure or non-poultry mortality compost
- 10,000 gallons of liquid manure

For farms that will be exporting using small quantity importers (this may be especially relevant to smaller horse operations), the nutrient management plan will need to describe in the “Nutrient Management Plan Summary; Additional Nutrient Management Plan Requirements; Exported Manure Summary section that small quantity importers

will be used for implementation of the plan and that records will be maintained to document these small quantity exports.

Records for these exports can be documented on the sample small quantity exports record keeping form included in Supplement 19: Small Quantity Manure Importer List. These records are required to be maintained for all small quantity exports to document who received the manure or mortality compost, how much and when.

It must be noted that importers of small quantities of manure are required to have, obtain, or develop a Manure Management Plan (MMP) under DEP's Chapter 91 requirements. A NBS developed under Act 38 can be used for the nutrient application requirements of the MMP. Other sections of the MMP may still be applicable, such as ACA management, manure stacking, etc., and will need to be address in a separate MMP document.

Manure Application Setbacks

Importers are restricted from applying imported manure any closer to water bodies, than the setbacks established for the Act 38 farms where the manure is generated. So if Options 1 or 2 are selected for the NBS, no additional setbacks are required on the importing site (other than 100' from active water wells) because the nutrient balance sheet process itself calls for a 150 foot setback; but if option 3 is used, than the setbacks established for Act 38 participating farms will be imposed for the manure imported to these other farms.

Other Organic Sources Applied

When other sources of nutrients are applied to a Crop Management Unit in addition to the imported manure, the following information must be included in the Nutrient Balance Sheet Summary Notes. For the application of other organic sources the notes must include the type of material and the application rate. For pastures, the specifics of the pasture management must be listed including the animal groups on the pasture, numbers in each animal group, grazing season, hours per day on pasture, and where animals are watered and fed (if applicable).

Appendix 9 Operation Maps

Nutrient Management Plans (NMPs) are required to include a map(s) of the operation that shall include a topographic map drawn to scale identifying the lands included in the agricultural operation. Note; a map scale is required to be on the topographic map. A topographic map represents the exact physical features of a place or region on a map. Section 83.281(a)(5) of the regulations require the watershed(s) in which the lands included in the NMP are located and the existence of any special protection waters as identified in the Department of Environmental Protections' Chapter 93.

The topographical map will give you all the necessary information to look up the required information regarding Watershed and Special Protection Waters.

A listing of Special Protection Waters is revised on a continuing basis and is available through an interactive DEP map program, eMap, at:

<http://www.emappa.dep.state.pa.us/emappa/viewer.htm>. For additional information on using the DEP eMap website tool refer to "Using eMAP to Identify Special Protection Watersheds" posted on the PA Nutrient Management Program website (<http://extension.psu.edu/plants/nutrient-management> under the Planning Resources page.

Additionally, DEP listing of Statewide Existing Use Classifications can be found at http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556/statewide_existing_use_classifications/553974

Copies of the relevant areas of the topographic maps can be obtained from the local conservation district or NRCS office.

Adding 150 foot Phosphorus Index (P Index) lines to the topographic or soils map can be helpful in determining if a crop management unit (CMU) is closer than 150 feet to a receiving body of water, as measured in the direction of water flow from the lower edge of the CMU. It is highly recommended that stream, lake, ponds, etc., names be placed on the map, if available. If the CMU is less than 150 feet (as measured in the direction of water flow) then Part A of the P-Index must be used (see Appendix 5: Phosphorus Index). Contributing Distance lines used in the P Index lines can be helpful on the topographic or soils map but are not required.

Section 83.281(b)(4) of the regulations requires the identification of all soil types and slopes on the agricultural operation. A copy of **the NRCS soil survey map** can be used as the base map for this mapping requirement. The map shall include a soil legend which explains the soil types and slope designations on the map. The NRCS soil survey map is not required to be used in the NMP. Soils and slope information needs to be provided at least to the detail of indicating the soil type and slope for each individual field strip or field. The soil types and slopes are required information when determining the maximum infiltration rates for soils proposed to receive spray irrigation

and also for estimating typical capabilities of major Pennsylvania soils; such as typical ratings of yields based on soil type.

Again, the Operator Management Map is to be included in the NMP Summary section of the submitted NMP as an easy reference for setbacks and other features on the operation (see NMP Summary section).

The Operator Management Map is to be included in the Nutrient Management Plan Summary section to provide easy reference for the farmer. This is the map that is considered to be the most valuable to the farmer on a day-to-day basis for the implementation of the approved nutrient management plan.

It is highly recommended that Aerial photography be used as an underlay on the Operator Management Map and that maps be printed in color when submitted to the reviewing agency and given to the operator.

The operator map is to include the following:

1. farm boundary,
2. field boundaries,
3. field identification,
4. field specific acreage (this information can be shown directly on the map for each field, or can be included as part of the map legend indicating the field acreage for each individually identified field),
5. manure application setbacks and buffers in accordance with 83.294 (f) and (g) (with an identification of the landscape feature that requires the setback, such as an indication of where the stream or sinkhole are, well locations, etc.),
6. location of existing and proposed structural BMPs (including manure storage facilities),
7. location of existing or proposed emergency manure stacking areas or in-field manure stacking areas, and
8. roads and road names adjacent to and within the operation.

It is recommended that the operator map also include the following:

1. Aerial Photography as an underlay
2. Stream, Lake, Pond names, if available
3. For operations that contain multiple farms, a county or township map, that shows the location of each individual farm, that make up the larger operation.

The above items must be clearly identified on the operator management map, either by direct notation on the map, or through a clear legend. Manure application setbacks and vegetative buffers must be clearly identified on the map with an indication of the required setback or buffer width. The farmer and program staff need to be able to interpret the information provided on the legend, so the legend needs to identify the given feature using legible font sizes and easily understood words or symbols. Avoid using cryptic symbols or phrases that are not well understood by those using this map.

Only setback landscape features on the map that are relevant to actual setbacks or buffers required on this operation need to be identified. Landscape features on adjoining properties that do not require a setback should not be included on the farm map. For example, a neighbor's well which is beyond 100' from fields on the operation does not need to be included on the nutrient management plan operator management map, although any wells on adjoining properties that fall within the 100 foot setback need to be identified.

To test if this map is adequate, just imagine if you were a new manure hauler brought into this operation to help them apply their manure. Would the direction given on this map, in conjunction with the application rates in the Nutrient Management Plan Summary, be adequate to allow someone new to find the field and apply manure properly on this operation.

Appendix 10

Supporting Information and Documentation

Attach information and documentation necessary to support plan content not included elsewhere in the plan or appendices.

The following items, if applicable to the nutrient management plan, must be included in Appendix 10:

- Rainfall Additions Worksheet
- Winter Manure Application Matrix (see guidance below)
- Residual N Calculation Worksheet (if using Table 1.2-15)
- NMP Spreadsheet Supplemental Worksheets
- Documentation of animal weights if Agronomy Facts #54 is not used
- Bedding calculations
- Calculations for irrigation rates
- Out of state manure applications (see guidance below)
- For CAFO Operation only, supporting information and calculations/ references for manure storage winter capacity planning levels
- SCC approval for use of Phosphorus Banking in nutrient management plans
- SCC approval for manure applications greater than 9,000 gallons per are per application (see guidance below)
- Completed neighbor waiver for storage setbacks
- Completed manure storage waivers, or a letter from the conservation district or SCC approving the setback waiver, for setbacks to streams, sinkholes, lakes, etc.
- SCC approval of nutrient concentration sources, when manure sampling and analysis is not required by the regulations and the NMS does not use the nutrient content levels contained in the Penn State Agronomy Guide, Table 1.2-13.
- Soil test level conversion calculations

All operations proposing winter manure application must prioritize fields receiving winter manure application by utilizing Supplement 10: Winter Manure Application Matrix. The matrix for those individual fields where the winter application of manure is proposed must be shown in this Appendix.

Approval from the State Conservation Commission must be obtained for manure application rates greater than 9000 gallons/acre or the use of the phosphorus banking option in a nutrient management plan. The name of the SCC person granting the approval and the date the approval was granted is required in this Appendix.

For acres under management control of the Act 38 operator that will be applying manure on crop acres in another state, they following is required:

1. List in the NMP the amount of manure proposed to be transported across state lines.
2. List the number of acres of cropland that are under management control in the other state

3. List the address where the cropland in the other state is located.
4. List the planned transport time of the manure to those acres in the other state.
5. Inform the other state's Nutrient Management Program that this farm is transporting XX amount of manure to the address above. Please provide the other state's Nutrient Management Program contact information for reviewing entities to use.
6. Confirm with the other state that this farm has met all of their legal requirements. Provide this confirmation in writing.
7. The Act 38 plan cannot be approved until the other state confirms the farm receiving the manure has met all of their legal obligations. It is the plan writer's responsibility to get this confirmation and the reviewing entities responsibly to review and confirm.
8. In Appendix 3 you will need to show that all the manure is accounted for in the "Manure Allocation Balance". This will show up as exported manure even though it is being transported to acres under your management control in the other state.

Note that guidance is provided in Appendix 8 of this manual for manure that is exported to another operation for land application in another state, but the letters of confirmation from the other state should also be included here.

Section III

Minimum Standards for Manure Storage Facilities

The standards contained in this section relate to the following manure storage facilities on CAO, Volunteers, and operations receiving financial assistance from the Nutrient Management Act or Chesapeake Bay Program.

- New manure storage facilities built to address proposed or existing operations.
- Existing storage facilities that are repaired or expanded in order to implement the Nutrient Management Plan (NMP).

This section of the manual describes what standards are to be followed when designing, constructing, locating, operating, maintaining, and removing from service, manure storage facilities addressed through the nutrient management program.

1. What is a manure storage facility?

A manure storage facility is defined in the regulations as **a permanent facility, or portion of a facility, utilized for the primary purpose of containing manure.**

Examples include: liquid manure structures, manure storage ponds, component reception pit and transfer pipes, containment structures built under a confinement building, permanent stacking and composting facilities and manure treatment facilities (such as anaerobic digestion facilities). The term **does not** include the animal confinement areas of poultry houses, horse stalls, freestall barns or bedded pack animal housing systems.

2. To whom do these standards apply?

The minimum standards for the design, construction, location, operation, maintenance and removal from service of manure storage facilities as outlined in the Act **apply to new storage facilities constructed and existing manure storage facilities expanded or repaired as part of an approved plan developed for a CAO, volunteer or an operation receiving financial assistance under the Chesapeake Bay Program.**

- a. It should be noted that the setback standards stated in the regulations **do not** apply to manure storage facilities **repaired** as part of an Act 38 nutrient management plan.
- b. The location and construction of manure storage facilities need to be coordinated with both the Township Government and the conservation district to ensure all requirements and regulations are met.
- c. The **expansion** of a manure storage facility is the enlargement of an existing storage to accommodate needed extra storage and is defined as any enlargement to the facility. Such manure storage enlargements will be included in the nutrient management plan or plan amendment and therefore must meet all setback requirements and Pennsylvania Technical Guide standards.

- d. As of January 2000, all liquid and semi-solid manure storage facilities built in Pennsylvania must be designed by a Professional Engineer and must be certified by a Professional Engineer after construction, indicating the storage facility was built in accordance with PA Technical Guide Standards.

3. Technical requirements for manure storage facilities.

Manure storage facilities shall be designed, constructed, located, operated, maintained, and, when no longer used for the storage of manure, removed from service, to prevent the pollution of surface water and groundwater, and the offsite migration of pollution. These facilities must meet **standards contained in the Pennsylvania Technical Guide**, except if these standards conflict with the Nutrient Management Act regulations, in which case the requirements in the regulations would take precedence. These conflicts mainly relate to setbacks, where the PA Technical Guide does not require specific setbacks, but the regulations do. **Setback standards** for manure storage facilities are established under this program for any storage constructed or expanded as part of an approved Act 38 nutrient management plan. These setback standards are explained in more detail under items "6" through "9" below.

- a. The Natural Resources Conservation Service maintains the Pennsylvania Technical Guide on the Internet and can be found at <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/fotg/>.
- b. At least 2 weeks prior to installation or major repair of a liquid or semisolid manure storage facility, the responsible engineer shall submit a verification (including a quality assurance inspection plan for construction) to the Commission or delegated conservation district documenting that the design, meeting the requirements of this subsection including applicable setbacks has been completed.
- c. Following completion of the installation or repair of a liquid or semisolid manure storage facility, the responsible engineer and contractor shall certify in writing to the Commission or delegated conservation district that the facility was constructed, expanded or repaired according to design/location, and meeting the requirements of this subsection. A sample format for the contractor/engineer certification document may be found in Supplement 14: New Waste Storage Facility Certification. The engineer's signature on the Chesapeake Bay Program (CBP-12) form or equal may also be used as this certification.

4. Manure storage repairs.

Manure storage repairs called for in the approved nutrient management plan shall be designed and constructed in accordance with the standards in the Pennsylvania Technical Guide. The location criteria required in the Act 38 regulations do **not** apply to manure storage facilities repaired under the program.

5. Contingency plans.

A written site specific contingency (emergency action) plan, developed in accordance with the standards contained in the Pennsylvania Technical Guide, addressing actions

to be taken in the event of a manure leak or spill from a manure storage facility installed, expanded, or repaired under the Act, shall be developed by the facility engineer by the time the storage is built, and kept on-site at the operation.

In the case of a leak or spill from a manure storage facility covered under the Act, the **operator is responsible for implementation** of the site-specific contingency plan developed for the storage facility. The contingency plan shall contain information necessary to meet the notification requirements contained in DEP's regulations (Section 101.2, relating to incidents causing or threatening pollution), for reporting leak or spill events that would result in pollution to surface water or groundwater. **These DEP regulations require operators** of manure storage facilities where a spill or leak has occurred, to immediately contact DEP as well as notify known downstream water users of the leak or spill. This DEP requirement needs to be included as part of the contingency plan so that the farmer understands this requirement. Supplement 13: Emergency Response Plan provides a model emergency response plan.

- a. It is recommended that the operator provide a copy of the contingency plan to the local Emergency Management Agency and others (such as neighbors who will assist with equipment, the local fire department, etc.) that would assist during a leak or spill event.
- b. Another resource for development of the contingency plan is DEP's Guidelines for the Development and Implementation of Environmental Emergency Response Plans.

6. General description, manure storage setback requirements for operations in existence ON OR BEFORE October 1, 1997:

There are two separate major categories of setback criteria established for the program based on when the farm operation went into existence. The first set of setback requirements described immediately below is for those operations that were producing livestock or poultry **on or before October 1, 1997**. The second set of setback requirements listed under items "8" and "9" below are for farms that came into existence **after October 1, 1997**. Please call state NMA program staff to assist you with making setback determinations in situations where you are not sure what the program setback requirements are.

- a. The regulations refer to CAOs that were producing livestock or poultry on or before October 1, 1997. The wording "producing livestock or poultry on or before October 1, 1997" is meant to describe an active animal production operation at the time the regulations went into effect. It is understood that there is down time due to production cycles or market trends and therefore there may not be animals on the operation on October 1, 1997, but the operation would still be considered as "producing livestock or poultry on or before October 1, 1997" if it was temporarily without animals consistent with the normal production cycle for the operation.
- If there is an **existing manure storage facility**, then, as part of the manure management portion of the plan, the storage would need to be visually

inspected by the planner and plan reviewer to assure that it is not leaking. An existing storage located within the setback distances does not have to be moved or reconstructed if it is not causing a problem. If the existing storage is determined to be leaking, then it will need to be repaired or replaced.

- If there is to be a **new manure storage facility** built on an existing operation, it would need to meet the standards and setback criteria explained in "7" below. These requirements recognize that where there is an existing barn housing the animals, the farmer may not have much of a choice of where to put the storage ("7" below allows for waivers of setbacks).
- If there is planned to be an **enlargement or a major alteration to an existing manure storage facility** on an existing operation, then the facility will again need to meet the setback requirements explained in "7" below.
- Where an existing CAO is building new animal confinement facilities (new barns) for an existing animal type, either due to the need to make facility renovations or as a part of an operation expansion, this shall generally be considered as an operation which was "producing livestock or poultry as of October 1, 1997" for purposes of determining setback criteria and shall be required to follow the setback criteria established in section "7" below.
- In contrast, where an existing CAO brings on a new animal enterprise (i.e. a dairy operation which is putting on a new broiler house), this portion of the farm would generally be considered to be an "agricultural operation coming into existence after October 1, 1997" for purposes of determining setback criteria and therefore the operator would be required to follow the setback distances for new CAOs covered in "8" and "9" below.
- Manure storage setback requirements are only relevant to those portions of the operation considered to be a manure storage facility. The definitions within the regulations define a manure storage facility. Setbacks relate to all types of manure storages built on participating farms including liquid, semi-solid, and solid storage facilities. These setbacks do not relate to animal confinement facilities (barns) that are not considered manure storage facilities.

7. For CAOs that were producing livestock or poultry ON OR BEFORE October 1, 1997, manure storage facilities, except reception pits and transfer pipes, may not be constructed:

- a. Within **100 feet** of a perennial stream, intermittent stream, river, spring, lake, pond or reservoir.
 - A **perennial stream is defined** as a body of water normally flowing year round, having defined bed and banks, and is capable, in the absence of manmade disturbances, of supporting bottom dwelling aquatic animals.

- An **intermittent stream is defined** as a body of water flowing only at times of surface water runoff or when the water table is high. This area may or may not have defined bed and banks, and is commonly not capable of supporting bottom dwelling aquatic animals year round.
 - A **spring is defined** as a place where groundwater flows onto the land surface at least 183 days a year.
- b. Within **100 feet** of a wetland that is identified on the National Wetlands Inventory maps, if the following apply:
- The wetland is within the 100-year floodplain of an Exceptional Value stream segment.
 - Surface flow is toward the wetland.
- c. Within **100 feet** of a private water well, or open sinkhole.
- d. Within **100 feet** of an active public drinking water well, unless other State or Federal laws or regulations require a greater isolation distance.
- A **public water supply is defined** as one that is used at least 60 days a year and either having at least 15 service connections or serving at least 25 individuals daily.
 - Please note that **no waivers** are available for the setbacks established for public wells.
- e. Within **100 feet** of an active public drinking water source surface intake, unless other State or Federal laws or regulations require a greater isolation distance.
- A **public water supply is defined** as one that is used at least 60 days a year and either having at least 15 service connections or serving at least 25 individuals daily.
 - Please note that **no waivers** are available for the setbacks established for public drinking water source surface intakes.
- f. Within **100 feet** of a property line, unless the **landowners** within the 100 feet distance from the manure storage facility otherwise agree and execute a waiver in a form acceptable to the Commission.
- A **road bisecting a property** is generally not considered a property line in relation to these setbacks. Operators are instructed to contact their local municipality to confirm this and to determine general township setbacks.

Please note that **township nutrient management ordinances** must be consistent with the Nutrient Management Act, but townships may have other setbacks that they establish such as for road siting distances, emergency fire lanes, etc.

- A **sample waiver form** is provided in Supplement 16: Sample Manure Storage Setback Waiver. Please note that a neighbor waiver is not transferable when the property is sold unless it is recorded with the deed or the subsequent landowner agrees in writing to accept the waiver. Also note that a neighbor waiver is only necessary for the *construction* of the manure storage facility. If a farmer obtained a waiver from his neighbor and the storage was subsequently built, and later on a new person buys the neighboring property after the storage is there, it is presumed that the new neighbor bought the property understanding that there is a manure storage located next to his property and that by buying the property, they are accepting its existence in that location.
- g. Within **200 feet** of an intermittent, or perennial stream, river, spring, lake, pond, reservoir or any water well, or wetland if a facility (except permanent stacking and compost facilities) is located on slopes exceeding 8% or a facility has a capacity of 1.5 million gallons or greater.
 - **To determine if a slope exceeds 8%** utilize soil maps along with a field review. The area where the slope is to be measured is the area within the 200 feet from the water source.
 - Note that the setback does not increase from the initial 100' setback distance for **manure stacking and composting facilities**.
- h. Within 200 feet of a property line, if a facility (except permanent stacking and compost facilities) is located on slopes exceeding 8% and if the slope is toward the property line, or a facility has a capacity of 1.5 million gallons or greater, unless the landowners within the 200 foot distance from the facility otherwise agree and execute a waiver in a form acceptable to the Commission.
 - **To determine if a slope exceeds 8%** utilize soil maps along with a field review. The area where the slope is to be measured is the area within the 200 feet from the water source.
 - A **road bisecting a property** is generally not considered a property line in relation to these setbacks. Operators are instructed to contact their local municipality to confirm this and to determine general township setbacks. Please note that **township nutrient management ordinances** must be consistent with the Nutrient Management Act, but townships may have other setbacks that they establish such as for road siting distances, emergency fire lanes, etc.

- A **sample waiver form** is provided in Supplement 16: Sample Manure Storage Setback Waiver. Please note that a neighbor waiver is not transferable when the property is sold unless it is recorded with the deed or the subsequent landowner agrees in writing to accept the waiver. Also note that a neighbor waiver is only necessary for the *construction* of the manure storage facility. If a farmer obtained a waiver from his neighbor and the storage was subsequently built, and later on a new person buys the neighboring property after the storage is there, it is presumed that the new neighbor bought the property understanding that there is a manure storage located next to his property and that by buying the property, they are accepting its existence in that location.

It should be noted that **waivers can be granted** for most of the manure storage facility setbacks listed above built on **existing farms**. Waivers are granted by the delegated conservation district or the Commission in accordance with the criteria listed in the program's administrative manual. **An operator must meet all of the criteria established in the Nutrient Management Program Administrative Manual (see item "10" below for a listing of waiver criteria) in order to be granted a waiver.**

It should also be noted that the district or Commission may only grant waivers for manure storage facilities built on existing farms, but the neighbor may provide a waiver from the property line setback for manure storage facilities built on existing **or new** operations. Again note that **no waivers are ever to be granted from the setbacks established for public water sources.**

8. General description, manure storage facility setback requirements for agricultural operations that come into existence AFTER October 1, 1997:

The regulations refer to CAOs on agricultural operations that come into existence after October 1, 1997. For farmers building a storage on these new operations, the operator is expected to follow the stricter setback criteria listed in "9" below. It is the intention of the program to require stricter standards of new operations because they have more of an opportunity to address barn placement, etc. as they design their general farm layout.

9. For CAOs on agricultural operations that come into existence AFTER October 1, 1997, manure storage facilities, except reception pits and transfer pipes, may not be constructed:

- Within **100 feet** of a perennial stream or **intermittent stream**, river, spring, lake, pond or reservoir.
 - A **perennial stream is defined** as a body of water normally flowing year round, having defined bed and banks, and is capable, in the absence of manmade disturbances, of supporting bottom dwelling aquatic animals.
 - An **intermittent stream is defined** as a body of water flowing only at times of surface water runoff or when the water table is high. This area may or may

not have defined bed and banks, and is commonly not capable of supporting bottom dwelling aquatic animals year round.

- A **spring is defined** as a place where groundwater flows onto the land surface at least 183 days a year.
- b. Within **100 feet** of a wetland that is identified on the National Wetlands Inventory maps, if the following apply:
- The wetland is within the 100-year floodplain of an Exceptional Value stream segment.
 - Surface flow is toward the wetland.
- c. Within **100 feet** of a private water well, or open sinkhole.
- d. Within **100 feet** of an active public drinking water well, unless other State or Federal laws or regulations require a greater isolation distance.
- A **public water supply is defined** as one that is used at least 60 days a year and either having at least 15 service connections or serving at least 25 individuals daily.
- e. Within **100 feet** of an active public drinking water source surface intake, unless other State or Federal laws or regulations require a greater isolation distance.
- A **public water supply is defined** as one that is used at least 60 days a year and either having at least 15 service connections or serving at least 25 individuals daily.
- f. Within **200 feet** of a property line, unless the **landowners** within the 200-foot distance from the manure storage facility otherwise agree and execute a waiver in a form acceptable to the Commission.
- A **road bisecting a property** is generally not considered a property line in relation to these setbacks. Operators are instructed to contact their local municipality to confirm this and to determine general township setbacks. Please note that **township nutrient management ordinances** must be consistent with the Nutrient Management Act, but townships may have other setbacks that they establish such as for road siting distances, emergency fire lanes, etc.
 - A **waiver may be granted by the neighboring landowner**. A sample waiver form is provided in Supplement 16: Sample Manure Storage Setback Waiver. Please note that a neighbor waiver is not transferable when the property is sold unless it is recorded with the deed or the subsequent landowner agrees in writing to accept the waiver. Also note that a neighbor

- waiver is only necessary for the *construction* of the manure storage facility. If a farmer obtained a waiver from his neighbor and the storage was subsequently built, and later on a new person buys the neighboring property after the storage is there, it is presumed that the new neighbor bought the property understanding that there is a manure storage located next to his property and that by buying the property, they are accepting its existence in that location.
- g. Within **200 feet** of an intermittent or perennial stream, river, spring, lake, pond, reservoir or any water well where these manure storage facilities (except permanent stacking and compost facilities) are located on slopes exceeding 8% or have a capacity of 1.5 million gallons or greater.
- **To determine if a slope exceeds 8%** utilize soil maps along with a field review. The area where the slope is to be measured is the area within the 200 feet from the water source.
- h. Within **300 feet** of a property line, where these facilities (except permanent stacking and compost facilities) are located on slopes exceeding 8% where the slope is toward the property line, or have a capacity of 1.5 million gallons or greater, unless the **landowners** within the 300 foot distance from the facility otherwise agree and execute a waiver in a form acceptable to the Commission.
- **To determine if a slope exceeds 8%** utilize soil maps along with a field review. The area where the slope is to be measured is the area within the 200 feet from the water source.
 - **A road bisecting a property** is generally not considered a property line in relation to these setbacks. Operators are instructed to contact their local municipality to confirm this and to determine general township setbacks. Please note that **township nutrient management ordinances** must be consistent with the Nutrient Management Act, but townships may have other setbacks that they establish such as for road siting distances, emergency fire lanes, etc.
 - **A waiver may be granted by the neighboring landowner.** A sample waiver form is provided in Supplement 16: Sample Manure Storage Setback Waiver. Please note that a neighbor waiver is not transferable when the property is sold unless it is recorded with the deed or the subsequent landowner agrees in writing to accept the waiver. Also note that a neighbor waiver is only necessary for the *construction* of the manure storage facility. If a farmer obtained a waiver from his neighbor and the storage was subsequently built, and later on a new person buys the neighboring property after the storage is there, it is presumed that the new neighbor bought the property understanding that there is a manure storage located next to his property and that by buying the property, they are accepting its existence in that location.

It should be noted that **NO WAIVERS may be granted by the districts or the Commission** for any of the setbacks listed in "9" above (these are the setbacks for storages built on new farms). It should also be noted that the **NEIGHBOR may provide a waiver from the property line setback** for storages built on existing or new operations.

10. What is the process to approve waivers for manure storage facilities?

The Nutrient Management Act Administrative Manual lays out the criteria and process to be followed when the districts or the Commission receive a waiver request. A sample waiver request form is included in Supplement 15: Waiver Request for Manure Storage Setback Requirements. The agency reviewing the waiver request (the district or the Commission), in conjunction with other relevant cooperating agency technical staff, shall perform an **on-site visit** to evaluate the site for which the waiver is proposed. An outline of the waiver criteria that must be met in order to obtain a waiver are as follows:

- a. The placement of the manure storage facility outside of the setback area is found to be physically impractical or economically unreasonable (an increase in cost of 50% or \$5,000 whichever is less).
- b. The placement of the manure storage facility within the setback area has been determined to adequately protect the surrounding area from offsite migration of manure (by way of existing topography, proposed diversion practices, or demonstrating that it is safer to have it within the area than it is to build a system to transport manure out of the setback area).
- c. The facility design meets PA Technical Guide standards.
- d. The operator agrees to allow for annual inspection of the manure storage facility when empty.
- e. The loading/unloading area is designed to retain or divert 3,000 gallons of manure.
- f. The manure storage facility shall **not** use a gravity unloading system.
- g. The foundation, floor and walls of the manure storage facility will be protected against erosion and flotation from a 25-year flood event.
- h. The **top** of the storage is above the 100-year flood elevation. The 100-year flood elevation will need to be determined by the engineer designing the manure storage.
- i. An operation and maintenance plan (including a contingency plan) must be developed and reviewed with the appropriate individuals.
- j. The loading/unloading equipment shall be outfitted with a secondary check valve (where appropriate).

Additional information concerning waivers is available in the program's administrative manual that may be viewed at the conservation district office. In addition to the sample waiver request form included as Supplement 15: Waiver Request for Manure Storage Setback Requirements, sample waiver approval/disapproval letters are included in the Nutrient Management Program Administrative Manual.

The program **allows neighbors to approve waivers from the property line setback**. Manure storage facilities do not need to meet the above criteria to get a waiver from the neighbor from the property line setback. The operator looking for the waiver needs only to get written agreement from the neighbor that the storage may be placed closer to the property line than the setbacks allow. A sample format for these neighbor waivers is provided in Supplement 16: Sample Manure Storage Setback Waiver.

11. The sides of facilities located in a floodplain shall be protected from erosion and scouring from a 25-year flood event.

This information relates to specific design criteria available from NRCS.

12. Chapter 105 regulations.

All manure storage facilities built under the act shall conform to the requirements in DEP's Chapter 105 Rules and Regulations. Chapter 105 requires operators to get a Dam Safety or Encroachment Permit for manure storage facilities built in certain areas next to streams, or for very large storages that are over 15 feet tall and hold more than 50 acre-feet of manure (50 acre-feet of manure is approximately 16 million gallons). Information related to these requirements can be obtained from the DEP regional offices or the conservation district office.

Section IV

Record Keeping and Informational Requirements

Unless otherwise specified, records required under this program are **not to be submitted** to the Commission or delegated conservation district, but shall be retained at the agricultural operation subject to the requirements of the act. Records are required to be **retained on the operation for at least 3 years**. Record keeping should begin as soon as the nutrient management plan is approved. Appendix 1: Nutrient Management Plan Agreement and Responsibilities in the NMP provides a summary of the required records that are to be kept by program participants. Also, you can access the “Record Keeping Packet” under Planning Resources of the Nutrient Management Program Website at: <http://extension.psu.edu/plants/nutrient-management/planning-resources/alternative-tech-manual/spreadsheets-and-forms>

1. Crop yield records.

Approximate **annual crop yield levels for each crop group shall be recorded**.

These yields do not need to be determined using precision hand yield checks, these can be estimated by calculations based on estimated total amount harvested taken from a particular field (knowing the acres of the field).

Records of annual crop yields shall include: field or crop group identification, acres of crop harvested, and bushel or tons per acre.

2. Land application of nutrients.

The land application of nutrients on NMP operations shall be documented on an annual basis by **recording the following information** for each source of nutrients:

- a. The location and number of acres of nutrient application by field number or field identification label
- b. The dates of nutrient application
- c. The rate of nutrient application for each crop management unit. The number of tons or gallons of manure applied per acre (if the application is less than 5 tons/acre, the rate shall be estimated to the nearest 10th of a ton)
- d. The number of animals on pasture, the number of days on pasture and the average number of hours per day on pasture
- e. Rate per acre (to the nearest 5-pound increment) and analysis of **commercial fertilizer** or other sources of nutrients applied.

3. Annual manure production records.

Annual manure production records should include the amount of manure produced on the operation determined by either:

- a. Recording the actual amount of manure that was stored (knowing the storage

capacity of the storage facility).

- b. Applied to the operation (knowing the number of loads applied over the year and the amount of manure applied per load) over the year's time.

4. Soil testing requirements.

After the approval of the initial plan, soil tests are **required at least every 3 years** from the date of the last test. At a minimum, the most recent soil test for each field shall be kept on site. If the operator does annual soil testing for the fields on the operation, he/she will need to retain the last 3 year's worth of soil tests for the fields.

Records of soil tests should include: date of sampling; the testing facility that did the analysis; fields tested; crop and yield information; Phosphorous, Potassium, and pH levels, and the soil test recommendations for N, P₂O₅, and K₂O. All of this information must be entered in Appendix 4: Crop and Manure Management Information for each crop management unit.

5. Manure sampling records.

Records of manure testing results and testing of other nutrient sources shall be maintained consistent with the determination of available nutrients. The regulations require farmers that are taking manure tests to retain these records the same as any other item where records are required. Manure testing is required once every year for each manure group, except manure groups associated with less than five AEUs of livestock or poultry at the operation and manure groups representing grazing. For these small quantity manure groups and manure deposited on the pasture, nutrient content values are to be based on Penn State Agronomy Guide values and Phosphorus Source Coefficient (PSC) values are to be based on PSC values provided in Appendix 5: Phosphorus Index.

Manure analysis information for each animal group must be entered in Appendix 3: Manure Group Information. There are no manure sampling records required for manure deposited on pasture or manure groups with less than 5 AEUs.

For those operations with less than one year storage capacity, which is open to receive rainfall, would have multiple manure groups requiring manure testing based on storage capacity and various degrees of dilution from rainfall. Multiple manure tests are not required when the storage does not receive rainfall.

During the implementation of the plan, operators of **NMP operations exporting manure are required to determine the nutrient content of the manure by using accepted manure sampling and chemical analysis methods** as outlined in the Penn State Agronomy Guide or the DEP Manure Management Manual.

Records of manure analysis shall include: date of sampling; the name of the testing facility; the type of manure analyzed; and the percent solids, amount of Total Nitrogen (as N), ammonium nitrogen (as NH₄-N), Total Phosphate (as P₂O₅), and Total Potash (as K₂O) per ton or gallon (or 1000 gallons).

6. Informational requirements when exporting manure off of the operation.

The importer has the primary responsibility for the application of the manure imported to his/her site. When an importer receives the manure from the exporter, the manure is changing ownership and it therefore becomes the importer's manure. Therefore it is the importer's responsibility to see that the manure is used correctly. The record keeping and informational requirements reflect this change of ownership, except in the case where the exporter is applying the manure. In this case, where the exporter applies the manure, the exporter retains some control of the application and therefore is required to record the field identification, the rate at which the manure was applied and the acres that the manure was applied to (See the Manure Export Sheet discussion below and Supplement 12: Manure Export Sheet).

When manure is exported **from a NMP operation for land application**, the program requires the NMP Operation (exporter) to provide the importer with various informational items to allow the importer to best manage the manure being imported. The 'Exported Manure Informational Packet' containing the following items required by the regulations must be provided by the exporter to the importer:

a. A completed **manure export sheet**,

- A manure export sheet shall be used for **all** manure transfers from NMP operations. The **NMP operation is responsible for providing the export sheet to the importers**. 'Blank' export sheets should be given to the NMP operation at the time when the operator is informed of his plan approval. **Computer-generated manure export forms** may be used if they contain the same information as, and are reasonably similar in format to, the manure export sheets provided by the program.
- The **exporter is responsible** for the completion of Section 1 of the Manure Export Sheet. When the exporter, or person working under the direction of the exporter (such as a commercial hauler, or a hired farm worker), applies the manure to the importing farm, the exporter is also responsible for completion of Section 2 of the Manure Export Sheet.
- A sample copy of a manure export sheet is attached in Supplement 12: Manure Export Sheet.

b. The **Pennsylvania Manure Management for Environmental Protection and the Land Application of Manure: Manure Management Plan Guidance (October 29, 2011)** of the Pennsylvania Manure Management Manual.

- The exporter is required to provide the importer with the relevant sections of the Pennsylvania Manure Management Manual at the time the manure is exported. If the exporter needs copies of the Pennsylvania Manure Management Manual to provide to the importer, copies may be obtained from the regional DEP office or from the delegated conservation district.

- c. A concise **educational publication describing the key concepts of nutrient management**. The program has developed this publication as a fact sheet titled: 'Agronomy Facts 60' - Nutrient Management Planning, An Overview'. This publication can be obtained from the county Penn State Cooperative Extension office or from the delegated conservation district.

d. Nutrient Balance Sheets

The conservation district or the Commission will provide the Exported Manure Informational Packet to the NMP operation for distribution to the importer. The NMP operation exporter is only required to provide those items (a-c) that have been made available to the exporter by the conservation district or the Commission. The NMP operation exporter is responsible for providing the informational materials to the importer or broker only if the importer or broker does not already have a current copy of the informational materials. A new manure export sheet is required for each export transaction."

The detailed record keeping documentation described above is not needed for small quantity importers, specifically importers receiving less than the following amounts of manure per year:

- 5 tons of poultry manure
- 25 tons of non-poultry manure
- 10,000 gallons of liquid manure

Records for these exports can be documented on the sample quantity exports record keeping form included in Supplement 19: Small Quantity Manure Importer List. These records are required to be maintained for all small quantity exports to document who received the manure, how much and when.

7. Record keeping requirements when exporting manure off of the operation.

NMP operations exporting manure for agricultural land use by importers identified in the plan need not submit manure export records to the agency approving the plan, but shall retain these records on site for a minimum of three years for possible review by the appropriate agency personnel.

8. BMP designs and certification for new liquid and semi-solid manure storage facilities.

During the implementation of the approved plan, the operator is responsible for obtaining the necessary BMP designs and associated operation and maintenance plans to implement the BMPs listed in the approved plan. These BMP designs and associated operation and maintenance plans shall be kept on record at the operation as a supplement to the plan.

Section V

Plan Review and Implementation

Plan Review and Approval

Plans or plan amendments are to be submitted to delegated conservation districts for review and approval (the Commission will assist in counties not delegated administrative authority). Nutrient management plans submitted as of January 1, 2011 must be developed using the NMP Spreadsheet. Electronic NMP submission will continue to be an option. Where a NMP is submitted electronically the Nutrient Management Plan Summary (including the maps), Appendix 1: Nutrient Management Plan Agreements and Responsibilities and Appendix 2: Operation Information must be submitted as a paper copy. This process is for the initial NMP submission and for changes needed during the review process. The nutrient management planner is responsible to submit a paper copy of the complete and final NMP for board action. The conservation district reviews the plan to assure accuracy and that it meets NMA program criteria. The conservation district assigns the plan review to their designated review specialist. This district plan review specialist must be a Certified Public Nutrient Management Specialist holding a valid, up to date certification in accordance with the Department of Agriculture's nutrient management specialist certification requirements.

The Commission or a delegated conservation district will, within 10 days from the date of receipt of the plan, perform an administrative completeness review of the plan and provide notice to the operator indicating whether all of the required plan elements have been received.

Section 83.361(c) of the Act 38 Rules and Regulations indicates "The Commission or a delegated conservation district will approve or disapprove a plan or plan amendment within 90 days of receipt of a complete plan or plan amendment". The reviewing agency has 10 days after the submission date to determine if the plan is administratively complete. If a determination is made that the plan received is administratively complete, the 90 day review period starts at the initial plan submission date. If the 10 day administrative completeness review indicates additional information is required, the 90 day review period begins when the additional information is received, and the plan is determined to be administratively complete.

In addition to determining that all required information is present in the plan, the 10 day administrative completeness review should determine that all the included information meets program criteria. Some dated information in the submitted plan may exceed the expiration date established by the regulations and must be identified during the administrative completeness review. One example would be soil test dates which are older than 3 years. The Commission is not concerned that the actual date of the new soil test never exceed the 3 year date of the previous test, but that the tests be taken in the same season. For review purposes, soil test dates for plan submissions, plan updates, and plan amendments must be within three years of the date of plan submission.

Another example of submitted information not meeting program criteria would be a single soil test sample that represents multiple fields totaling more than 20 acres. While a single field larger than 20 acres can be represented by one soil test, a combination of multiple fields greater than 20 acres may not.

Section 83.294(c) of the regulations indicates “Manure application rates and procedures must be consistent with the capabilities, including capacity and calibration range, of the available application equipment”. For existing operations using their own application equipment, the plan must include a statement indicating that the existing equipment has been calibrated. If the plan does not include an adequate statement to allow you to confirm that the required manure spreader calibration was completed and the manure application rates in the plan are based on those calibration rates, the plan must be considered incomplete unless mitigating circumstances preclude the manure spreader calibration. What the scenarios above hope to convey is the impact those situations have on the 90 day review period when soil testing, manure testing, and manure spreader calibration, are required.

There should be more involved in your 10 day administrative completeness review than just making sure all the empty spaces in the submitted plan are filled in.

Listed are common issues the plan reviewer should look at during the administrative completeness review:

1. Are all the required sections of the plan submitted?
2. Are all the sections of the plan completed?
3. Were the required sections of the plan completed using the required version of the NMP Standard Format Spreadsheet?
4. Are all the submitted soil test results within the required date range and all the required information included?
5. Were the required manure test results utilized in Appendix 3: Manure Group Information?
6. Are the plan years within the required date range?
7. Is the manure spreader calibration statement included and adequate?

After you have completed the administrative review of the submitted plan you need to tell the farmer of your findings. Make sure you carbon-copy the plan writer in the letter informing the farmer of the result of your administrative evaluation.

If the plan is administratively complete:

1. Send an Administratively Complete letter
2. If this is a CAFO operation you can now submit the appropriate documentation to the DEP regional office where the animal operation resides to have the plan advertised in the PA Bulletin and also remind (via e-mail) the plan writer to submit a copy of the plan to the DEP regional office for their review.
3. If this is a CAO or a VAO, then proceed with the technical review of the plan. You have 90 days from the date of the plan submission to complete the review.

If the plan is NOT administratively complete:

Send an Administratively Incomplete Letter listing the plan deficiencies to the farmer and carbon-copy the plan writer.

NMP signatures (operator and planner) are required at the time of submission of the NMP to the District. First signature is required at the time of initial NMP submission and the second signature at the time of final submission if the plan has undergone significant changes during the plan review. If there is no farmer signature with the initial NMP submission the NMP is administratively incomplete.

The 90 day review process requires an on-site evaluation of the operation.

During the NMP review field visit, NMP reviewers will generally ask farmers if the plan writer has reviewed the NMP with them and if they understand and are able to implement the practices in the NMP. This represents a significant change in the approach Conservation District staff will take in NMP site visits. The main difference is the reviewer will not complete a detailed review of the NMP with the farmer. Instead the NMP review with the farmer will include general questions about whether or not the NMP was reviewed by the NMP developer and address any management questions resulting from the review process.

Listed are examples of questions the NMP reviewer should be asking the farmer.

1. Did the planner explain the manure application rates?
2. Was the manure spreader calibrated to meet the application rates in the plan?
3. Do you feel you are able to meet the manure application rates with your current equipment?
4. Did the planner explain any setbacks you may need to be aware of for manure application?
5. Did the planner explain any Best Management Practices (BMPs) needed in your plan and if yes, do you understand what the BMPs entail?
6. Did the planner explain any environmentally sensitive areas to be aware of for manure application?
7. Is there anything in your nutrient management plan that you do not understand?

If a review of the NMP with the farmer as outlined above has not been completed by the NMP planner, the PA Department of Agriculture Nutrient Management Certification Program should be notified in writing.

During the on-site evaluation there are several items the plan reviewer should verify: 1) The plan reviewer must verify records which are required to be maintained on the operation but are not required to be submitted with the NMP, and 2) The plan reviewer must verify that a current Ag E&S Plan written for the operation meets the requirements of Chapter 102.4. Chapter 102.4(a) indicates "The E&S Plan shall be available for review and inspection at the agricultural operation. The Act 38 NMP can't be approved

by a District Board unless a current Ag E&S Plan exists for the operation and has been verified by the plan reviewer during the on-site evaluation. The term “current” refers to the crop rotation and tillage practices currently employed on the operation.

Traditionally, Erosion and Sediment Control plans have been required for agricultural plowing and tilling activities that disturb 5,000 sq. ft. (1/10 acre) or more of land. No-till and manure injection is considered plowing and tillage under the Chapter 102 Regulations. Also, due to recent regulatory updates, these Ag E&S Plans must also cover certain animal activities which include Animal Concentration Areas (ACAs) and Animal Heavy Use Areas (AHUAs). The landowner, and any lessee, renter, tenant or other land occupier, conducting or planning to conduct agricultural plowing or tilling activities or erosion-causing animal activities are jointly and individually responsible for developing a written Erosion and Sediment Control Plan.

Ag E&S plan verification is required for all lands in the NMP. It is critically important that the Ag E&S plan and the proposed Act 38 NMP correlate and complement each other. Having two separate plans that do not relate only serves to confuse the operator and additionally make the operator out of compliance with either Act 38 or Chapter 102.

Ag E&S plans are now required for operations that are conducting plowing and tilling activities and operations where earthen ACAs and/or AHUAs exist. However, the possibility does exist where certain operations are not required to have an Ag E&S Plan. One example would be a total grazing operation where no plowing or tilling activities occur and no earthen ACAs or AHUAs exist. All earthen ACAs and/or AHUAs must be listed and described in the Ag E&S Plan; however, BMPs are only needed to address these areas that are directly discharging to surface water or groundwater.

Portions of a traditional conservation plan, developed by NRCS, a Technical Service Provider (TSP) or the conservation district (CD), may meet these Ag E&S Plan requirements. It is recommended that operators contact NRCS, the TSP, or the CD to determine if their conservation plan meets DEP's Chapter 102.4(a) requirements. It is important to note that if a current Ag E&S Plan does not exist for the operation at the time of the plan review site visit and one cannot be obtained by the time the plan is ready for board action, the plan should be disapproved.

In addition to the Ag E&S Plan requirements discussed above, it is also important to note that any construction or earthmoving activities taking place on agricultural operations must also meet DEP's traditional E&S Plan requirements under Chapter 102.4(b) or Chapter 102.4(c).

Plans shall be reviewed against the standard plan format and a technical review to assure that the information in the plan is correct. A comprehensive list of items which must be assessed during the on-site evaluation is included in the Nutrient Management Program Administrative Manual.

The delegated conservation district (or the Commission in unusual circumstances) shall approve, modify or disapprove the plan or plan amendment within **90 days** of receipt of

a complete plan or plan amendment. The district's action on the plan requires a formal action of the board. An operation that submits a complete NMP or plan amendment is authorized to implement the plan if the conservation district fails to act within 90 days of submittal. When the conservation district fails to act within 90 days of plan submission and the district again fails to act within 90 days of the expiration of the initial 90 days review period, the plan shall be deemed approved.

If a NMP operation plan or plan amendment submission is disapproved, the NMP operation submitting the plan or plan amendment for the first time shall have 90 days after receipt of a written notice explaining specific reasons for the disapproval to resubmit a revised plan amendment.

Conservation district plan review and approval actions are explained in more detail in the Program's NMA Administrative Manual, provided to all of the delegated conservation districts.

Correspondence with Plan Writers and Owners/Operators

It is imperative that owner/operators and plan writers are equally aware of the status of the submitted NMP. The following should occur with each submitted plan.

1. Owner/Operator is to receive a copy of the administratively complete/incomplete letter per paragraph 83.361(b) of the Act 38 regulations. The planner should also receive a copy of this letter.
2. Owner/Operator and planner is to receive the second and all other "request for corrections" letters after informal efforts to make corrections with the planner has failed.
 - a. Informal efforts could include e-mails and telephone calls before a formal review letter.
 - b. Conservation Districts are allowed to send all correspondence by letter, if directed to do so by their district manager or Board of Directors.
 - c. Conservation Districts are allowed to send the first correction letter (copy of the first technical review e-mail or notes from the first technical review telephone call), if directed to do so by their District Manager or Board of Directors. However, this is not required.
3. Owner/Operator is to receive a determination to disapprove a NMP along with the reasoning per paragraph 83.361(e) of the Act 38 regulations. The planner should also receive a copy of this communication.
4. Both the owner/operator and the planner are to receive a copy of the approval letter.

Provisions for Withdrawing of a Plan Under Review

The following guidance is provided for CAO, CAFO and volunteer (VAO) plans undergoing review under the Act 38 program. It should be noted that CAOs and CAFOs have an obligation to maintain a valid nutrient management plan for the life of their operation. Therefore if one of these mandated Act 38 participating farms withdraws a plan under review, they are required to resubmit a new plan submission within 30 days of withdrawal in order to demonstrate a desire to maintain compliance. In contrast, non-mandated Act 38 VAOs have no legal obligation to resubmit a plan which they withdrew

unless they received BMP installation funding under Act 38 or AgriLink (but this resubmission obligation only lasts for the life span of the funded BMP), or if they wish to continue their efforts to participate as a VAO under the program.

Conservation districts have a finite timeframe in which to act on a nutrient management plan under review for the Act 38 program. Unless there is a plan review delay caused by the conservation district, action on the plan must take place within 90 days of receiving a complete plan. If the conservation district provides its full set of initial plan review comments to the planner, giving the planner at least 30 days to address the comments prior to the first 90 day deadline, the district is expected to act on the plan within 90 days. However, if the district is delayed in providing its complete initial plan comments to the extent that the planner does not have the aforementioned 30-day time period to make any required plan revisions, the district is expected to roll the plan review over to the second 90-day timeframe.

Given the time restriction on the approval/disapproval of the submitted Act 38 NMPs, there will be times when the planner cannot adequately address the comments provided within the allotted timeframe. Farmers and planners may not want a NMP “disapproval” on public record with the district, so they may want to avoid that formal action. In these cases, the planner or operator submitting the plan may make a written request (via letter or e-mail) to the conservation district, requesting that the plan be withdrawn from the review process. The conservation district will send a letter to the planner or farmer (depending on who sent in the withdraw request) and copy the other party (such as copying in the farmer for a planner request, and copying in the planner for a farmer request), acknowledging the withdrawal request. This acknowledgement letter will also notify mandated Act 38 participating farms about the 30-day resubmission requirements.

In light of this process, when conservation districts provide their initial plan review comments they should alert the planner regarding the specific timelines mentioned above. For planes requiring extensive revisions, the planner may want to discuss with the conservation district the option to withdraw the initial submission and resubmit a revised version of the plan that would be expected to move through the revision and review process within the 90-day plan review timeframe.

Plan Implementation

A NMP operation shall fully implement the plan within 3 years of the date the plan is approved. It should be noted that this 3-year implementation time frame relates to implementing conservation practices called for in the plan. The proper manure handling and application rates called for in the plan shall be implemented immediately upon approval of the plan. For a plan that calls for converting an operation from solid manure daily haul to constructing a liquid manure storage, the plan shall address manure handling and application rates for the proposed liquid system and shall also include interim solid manure handling and application rates and procedures to be implemented until the liquid system is installed. The implementation schedule may be extended upon approval of the Commission or Delegated Conservation District.

Whatever adjustments to the operation are made during the implementation of the approved plan, nutrient application rates shall always be balanced to assure that **nitrogen is not over-applied** in relation to crop nitrogen needs. The owner, operator or specialist shall review the approved plan at least annually to ensure that this condition is met.

At least every 3 years the plan shall be reviewed by a Public, Commercial or Individual Certified Nutrient Management Specialist. **If the plan requires an update (year specific) or amendment, it shall be developed and certified by an Individual or Commercial Nutrient Management Specialist.** If the agricultural operation has changed from that described in the approved plan or the plan requires an update (year specific), reference Section VI: Plan Amendments and Transfers.

Limited Liability Protection

Section 13 of the Nutrient Management Act states: *"If a person is fully and properly implementing a nutrient management plan approved by a delegated county conservation district or the Commission and maintained under the act and this subchapter, the implementation shall be given appropriate consideration as a mitigating factor in any civil action for penalties or damages alleged to have been caused by the management or utilization of nutrients under the implementation."*

Limited liability protection is afforded to those operators properly implementing an approved plan under this subchapter.

- This protection is intended to only provide protection to the extent that the plan is implemented. Liability protection for a leaking manure storage facility planning to be repaired can't be granted until the storage is repaired. Nor would an operator get protection from a complaint of over-application of manure, if the operator were not implementing the proper manure application rates listed in the plan.
- The "appropriate consideration" phrase in the law is a matter of discretion, either for the judge in a civil action or for the state or local government enforcement agency.

If the Commission finds that nutrient pollution or the danger of nutrient pollution results from activities which are being or have been implemented in accordance with a plan approved under this act, the owner or operator of the agricultural operation shall be exempt from penalties under the Nutrient Management Act.

The implementation schedule should describe the timing, by year and season, of construction activities for the listed Best Management Practices (BMPs).

Working Together to Help Farmers Meet the Program Requirements

Implement your day-to-day activities in the program in such a way as to facilitate and build good working relations between planners, reviewers and the participating farmers. The more we can work together in a cooperative way, the better the farm community and the environment will be served. I have seen a number of ways that planners and reviewers have been working together that have been great in helping get the job done for the program. These include:

- a. Planners inviting reviewers out to the farm with them as they are developing the plan. This is especially helpful with complex farm situations including those with a number of animal types and various Animal Concentration Area (ACA) situations. These meetings are most helpful when they are scheduled to take place prior to plan submission.
- b. Planners hand delivering plan submissions (especially complex ones) to the district office and spending time going over the plan with the reviewer.
- c. Reviewers inviting planners out to their site visits as part of their plan review process. This allows the planner and reviewer to discuss various issues in question in the plan. This again is especially helpful for complex plans. It is best for the reviewer to review the paperwork part of the plan prior to this visit so any issues that have come to light during the paperwork review, can be discussed with the planner on site.
- d. Reviewers calling planners to discuss comments that arise during their review of the plan (backed up by an email message to the planner listing the issues identified during the review). This provides an opportunity to determine if the concerns raised during the review are valid given the particular farm situation, and also provides an opportunity for planners and reviewers to become better informed concerning the planning requirements.
- e. District staff providing maps and assistance with soil testing, for farmers who want to import manure to their operation. This assistance helps the planners in getting the necessary background work from the farmer for developing Nutrient Balance Sheets (NBSs) for importing operations. This helps keep the cost of NBS development down for importing farms.
- f. Reviewers providing their comments on a plan within 2 to 3 weeks of receipt of the plan, thus providing adequate time for the planner to address the comments found during their review.
- g. District staff (with the farmer's approval) providing a copy of their status review comments/notes to the planners so that the planner can utilize these comments in their update of the farmers nutrient management plan.
- h. District staff accepting more minor emailed revisions to plan pages addressing the comments submitted during the district's review. Revisions requiring significant page changes and map changes may require the submission of a hard copy by the planner in order to ensure that the plan is complete and arranged in the way the planner would want.
- i. Most important the farmer should be intimately involved in the process. The plan is written for the farmer not the planner or the plan reviewer. This should not be something that is developed independently from the farmer and presented to him

when completed. He/she should be encouraged to provide input on all aspects of the plan before and during plan development. Try to find out what the farmer currently does or would like to do and if possible write the plan accordingly. The plan is more likely to be implemented if it reflects the farmer's management.

Plan Review Guidance

Planners

Planners should make sure they are including all the required nutrient management plan elements as outlined in the regulations and the Nutrient Management Program Technical Manual. This can be accomplished by completing all components of the standard formats of the nutrient management plan and nutrient balance sheet. At times this may be a daunting task, but in order to ensure all areas of the farm are properly addressed the required program elements are necessary in the plan. In addition, if a particular plan section does not apply to the operation that should be noted with "Not Applicable" or something similar. In this way, the plan reviewer will know that this was not missed and that it is not relevant to this farm.

Reviewers

Reviewers are strongly directed not to require additional items during the plan review, that **are not required** in the standard plan or the technical manual. For example, township designation, specific watershed codes (the watershed needs to be named in the plan but the code is to be determined by the conservation district when they fill out their DEP forms), a copy of the emergency response plan, soils data or descriptions for NBSs, winter spreading procedures when no winter application is planned, in-field manure stacking procedures when no manure stacking is planned (unless it is a CAFO), rainfall calculations when the storage is under the barn, signed agreements for farmers importing manure should not be required by reviewers. Also, rounded off numbers should be accepted (the exception is the AEUs/acre calculation which must be shown to the second decimal place). In addition, every gallon of manure doesn't need to be spread during an application period. Recognize that the figures we work with in these calculations are not exact and therefore we do not need to be overly exact in assessing these numbers during plan review.

When reviewing NBSs for importing farms, the NBSs and associated documentation such as maps, setbacks, etc. should be reviewed with the same scrutiny as you would utilize in the review of the NMP. For additional information on review of NBSs submitted by manure brokers, see the NM/MM Administrative Manual Chapter 2.

The planning process has become very involved in order to address the various nutrient issues that can arise on a farm. It is imperative that this not be made more complicated or burdensome than necessary. In addition, we need to be diligent to maintain consistency across the program statewide. Make sure the plans are complete, and we do not require any more plan components than we are authorized to require.

Planners are encouraged to involve reviewers as soon as possible in the planning process, especially when writing more complex plans. This will ensure a much quicker review and timely plan approval.

Section VI Plan Amendments and Transfers

Significant Changes in Management Requiring a Plan Amendment

In order to assure the plan is valid; a plan amendment **is required** when the operator of an operation falling under the act expects to make significant changes in the management of nutrients from those activities listed in the approved plan (Section 83.371(1) – (10)). Significant changes in the management of the operation that would require a plan amendment are one of the following:

- a. A net increase of greater than 10% in the AEUs/acre.
 - For example, if a farmer with 100 dairy cows (weighing 1300 lbs each) on 50 acres brings on another 12 cows (weighing 1300 lbs each). This operation would go from 2.6 AEUs/acre to 2.91 AEUs/acre, which is a 12% increase.
- b. A change in crop management that results in a reduction of greater than 20% in nitrogen necessary for realistic expected crop yields or in the amount of nitrogen that the crops will use in the given crop year.
 - For example, if a farmer changes from all corn silage (21 ton yield) on 50 acres (which uses a total of 7500 lbs of nitrogen), to all wheat (60 bu yield) on the 50 acres (which could use up to 4500 lbs of nitrogen), this would be a 40% reduction in nitrogen used on the operation.
- c. A change in the method of excess manure utilization arrangements.
 - For example, where a CAO changes from providing exported manure to known neighboring landowners to providing exported manure to a manure broker.
- d. Calculations in the approved plan are found to be in error, or figures used in the approved plan are inconsistent with the variables contained in the Penn State Agronomy Guide and adequate written justification for the inconsistency has not been given.
 - For example, where the planner projected that a 125 bushel corn yield will require 175 lbs of nitrogen (instead of 125 lbs as in the Agronomy Guide) and it was not found during the initial plan review.
 - If the plan was approved using the correct Agronomy Guide figures at the time of plan development, and the Agronomy Guide figures change after approval, the plan is not considered to be incorrect until after the 3 year review. During the 3 year update of the plan, the plan should be amended to reflect the revised variables listed in the most recent Agronomy Guide.
- e. A different BMP than that called for in the approved plan is proposed to address a manure management or stormwater management concern.

- For example, where the approved plan stated that a concreted barnyard and curbing will be used to address a barnyard problem, but when the barnyard improvement is being designed the farmer decides to instead use roof gutters and a buffer strip to address the problem.
- f. After the first 3 years of implementation, the three-year average of the actual yields are less than 80% of the expected crop yields listed in the approved plan.
- For example, if the approved plan estimated a crop yield of 150 bushels per acre but the crop yields over the first three years are 100 bu, 140 bu, and 110 bu per acre respectively. The average yield over the first three years would be 117 bushel. This average actual yield is only 78% of what the projected yield was for the operation. Therefore, the plan would have to be amended to more closely reflect these lower yields.
 - For instances where there is a documented severe drought or other natural catastrophe which drastically reduced crop yields, at the discretion of program staff, those years may be able to be disregarded for purposes of determining an average 3 year yield for the operation. Please call the state NMA program staff to get direction on when a farmer can disregard particular years' yield data due to a natural disaster.
- g. If alternative organic nutrient sources will replace or augment nutrient sources described in the plan.
- h. If additional lands are brought into the operation through purchase, lease or renting.
- i. If there is a change in the manure management system that is expected to result in a different nutrient content that requires a change in manure application rates under Section 83.293 (relating to determination of nutrient application rates).
- j. If a change in manure application is necessary based on the reevaluation of potential phosphorus loss as part of the triennial review under Section 83.362(c) (relating to plan implementation), or a change in manure application is necessary due to the end of the phase-in period under Section 83.293(c)(3).
- k. When a BMP is not implemented within the 3 year time frame of the initial plan approval.
- l. If the plan initially called for no winter application and it is being changed to allow for the winter application of manure

Plan Amendment Procedure

If an amendment is required, it shall be developed and certified by an Individual or Commercial Nutrient Management Specialist and it shall require Conservation District Board approval, similar to the approval process for a new NMP submission.

A plan amendment is required if the operator expects to make significant changes in the management of nutrients from those contained in the approved NMP. A significant change in management is defined in the regulations in Section 83.371 (1) – (10) and is listed above in # 1. (Significant Changes in Management Requiring a Plan Amendment). If any of the listed changes pertain to the operation, a plan amendment is required.

Only plan amendments developed using the most current version of the standardized Act 38 Nutrient Management Plan Spreadsheet will be accepted for review and approval under the Act 38 program.

Note: When a NMP that contains NBSs for importers is amended, the NBSs are to be updated to the most recent planning version of the Nutrient Balance Sheet Spreadsheet.

For more information on submission of Plan Amendments see the NMP Submission section of this manual.

A plan amendment shall be submitted to the reviewing agency in accordance with Section 83.361(a) of the regulations. It is the obligation of the planner to submit a copy of the initial amendment submission to DEP if the operation is a CAFO. The Conservation District will send an approval letter for amended plans obtaining Conservation District Board approval to the operator and c.c. the planner (and DEP if the operation is a CAFO). The planner is responsible for sending a copy of the approved plan amendment to DEP for their CAFO file.

A plan amendment shall be submitted, for any plan updates (#3 below), to obtain approval of these plan update changes, when the plan is subject to the triennial review under Section 83.362(c) of the regulations.

A majority of approved NMPs will need to go through the formal Amendment process after every triennial review, if an amendment is not needed sooner according to 83.371(a) (1)-(10). It is possible to have a very old plan not needing any formal amendments, but probably only relevant to total export plans, using a manure broker. In these situations, plan updates are still required.

Plan Update Procedures

If a plan update is needed to address operational or computation changes other than those described in the regulations Section 83.371(a) (1) – (10) or listed in #1 above (Significant Changes in Management Requiring a Plan Amendment), the plan update shall be developed and certified by a Commercial or Individual Certified Nutrient Management Specialist.

- a. The Commercial or Individual Certified Nutrient Management Specialist shall:
 - Make the necessary revisions,
 - Update all dates and crop year dates, that are applicable, to reflect which crop years the plan update will cover. These dates are contained in the Cover Page; NMP Summary; Appendix 1; Appendix 3; Appendix 4

- Review the updates with the farmer for approval before submission, and
 - Submit the revisions to the District for inclusion into the operation's file.
- b. The District shall evaluate these plan updates and provide any necessary direction to the operator and/or planner relating to the revised practices proposed for the operation. **Plan updates do NOT require Conservation District Board approval.**

Once the update has been evaluated and determined to be complete, the District sends a plan update acceptance letter to the farmer, cc. to the planner (and to DEP if the update is a CAFO). The planner is responsible for sending accepted plan updates to the DEP and the farmer. The District and DEP files need to have the same plan and the plan has to be current such that it covers the current crop year and whatever future years the plan may address.

Amendments Due To Unforeseen Circumstances

In cases due to unforeseen circumstances where the operator is not able to implement the management practices outlined in the approved plan; a plan amendment shall also be required. This emergency amendment shall conform to program requirements explained in this section of the manual, be developed by a Certified Nutrient Management Specialist, and be submitted to the district within 30 days of implementation. These emergency amendments due to unforeseen circumstances will not require a formal approval of the conservation district, but shall temporarily become part of the plan until normal operations are resumed.

Unforeseen circumstances include the following:

- a. Outbreak of a contagious disease. In these cases the program recognizes that manure may not be transported off-site due to the concern of spreading a contagious disease. The program allows the operator (only in this case) to over-apply manure nitrogen in order to provide for a disposal site for the manure. In cases where manure is over-applied due to this provision, the operator shall, where applicable, plant cover crops to take up excess nutrients and harvest the cover crops to remove the excess nutrients. These operators are required to take standard soil tests each year for fields where manure is over-applied; as well as take a soil nitrogen test for 1 year beyond the cessation of excess manure application.
- b. Failures or malfunctions of equipment or storage that require a change in manure handling procedures.
- c. Other unforeseen circumstances that may cause a significant change in the management of nutrients on the agricultural operation include:
 - unforeseen weather conditions which significantly impact plan implementation (i.e. hail, drought, etc.), or
 - crop failure as from plant diseases or insects, or
 - unanticipated loss of rented land or exporting sites that would create a reduction of greater than 20% in the nitrogen necessary for expected crop

- yields.
- Some form of emergency that would require winter manure application on an operation where no winter manure application is included in the approved plan. SCC Regional Nutrient Management Coordinators should be contacted for guidance when this situation arises.

Those instances where amended activities will be implemented over a long period of time (over 3 months) or done on a continuing basis will require the amendment to be reviewed and approved by the district.

Plan Transfers

An approved nutrient management plan may be transferred to a subsequent owner or operator of an agricultural operation by written notification of the transfer to the conservation district, unless the transfer results in operational changes requiring a plan amendment.

If the transfer of the plan results in operational changes requiring a plan amendment as described in item "1" above (Significant Changes in Management Requiring a Plan Amendment), the plan amendment shall be developed by a properly certified individual and submitted to the conservation district for approval.

Withdrawal of a Volunteer Plan from the Nutrient Management Act Program

If an approved Act 38 Nutrient Management Plan (NMP) on file at the Conservation District is expected to expire it is recommended that in the January/February time frame of the year when the plan expires, the Conservation District sends a letter informing the operator their Act 38 plan expires on September 30th of that year. Those letters mailed in January/February informs the operators that they should be contacting their nutrient management specialist to start the process of performing their triennial review. Since the letter will go out early in the year (January/February) the operators/planners should have sufficient time to gather the required soil and manure test results collected over the previous 3 years to write the new annual or three year NMP. No sample letter is provided as this is not a program requirement of the Conservation Districts but rather a preferred practice.

If the operator allows the volunteer plan to expire, the operator has one of two alternatives: 1) either submit a new annual or triennial plan for review and approval, or 2) withdrawal the plan from the Act 38 program. When withdrawing a volunteer nutrient management plan from the nutrient management act program the operator should send an appropriate withdrawal letter to the appropriate Conservation District. An example letter is attached and titled "Nutrient Management Act Program Withdrawal".

The SCC has developed a sample "Nutrient Management Plan Date Expiration, 1st letter" which can be utilized to inform operators of their responsibility. The sample letter contains a copy of the "Nutrient Management Act Program Withdrawal" form which must be returned to the Conservation District. Some Conservation Districts send a second letter, similar to the 1st letter, if no response to the first mailing, giving the operator an additional opportunity to comply and return the intent to withdraw the plan from the

program form.

When all else fails, the farm operator is to receive the “Nutrient Management Plan Date Expiration, 2nd letter” from the County Conservation District indicating the plan on file at the District has now expired and no correspondence from the plan operator has been received at the District indicating the desire to have a new NMP approved or withdraw from the program and they have forfeited the limited liability eligibility as well as the ability to receive funding from the program.

When the “Nutrient Management Plan Date Expiration, 2nd letter” is sent, the NMP should be removed from the list of county NMPs and removed from the program on the counties next quarterly report.

Both sample letters from the conservation district indicating the expiration date of the plan and the form indicating the intent of withdrawing the volunteer plan from the Act 38 program are available on the nutrient management web-site under “SCC Policy and Information”.

Supplement 1 Agronomy Guide Tables

Table 1.2-5. Nitrogen recommendations for agronomic crops.

These are base recommendations and should be adjusted for previous crop, previous manure history, and planned manure applications (see “Manure Nutrient Management” section).

Crop	Recommendation (lb N/unit* of expected yield)	Comments
Corn grain (bu/A)*	1	For better N efficiency, delay application of the nitrogen until the corn is between 10 and 20 inches tall. If the field has a history of manure and/or legumes, delay all of the N. If there is no history of manure and/or legumes, split the N, applying one-third near to planting and delaying the balance. Adjust this recommendation for any previous legume in the rotation (see Table 1.2-7) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15). The PSNT or chlorophyll meter test can be used to refine N recommendations for corn, especially where manure is a major nutrient source.
Corn silage (ton/A)*	7	For better N efficiency, delay application of the nitrogen until the corn is between 10 and 20 inches tall. If the field has a history of manure and/or legumes, delay all of the N. If there is no history of manure and/or legumes, split the N, applying one-third near to planting and delaying the balance. Adjust this recommendation for any previous legume in the rotation (see Table 1.2-7) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15). The PSNT or chlorophyll meter test can be used to refine N recommendations for corn, especially where manure is a major nutrient source.
Grain sorghum (bu/A)*	0.75	Adjust this recommendation for any previous legume in the rotation (see Table 1.2-7) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Forage sorghum (ton/A)*	7	Adjust this recommendation for any previous legume in the rotation (see Table 1.2-7) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Oats (bu/A)*	0.8	Apply the N with any other fertilizer before planting. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Wheat/Rye (bu/A)*	1.0	If plants did not tiller well, apply N by mid-March; otherwise, apply any time up to growth stage 5. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Barley (bu/A)*	0.8	If plants did not tiller well, apply N by mid-March; otherwise, apply any time up to growth stage 5. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Small grain silage (ton/A)*	17	Apply at greenup in the spring.
Grass hay (ton/A)*	50	Split the nitrogen recommendation and apply it based on the expected yield for each cutting. For grass-legume mixtures, if the legume is more than 50% of the stand, the field should be managed as a legume; thus, no nitrogen is recommended. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).

Table 1.2-6. Residual nitrogen contributions from legumes.

Previous crop ¹	Percent stand	High-productivity fields (Soil productivity group 1) ²	Moderate-productivity fields (Soil productivity groups 2 & 3) ²	Low-productivity fields (Soil productivity groups 4 & 5) ²
Nitrogen credit (lbs/A)				
First year after alfalfa	>50 stand	120	110	80
	25–49 stand	80	70	60
	<25 stand	40	40	40
First year after clover or trefoil	>50 stand	90	80	60
	25–49 stand	60	60	50
	<25 stand	40	40	40
First year after soybeans harvested for grain	1 lb N/bu soybeans			

1. When a previous legume crop is checked on the Penn State soil test information sheet, the residual nitrogen for the year following the legume is calculated and given on the report. This credit should be deducted from the N recommendation given on the soil test report.
2. See Agronomy Guide Table 1.1-1 in the basic soils section for information on soil productivity groups.

Table 1.2-7. Nitrogen removal by legumes.

Legume crop (no nitrogen application recommended)	Pounds of N removed/unit* of yield	Comments
Alfalfa (ton/A)*	50	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Clover (ton/A)*	40	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Trefoil (ton/A)*	50	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Soybeans (bu/A)*	3.2	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.

Table 1.2-8. Typical crop nutrient removal for phosphorus and potassium.

Crop (units)	Per unit of yield		Typical yield/A	Removal for given yield	
	P ₂ O ₅	K ₂ O		P ₂ O ₅	K ₂ O
Corn (bu)	0.4	0.3	150 (bu)	60	45
Corn silage (T) ¹	5.0	11.0	25 (T)	125	275
Grain sorghum (bu)	0.6	0.8	125 (bu)	75	100
Forage sorghum (T) ¹	3.0	10.0	15 (T)	45	150
Sorghum/sudangrass ¹	7.0	7.0	15 (T)	105	105
Alfalfa (T) ^{2,3}	15.0	50.0	5 (T)	75	250
Red Clover (T) ^{2,3}	15.0	40.0	3.5 (T)	55	140
Trefoil (T) ^{2,3}	15.0	40.0	3.5 (T)	55	140
Cool-season grass (T) ^{2,3}	15.0	50.0	4 (T)	60	200
Bluegrass (T) ^{2,3}	10.0	30.0	2.5 (T)	25	75
Wheat/rye (bu) ⁴	1.0	1.8	60 (bu)	60	110
Oats (bu) ⁴	0.9	1.5	80 (bu)	70	120
Barley (bu) ⁴	0.6	1.5	75 (bu)	45	110
Soybeans (bu)	1.0	1.4	50 (bu)	50	70
Small grain silage (T) ¹	7.0	26.0	6 (T)	40	160

1. 65 percent moisture.

2. For legume-grass mixtures, use the predominant species in the mixture.

3. 10 percent moisture.

4. Includes straw.

Table 1.2-13. Average daily production and total content of manure.

Animal type	Daily production	Manure % dry matter	Analysis units	N	P ₂ O ₅	K ₂ O	Comments
Dairy cattle							
Lactating cows, liquid	13 gal/AU/day	<5	lb/1,000 gal	28	13	25	Production does not include dilution. Analysis includes dilution to approximately 5% solids.
Lactating cows, solid	111 lb/AU/day	12	lb/ton	10	4	8	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by dairy cows, dairy dry cattle, and dairy young cattle.
Dry cow	51 lb/AU/day		lb/ton	9	3	7	
Heifer	60 lb/AU/day		lb/ton	10	3	7	
Calf	80 lb/AU/day		lb/ton	10	3	4	
Veal	7 gal/AU/day	2	lb/1,000 gal	19	13	25	Production does not include dilution. Analysis includes dilution.
Beef cattle							
Cow	90 lb/AU/day	12	lb/ton	11	7	10	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by a beef cow and calf, beef calves, and steers.
Calf	90 lb/AU/day	12	lb/ton	11	7	10	
Finishing cattle	65 lb/AU/day	8	lb/ton	14	5	8	
Swine							
Farrow to wean (includes sows)	11 gal/AU/day	2.5	lb/1,000 gal	18	18	11	Production includes a typical amount of in-barn dilution water but not rainfall for an outdoor storage, except for farrow to wean which also includes rainfall. Analysis includes dilution to approximately the % dry matter indicated.
Nursery	14 gal/AU/day	1.5	lb/1,000 gal	19	8	14	
Wean to finish	5.5 gal/AU/day	4	lb/1,000 gal	37	23	21	
Grow-finish	7 gal/AU/day	4	lb/1,000 gal	31	24	22	
Swine, anaerobic lagoon							These figures apply only to a treatment lagoon.
Supernatant	—	0.25	lb/1,000 gal	2.9	0.6	3.2	
Sludge	—	7.6	lb/1,000 gal	25	23	63	
Sheep/Goats	40 lb/AU/day	25	lb/ton	23	8	20	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by sheep.
Horse	55 lb/AU/day	20	lb/ton	12	5	9	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by horses.

Animal type	Daily production	Manure % dry matter	Analysis units	N	P ₂ O ₅	K ₂ O	Comments
Poultry							
Layer (364 d) ¹	26 lb/AU/day	41	lb/ton	37	55	31	
Pullet (126 d) ¹	48 lb/AU/day	35	lb/ton	43	46	26	
Light broiler (44 d) ¹	22 lb/AU/day	66	lb/ton	79	62	42	Production and analysis figures include litter.
Heavy broiler (57 d) ¹	20 lb/AU/day	75	lb/ton	66	63	47	Production and analysis figures include litter.
Turkey (tom) (123 d) ¹	13 lb/AU/day	60	lb/ton	52	76	42	Production and analysis figures include litter.
Turkey (hen) (88 d) ¹	11 lb/AU/day	65	lb/ton	73	88	46	Production and analysis figures include litter.
Duck (dry)	110 lb/AU/day	27	lb/ton	21	26	15	No bedding included in production or analysis figures.
Duck (wet)	13 gal/AU/day	5	lb/1000 gal	33	23	16	Production does not include dilution. Analysis includes dilution to approximately 5% solids.

Note: When possible, have manure analyzed. Actual values may vary over 100 percent from averages in the table.

1. Typical production days.

Table 1.2-14. Manure nitrogen availability factors for use in determining manure application rates based on planning conditions.

A. Current Year

To use this table find the **planned manure application season** in the left column, then move to the right in that row and select the **target crop utilization**. Continue to the right in that row to find the **nitrogen availability factor** for the **planned manure application management**. The manure nitrogen availability factor is the fertilizer equivalence of the manure N or the lb of fertilizer N equivalent per pound of total manure N. For example, if the N Availability Factor = 0.50, effectively there is the equivalent of 0.50 lb of fertilizer N for every pound of total N in the manure.

Planned manure application season	Planned manure target crop utilization	Application management	Nitrogen availability factor ¹		
			Poultry manure	Swine manure	Other manure
Spring or summer	Spring utilization by grass hay and small grains. Summer utilization by corn, other summer annuals, and grass hay.	Incorporation the same day	0.75	0.70	0.50
		Incorporation within 1 day	0.50	0.60	0.40
		Incorporation within 2–4 days	0.45	0.40	0.35
		Incorporation within 5–7 days	0.30	0.30	0.30
		Incorporation after 7 days or no incorporation	0.15	0.20	0.20
Early fall ^{2,3}	Early spring utilization by small grains, small grain silage, and grass hay, including the winter crop in a double crop system.	Incorporated less than 2 days	0.50	0.45	0.40
		Incorporated 3-7 days	0.30	0.30	0.30
		Incorporated more than 7 days or no incorporation	0.15	0.20	0.20
Early fall Additional N available to the summer crop in a double crop system from manure applied in the fall for the winter crop (above) ^{2,4}	Summer utilization by the second crop, corn or other summer annuals in a double crop system.	All methods of incorporation	0.15	0.20	0.20
Early fall with a cover crop not harvested and used as a green manure ²	Summer utilization by corn, other summer annuals, and grass hay.	Incorporated less than 2 days	0.45	0.40	0.35
		Incorporated 3-7 days	0.25	0.25	0.25
		Incorporated more than 7 days or no incorporation	0.15	0.20	0.20

Planned manure application season	Planned manure target crop utilization	Application management	Nitrogen availability factor ¹		
			Poultry manure	Swine manure	Other manure
Early fall with no cover crop²	Summer utilization by corn, other summer annuals, and grass hay.	All methods of incorporation	0.15	0.20	0.20
Late Fall or Winter³	Spring utilization by small grains and grass hay.	All situations	0.50	0.45	0.40
	Following summer utilization by corn or other summer annuals.	No cover crop	0.15	0.20	0.20
		Cover crop harvested for silage	0.15	0.20	0.20
		Cover crop used as green manure	0.50	0.45	0.40
Grazing	Grazing anytime with nutrient uptake during growing season	Manure deposited more or less continuously by grazing cattle	0.15	0.20	0.20

1. Multiply this factor times the manure N content to estimate the manure N available for the planning conditions.
2. Early fall would be when it is still warm enough for plant growth and microbial activity to continue (soil temperature >50°F at 2").
3. When manure is applied in the early fall to the winter crop in a double crop system, use these factors to determine the N available to the winter crop.
4. Use these factors to determine the N available from the fall application in a double crop system to the summer crop. These factors would be applied to the same manure application that was used for the winter crop (See footnote 3 above).
5. Late fall and winter is when it is so cold that there is no plant growth or microbial activity (soil temperature <50°F at 2 inches).

B. Historical Frequency of Manure Application on the Field

To use this table, determine the frequency of manure application and move to the right in the row to determine the amount of residual N that is available from past manure applications. Deduct this amount of residual N from the basic N recommendation before determining any additional fertilizer or manure application rates.

	Pounds N available to a Summer Crop (corn, grass hay, oats, etc.)	Pounds N available to a Winter Crop (wheat, barley, rye, etc.)	Pounds N available to the Winter Crop in a Double Crop System	Pounds N available to the Summer Crop in a Double Crop System
Rarely received manure in the past (<2 out of 5 years) NOTE: If a field only received manure once out of 5 years, but this application was made the previous year, use the frequent credit for the following year.	0	0	0	0
Frequently received manure (2–3 out of 5 years)	20	7	7	13
Continuously received manure (4–5 out of 5 years)	35	11	11	24

Table 1.2-15. Factors for calculating manure nitrogen availability based on time of application, incorporation, field history, and manure analysis with ammonium and organic N fractions. Recommended for all manures, but required for atypical or treated manures.

The manure nitrogen availability factor is the fertilizer equivalence of the manure N or the lb of fertilizer N equivalent per pound of ammonium or organic manure N. For example, if the ammonium-N Availability Factor = 0.80, effectively there is the equivalent of 0.80 lb of fertilizer N for every pound of ammonium-N in the manure. Likewise, if the organic-N Availability Factor = 0.35, effectively there is the equivalent of 0.35 lb of fertilizer N for every pound of organic-N in the manure.

TOTAL MANURE N

AMMONIUM N ANALYSIS

Spring/summer			
For spring utilization by small grains and grass hay and summer utilization by corn, other summer annuals, and grass hay			
Days to incorp. ¹	Poultry ²	Other ²	Compost
Immediately	0.90	0.80	0.80
1	0.80	0.60	0.60
2-4	0.60	0.40	0.40
5-7	0.40	0.20	0.20
>7	0.20	0.10	0.10
Early fall ³			
Days to incorp. ¹	Poultry ²	Other ²	Compost
For fall and spring use by grass hay, small grains, and small grain silage			
0-2	0.80	0.60	0.40
3-7	0.50	0.30	0.20
>7	0.20	0.10	0
For following summer utilization by a summer crop following a non-harvested cover crop used as a green manure			
0-2	0.45	0.35	0.35
3-7	0.20	0.15	0.15
>7	0	0	0

ORGANIC N ANALYSIS (total N – ammonium N)

Organic N decomposed during year applied				
	Poultry	Swine	Other	Compost
Summer crop	0.60	0.50	0.35	0.10
Winter crop	0.40	0.30	0.25	0.10
Additional organic N available to the summer crop in a double crop system from manure applied in the fall for the winter crop (above)				
Summer crop	0.30	0.25	0.20	0.10

Organic N decomposed from past applications		
Manure applied	Manure	Compost
1 yr ago	0.12	0.05
2 yrs ago	0.05	0.02
3 yrs ago	0.02	0.01
4 yrs ago	0.02	0.01
5 yrs ago	0.01	0.01

Early fall (cont.)

For following summer utilization by a summer crop following a harvested winter crop or no winter crop			
No ammonium-N credit			
Late fall/winter⁴			
For following summer utilization by a summer crop following a harvested winter crop or no winter crop			
No ammonium -N credit			
For spring use by grass hay or small grains, or summer use by corn or summer annuals <u>with green manure cover crop</u>			
	Poultry ²	Other	Compost
All situations	0.60	0.50	0.50

1. Mechanical incorporation or incorporation by 0.5 inch of rain.
2. Increase these factors by 0.2 after one day for very liquid manures (<5 percent solids) to account for soaking-in on application. For spring use by grass hay or small grains, or summer use by corn or summer annuals with green manure cover crop
3. Early fall would be when it is still warm enough for plant growth and microbial activity to continue (soil temperature >50°F at 2 inches).
4. Late fall and winter is when it is so cold that there is no plant growth or microbial activity (soil temperature <50°F at 2 inches).

Table 1.1-1. Selected properties and typical capabilities of major Pennsylvania soils.

Note: Ratings provide relative information for comparing soils and should not be used quantitatively.

Moisture contents: corn grain = 15.5%; corn silage = 65%; alfalfa and clover = dry matter; wheat, oats, and barley = 12%; sorghum/sudan = 65%; and soybeans = 13%

Soil series	Depth class ¹	Drain class ²	Leaching potential	Crop		Corn silage (t/A)	Alfalfa (t/A)	Clover (t/A)	Wheat (bu/A)	Oats (bu/A)	Barley (bu/A)	Sorghum/sudan (t/A)	Soybeans (bu/A)
				prod. group	grain (bu/A)								
Abbotstown	D ⁵	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Albrights	D ⁵	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Allegheny	D	WD	2	1	150	25	6	4	60	80	75	25	45
Allenwood	D	WD	2	1	150	25	6	4	60	80	75	25	45
Alton	D	WD ⁵	3	3	125	21	4	3	50	60	50	21	30
Alvira	D ⁵	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Andover	D ⁵	PD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Armagh	D	PD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Aukins	D	PD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Barbour	D	WD	2 ⁷	1	150	25	6	4	60	80	75	25	45
Basler	D	MWD	2 ⁷	2	125	21	5	3.5	60	80	75	21	40
Bath	D ⁵	WD	1 ⁷	2	125	21	5	3.5	60	80	75	21	40
Bedington	D	WD	2	1	150	25	6	4	60	80	75	25	45
Betts	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Birdsell	D	PD	1 ⁷	5	100	17	3 ⁸	2	40 ⁸	60	40 ⁸	17	30
Birsteoro	D	MWD	2 ⁷	1	150	25	6	4	60	80	75	25	45
Blairton	MD	MWD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Bowmansville	D	SWPD	2 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Braceville	D ⁵	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Brecknock	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Brimketon	D	PD	2	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Brooke	MD	WD	1	2	125	21	5	3.5	60	80	75	21	40
Buchanan	D ⁵	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Bucks	D	WD	2	1	150	25	6	4	60	80	75	25	45
Calvin	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Cambridge	D ⁵	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Canfield	D ⁵	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Caronde	D	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Chenango	D	WD ⁵	3	2	125	21	5	3.5	60	80	75	21	40
Chester	D	WD	2	1	150	25	6	4	60	80	75	25	45
Chippewa	D ⁵	PD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Chatsburg	D ⁵	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Clymer	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Comly	D	SWPD	1 ⁷	3	125	21	4 ⁸	3	50	60	50	21	30
Conestoga	D	WD	2	1	150	25	6	4	60	80	75	25	45
Conorton	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Cookport	D ⁵	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Croton	D ⁵	PD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Culleoka	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Dekalb	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Dormont	D	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Duffield	D	WD	2	1	150	25	6	4	60	80	75	25	45
Durancannon	D	WD	2	1	150	25	6	4	60	80	75	25	45
Edgemont	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Edom	D	WD	1	2	125	21	5	3.5	60	80	75	21	40
Elliber	D	WD ⁸	3	2	125	21	5	3.5	60	80	75	21	40
Erie	D ⁴	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Ernest	D ⁵	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Frederon	D	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Franktown	D ⁵	PD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Glipin	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Glenbig	D	WD	2	1	150	25	6	4	60	80	75	25	45
Glenville	D ⁵	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Guernsey	D	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Hagerstown	D	WD	1	1	150	25	6	4	60	80	75	25	45
Harvor	D ⁵	WD	1 ⁷	2	125	21	5	3.5	60	80	75	21	40
Hartleton	D	WD	2	3	125	21	4	3	50	60	50	21	30
Hazleton	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Highfield	D	WD	2	1	150	25	6	4	60	80	75	25	45
Holly	D	PD	2 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30

(continued)

Table 1.1-1. Selected properties and typical capabilities of major Pennsylvania soils (continued).

Soil series	Depth class ¹	Drain class ²	Leaching potential	Crop prod. group	Com grain (bu/A)	Com silage (T/A)	Alfalfa (T/A)	Clover (T/A)	Wheat (bu/A)	Oats (bu/A)	Barley (bu/A)	Sorghum/sudan (T/A)	Soybeans (bu/A)
Huileburg	D	WD	2	1	150	25	6	4	60	80	75	25	45
Huntington	D	WD	2	1	150	25	6	4	60	80	75	25	45
Klinesville	S	WD	2	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Kremer	D	MWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Lackawanna	D ⁵	WD	1 ⁷	2	125	21	5	3.5	60	80	75	21	40
Ladig	D ⁵	WD	1 ⁷	2	125	21	5	3.5	60	80	75	21	40
Langford	D ⁵	WD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Lansdale	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Leck Kill	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Lehigh	D	MMWD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Lehigh	D	WD	2	1	150	25	6	4	60	80	75	25	45
Lewisberry	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Lordsburg	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Maror	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Martin	D ⁵	MMWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Meckesville	D ⁵	WD	1 ⁷	2	125	21	5	3.5	60	80	75	21	40
Mein	D	PD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Mertz	D	WD	1	2	125	21	5	3.5	60	80	75	21	40
Monongahela	D ⁵	MMWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Morris	D ⁴	SWPD	2	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Morrison	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Murtill	D	WD	2	1	150	25	6	4	60	80	75	25	45
Nesaminy	D	WD	2	1	150	25	6	4	60	80	75	25	45
Opequon	S	WD	2	4	100	17	4 ⁸	2.5	40	60	40	17	30
Oquaga	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Penn	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Philo	D	MMWD	2 ⁷	2	125	21	5	3.5	60	80	75	21	40
Platea	D ⁵	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Pope	D	WD	2	1	150	25	6	4	60	80	75	25	45
Rainston	D	MMWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Ravenna	D ⁵	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Rayne	D	WD	2	1	150	25	6	4	60	80	75	25	45
Readington	D ⁵	MMWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Reaville	D	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Red Hook	D	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Sheffield	D ⁵	PD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Stetmadine	D ⁵	PD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Swartswood	D ⁵	MMWD	1 ⁷	2	125	21	5	3.5	60	80	75	21	40
Tunkhannock	D	WD ⁵	3	2	125	21	5	3.5	60	80	75	21	40
Tyler	D	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Uphur	D	WD	1	2	125	21	5	3.5	60	80	75	21	40
Venango	D ⁵	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Volusia	D	SWPD	1 ⁷	4	100	17	4 ⁸	2.5	40 ⁸	60	40 ⁸	17	30
Washington	D	WD	2	1	150	25	6	4	60	80	75	25	45
Watson	D ⁵	MMWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Weikert	S	WD ⁵	2	4	100	17	4 ⁸	2.5	40	60	40	17	30
Weilsboro	D ⁵	MMWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Westmoreland	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Wharton	D	MMWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Wheeling	D	WD	2	1	150	25	6	4	60	80	75	25	45
Wurtsboro	D ⁵	MMWD	1 ⁷	3	125	21	4	3	50	60	50	21	30
Wyoming	D	WD ⁵	3	3	125	21	4	3	50	60	50	21	30

1. Depth classes: D = deep (>40 inches); MD = moderately deep (20 to 40 inches); S = shallow (<20 inches)
2. Drainage classes: WD = well drained; MWD = moderately well drained; SWPD = somewhat poorly drained; PD = poorly drained
3. Leaching ratings—these are only a relative rating of leaching potential. The higher the number, the greater the relative leaching potential.
4. A fragipan is present at 10 to 16 inches (0.25 to 0.40 meter) below the surface of the soil.
5. A fragipan is present at 16 to 40 inches (0.40 to 1 meter) below the surface.
6. These soils are well drained to excessively well drained.
7. These soils have a seasonal high water table that is less than 6 feet from the surface. Leaching potential may be a consideration of water resource use and water table following pesticide application.
8. Crop is not well suited for this soil.

Typical Manure Only

This example illustrates calculating the maximum rate of manure required to meet the nitrogen needs of a crop and the net recommendation for the field based on total analysis for N, P₂O₅, and K₂O and can only be used for typical, non-treated dairy, swine, other livestock, and poultry manures.

Situation

- Recommendations for 150 bu/A corn crop from the soil test report were 150-50-100 pounds of N, P₂O₅ and K₂O, respectively.
- The liquid dairy manure analysis is 20 pounds total N, 11 pounds P₂O₅, and 21 pounds K₂O per 1,000 gallons.
- Manure is to be applied in the spring for this corn crop and incorporated the day after application.
- Similar manure has been applied to this field frequently in the past (two or three out of the last five years).
- The starter fertilizer program is 150 pounds per acre of 10-20-10.
- Last year, the crop in this field was soybeans, which yielded 50 bu/A.

Net Crop Nutrient Requirement

First, all sources of nutrients must be accounted for before a manure rate is calculated by starting with the soil test recommendations and then deducting any other sources of nutrients applied or already available in the field.

Net nutrients required = soil test recommendation – residual N from past manure – residual N from a previous legume crop in the rotation – starter nutrients

Residual N from Past Applications (Table 1.2-14, Part B)

Residual N = 20 lb N/A for a history of frequent manure applications

Residual N from a Previous Legume Crop in the Rotation (Table 1.2-9)

Soybeans @ 50 bu/A x 1 lb residual N/bu = 50 lb N/A from the soybeans the previous year

Starter Fertilizer Nutrients That Will Be Applied Regardless of the Planned Manure Application

150 bu/A of a 10-20-10 starter fertilizer will be used on this field. The N, P₂O₅, and K₂O applied in this fertilizer is calculated as follows:

150 lbs fertilizer/A x 10% N = 15 lb N/A
150 lbs fertilizer/A x 20% P₂O₅ = 30 lb P₂O₅/A
150 lbs fertilizer/A x 10% K₂O = 15 lb K₂O/A

Net nutrients required

	N	P ₂ O ₅	K ₂ O
Soil test recommendation	150	50	100
-Residual manure N	20	—	—
-Residual legume N	50	—	—
-Starter nutrients	15	30	15
Net requirement (lbs/A)	65	20	85

N Balance Manure Application Rate

The N balanced manure application rate is determined by dividing the available N in the manure into the net crop N requirement calculated above.

Available N in the manure = total manure N x N availability factor (Table 1.2-14, Part A)

N availability factor = 0.4 from Table 1.2-14 (based on the time until incorporation or 1 day in this example).

Available N = 20 lb N/1,000 gal x 0.4 = 8 lb N/1,000 gal

Maximum rate per acre to meet N need = net N requirement ÷ available manure N

Rate per acre to meet N need = 65 lbs N/A ÷ 8 lbs N/1,000 gal = 8,125 gal/A

(Note: Any rate less than or equal to this rate is acceptable.)

Nutrients Applied at the Planned Rate

Based on this calculation, the farmer decided to apply 8,000 gal/A. At this application rate the following amounts of nutrients would be applied:

Nitrogen: 8,000 gal/A x 8 lb available N/1,000 gal = 64 lb available N/A
Phosphorus: 8,000 gal/A x 11 lb P₂O₅/1,000 gal = 88 lb P₂O₅/A
Potassium: 8,000 gal/A x 21 lb K₂O/1,000 gal = 168 lb K₂O/A

Final Nutrient Balance on the Field after Manure Application

The nutrient balance is simply the difference between the net crop nutrient requirement and the nutrients applied at the planned rate.

	N	P ₂ O ₅	K ₂ O
(lb/A)			
Net crop nutrient requirement	65	20	85
Nutrients applied at planned rate (8,000 gal/acre)	64	88	168
Balance after manure application	1 short	68 excess	83 excess

As discussed earlier, this excess P should be evaluated with the Phosphorus Index to see if it represents a potential risk to the environment. If the P Index indicates that the risk is high, manure management may have to be changed to address this concern. The excess K could result in high K levels in crops, which can, under certain circumstances, cause problems in animal feeding programs and animal health.

All Manure Including Atypical or Treated Manure

This example illustrates calculating the maximum rate of manure required to meet the nitrogen needs of a crop and the net recommendation for the field based on analysis for dry matter, total N, NH₄-N, total P₂O₅, and K₂O. This calculation can be used for all manure, but it is required for atypical and/or treated manures.

Situation

- Recommendations from the soil test report were 160-50-40 lbs of N, P₂O₅ and K₂O, respectively.
- This poultry manure was composted and has an analysis of 50 lbs total N, 10 lbs NH₄-N, 40 lbs P₂O₅, and 30 lbs K₂O/dm, and 40 percent moisture.
- Manure is to be incorporated three days after application.
- Manure with the same analysis has been applied to this field at the rate of 10 dm/A each of the last three years.
- The starter fertilizer program is 5 gal/A of 10-34-0 (Note: 10-34-0 weighs 11.86 lb/gal).

Net Crop Nutrient Requirement

First all sources of nutrients must be accounted for before a manure rate is calculated by starting with the soil test recommendations and then deducting any other sources of nutrients applied or already available in the field.

Net nutrients required = soil test recommendation – residual N from past manure – residual N from a previous legume crop in the rotation – starter nutrients

Residual N from Past Applications (Table 1.2-15)

Residual N from past manure applications is estimated as follows: For each year in the last five when manure was applied, multiply the rate applied x organic N analysis x the appropriate factor from the section of Table 1.2-15 labeled "Organic N decomposed from past applications." Note that if the organic N is not given on the manure analysis report it can be calculated by subtracting the ammonium N from the total N on the report. In this example the manure is composted and has 50 lbs total N/dm and 10 lbs of NH₄-N/dm.

Organic N = total N – ammonium N = 50 lb/dm – 10 lb/dm = 40 lb/dm organic N

Residual N from last year: 10 dm/A x 40 lbs organic N/dm x 0.05 = 20 lbs N/A

Residual N from 2 years ago: 10 dm/A x 40 lbs organic N/dm x 0.02 = 8 lbs N/A

Residual N from 2 years ago: 10 dm/A x 40 lbs organic N/dm x 0.01 = 4 lbs N/A

Total residual N from past applications: 32 lbs N/A

Residual N from a Previous Legume Crop in the Rotation (Table 1.2-9)

None in this example.

Starter Fertilizer Nutrients That Will Be Applied Regardless of the Planned Manure Application

5 gal/A of a 10-34-0 starter fertilizer will be used on this field. First, since this is a liquid fertilizer the gal/A must be converted to dm/A. To do this multiply the number of gal/A x the weight/gal. 5 gal/A x 11.86 lbs/gal = 59.3 lbs/A

Then the N, P₂O₅, and K₂O applied in this fertilizer are calculated as follows:

59.3 lbs fertilizer/A x 10% N = 6 lbs N/A
59.3 lbs fertilizer/A x 20% P₂O₅ = 20 lbs P₂O₅/A
There is no K₂O in this fertilizer.

Net nutrients required

	N	P ₂ O ₅	K ₂ O
(lb/A)			
Soil test recommendation	160	50	40
-Residual manure N	32	—	—
-Residual legume N	0	—	—
-Starter nutrients	6	20	0
Net requirement (lb/A)	122	30	40

N Balance Manure Application Rate

The N balanced manure application rate is determined by dividing the available N in the manure into the net crop N requirement calculated above. For treated manures the available N is the sum of the N available from both the ammonium and organic N.

Available NH₄-N in the manure = NH₄-N x NH₄-N availability factor (Table 1.2-15)

NH₄-N availability factor = 0.4 from Table 1.2-15 (based on the time until incorporation or 3 days in this example).

NH₄-N x NH₄-N availability factor = 10 x 0.40 = 4 lbs N/dm

Available organic N in the manure = organic N x organic N availability factor (Table 1.2-15)

In this example, the manure is composted and has 50 lbs total N/dm and 10 lbs NH₄-N/dm

Organic N = total N – ammonium N = 50 lb/dm – 10 lb/dm = 40 lb/dm organic N

Organic N availability factor = 0.1 from Table 1.2-15 (composted manure in this example):

Organic N x Organic N availability factor = 40 x 0.10 = 4 lbs N/dm

Total available N in the manure = available NH₄-N + available organic N

Total available N = 4 lbs NH₄-N/dm + 4 lbs organic N/dm = 8 lbs available N/dm

Maximum rate per acre to meet N need = net N requirement ÷ available manure N

Rate per acre to meet N need = 126 lbs N/A ÷ 8 lb N/dm = 15.25 dm/A

(Note: Any rate less than or equal to this rate is acceptable.)

(Note: This may seem to be a very high rate for poultry manure, but because it was composted, the N availability is very low compared to raw poultry manure, thus a larger amount is required to supply adequate available N for this crop.)

Nutrients Applied at the Planned Rate

Based on this calculation, which determined that up to 15.25 dm/A could be applied, the farmer decided to apply 10 dm/A. At this application rate the following amounts of nutrients would be applied:

Nitrogen: 10 dm/A x 8 lbs available N/dm = 80 lbs available N/A
Phosphorus: 10 dm/A x 40 lbs P₂O₅/dm = 400 lbs P₂O₅/A
Potassium: 10 dm/A x 30 lbs K₂O/dm = 300 lbs K₂O/A

Final Nutrient Balance on the Field after Manure Application

The nutrient balance is simply the difference between the net crop nutrient requirement and the nutrients applied at the planned rate.

	N	P ₂ O ₅	K ₂ O
(lb/A)			
Net crop nutrient requirement	122	30	40
Nutrients applied at planned rate	80	400	300
Balance after manure application	42 short	370 excess	260 excess

Note that one of the consequences of applying a low N availability material like compost at a rate that comes close to matching the N needs of the crop will usually apply a large excess of P and K. This is very clear in this example even though the rate the farmer chose was much lower than the rate required to supply the available N needs.

Supplemental Fertilizer Needs

In this example the N applied at the farmers planned rate will not be adequate to meet the needs of the crop. Therefore, a supplemental N fertilizer application will be needed to supply the 42 lbs N/A that he is short.

Supplement 2

Sample Nutrient Management Plan

Supplement 2 provides a sample of a completed Nutrient Management Plan. The sample Nutrient Management Plan was developed using Nutrient Management Plan Standard Format: Version 4.1 – September 2013.

Nutrient Management Plan

For Crop Years(s)
2014

Prepared for

Creekside Dairy
Jesse L. Landis
1000 Penn Grant Road
Lancaster, PA 17602
717-626-9034

Prepared by

Thomas D. Smith
1000
Smith Crop Consulting
123 Pine Hill Lane
Lancaster, PA 17601
717-393-0208

Date of Plan Submission

September 14, 2013

Date(s) of Plan Update Submissions

(updates to approved plan not requiring board action)

Table of Contents

- Nutrient Management Plan Summary
 - Nutrient Management Plan Summary Notes
 - Additional Nutrient Management Plan Requirements
 - Operator Management Map
- Appendix 1: Nutrient Management Plan Agreement & Responsibilities
- Appendix 2: Operation Information
- Appendix 3: Manure Group Information
- Appendix 4: Crop and Manure Management Information
- Appendix 5: Phosphorus Index
- Appendix 6: Manure Management
- Appendix 7: Stormwater Control
- Appendix 8: Importer/Broker Agreements & Nutrient Balance Sheets
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Nutrient Management Plan Summary

Total acres reported in NMP Summary: 246.6

Crop Year(s) 2014

If manure runs out for any field, consult Appendix 4 of the plan for that field. The fertilizer required on any part of the field that does not receive manure can be determined from the 'Net Nutrients Required' for that field.

Whole Farm Note:

CMU/Field ID	Acres	Crop	Manure Group	Application Season	Application Management	Planned Manure Rate	Starter/Other Fertilizer (lb/A)			Supplemental Fertilizer (lb/A)			Nutrient Balance (lb/A) ¹			Notes (Select "Yes")
							N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
A6	3.9	Pasture	Dry Cows Fall - uncollected	Grazing	Late spring through early fall	Grazing See Notes	0	0	0	103	0	0	0	-11	-48	Yes
A20	2.9	Pasture	Pre-Fresh Heifers - uncollected	Grazing	Late spring through early fall	Grazing See Notes	0	0	0	85	0	0	0	-44	-64	Yes
A5	4.7	Small grain silage	No Manure	No Manure	No Manure	0	0	0	0	79	0	0	0	0	0	
A5	4.7	Corn Silage	Heifer Spring	Spring	Incorporated within 2-4 days	10 ton/A	0	0	0	116	0	0	0	-61	-73	
A7	9	Small grain silage	No Manure	No Manure	No Manure	0	0	0	0	79	0	0	0	0	0	Yes
A7	9	Corn Silage	Heifer Spring	Spring	Incorporated within 2-4 days	10 ton/A	0	0	0	116	0	0	0	-61	-73	Yes
A16	2.4	Small grain silage	No Manure	No Manure	No Manure	0	0	0	0	79	0	30	0	0	0	
A16	2.4	Corn Silage	Heifer Spring	Spring	Incorporated within 2-4 days	10 ton/A	0	0	0	116	0	0	0	-61	-13	
A19	4.4	Small grain silage	No Manure	No Manure	No Manure	0	0	0	0	79	0	0	0	0	0	Yes
A19	4.4	Corn Silage	Heifer Spring	Spring	Incorporated within 2-4 days	10 ton/A	0	0	0	116	0	0	0	-61	-73	Yes
B8	12.5	Small grain silage	No Manure	No Manure	No Manure	0	0	0	0	79	0	0	0	0	0	Yes
B8	12.5	Corn Silage	No Manure	No Manure	No Manure	0	0	0	0	156	0	0	0	0	0	Yes

¹ See rate calibration table (Nutrient Management Plan Summary Notes).

² Positive numbers = nutrient deficit;
Negative numbers = nutrient excess

Nutrient Management Plan Summary

Total acres reported in NMP Summary: 246.6

Crop Year(s) 2014

If manure runs out for any field, consult Appendix 4 of the plan for that field. The fertilizer required on any part of the field that does not receive manure can be determined from the 'Net Nutrients Required' for that field.

Whole Farm Note:

CMU/Field ID	Acres	Crop	Manure Group	Application Season	Application Management	Planned Manure Rate	Starter/Other Fertilizer (lb/A)			Supplemental Fertilizer (lb/A)			Nutrient Balance (lb/A) ¹			Notes (Select "Yes")
							N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
A21	10.4	Small grain silage	Heifer Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	10 ton/A	0	0	0	43	0	0	0	-67	-56	Yes
A21	10.4	Corn Silage	No Manure	No Manure	No Manure	0	0	0	0	132	0	0	0	-67	-26	Yes
B9	3.8	Small grain silage	Heifer Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	10 ton/A	0	0	0	47	0	84	0	-67	0	Yes
B9	3.8	Corn Silage	Cow Spring	Spring	Incorporated within 2-4 days	7850 gal/A	0	0	0	56	0	148	0	-142	0	Yes
B13	5.5	Small grain silage	Heifer Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	10 ton/A	0	0	0	43	0	0	0	-67	-76	Yes
B13	5.5	Corn Silage	Cow Spring	Spring	Incorporated within 2-4 days	7850 gal/A	0	0	0	80	0	0	0	-142	-208	Yes
A11	3.4	Small grain silage	Cow Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	7850 gal/A	0	0	0	31	0	0	0	-82	-3	
A11	3.4	Corn Silage	Cow Spring	Spring	Incorporated within 2-4 days	7850 gal/A	0	0	0	72	0	115	0	-157	0	

¹ See rate calibration table (Nutrient Management Plan Summary Notes).

² Positive numbers = nutrient deficit;
Negative numbers = nutrient excess

Nutrient Management Plan Summary

Total acres reported in NMP Summary: 246.6

Crop Year(s) 2014

If manure runs out for any field, consult Appendix 4 of the plan for that field. The fertilizer required on any part of the field that does not receive manure can be determined from the 'Net Nutrients Required' for that field.

Whole Farm Note:

CMU/Field ID	Acres	Crop	Manure Group	Application Season	Application Management	Planned Manure Rate	Starter/Other Fertilizer (lb/A)			Supplemental Fertilizer (lb/A)			Nutrient Balance (lb/A) ¹			Notes (Select "Yes")
							N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
A13	8.3	Small grain silage	Cow Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	7850 gal/A	0	0	0	31	0	47	0	-82	0	
A13	8.3	Corn Silage	Cow Spring	Spring	Incorporated within 2-4 days	7850 gal/A	0	0	0	72	0	158	0	-157	0	
A17	18.2	Small grain silage	Cow Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	7850 gal/A	0	0	0	35	0	0	0	-82	-83	Yes
A17	18.2	Corn Silage	Cow Spring	Spring	Incorporated within 2-4 days	7850 gal/A	0	0	0	48	0	0	0	-157	-105	Yes
B3	5.3	Small grain silage	Cow Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	7850 gal/A	0	0	0	31	0	0	0	-82	-23	
B3	5.3	Corn Silage	Cow Spring	Spring	Incorporated within 2-4 days	7850 gal/A	0	0	0	72	0	65	0	-157	0	
A2	4	Small grain silage	Cow Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	7850 gal/A	0	0	0	31	0	0	0	-82	-123	
A2	4	Corn Silage	Cow Spring	Spring	Incorporated within 2-4 days	7850 gal/A	0	0	0	72	0	0	0	-157	-225	

¹ See rate calibration table (Nutrient Management Plan Summary Notes).

² Positive numbers = nutrient deficit;
Negative numbers = nutrient excess

Nutrient Management Plan Summary

Total acres reported in NMP Summary: 246.6

Crop Year(s) 2014

If manure runs out for any field, consult Appendix 4 of the plan for that field. The fertilizer required on any part of the field that does not receive manure can be determined from the 'Net Nutrients Required' for that field.

Whole Farm Note:

CMU/Field ID	Acres	Crop	Manure Group	Application Season	Application Management	Planned Manure Rate	Starter/Other Fertilizer (lb/A)			Supplemental Fertilizer (lb/A)			Nutrient Balance (lb/A) ¹			Notes (Select "Yes")
							N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
A4	5.9	Small grain silage	Cow Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	7850 gal/A	0	0	0	31	0	0	0	-82	-143	
A4	5.9	Corn Silage	Cow Spring	Spring	Incorporated within 2-4 days	7850 gal/A	0	0	0	72	0	0	0	-157	-275	
A18	3.6	Small grain silage	Cow Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	7850 gal/A	0	0	0	31	0	0	0	-82	-143	Yes
A18	3.6	Corn Silage	Heifer Spring	Spring	Incorporated within 2-4 days	18 ton/A	0	0	0	52	0	0	0	-192	-274	Yes
B1	4.8	Small grain silage	Cow Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	7850 gal/A	0	0	0	35	0	0	0	-82	-113	
B1	4.8	Corn Silage	Cow Spring	Spring	Incorporated within 2-4 days	7850 gal/A	0	0	0	48	0	0	0	-157	-185	
B5	5.6	Small grain silage	Heifer Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	18 ton/A	0	0	0	14	0	23	0	-121	0	Yes
B5	5.6	Corn Silage	Heifer Spring	Spring	Incorporated within 2-4 days	18 ton/A	0	0	0	40	0	149	0	-231	0	Yes

¹ See rate calibration table (Nutrient Management Plan Summary Notes).

² Positive numbers = nutrient deficit;
Negative numbers = nutrient excess

Nutrient Management Plan Summary

Total acres reported in NMP Summary: 246.6

Crop Year(s) 2014

If manure runs out for any field, consult Appendix 4 of the plan for that field. The fertilizer required on any part of the field that does not receive manure can be determined from the 'Net Nutrients Required' for that field.

Whole Farm Note:

CMU/Field ID	Acres	Crop	Manure Group	Application Season	Application Management	Planned Manure Rate	Starter/Other Fertilizer (lb/A)			Supplemental Fertilizer (lb/A)			Nutrient Balance (lb/A) ¹			Notes (Select "Yes")
							N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
B12	2.3	Small grain silage	Heifer Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	10 ton/A	0	0	0	47	0	94	0	-67	0	
B12	2.3	Corn Silage	Heifer Spring	Spring	Incorporated within 2-4 days	18 ton/A	0	0	0	36	0	149	0	-177	0	
C1	10.7	Corn Silage	Cow Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	7850 gal/A	0	0	0	52	0	137	0	-82	0	
C2	13.4	Small grain silage	No Manure	No Manure	No Manure	0	0	0	0	90	0	140	0	0	0	
C2	13.4	Corn Silage	No Manure	No Manure	No Manure	0	0	0	0	180	0	250	0	0	0	
C3	13.7	Small grain silage	No Manure	No Manure	No Manure	0	0	0	0	79	0	170	0	0	0	Yes
C3	13.7	Corn Silage	No Manure	No Manure	No Manure	0	0	0	0	156	0	280	0	0	0	Yes
A8	3.2	Small grain silage	Heifer Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	10 ton/A	0	0	0	43	0	4	0	-67	0	
A8	3.2	Corn Silage	No Manure	No Manure	No Manure	0	0	0	0	132	0	140	0	-67	0	

¹ See rate calibration table (Nutrient Management Plan Summary Notes).

² Positive numbers = nutrient deficit;
Negative numbers = nutrient excess

Nutrient Management Plan Summary

Total acres reported in NMP Summary: 246.6

Crop Year(s) 2014

If manure runs out for any field, consult Appendix 4 of the plan for that field. The fertilizer required on any part of the field that does not receive manure can be determined from the 'Net Nutrients Required' for that field.

Whole Farm Note:

CMU/Field ID	Acres	Crop	Manure Group	Application Season	Application Management	Planned Manure Rate	Starter/Other Fertilizer (lb/A)			Supplemental Fertilizer (lb/A)			Nutrient Balance (lb/A) ¹			Notes (Select "Yes")
							N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
A9	4.8	Small grain silage	Heifer Fall	Early Fall	Spring use by winter crops or grass hay > Incorporated within 3-7 days	10 ton/A	0	0	0	43	0	14	0	-67	0	
A9	4.8	Corn Silage	No Manure	No Manure	No Manure	0	0	0	0	132	0	170	0	-67	0	
A1	6.6	First year Alfalfa	No Manure	No Manure	No Manure	0	0	0	0	0	0	210	0	0	0	
A3	2.4	Alfalfa	No Manure	No Manure	No Manure	0	0	0	0	0	0	270	0	0	0	
A10	5.2	Alfalfa	No Manure	No Manure	No Manure	0	0	0	0	0	0	270	0	0	0	
A12	3.9	Alfalfa	No Manure	No Manure	No Manure	0	0	0	0	0	0	200	0	0	0	Yes
A15	5.8	Alfalfa	No Manure	No Manure	No Manure	0	0	0	0	0	0	30	0	0	0	
B2	5.4	First year Alfalfa	No Manure	No Manure	No Manure	0	0	0	0	0	0	220	0	0	0	
B4	5.5	Alfalfa	No Manure	No Manure	No Manure	0	0	0	0	0	0	0	0	0	0	Yes
B7	5.5	Alfalfa	No Manure	No Manure	No Manure	0	0	0	0	0	0	130	0	0	0	Yes
B11	6.6	Alfalfa	No Manure	No Manure	No Manure	0	0	0	0	0	0	270	0	0	0	
A14	10.8	Soybeans	No Manure	No Manure	No Manure	0	0	0	0	0	0	80	0	0	0	Yes
A22	12.8	Soybeans	No Manure	No Manure	No Manure	0	0	0	0	0	0	0	0	0	0	Yes
B6	5.4	Soybeans	No Manure	No Manure	No Manure	0	0	0	0	0	0	110	0	0	0	Yes
B10	4	Soybeans	No Manure	No Manure	No Manure	0	0	0	0	0	0	0	0	0	0	

¹ See rate calibration table (Nutrient Management Plan Summary Notes).

² Positive numbers = nutrient deficit;
Negative numbers = nutrient excess

Nutrient Management Plan Summary Notes

Crop Years. 2014

CMU/Field ID	Notes
A6	Dry cow pasture grazing season is from April through October. Average number of 8 cows are fed and watered in the barn and have unlimited access to pasture during the grazing season. 35' manure (mechanical) application setback from stream.
A20	Heifer pasture grazing season is from April through October. Average number of 12 heifers are fed and watered in the barn and have unlimited access to pasture during the grazing season. 35' manure (mechanical) application setback from stream.
A7	100' manure application setback from stream.
A7	100' manure application setback from stream.
A19	100' manure application setback from stream.
A19	100' manure application setback from stream.
B8	100' manure application setback from stream.
B8	100' manure application setback from stream.
A21	100' manure application setback from stream.
A21	100' manure application setback from stream.
B9	100' manure application setback from stream.
B9	100' manure application setback from stream.
B13	100' manure application setback from stream.
B13	100' manure application setback from stream.
A17	100' manure application setback from wellhead.
A17	100' manure application setback from wellhead.
A18	100' manure application setback from stream.
A18	100' manure application setback from stream.
B5	100' manure application setback from stream.
B5	100' manure application setback from stream.
C3	100' manure application setback from wellhead.
C3	100' manure application setback from wellhead.
A12	100' manure application setback from wellhead.
B4	100' manure application setback from stream.
B7	100' manure application setback from stream.
A14	100' manure application setback from wellhead.
A22	100' manure application setback from wellhead.
B6	100' manure application setback from stream.

Manure Spreader Calibration Notes

Manure Application Rate	Manure Spreader Used	Spreader Settings	Tractor Used (if applicable)	Tractor Settings (speed, gear, rpm, pto, etc.)
7850 gallons/acre	Nuhn 6500		John Deere 8300	1.8 mph @ 1700 rpm
10 ton/acre	Knight 8018 Pro-Twin		John Deere 8300	4.5 mph @ 1700 rpm
18 ton/acre	Knight 8018 Pro-Twin		John Deere 8300	2.8 mph @ 1700 rpm

Additional Nutrient Management Plan Requirements

Manure Management and Stormwater BMP Implementation Summary

¹ - If applicable, enter USDA-NRCS Practice Code. For additional BMPs, enter the BMP description in the first blank cell.

Best Management Practice	NRCS Practice Code ¹	BMP Location	Implementation Season & Year
Heavy Use Area Protection	561	Cow Facility	Summer 2014
Animal Trails and Walkways	575	Cow Facility	Summer 2014
Animal Trails and Walkways	575	Calf & Heifer Facility	Summer 2014

In-Field Manure Stacking Procedures

Manure must be applied to the field within 120 days of stacking or the stacks must be covered. Stacks must be implemented and maintained according to sound BMPs, addressing concerns such as soil type, soil slope, shape of the pile, setbacks, and rotation of piles.

There will be no regular in-field stacking of manure on the operation. An emergency in-field stacking area for the calf and heifer manure has been designated in field A15 (located on Farm 1 Operator Map).

Additional CAFO Requirements

In-field stacking criteria, winter storage requirements, and other issues identified by DEP's review of the nutrient management plan.

Not applicable.

Proposed Manure Storage Description

Type, dimensions, volume, freeboard and location on map.

Not applicable.

Description of Planned Alternative Manure Technology Practices

Type of practice, volume of manure addressed, and result of practice.

Exported Manure Summary

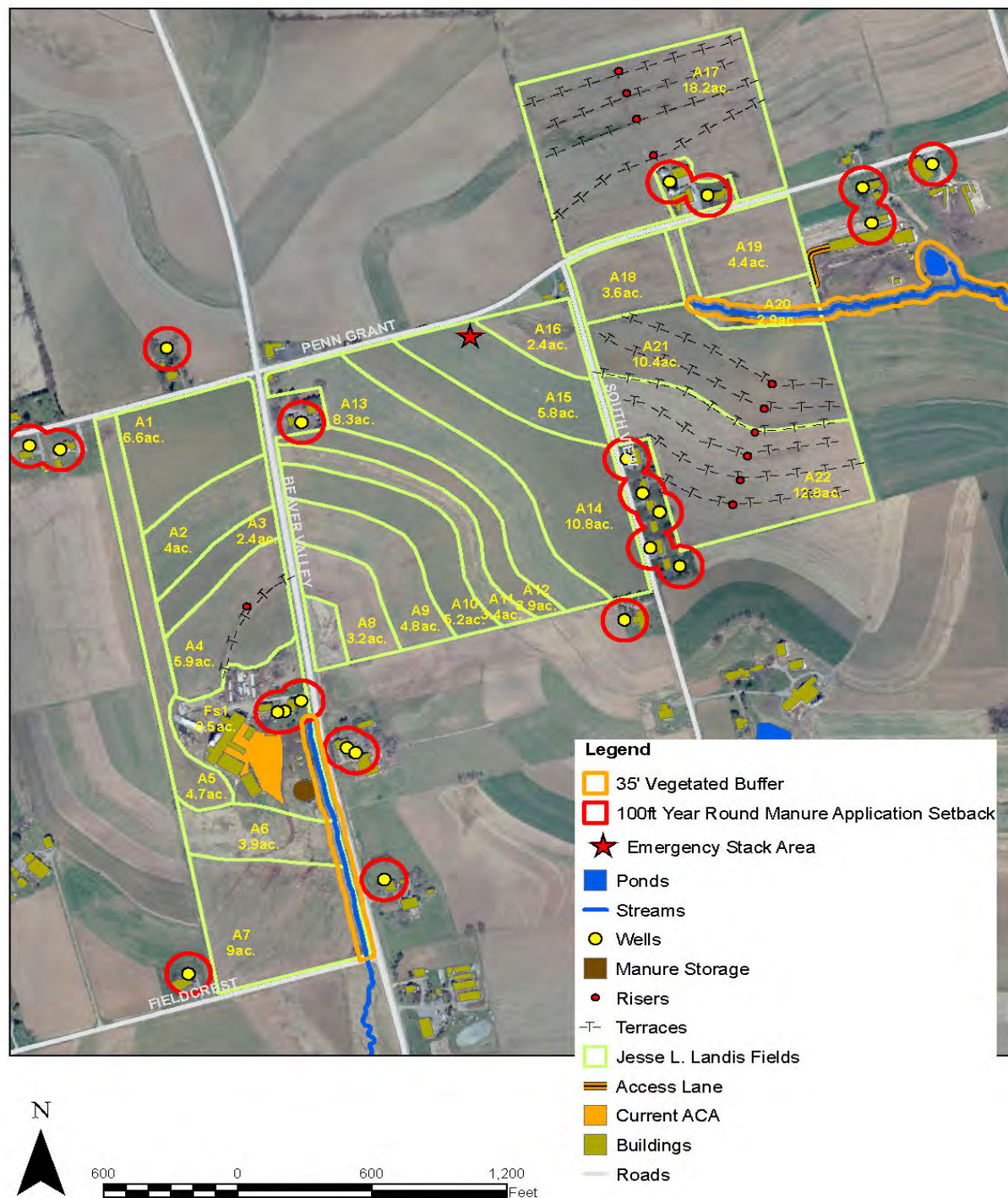
Summarize in a short paragraph the arrangements proposed for the manure to be exported from the operation. This information is described in more detail in Appendix 8 of this plan.

There is no exported manure.

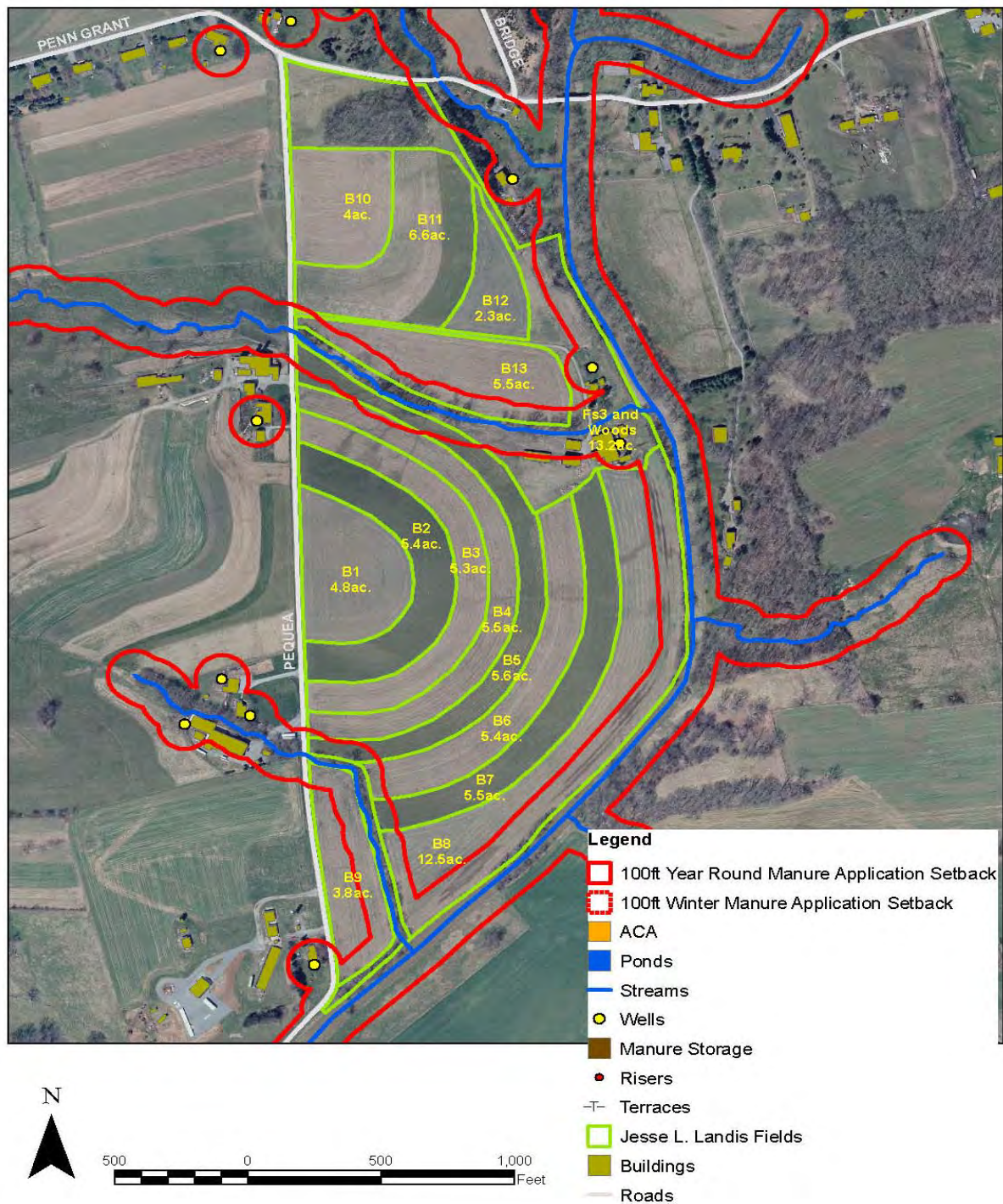
Operator Management Map

Three types of maps are required for an Act 38 Nutrient Management Plan: 1) Topographic Map, 2) Soils Map, and 3) Operator Management Map. The **Operator Management Map** is to be included here in the Nutrient Management Plan Summary and must include field identification, acreage and boundaries, manure application setback areas and buffers and associated landscape features (streams and other water bodies, sinkholes and active water wells), location of existing and proposed structural BMPs (including manure storage facilities), location of existing or proposed emergency manure stacking areas and in-field manure stacking areas, and road names adjacent to and within the operation. All features on the map must be clearly identified and include a legend for setback areas and other features. The Topographic Map and Soils Map must be included in Appendix 9.

CREEKSIDE DAIRY - FARM 1 OPERATOR MAP



CREEKSIDE DAIRY - FARM 2 OPERATOR MAP



CREEKSIDE DAIRY - FARM 3 OPERATOR MAP



Nutrient Management Plan Agreement & Responsibilities

Plan Implementation Requirements

This nutrient management plan has been developed to meet the requirements of the following programs:

- ☒ Pennsylvania Act 38 of 2005, Select one → ☐ CAO ☒ VAO
☐ Pennsylvania CAFO (Concentrated Animal Feeding Operation) program
☐ NRCS (Natural Resources Conservation Service) 590 Nutrient Management Standard
☐ NRCS CNMP (Comprehensive Nutrient Management Plan)
☐ Other program: _____

Plans developed under these programs are required to be implemented as approved in order to maintain compliance with the specific law or program. Implementation includes adherence to manure and fertilizer application rates, timing, setbacks and conditions; installation of listed BMPs within implementation timeframes; and recordkeeping obligations of the program.

The nutrient management plan has been developed as a: (check one)

- ☒ 1 - Year Plan for crop year _____ 2014 (annual updates will be completed)
☐ 3 - Year Plan for crop years _____

Records required to be maintained include the following:

- 1) Annual crop yields
- 2) Manure and fertilizer application rates, locations and date of application
- 3) Manure production figures for the various manure groups listed in your plan
- 4) Soil test reports (testing required every 3 years per crop management unit)
- 5) Manure test reports (testing required once a year for each manure group)
- 6) Number of animals on pasture, number of days on pasture, and hours per day on pasture
- 7) For operations exporting manure, Manure Export Sheets
- 8) BMP designs and certification for new liquid and semi-solid manure storage facilities

The following has been confirmed:

- ☒ Verification of Existing Site Specific Emergency Response Plan
☐ Verification that owners of rented/leased lands have been notified that a nutrient management plan has been developed which calls for manure to be applied to their lands and that they have no objections to the plan requirements.
☒ No rented/leased lands

Specialist Signature

I affirm that the information contained in this nutrient management plan is true, accurate and complete to the best of my knowledge and belief, based on information provided by the operator. This plan has been developed in accordance with the criteria established for the program(s) indicated above. I affirm that I have discussed the content and implementation of this plan with the operator.

Specialist Signature

Date July 25, 2013

Operator Agreement

I affirm that all information provided in this nutrient management plan is true, accurate and complete to the best of my knowledge and belief, and reflects the current and planned activities of the operation. I understand and affirm that I will implement the practices, procedures and record keeping obligations as outlined in this plan in order to protect water quality and address the nutrient needs of the crops associated with the operation. I affirm that if I use a commercial hauler or broker for the application or export of manure, that only haulers or brokers that hold a valid certification issued by the Pa Department of Agriculture, under Act 49 of 2004, will be used.

Operator's Signature

Date July 25, 2013

Operator's Title Owner

Appendix 2

Operation Information

Operation Description

Animal types and numbers; cropland, hayland and pastureland acreage; farmstead acreage; crop rotation (crops, sequence of crops, and number of years for each crop); manure group management, including atypical manure (contributing animal groups, collection, storage and handling procedures); mortality composting management.

This dairy operation is a purebred Holstein dairy with approximately 100 cows and 84 replacement heifers.

The cows are housed in a freestall barn. The manure from the cows, along with milkhouse wastewater and barnyard runoff is collected in a circular concrete storage. Dry cows are pastured on a 3.9 acre pasture from April to October and are fed and watered in the barn during the grazing season.

Replacement animals are housed and raised in a roofed calf and heifer facility from birth to freshening. Calves are raised in individual calf pens. After weaning they move through a series of seven group bedded pack pens until freshening. Manure from all the pens is scraped into a roofed manure storage that is part of the heifer facility. The oldest group of heifers (1100 – 1200 pounds) has access to a 2.9 acre pasture from April to October and are fed and watered in the barn.

Both storages are emptied in the spring and fall and the manure is land applied on the operation.

The operation consists of 246.6 crop acres and 20.4 farmstead acres. The crop rotation is Small Grain Silage/Corn Silage (4 years), Alfalfa (4 years), and Soybeans (1 year). Tillage is a chisel/disk.

County(s)

Lancaster

Name of Receiving Stream(s)/Watershed(s)

Pequea Creek

Notation of Special Protection Waters

None

Operation Acres

Total Acres: 267

Total Acres Available For Nutrient Application Under Operator's Control

Owned: 246.6

Rented: 0

Names & Addresses of Owners of Rented or Leased Land

Not applicable.

Animal Equivalent Units: 184.44

Animal Equivalent Units Per Acre: 0.75

Existing Manure Storages & Capacity

Type of storage, dimensions, useable capacity, freeboard, top or bottom loaded, dimensions and description of contributing runoff area, description of wastewater additions, types and amounts of bedding. Briefly describe, for each manure group, manure storage management during removal (degree of agitation, method of manure removal, extent the storage is emptied, type of unremoved manure, etc.) and manure sampling procedures. If additional space is needed, make a note and include the information in Appendix 10.

The manure storage for the cow facility is an 80' x 18' slurrystore. With a 1' freeboard the useable capacity is 638,852 gallons. Runoff from the proposed 50' x 100' concrete exercise lot along with the milkhous wastewater will be directed to the storage and bottom loaded. Sawdust bedding is used at the rate of 8 cubic yards/week. The storage is thoroughly agitated and completely emptied during each application season. Manure analysis lab samples are obtained when the storage is emptied from subsamples taken from every fifth load and mixed together.

The manure storage for the calf and heifer facility is located between the calf and heifer barns. The 75' x 42' x 6' concrete stacking area is walled and roofed with a capacity of 520 tons. Manure from all pens is scraped and stored in this area. Straw bedding is used. The storage is completely emptied during each application season. Manure analysis lab samples are obtained when the storage is emptied from subsamples taken from every fifth load and mixed together.

Manure Application Equipment Capacity & Practical Application Rates

Description of application equipment, practical application rates based on calibration and calibration method used, the data recorded during equipment calibration is to be retained on the farm.

A Knight 8018 Pro-Twin spreader is used to apply the solid manure and was calibrated using the tarp method at rates of 10 and 18 tons per acre. A Nuhn 6500 spreader is used to apply the liquid manure and was calibrated using the swath area method at a rate of 7850 gallons per acre.

Appendix 3

Manure Group Information

When entering manure group information for the first time, select "Calculated or Records" button.

Manure Group Identification	Cow Spring		Cow Fall		Heifer Spring		Heifer Fall	
Manure Report Date (note if averaging several reports)	March 26, 2013		October 3, 2012		March 26, 2013		October 28, 2012	
Laboratory Name	AASL		AASL		AASL		AASL	
Manure Type	Dairy		Dairy		Dairy		Dairy	
Manure Unit (lbs/ton or 1000 gal)	lb/1000 gal		lb/1000 gal		lb/ton		lb/ton	
Total Nitrogen (N) (lbs/ton or 1000 gal)	18.9		20.5		11.4		12.1	
Ammonium N (NH ₄ -N) (lbs/ton or 1000 gal)	7.4		8.3		2.5		2.8	
Total Organic N (lbs/ton or 1000 gal)	11.5		12.2		8.9		9.3	
Total Phosphate (P ₂ O ₅) (lbs/ton or 1000 gal)	9.6		10.4		6.1		6.7	
Total Potash (K ₂ O) (lbs/ton or 1000 gal)	16.8		18.2		7.3		7.6	
Percent Solids	5.70		5.50		34.70		34.70	
PSC Value (Enter analytical or book value)	0.80	0.80	0.80	0.80				
Inventory Method	Calculated		Calculated		Calculated		Calculated	
	Collected Calc.	Uncollected Calc.	Collected Calc.	Uncollected Calc.	Collected Calc.	Uncollected Calc.	Collected Calc.	Uncollected Calc.
Manure Group Identification	Cow Spring	Cow Spring - uncollected	Cow Fall	Cow Fall - uncollected	Heifer Spring	Heifer Spring - uncollected	Heifer Fall	Heifer Fall - uncollected
Description: Site & Season Applied	Slurrystore - Spring		Slurrystore - Early Fall		Heifer Barn Storage - Spring		Heifer Barn Storage - Early Fall	
CALCULATED: Total Manure Collected Per Manure Group Unit	469069 Gallons	4 Tons	498354 Gallons	23 Tons	414 Tons	6 Tons	383 Tons	37 Tons
RECORDS: Total Manure Collected Per Manure Group Unit								
	Collected	Uncollected	Collected	Uncollected	Collected	Uncollected	Collected	Uncollected
Manure Used On-Farm	464720	0	503970	27	412	0	401	43
Units	Gallons	Tons	Gallons	Tons	Tons	Tons	Tons	Tons
Manure Allocation Balance	4349	4	-5616	-4	2	6	-18	-6
Units	Gallons	Tons	Gallons	Tons	Tons	Tons	Tons	Tons
Manure Exported								
Units								
Total Rainfall and Runoff	117405		151370		0		0	

	Manure Generation per Animal Group *	Uncollected Manure: Nutrient Analysis Book Values	Manure Generation per Animal Group *	Uncollected Manure: Nutrient Analysis Book Values	Manure Generation per Animal Group *	Uncollected Manure: Nutrient Analysis Book Values	Manure Generation per Animal Group *	Uncollected Manure: Nutrient Analysis Book Values
Animal Group 1	Lactating Cows		Lactating Cows		Calves & Heifers		Calves & Heifers	
Animal Type	Dairy:Lact. Cows, liquid		Dairy:Lact. Cows, liquid		Dairy:Calf		Dairy:Calf	
Animal Number	92		92		72		72	
Animal Weight	1300		1300		600		600	
Animal Group AUs	119.6		119.6		43.2		43.2	
Animal Group AEUs	58.98		58.98		21.30		21.30	
Daily Manure Production per AU	13		13		80		80	
Total Days Manure Produced	180		180		180		180	
Total Manure Produced	279864		279864		311		311	
Days On Pasture	0		0		0		0	
Hours Per Day On Pasture	0		0		0		0	
Total Bedding	21004		21004		35		35	
Total Washwater	40500		40500		0		0	
CALCULATED - Total Uncollected Manure								
CALCULATED-Total Manure Collected Per Animal Group	458773		492738		346		346	
Animal Group 2	Dry Cows Spring	Dry Cows Spring - uncollected	Dry Cows Fall	Dry Cows Fall - uncollected	Pre-Fresh Heifers	Pre-Fresh Heifers - uncollected	Pre-Fresh Heifers	Pre-Fresh Heifers - uncollected
Animal Type	Dairy:Dry Cow	Total Nitrogen (N) (lbs/ton or 1000 gal)	Dairy:Dry Cow	Total Nitrogen (N) (lbs/ton or 1000 gal)	Dairy:Heifer	Total Nitrogen (N) (lbs/ton or 1000 gal)	Dairy:Heifer	Total Nitrogen (N) (lbs/ton or 1000 gal)
Animal Number	8	9.00	8	9.00	12	10.00	12	10.00
Animal Weight	1300	Total Phosphate (P2O5) (lbs/ton or 1000 gal)	1300	Total Phosphate (P2O5) (lbs/ton or 1000 gal)	1150	Total Phosphate (P2O5) (lbs/ton or 1000 gal)	1150	Total Phosphate (P2O5) (lbs/ton or 1000 gal)
Animal Group AUs	10.4	3.00	10.4	3.00	13.8	3.00	13.8	3.00
Animal Group AEUs	5.13	Total Potash (K2O) (lbs/ton or 1000 gal)	5.13	Total Potash (K2O) (lbs/ton or 1000 gal)	6.81	Total Potash (K2O) (lbs/ton or 1000 gal)	6.81	Total Potash (K2O) (lbs/ton or 1000 gal)
Daily Manure Production per AU	6	7.00	6	7.00	60	7.00	60	7.00
Total Days Manure Produced	180	PSC Value	180	PSC Value	180	PSC Value	180	PSC Value
Total Manure Produced	11232	0.80	11232	0.80	75	0.80	75	0.80
Days On Pasture	30		180		30		180	
Hours Per Day On Pasture	12		12		12		12	
Total Bedding	0		0		0		0	
Total Washwater	0		0		0		0	
CALCULATED - Total Uncollected Manure	936		5616		6		37	
CALCULATED-Total Manure Collected Per Animal Group	10296		5616		68		37	

App. 4: Crop Yrs. 2014 CMU/Field ID	A6			A20			A5			A5			A7		
Acres	3.9			2.9			4.7			4.7			9.0		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	44	211	6.9	78	165	5.9	204	280	6.5	204	280	6.5	196	211	6.9
P Index Part A	<150 ft from water			<150 ft from water			Soil Test P (STP)			Answer Part A Questions			<150 ft from water		
	Part B			Part B			Part B						Part B		
Crop	Pasture			Pasture			Small grain silage			Corn Silage			Small grain silage		
Planned Yield	3 ton/A			3 ton/A			6 ton/A			25 ton/A			6 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	150	10	0	150	0	40	90	0	0	180	0	0	90	0	0
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Continuously - Summer Crop			Continuously - Summer Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop			Continuously - Winter Double Crop		
Residual Manure N (lb/A)	35			35			11			24			11		
Legume History Description Residual Legume N (lb/A)	0			0			0			0			0		
	No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume		
Net Nutrients Required (lb/A)	115	10	0	115	0	40	79	0	0	156	0	0	79	0	0
Manure Group	Dry Cows Fall - uncollected			Pre-Fresh Heifers - uncollected						Heifer Spring					
Application Season Application Management (Incorporation, cover crops, etc.)	Grazing Late spring through early fall			Grazing Late spring through early fall						Spring Incorporated within 2-4 days					
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
	0.2			0.2						0.35					
P Index Application Method	April - Oct: No incorp or incorp > 1 wk.			April - Oct: No incorp or incorp > 1 wk.											
N Balanced Manure Rate (ton; gal/A)	63.9 tons/A			57.5 tons/A						39.1 tons/A					
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)	15 tons/A			15 tons/A						20.5 tons/A					
	Crop P Removal (lb/A)		45.0	Crop P Removal (lb/A)		45.0				Crop P Removal (lb/A)		125.0			
P Index Value	17			34											
Planned Manure Rate (ton or gal/A)	6.9 ton/A			14.8 ton/A						10 ton/A					
Nutrient Balance after Manure	103	-11	-48	85	-44	-64	79	0	0	116	-61	-73	79	0	0
Supplemental Fertilizer (lb/A)	103	0	0	85	0	0	79	0	0	116	0	0	79	0	0
P Index Application Method															
Final Nutrient Balance (lb/A)	0	-11	-48	0	-44	-64	0	0	0	0	-61	-73	0	0	0
Manure Utilized on CMU	27 tons			43 tons			0			47 tons			0		

Double Crop

Double Crop

Double Crop

App. 4: Crop Yrs. 2014 CMU/Field ID	A7			A16			A16			A19			A19		
Acres	9.0			2.4			2.4			4.4			4.4		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	196	211	6.9	218	173	6.8	218	173	6.8	189	245	6.1	189	245	6.1
P Index Part A	<150 ft from water			Soil Test P (STP)			Soil Test P (STP)			<150 ft from water			<150 ft from water		
	Part B			Part B			Part B			Part B			Part B		
Crop	Corn Silage			Small grain silage			Corn Silage			Small grain silage			Corn Silage		
Planned Yield	25 ton/A			6 ton/A			25 ton/A			6 ton/A			25 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	180	0	0	90	0	30	180	0	60	90	0	0	180	0	0
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Continuously - Summer Double Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop		
Residual Manure N (lb/A)	24			11			24			11			24		
Legume History Description Residual Legume N (lb/A)	0			0			0			0			0		
	No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume		
Net Nutrients Required (lb/A)	156	0	0	79	0	30	156	0	60	79	0	0	156	0	0
Manure Group	Heifer Spring						Heifer Spring						Heifer Spring		
Application Season Application Management (Incorporation, cover crops, etc.)	Spring Incorporated within 2-4 days						Spring Incorporated within 2-4 days						Spring Incorporated within 2-4 days		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
	0.35						0.35						0.35		
P Index Application Method	Incorporated within 1 week						Incorporated within 1 week						Incorporated within 1 week		
N Balanced Manure Rate (ton; gal/A)	39.1 tons/A						39.1 tons/A						39.1 tons/A		
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)	20.5 tons/A						20.5 tons/A						20.5 tons/A		
	Crop P Removal (lb/A)		125.0				Crop P Removal (lb/A)		125.0				Crop P Removal (lb/A)		125.0
P Index Value	64						47						62		
Planned Manure Rate (ton or gal/A)	10 ton/A						10 ton/A						10 ton/A		
Nutrient Balance after Manure	116	-61	-73	79	0	30	116	-61	-13	79	0	0	116	-61	-73
Supplemental Fertilizer (lb/A)	116	0	0	79	0	30	116	0	0	79	0	0	116	0	0
P Index Application Method															
Final Nutrient Balance (lb/A)	0	-61	-73	0	0	0	0	-61	-13	0	0	0	0	-61	-73
Manure Utilized on CMU	90 tons			0			24 tons			0			44 tons		

Double Crop

Double Crop

Double Crop

Double Crop

Double Crop

App. 4: Crop Yrs. 2014 CMU/Field ID	B8			B8			A21			A21			B9		
Acres	12.5			12.5			10.4			10.4			3.8		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	225	227	6.1	225	227	6.1	117	188	5.9	117	188	5.9	114	91	5.3
P Index Part A	STP & <150 ft from water			STP & <150 ft from water			<150 ft from water			<150 ft from water			<150 ft from water		
	Part B			Part B			Part B			Part B			Part B		
Crop	Small grain silage			Corn Silage			Small grain silage			Corn Silage			Small grain silage		
Planned Yield	6 ton/A			25 ton/A			6 ton/A			25 ton/A			6 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	90	0	0	180	0	0	90	0	20	180	0	30	90	0	160
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Continuously - Winter Double Crop			Continuously - Summer Double Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop			Frequently - Winter Double Crop		
Residual Manure N (lb/A)	11			24			11			24			7		
Legume History Description Residual Legume N (lb/A)	0			0			0			0			0		
	No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume		
Net Nutrients Required (lb/A)	79	0	0	156	0	0	79	0	20	132	-67	-26	83	0	160
Manure Group							Heifer Fall						Heifer Fall		
Application Season Application Management (Incorporation, cover crops, etc.)							Spring use by winter crops or grass hay > Incorporated within 3-7 days Early Fall						Spring use by winter crops or grass hay > Incorporated within 3-7 days Early Fall		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
							0.3						0.3		
P Index Application Method							Incorporated within 1 week						Incorporated within 1 week		
N Balanced Manure Rate (ton; gal/A)							21.8 tons/A						22.9 tons/A		
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)							6.3 tons/A						6.3 tons/A		
							Crop P Removal (lb/A) 42.0						Crop P Removal (lb/A) 42.0		
P Index Value							49						68		
Planned Manure Rate (ton or gal/A)							10 ton/A						10 ton/A		
Nutrient Balance after Manure	79	0	0	156	0	0	43	-67	-56	132	-67	-26	47	-67	84
Supplemental Fertilizer (lb/A)	79	0	0	156	0	0	43	0	0	132	0	0	47	0	84
P Index Application Method															
Final Nutrient Balance (lb/A)	0	0	0	0	0	0	0	-67	-56	0	-67	-26	0	-67	0
Manure Utilized on CMU	0			0			104 tons			0			38 tons		

Double Crop

Double Crop

Double Crop N Carryover=24 lb/A

Double Crop

Double Crop N Carryover=24 lb/A

App. 4: Crop Yrs. 2014 CMU/Field ID	B9			B13			B13			A11			A11		
Acres	3.8			5.5			5.5			3.4			3.4		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	114	91	5.3	88	191	6.0	88	191	6.0	99	101	6.5	99	101	6.5
P Index Part A	<150 ft from water			<150 ft from water			<150 ft from water			No to all Part A ques.			No to all Part A ques.		
	Part B			Part B			Part B			N-based			N-based		
Crop	Corn Silage			Small grain silage			Corn Silage			Small grain silage			Corn Silage		
Planned Yield	25 ton/A			6 ton/A			25 ton/A			6 ton/A			25 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	180	0	280	90	0	0	180	0	0	90	0	140	180	0	250
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Frequently - Summer Double Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop		
Residual Manure N (lb/A)	13			11			24			11			24		
Legume History Description Residual Legume N (lb/A)	35 Soybeans, 35 bu/A			0 No Previous Year Legume			0 No Previous Year Legume			0 No Previous Year Legume			0 No Previous Year Legume		
Net Nutrients Required (lb/A)	108	-67	280	79	0	0	132	-67	-76	79	0	140	124	-82	247
Manure Group	Cow Spring			Heifer Fall			Cow Spring			Cow Fall			Cow Spring		
Application Season Application Management (Incorporation, cover crops, etc.)	Spring Incorporated within 2-4 days			Early Fall Spring use by winter crops or grass hay > Incorporated within 3-7 days			Spring Incorporated within 2-4 days			Early Fall Spring use by winter crops or grass hay > Incorporated within 3-7 days			Spring Incorporated within 2-4 days		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
	0.35			0.3			0.35			0.3			0.35		
P Index Application Method	Incorporated within 1 week			Incorporated within 1 week			Incorporated within 1 week								
N Balanced Manure Rate (ton; gal/A)	16314 gal/A			21.8 tons/A			19940 gal/A			12846 gal/A			18731 gal/A		
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)	10417 gal/A			6.3 tons/A			10417 gal/A			4038 gal/A			8854 gal/A		
	Crop P Removal (lb/A)		100.0	Crop P Removal (lb/A)		42.0	Crop P Removal (lb/A)		100.0	Crop P Removal (lb/A)		42.0	Crop P Removal (lb/A)		85.0
P Index Value	68			63			63								
Planned Manure Rate (ton or gal/A)	7850 gal/A			10 ton/A			7850 gal/A			7850 gal/A			7850 gal/A		
Nutrient Balance after Manure	56	-142	148	43	-67	-76	80	-142	-208	31	-82	-3	72	-157	115
Supplemental Fertilizer (lb/A)	56	0	148	43	0	0	80	0	0	31	0	0	72	0	115
P Index Application Method															
Final Nutrient Balance (lb/A)	0	-142	0	0	-67	-76	0	-142	-208	0	-82	-3	0	-157	0
Manure Utilized on CMU	29830 gal			55 tons			43175 gal			26690 gal			26690 gal		

Double Crop

Double Crop N Carryover=24 lb/A

Double Crop

Double Crop N Carryover=32 lb/A

Double Crop

App. 4: Crop Yrs. 2014 CMU/Field ID	A13			A13			A17			A17			B3		
Acres	8.3			8.3			18.2			18.2			5.3		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	73	59	5.8	73	59	5.8	73	160	6.7	73	160	6.7	87	118	5.4
P Index Part A	No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.		
	N-based			N-based			N-based			N-based			N-based		
Crop	Small grain silage			Corn Silage			Small grain silage			Corn Silage			Small grain silage		
Planned Yield	6 ton/A			25 ton/A			6 ton/A			25 ton/A			6 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	90	0	190	180	0	290	90	0	60	180	0	110	90	0	120
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Continuously - Winter Double Crop			Continuously - Summer Double Crop			Frequently - Winter Double Crop			Frequently - Summer Double Crop			Continuously - Winter Double Crop		
Residual Manure N (lb/A)	11			24			7			13			11		
Legume History Description Residual Legume N (lb/A)	0			0			0			35			0		
	No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			Soybeans, 35 bu/A			No Previous Year Legume		
Net Nutrients Required (lb/A)	79	0	190	124	-82	290	83	0	60	100	-82	27	79	0	120
Manure Group	Cow Fall			Cow Spring			Cow Fall			Cow Spring			Cow Fall		
Application Season Application Management (Incorporation, cover crops, etc.)	Spring use by winter crops or grass hay > Incorporated within 3-7 days			Spring use by winter crops or grass hay > Incorporated within 2-4 days			Spring use by winter crops or grass hay > Incorporated within 3-7 days			Spring use by winter crops or grass hay > Incorporated within 2-4 days			Spring use by winter crops or grass hay > Incorporated within 3-7 days		
	Early Fall			Spring			Early Fall			Spring			Early Fall		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
	0.3			0.35			0.3			0.35			0.3		
P Index Application Method															
N Balanced Manure Rate (ton; gal/A)	12846 gal/A			18731 gal/A			13496 gal/A			15106 gal/A			12846 gal/A		
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)	4038 gal/A			8854 gal/A			4038 gal/A			8854 gal/A			4038 gal/A		
	Crop P Removal (lb/A) 42.0			Crop P Removal (lb/A) 85.0			Crop P Removal (lb/A) 42.0			Crop P Removal (lb/A) 85.0			Crop P Removal (lb/A) 42.0		
P Index Value															
Planned Manure Rate (ton or gal/A)	7850 gal/A			7850 gal/A			7850 gal/A			7850 gal/A			7850 gal/A		
Nutrient Balance after Manure	31	-82	47	72	-157	158	35	-82	-83	48	-157	-105	31	-82	-23
Supplemental Fertilizer (lb/A)	31	0	47	72	0	158	35	0	0	48	0	0	31	0	0
P Index Application Method															
Final Nutrient Balance (lb/A)	0	-82	0	0	-157	0	0	-82	-83	0	-157	-105	0	-82	-23
Manure Utilized on CMU	65155 gal			65155 gal			142870 gal			142870 gal			41605 gal		

Double Crop N Carryover=32 lb/A

Double Crop

Double Crop N Carryover=32 lb/A

Double Crop

Double Crop N Carryover=32 lb/A

App. 4: Crop Yrs. 2014 CMU/Field ID	B3			A2			A2			A4			A4		
Acres	5.3			4.0			4.0			5.9			5.9		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	87	118	5.4	135	187	6.8	135	187	6.8	146	193	6.7	146	193	6.7
P Index Part A	No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.		
Crop	N-based			N-based			N-based			N-based			N-based		
	Corn Silage			Small grain silage			Corn Silage			Small grain silage			Corn Silage		
Planned Yield	25 ton/A			6 ton/A			25 ton/A			6 ton/A			25 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	180	0	220	90	0	20	180	0	30	90	0	0	180	0	0
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Continuously - Summer Double Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop		
Residual Manure N (lb/A)	24			11			24			11			24		
Legume History Description Residual Legume N (lb/A)	0			0			0			0			0		
	No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume		
Net Nutrients Required (lb/A)	124	-82	197	79	0	20	124	-82	-93	79	0	0	124	-82	-143
Manure Group	Cow Spring			Cow Fall			Cow Spring			Cow Fall			Cow Spring		
Application Season Application Management (Incorporation, cover crops, etc.)	Spring Incorporated within 2-4 days			Early Fall Spring use by winter crops or grass hay > Incorporated within 3-7 days			Spring Incorporated within 2-4 days			Early Fall Spring use by winter crops or grass hay > Incorporated within 3-7 days			Spring Incorporated within 2-4 days		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
	0.35			0.3			0.35			0.3			0.35		
P Index Application Method															
N Balanced Manure Rate (ton; gal/A)	18731 gal/A			12846 gal/A			18731 gal/A			12846 gal/A			18731 gal/A		
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)	8854 gal/A			4038 gal/A			8854 gal/A			4038 gal/A			8854 gal/A		
	Crop P Removal (lb/A) 85.0			Crop P Removal (lb/A) 42.0			Crop P Removal (lb/A) 85.0			Crop P Removal (lb/A) 42.0			Crop P Removal (lb/A) 85.0		
P Index Value															
Planned Manure Rate (ton or gal/A)	7850 gal/A			7850 gal/A			7850 gal/A			7850 gal/A			7850 gal/A		
Nutrient Balance after Manure	72	-157	65	31	-82	-123	72	-157	-225	31	-82	-143	72	-157	-275
Supplemental Fertilizer (lb/A)	72	0	65	31	0	0	72	0	0	31	0	0	72	0	0
P Index Application Method															
Final Nutrient Balance (lb/A)	0	-157	0	0	-82	-123	0	-157	-225	0	-82	-143	0	-157	-275
Manure Utilized on CMU	41605 gal			31400 gal			31400 gal			46315 gal			46315 gal		

Double Crop

Double Crop N Carryover=32 lb/A

Double Crop

Double Crop N Carryover=32 lb/A

Double Crop

App. 4: Crop Yrs. 2014 CMU/Field ID	A18			A18			B1			B1			B5		
Acres	3.6			3.6			4.8			4.8			5.6		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	130	197	6.2	130	197	6.2	127	173	5.9	127	173	5.9	119	96	6.1
P Index Part A	No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.		
	N-based			N-based			N-based			N-based			N-based		
Crop	Small grain silage			Corn Silage			Small grain silage			Corn Silage			Small grain silage		
Planned Yield	6 ton/A			25 ton/A			6 ton/A			25 ton/A			6 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	90	0	0	180	0	0	90	0	30	180	0	60	90	0	160
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Continuously - Winter Double Crop			Continuously - Summer Double Crop			Frequently - Winter Double Crop			Frequently - Summer Double Crop			Continuously - Winter Double Crop		
Residual Manure N (lb/A)	11			24			7			13			11		
Legume History Description Residual Legume N (lb/A)	0			0			0			35			0		
	No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			Soybeans, 35 bu/A			No Previous Year Legume		
Net Nutrients Required (lb/A)	79	0	0	124	-82	-143	83	0	30	100	-82	-53	79	0	160
Manure Group	Cow Fall			Heifer Spring			Cow Fall			Cow Spring			Heifer Fall		
Application Season Application Management (Incorporation, cover crops, etc.)	Spring use by winter crops or grass hay > Incorporated within 3-7 days			Spring use by winter crops or grass hay > Incorporated within 2-4 days			Spring use by winter crops or grass hay > Incorporated within 3-7 days			Spring use by winter crops or grass hay > Incorporated within 2-4 days			Spring use by winter crops or grass hay > Incorporated within 3-7 days		
	Early Fall			Spring			Early Fall			Spring			Early Fall		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
	0.3			0.35			0.3			0.35			0.3		
P Index Application Method															
N Balanced Manure Rate (ton; gal/A)	12846 gal/A			31.1 tons/A			13496 gal/A			15106 gal/A			21.8 tons/A		
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)	4038 gal/A			13.9 tons/A			4038 gal/A			8854 gal/A			6.3 tons/A		
	Crop P Removal (lb/A) 42.0			Crop P Removal (lb/A) 85.0			Crop P Removal (lb/A) 42.0			Crop P Removal (lb/A) 85.0			Crop P Removal (lb/A) 42.0		
P Index Value															
Planned Manure Rate (ton or gal/A)	7850 gal/A			18 ton/A			7850 gal/A			7850 gal/A			18 ton/A		
Nutrient Balance after Manure	31	-82	-143	52	-192	-274	35	-82	-113	48	-157	-185	14	-121	23
Supplemental Fertilizer (lb/A)	31	0	0	52	0	0	35	0	0	48	0	0	14	0	23
P Index Application Method															
Final Nutrient Balance (lb/A)	0	-82	-143	0	-192	-274	0	-82	-113	0	-157	-185	0	-121	0
Manure Utilized on CMU	28260 gal			65 tons			37680 gal			37680 gal			101 tons		

Double Crop N Carryover=32 lb/A

Double Crop

Double Crop N Carryover=32 lb/A

Double Crop

Double Crop N Carryover=44 lb/A

App. 4: Crop Yrs. 2014 CMU/Field ID	B5			B12			B12			C1			C2		
Acres	5.6			2.3			2.3			10.7			13.4		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	119	96	6.1	127	88	5.8	127	88	5.8	107	84	6.0	102	105	6.1
P Index Part A	No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.		
	N-based			N-based			N-based			N-based			N-based		
Crop	Corn Silage			Small grain silage			Corn Silage			Corn Silage			Small grain silage		
Planned Yield	25 ton/A			6 ton/A			25 ton/A			25 ton/A			6 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	180	0	280	90	0	170	180	0	280	180	0	280	90	0	140
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Continuously - Summer Double Crop			Frequently - Winter Double Crop			Frequently - Summer Double Crop			Rarely - Summer Crop			Rarely - Winter Double Crop		
Residual Manure N (lb/A)	24			7			13			0			0		
Legume History Description Residual Legume N (lb/A)	0			0			35			80			0		
	No Previous Year Legume			No Previous Year Legume			Soybeans, 35 bu/A			1st yr. after alfalfa 25-49% stand, High productivity soils			No Previous Year Legume		
Net Nutrients Required (lb/A)	112	-121	280	83	0	170	108	-67	280	100	0	280	90	0	140
Manure Group	Heifer Spring			Heifer Fall			Heifer Spring			Cow Fall					
Application Season Application Management (Incorporation, cover crops, etc.)	Spring Incorporated within 2-4 days			Early Fall Spring use by winter crops or grass hay > Incorporated within 3-7 days			Spring Incorporated within 2-4 days			Early Fall Spring use by winter crops or grass hay > Incorporated within 3-7 days					
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
	0.35			0.3			0.35			0.3					
P Index Application Method															
N Balanced Manure Rate (ton; gal/A)	28.1 tons/A			22.9 tons/A			27.1 tons/A			16260 gal/A					
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)	7.5 tons/A			6.3 tons/A			16.4 tons/A			12019 gal/A					
	Crop P Removal (lb/A)		46.0	Crop P Removal (lb/A)		42.0	Crop P Removal (lb/A)		100.0	Crop P Removal (lb/A)		125.0			
P Index Value															
Planned Manure Rate (ton or gal/A)	18 ton/A			10 ton/A			18 ton/A			7850 gal/A					
Nutrient Balance after Manure	40	-231	149	47	-67	94	36	-177	149	52	-82	137	90	0	140
Supplemental Fertilizer (lb/A)	40	0	149	47	0	94	36	0	149	52	0	137	90	0	140
P Index Application Method															
Final Nutrient Balance (lb/A)	0	-231	0	0	-67	0	0	-177	0	0	-82	0	0	0	0
Manure Utilized on CMU	101 tons			23 tons			41 tons			83995 gal			0		

Double Crop

Double Crop N Carryover=24 lb/A

Double Crop

Double Crop

App. 4: Crop Yrs. 2014 CMU/Field ID	C2			C3			C3			A8			A8		
Acres	13.4			13.7			13.7			3.2			3.2		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	102	105	6.1	95	83	6.6	95	83	6.6	182	146	6.9	182	146	6.9
P Index Part A	No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.		
	N-based			N-based			N-based			N-based			N-based		
Crop	Corn Silage			Small grain silage			Corn Silage			Small grain silage			Corn Silage		
Planned Yield	6 ton/A			6 ton/A			25 ton/A			6 ton/A			25 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	180	0	250	90	0	170	180	0	280	90	0	80	180	0	140
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Rarely - Summer Double Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop			Continuously - Winter Double Crop			Continuously - Summer Double Crop		
Residual Manure N (lb/A)	0			11			24			11			24		
Legume History Description Residual Legume N (lb/A)	0			0			0			0			0		
	No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume		
Net Nutrients Required (lb/A)	180	0	250	79	0	170	156	0	280	79	0	80	132	-67	140
Manure Group										Heifer Fall					
Application Season Application Management (Incorporation, cover crops, etc.)										Early Fall Spring use by winter crops or grass hay > Incorporated within 3-7 days					
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
										0.3					
P Index Application Method															
N Balanced Manure Rate (ton; gal/A)										21.8 tons/A					
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)										6.3 tons/A					
										Crop P Removal (lb/A)			42.0		
P Index Value															
Planned Manure Rate (ton or gal/A)										10 ton/A					
Nutrient Balance after Manure	180	0	250	79	0	170	156	0	280	43	-67	4	132	-67	140
Supplemental Fertilizer (lb/A)	180	0	250	79	0	170	156	0	280	43	0	4	132	0	140
P Index Application Method															
Final Nutrient Balance (lb/A)	0	0	0	0	0	0	0	0	0	0	-67	0	0	-67	0
Manure Utilized on CMU	0			0			0			32 tons			0		

Double Crop

Double Crop

Double Crop

Double Crop N Carryover=24 lb/A

Double Crop

App. 4: Crop Yrs. 2014 CMU/Field ID	A9			A9			A1			A3			A10		
Acres	4.8			4.8			6.6			2.4			5.2		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	178	138	6.8	178	138	6.8	94	88	6.7	95	68	6.5	101	59	6.0
P Index Part A	No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.		
	N-based			N-based			N-based			N-based			N-based		
Crop	Small grain silage			Corn Silage			First year Alfalfa			Alfalfa			Alfalfa		
Planned Yield	6 ton/A			25 ton/A			4 ton/A			5 ton/A			5 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	90	0	90	180	0	170	0	0	210	0	0	270	0	0	270
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Continuously - Winter Double Crop			Continuously - Summer Double Crop			Continuously - Summer Crop			Continuously - Summer Crop			Frequently - Summer Crop		
Residual Manure N (lb/A)	11			24			35			35			20		
Legume History Description Residual Legume N (lb/A)	0			0			0			0			0		
	No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume		
Net Nutrients Required (lb/A)	79	0	90	132	-67	170	0	0	210	0	0	270	0	0	270
Manure Group	Heifer Fall						Select a Manure Group			Select a Manure Group			Select a Manure Group		
Application Season Application Management (Incorporation, cover crops, etc.)	Spring use by winter crops or grass hay > Incorporated within 3-7 days						Select Manure Application Timing			Select Manure Application Timing			Select Manure Application Timing		
	Early Fall						Select Manure Application Method			Select Manure Application Method			Select Manure Application Method		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
	0.3														
P Index Application Method															
N Balanced Manure Rate (ton; gal/A)	21.8 tons/A														
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)	6.3 tons/A														
	Crop P Removal (lb/A) 42.0														
P Index Value															
Planned Manure Rate (ton or gal/A)	10 ton/A														
Nutrient Balance after Manure	43	-67	14	132	-67	170	0	0	210	0	0	270	0	0	270
Supplemental Fertilizer (lb/A)	43	0	14	132	0	170	0	0	210	0	0	270	0	0	270
P Index Application Method															
Final Nutrient Balance (lb/A)	0	-67	0	0	-67	0	0	0	0	0	0	0	0	0	0
Manure Utilized on CMU	48 tons			0			0			0			0		

Double Crop N Carryover=24 lb/A Double Crop

App. 4: Crop Yrs. 2014 CMU/Field ID	A12			A15			B2			B4			B7		
Acres	3.9			5.8			5.4			5.5			5.5		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	121	117	5.8	168	189	6.8	57	54	5.8	172	221	6.2	113	147	6.8
P Index Part A	No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.		
Crop	N-based			N-based			N-based			N-based			N-based		
Planned Yield	Alfalfa 5 ton/A			Alfalfa 5 ton/A			First year Alfalfa 4 ton/A			Alfalfa 5 ton/A			Alfalfa 5 ton/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	0	0	200	0	0	30	0	0	220	0	0	0	0	0	130
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Continuously - Summer Crop			Frequently - Summer Crop			Continuously - Summer Crop			Frequently - Summer Crop			Continuously - Summer Crop		
Residual Manure N (lb/A)	35			20			35			20			35		
Legume History Description Residual Legume N (lb/A)	0			0			0			0			0		
Net Nutrients Required (lb/A)	0	0	200	0	0	30	0	0	220	0	0	0	0	0	130
Manure Group	Select a Manure Group			Select a Manure Group			Select a Manure Group			Select a Manure Group			Select a Manure Group		
Application Season Application Management (Incorporation, cover crops, etc.)	Select Manure Application Timing Select Manure Application Method			Select Manure Application Timing Select Manure Application Method			Select Manure Application Timing Select Manure Application Method			Select Manure Application Timing Select Manure Application Method			Select Manure Application Timing Select Manure Application Method		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
P Index Application Method															
N Balanced Manure Rate (ton; gal/A)															
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)															
P Index Value															
Planned Manure Rate (ton or gal/A)															
Nutrient Balance after Manure	0	0	200	0	0	30	0	0	220	0	0	0	0	0	130
Supplemental Fertilizer (lb/A)	0	0	200	0	0	30	0	0	220	0	0	0	0	0	130
P Index Application Method															
Final Nutrient Balance (lb/A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manure Utilized on CMU	0			0			0			0			0		

App. 4: Crop Yrs. 2014 CMU/Field ID	B11			A14			A22			B6			B10		
Acres	6.6			10.8			12.8			5.4			4.0		
Soil Test Report Date	September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012			September 17, 2012		
Laboratory Name	AASL			AASL			AASL			AASL			AASL		
Soil Test Levels (Mehlich-3 P & K) (Show conversions to ppm in Appendix 10)	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH	ppm P	ppm K	pH
	59	56	6.1	76	71	5.5	55	187	5.9	83	49	6.7	107	188	6.2
P Index Part A	No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.			No to all Part A ques.		
	N-based			N-based			N-based			N-based			N-based		
Crop	Alfalfa			Soybeans			Soybeans			Soybeans			Soybeans		
Planned Yield	5 ton/A			35 bu/A			35 bu/A			35 bu/A			35 bu/A		
Soil Test Recommendation (lb/Acre)	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
	0	0	270	0	0	80	0	0	0	0	0	110	0	0	0
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P Index Application Method															
Manure History Description	Frequently - Summer Crop			Frequently - Summer Crop			Frequently - Summer Crop			Frequently - Summer Crop			Frequently - Summer Crop		
Residual Manure N (lb/A)	20			20			20			20			20		
Legume History Description Residual Legume N (lb/A)	0			0			0			0			0		
	No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume			No Previous Year Legume		
Net Nutrients Required (lb/A)	0	0	270	0	0	80	0	0	0	0	0	110	0	0	0
Manure Group	Select a Manure Group			Select a Manure Group			Select a Manure Group			Select a Manure Group			Select a Manure Group		
Application Season Application Management (Incorporation, cover crops, etc.)	Select Manure Application Timing			Select Manure Application Timing			Select Manure Application Timing			Select Manure Application Timing			Select Manure Application Timing		
	Select Manure Application Method			Select Manure Application Method			Select Manure Application Method			Select Manure Application Method			Select Manure Application Method		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N	Total N	NH4-N	Org. N
P Index Application Method															
N Balanced Manure Rate (ton; gal/A)															
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)															
P Index Value															
Planned Manure Rate (ton or gal/A)															
Nutrient Balance after Manure	0	0	270	0	0	80	0	0	0	0	0	110	0	0	0
Supplemental Fertilizer (lb/A)	0	0	270	0	0	80	0	0	0	0	0	110	0	0	0
P Index Application Method															
Final Nutrient Balance (lb/A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manure Utilized on CMU	0			0			0			0			0		

Appendix 5
Phosphorus Index

The current Pennsylvania Phosphorus Index Spreadsheet for each field from Appendix 4 that required Part B of the P Index must be included here.

	A	B	C	D	E	F	G
1	Appendix 5 - P Index						
2	Crop Yrs. 2014						
3	Pennsylvania P Index Version 2						
4	Go to Appendix 4						
5	Go to NMP Index						
6	Go to Appendix 6						
7							
8							
9							
10							
11							
12							
13	PART A: SCREENING TOOL				CMU/Field ID		A6
	Is the CMU in a Special Protection watershed?				If the answer is Yes to <u>any</u> of these questions, Part B must be used.		No
	Is there a significant farm management change as defined by Act 38? (see below)						No
	Is the Soil Test Mehlich 3 P greater than 200 ppm P? (enter soil test value in ppm P)						44
	Is the Contributing Distance from this CMU to receiving water less than 150 ft.?						Yes
	The following Act 38 criteria determine when there is a significant farm management change:						
	1. net increase of greater than 10% in AEU's per acre						
	2. a change in crop management that results in a farmwide reduction of greater than 20% in nitrogen necessary for realistic expect						
	3. alternative organic sources will replace all or some of the nutrient sources listed in the plan						
	4. additional lands are brought into the operation (purchased or rented)						
13	PART B: SOURCE FACTORS				CMU/Field ID		A6
14	SOIL TEST		Mehlich 3 Soil Test P (ppm P)				44
15	Soil Test Rating = 0.20* Mehlich 3 Soil Test P (ppm P)						9
16	FERTILIZER P RATE		Fertilizer P (lb P2O5/acre)				0
	FERTILIZER APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April - October	0.8 Incorporated >1 week or not incorporated following application in Nov. - March	1.0 Surface applied to frozen or snow covered soil	None, None
17							
18	Fertilizer Rating = Fertilizer Rate x Fertilizer Application Method						0
19	MANURE P RATE		Manure P (lb P2O5/acre)				21
	MANURE APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April - October	0.8 Incorporated >1 week or not incorporated following application in Nov. - March	1.0 Surface applied to frozen or snow covered soil	0.6
20							
21	P SOURCE COEFFICIENT	Refer to: Test results for P Source Coefficient OR Book values from P Index Fact Sheet Table 1					0.8
22	Manure Rating = Manure Rate x Manure Application Method x P Source Coefficient						10
23	Source Factor Sum						19
24	PART B: TRANSPORT FACTORS				CMU/Field ID		A6
25	EROSION		Soil Loss (ton/acre/yr)				1
	RUNOFF POTENTIAL	0 <i>Drainage Class is Excessively</i>	2 <i>Drainage Class is Somewhat Excessively</i>	4 <i>Drainage Class is Well/Moderately Well</i>	6 <i>Drainage Class is Somewhat Poorly</i>	8 <i>Drainage Class is Poorly/Very Poorly</i>	4
26							
27	SUBSURFACE DRAINAGE	0 None		1 Random		2* Patterned	0
28	CONTRIBUTING DISTANCE	0 > 500 ft.	2 350 to 500 ft.	4 200 to 349 ft.	6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer	9 [‡] < 100 ft.	6
29	Transport Sum = Erosion + Runoff Potential + Subsurface Drainage + Contributing Distance						11
30	MODIFIED CONNECTIVITY	0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT		1.0 Grassed Waterway or None		1.1 Direct Connection APPLIES TO DIST > 100 FT	1.0
31	* OR rapidly permeable soil near a stream				Transport Sum x Modified Connectivity / 24		0.46
32	[‡] "9" factor does <u>not</u> apply to fields receiving manure with a 35 ft. buffer.				P Index Value = 2 x Source x Transport		17

	A	H	I	J	K	L	M	N	O
1	Appendix 5 - P Index								
2	Crop Yrs. 2014								
3	Pennsylvania P Index Version 2	A20	A5	A7	A16	A19	B8	A21	B9
4	Go to Appendix 4	No	No	No	No	No	No	No	No
5	Go to NMP Index	No	No	No	No	No	No	No	No
6	Go to Appendix 6	78	204	196	218	189	225	117	114
7		Yes	No	Yes	No	Yes	Yes	Yes	Yes
8									
9									
10	ted crop yields								
11									
12									
13	PART B: SOURCE FACTORS	A20	A5	A7	A16	A19	B8	A21	B9
14	SOIL TEST	78	204	196	218	189	225	117	114
15		16	41	39	44	38	45	23	23
16	FERTILIZER P RATE	0	0	0	0	0	0	0	0
17	FERTILIZER APPLICATION METHOD	None, None	None, None	None, None None, None	None, None None, None	None, None None, None	None, None None, None	None, None None, None	None, None None, None
18		0	0	0	0	0	0	0	0
19	MANURE P RATE	44	0	61	61	61	0	67	142
20	MANURE APPLICATION METHOD	0.6	0.4	0.4 0.4	0.4 0.4	0.4 0.4	0.4 0.4	0.4 0.4	0.4 0.4
21	P SOURCE COEFFICIENT	0.8	None	None None	None None	None None	None None	0.8 0	0.8 0.8
22		21	0	20	20	20	0	21	45
23		37	41	59	63	57	45	45	68
24	PART B: TRANSPORT FACTORS	A20	A5	A7	A16	A19	B8	A21	B9
25	EROSION	1	3	3	3	3	2	3	2
26	RUNOFF POTENTIAL	4	4	4	6	4	4	4	4
27	SUBSURFACE DRAINAGE	0	0	0	0	0	0	0	0
28	CONTRIBUTING DISTANCE	6	2	6	0	6	6	6	6
29		11	9	13	9	13	12	13	12
30	MODIFIED CONNECTIVITY	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
31	* OR rapidly permeable soil near a stream	0.46	0.38	0.54	0.38	0.54	0.50	0.54	0.50
32	* "9" factor does <u>not</u> apply to fields receiving	34	31	64	47	62	45	49	68

	A	P
1	Appendix 5 - P Index	
2	Crop Yrs. 2014	
3	Pennsylvania P Index Version 2	B13
4	Go to Appendix 4	No
5	Go to NMP Index	No
6	Go to Appendix 6	88
7		Yes
8		
9		
10		
11		
12		
13	PART B: SOURCE FACTORS	B13
14	SOIL TEST	88
15		18
16	FERTILIZER P RATE	0
17	FERTILIZER APPLICATION METHOD	None,None None,None
18		0
19	MANURE P RATE	142
20	MANURE APPLICATION METHOD	0.4 0.4
21	P SOURCE COEFFICIENT	0.8 0.8
22		45
23		63
24	PART B: TRANSPORT FACTORS	B13
25	EROSION	2
26	RUNOFF POTENTIAL	4
27	SUBSURFACE DRAINAGE	0
28	CONTRIBUTING DISTANCE	6
29		12
30	MODIFIED CONNECTIVITY	1.0
31	* OR rapidly permeable soil near a stream	0.50
32	‡ "9" factor does <u>not</u> apply to fields receiving	63

Appendix 6

Manure Management

Date of Site Evaluation

May 15, 2013

Statement Documenting Areas Evaluated During Site Evaluation

Evaluated the liquid manure storage, dry cow animal concentration area, heifer animal concentration area, and the feed storage area. All the pastures were evaluated for cogregation areas.

Identification of Inadequate Manure Management Practices and Conditions

Dry Cow ACA – a large bare congregation area has developed between the barn and the pasture. Runoff from this areas discharges directly into the stream. Roof and upslope water controls related to this area are adequate.

Heifer ACA – a large bare congregation area has developed between the barn and the pasture. Runoff from this areas discharges directly into the stream. Roof water control is adequate but upslope water controls related to this area are not adequate.

BMPs to Address Manure Management Problem Areas

Dry Cow ACA – a 50' x 100' concrete exercise lot will be installed with an improved access lane from the exercise lot to the pasture. Runoff from the exercise lot will be directed to the manure storage.

Heifer ACA – the current congregation area will be eliminated by installing an improved access lane from the barn to the pasture. The bare area will be reseeded and maintained as lawn area around the calf and heifer facility. These practices will eliminate the need for upslope water controls.

Appendix 7
Stormwater Control

Date of Site Evaluation

May 15, 2013

Statement Documenting Areas Evaluated During Site Evaluation

All crop fields and pastures were evaluated. There is a current conservation plan for each farm in the operation. Conservation practices have been installed and maintained.

Identification of Critical Runoff Problem Areas

None.

BMPs to Address Critical Runoff Problem Areas

None.

Appendix 8
Importer/Broker Agreements & NBSs

Nutrient Balance Sheets are not required for importers that have an approved Nutrient Management Plan.

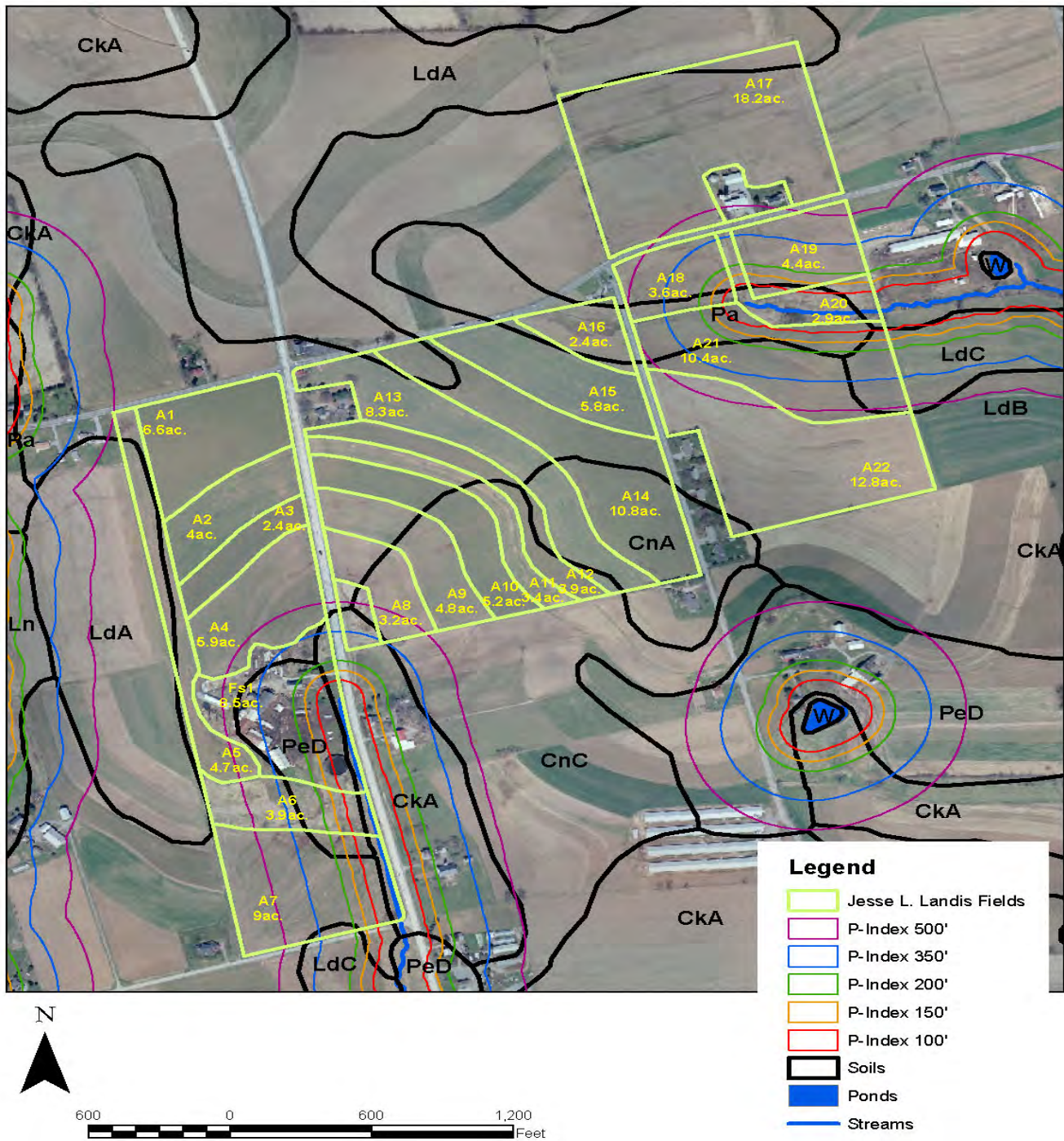
Not Applicable

Appendix 9

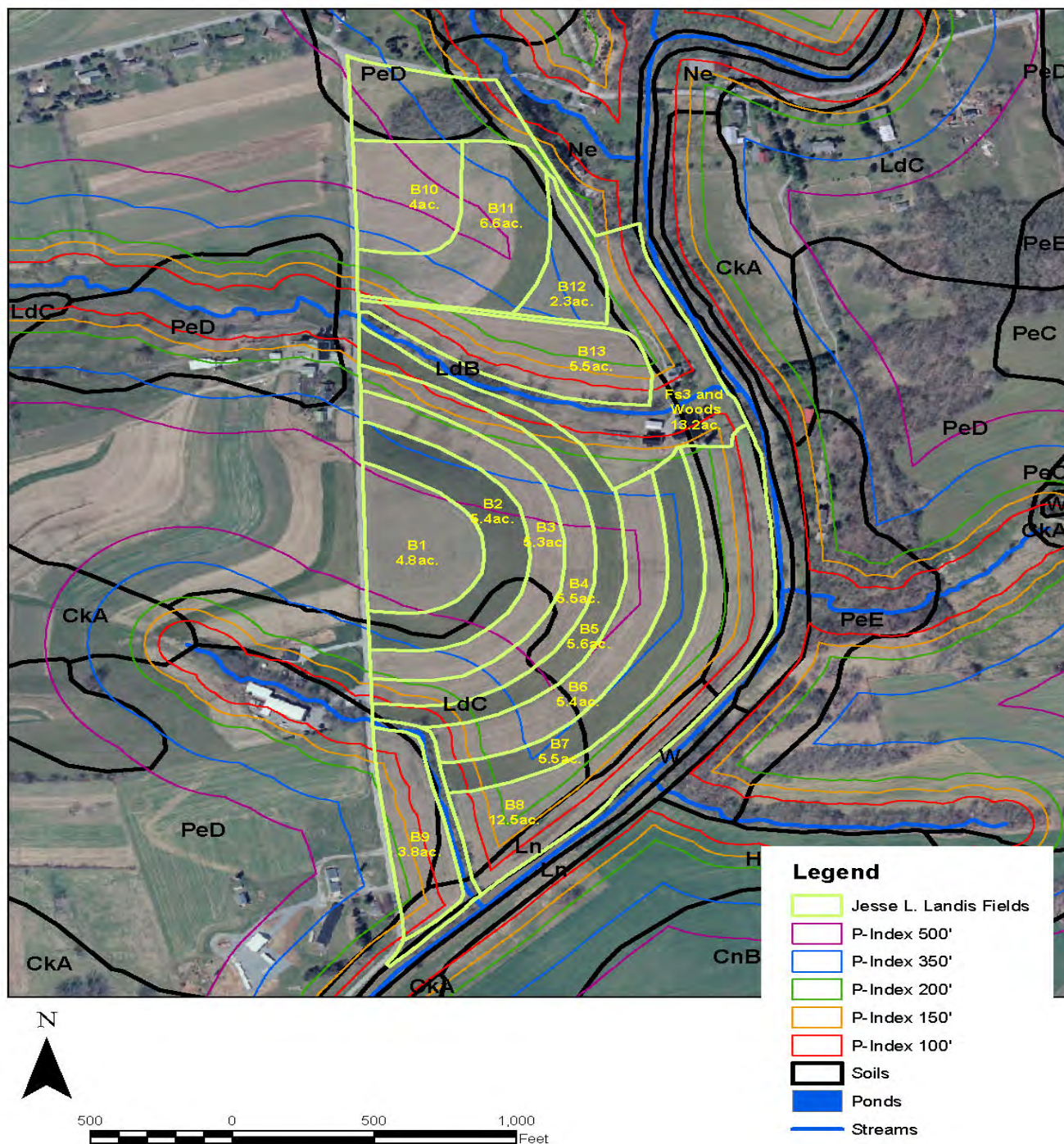
Operation Maps

Three types of maps are required for an Act 38 Nutrient Management Plan: 1) Topographic Map, 2) Soils Map, and 3) Operator Management Map. The **Topographic Map and Soils Map** must be included here. The Topographic Map must be drawn to scale and identify the land included in the plan with operation boundaries. The Soils Map must include field identification and boundaries, soils types and slopes with soils legend. Adding P Index lines can be helpful on the Topographic or Soils Map, but are not required. The Operator Management Map must be included in the Nutrient Management Plan Summary.

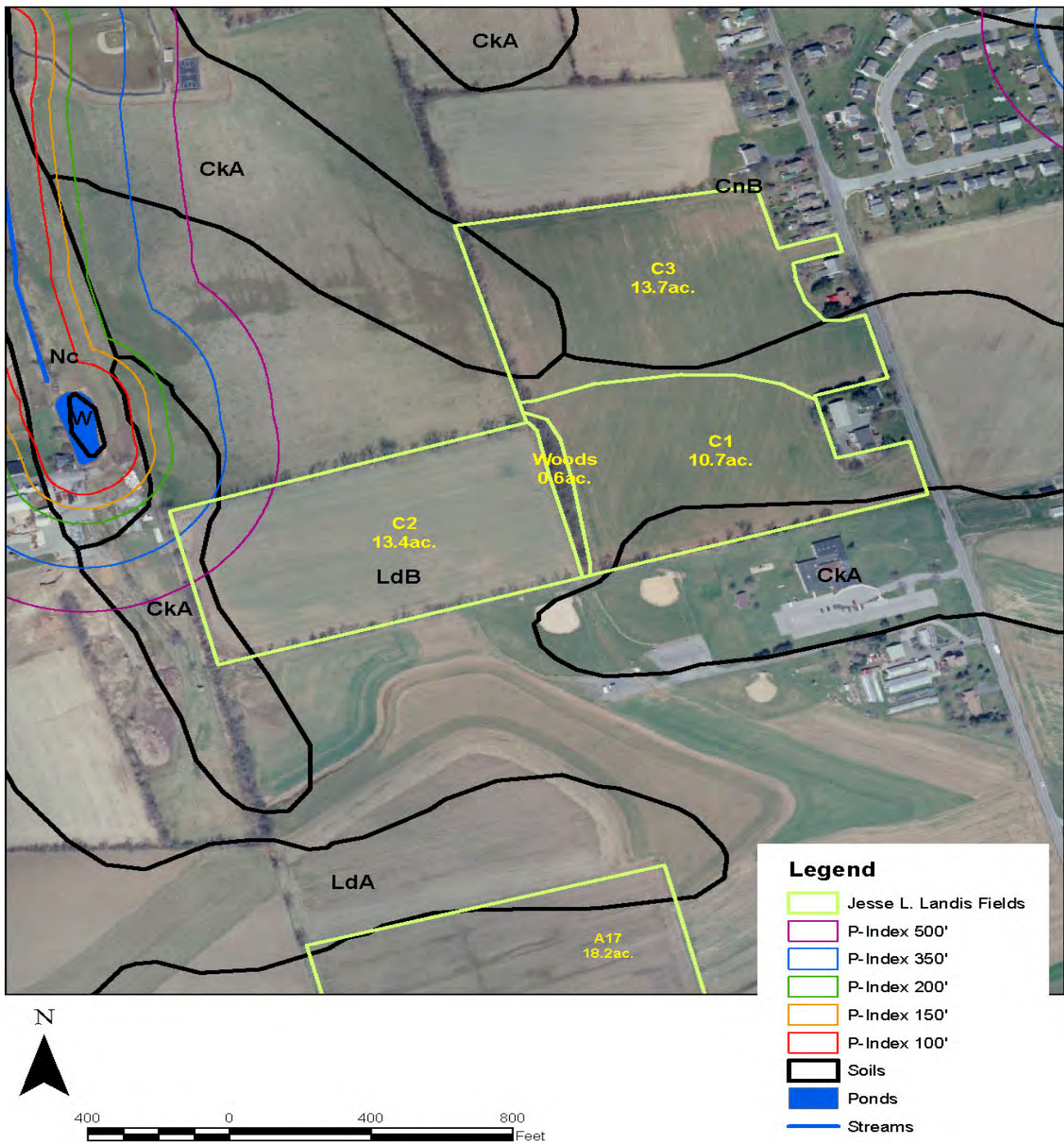
CREEKSIDE DAIRY - FARM 1 SOILS MAP



CREEKSIDE DAIRY - FARM 2 SOILS MAP



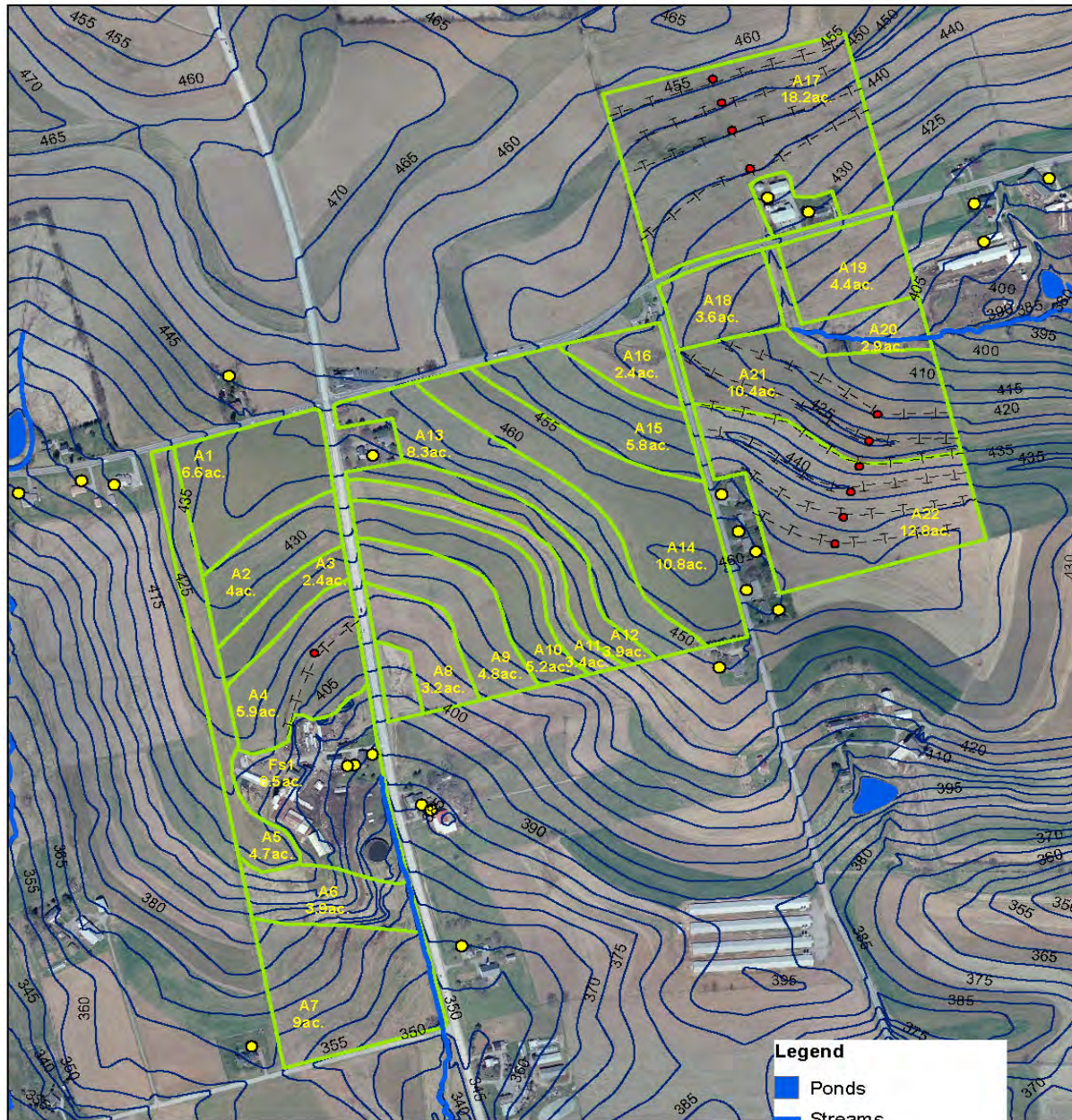
CREEKSIDA DAIRY - FARM 3 SOILS MAP



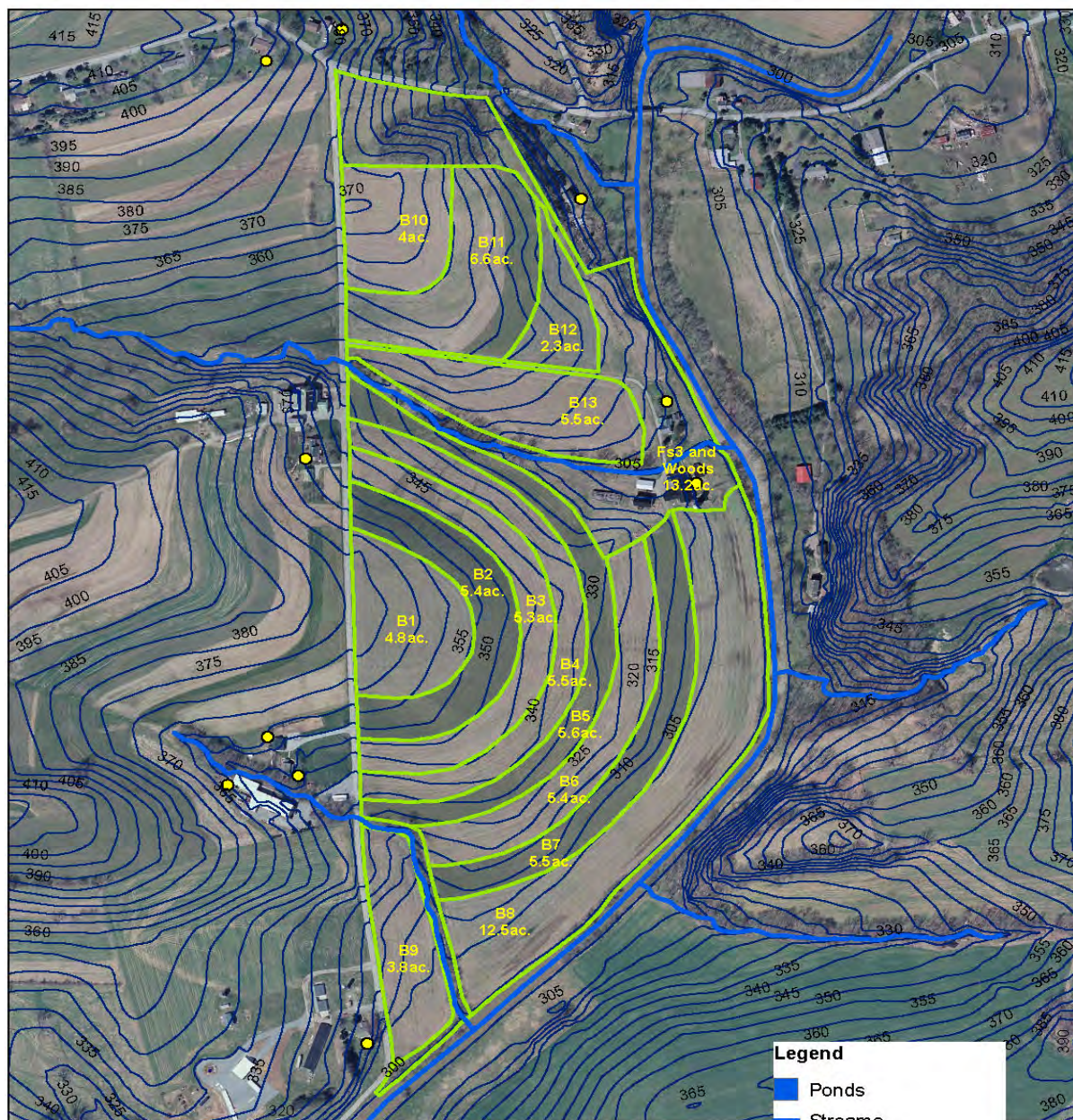
Soils Maps Farm 1, Farm 2 and Farm 3: Map Unit Legend

Map Unit	Soil Type	Slope
CkA	Clarksburg	0 to 5%
CnA	Conestoga	0 to 3%
CnB	Conestoga	3 to 8%
CnC	Conestoga	8 to 15%
LdA	Letort	0 to 3%
LdB	Letort	3 to 8%
LdC	Letort	8 to 15%
Ln	Linside	N/A
Ne	Nolin	N/A
Pa	Penlaw	N/A
PeD	Pequea	15 to 25%

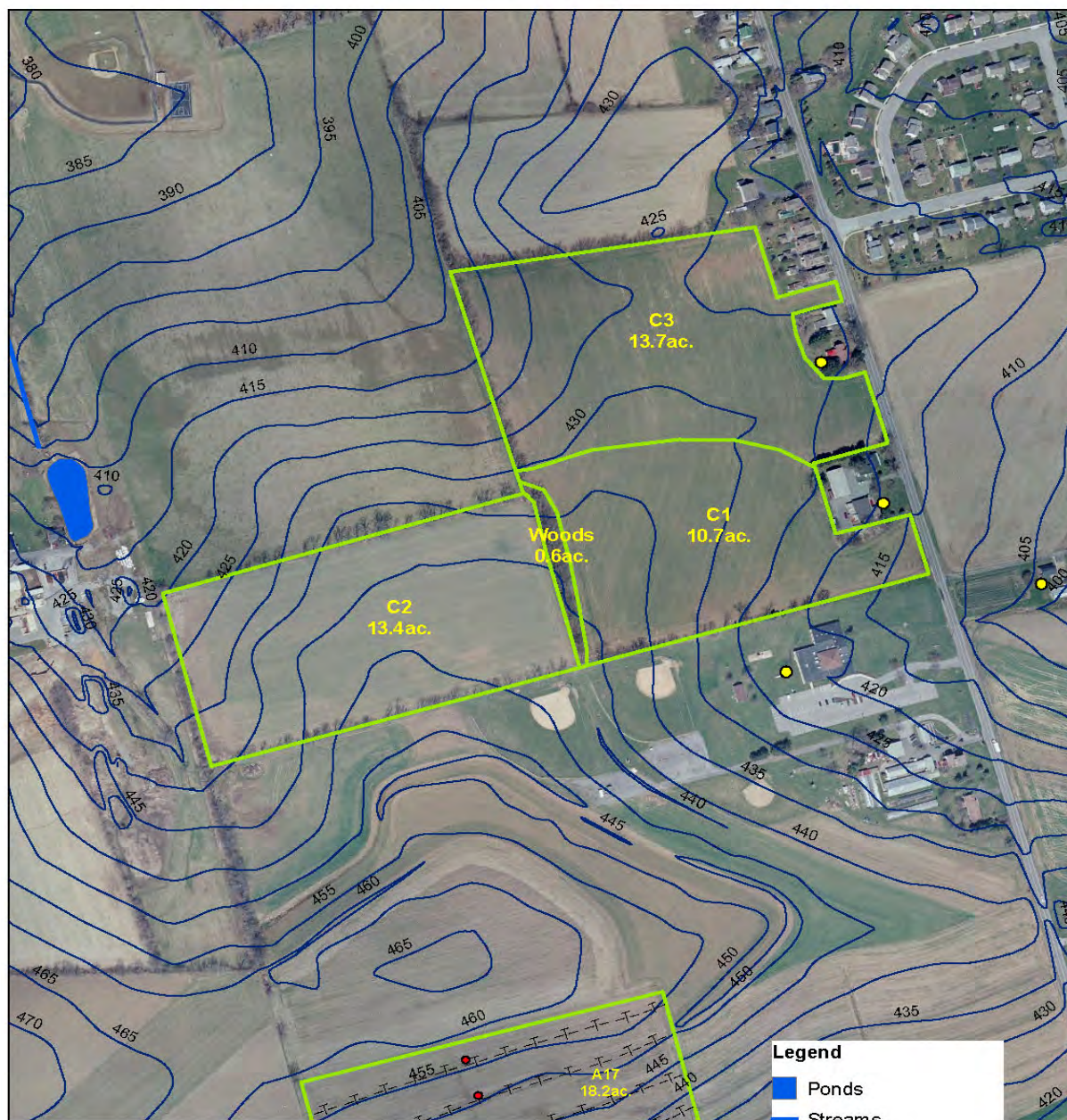
CREEKSIDE DAIRY - FARM 1 TOPOGRAPHIC MAP



CREEKSIDE DAIRY - FARM 2 TOPOGRAPHIC MAP



CREEKSIDE DAIRY - FARM 3 TOPOGRAPHIC MAP



- Legend**
- Ponds
 - Streams
 - Wells
 - Risers
 - Terraces
 - Jesse L. Landis Fields
 - Five-Foot Contours

Appendix 10

Supporting Information & Documentation

Includes if applicable the Rainfall Additions Worksheet, Winter Application Matrix, Residual N Calculation Worksheet and other supplemental worksheets included in the NMP Spreadsheet. Attach information and documentation necessary to support plan content not included elsewhere in the NMP Spreadsheet or appendices. Examples include, but are not limited to, documentation of animal weights if Agronomy Facts 54 is not used, bedding calculations, or calculations for irrigation rates.

Liquid Bedding Calculations:

- $8 \text{ yds}^3 \times 26 \text{ weeks per manure group} \times 27 \text{ ft}^3/\text{yds}^3 \times 7.48 \text{ gal/ft}^3 \div 2 = 21,004 \text{ gallons per manure group}$

Milkhouse Wastewater Calculations:

- $225 \text{ gallons/day} \times 180 \text{ days per manure group} = 40,500 \text{ gallons per manure group}$

Liquid Storage Capacity

- $80' \times 18' (1' \text{ freeboard})$
- $17' \times (3.14 \times 40 \times 40) \times 7.48 \text{ gal/ft}^3 = 638,852 \text{ gallons}$

Heifer Bedded Pack Storage Capacity

- $75' \times 42' \times 6'$

Rainfall Worksheet

[Return to Appendix 3](#)

County Lancaster			
Evaporation or no Evaporation No Evaporation - Directly on Storage			
Paved or Unpaved Paved - Directed to Storage			
Manure Group	Cow Spring	117405	gallons of rain water added to this manure group
Beginning Month (1-12)	10		
Ending Month (1-12)	3	Gallons of water for this manure group	
Storage Surface Area (Sq. ft.)	7850	87049	gallons directly on storage
Runoff Surface Area (Sq. ft.)	5000	30356	gallons directed to storage

County Lancaster			
Evaporation or no Evaporation No Evaporation - Directly on Storage			
Paved or Unpaved Paved - Directed to Storage			
Manure Group	Cow Fall	151370	gallons of rain water added to this manure group
Beginning Month (1-12)	4		
Ending Month (1-12)	9	Gallons of water for this manure group	
Storage Surface Area (Sq. ft.)	7850	110292	gallons directly on storage
Runoff Surface Area (Sq. ft.)	5000	41078	gallons directed to storage

Supplement 3

Nutrient Balance Worksheet User Guide

Completing Nutrient Balance Worksheets for Imported Manure

Nutrient Balance Sheets (NBS) are required under Pennsylvania's Nutrient Management Act (NMA) and Concentrated Animal Feeding Operation (CAFO) programs to meet the manure exporting requirements established for these programs. The Nutrient Balance Sheet, Version 3.2 can be downloaded from the Pennsylvania Nutrient Management Program website (<http://panutrientmgmt.cas.psu.edu/>).

The Nutrient Balance Worksheet includes the following required components:

- Cover Page
- Nutrient Balance Sheet Summary and Summary Notes
- Nutrient Balance Worksheet(s)
- Appendix 1: Operation Maps
- Appendix 2: Phosphorus Index (if using Option 3)

This guide provides direction on how to complete the Nutrient Balance Worksheets for the Nutrient Balance Sheet. The worksheet documents appropriate nutrient (manure and fertilizer) application rates, timing and application procedures for the crop management units listed in the NBS. If the importing farm has an approved nutrient management plan a NBS is not required.

To meet the requirements of the NMA or CAFO program, these forms must be developed or signed off by either an Act 38 Nutrient Management Specialist or an Act 49 Manure Broker 2 as certified through the Pennsylvania Department of Agriculture.

The Nutrient Balance Worksheet format provides three options for a farmer to follow in order to determine appropriate manure and fertilizer application rates, taking into account the concerns relating to the application of nitrogen and phosphorus. All three options require that nitrogen not be applied above the amount that the crop will take up the given year, with phosphorus addressed by implementing one of the following options:

1. Application rates based on phosphorus removal of the planned crop with a 150' manure application setback from streams, lakes and ponds.
2. Application rates based on the annual nitrogen requirements of the planned crop with a 150' manure application setback from streams, lakes and ponds. This option is only available for fields that have soil test levels less than 200 ppm phosphorus by Mehlich-3 test.
3. Implementation of the phosphorus index on each crop management unit where manure will be applied.

Complete a worksheet for each crop group on the importing operation. Fields with similar historical and planned management can be combined into a crop group and one

worksheet developed for the group. The worksheet Crop Management Unit will need to list the fields covered by that worksheet. The same CMU is likely to appear on several worksheets for a particular farm, as there are various crops that may be grown on that CMU over the crop rotation for the farm.

Check the Manure Plan Basis option that will be followed for the completion of the worksheet. Remember to include maps covering all the fields addressed in the NBS. These maps need to include crop management unit (field) identification, acreage and boundaries, manure application setback areas and buffers and associated landscape features (streams and other water bodies, sinkholes, and active water wells), and location of in-field manure stacking areas (including each site in stacking rotation).

Nutrient Balance Worksheet

CMU/Field Identification <small>(Area must be clearly identified on a map)</small>			Acres	Crop Group	Yield
Manure Plan Basis <small>(check planning option)</small>	OPTION 1 P Removal		OPTION 2 N Requirement		OPTION 3 P Index
	<ul style="list-style-type: none"> P removal rates 150' application setback from streams, lakes or ponds 		<ul style="list-style-type: none"> N requirement rates 150' application setback from streams, lakes or ponds Soil test < 200 ppm Mehlich 3 P 		<ul style="list-style-type: none"> P Index evaluation (must be attached)
	Will P banking be used?		Soil Test Mehlich 3 P (ppm)		
	No				
	Yes, for _____ years.				
	(Use the P ₂ O ₅ column to determine acceptable rate)		(Use the N column to determine acceptable rate)		(Use appropriate column based on the P Index to determine acceptable rate)
Manure Type	Manure Analysis (lb/ton or 1000 gal) Total N P ₂ O ₅ K ₂ O		Application Timing	Application Method	
Notes					

	N ¹	P ₂ O ₅ ¹	K ₂ O ¹	Recommendation Basis
A) Recommendation or Removal (lb/A) <small>N – Soil Test or Tables 1 & 2 (AG Table 1.2-5; 1.2-7) P₂O₅ & K₂O – Soil Test or Table 3 (AG Table 1.2-8)</small>				Soil Tests
B) Fertilizer Applied (lb/A) <small>(Regardless of Manure e.g. Starter)</small>				Crop Removal
C) Other Organic Sources Applied (lb/A) <small>(e.g. Biosolids, Other Manure)</small>				Application Record & Notes <small>Record when the planned manure and fertilizer rates were applied or note changes.</small>
D) Residual Manure N (lb/A) <small>Table 4 (AG Table 1.2-14B)</small>				
E) Previous Legume N (lb/A) <small>Table 5 (AG Table 1.2-6) or Soil Test Report</small>				
F) Net Nutrient Requirement (lb/A) <small>(A – B – C – D – E)</small>				
G) Manure Nutrient Content <small>(lb/ton or lb/1000gal)</small>				
H) Nitrogen Availability Factor <small>Table 6 (AG Table 1.2-14A)</small>				
I) Available Nitrogen <small>(lb/ton or lb/1000gal) (G x H)</small>				
J) Balanced Manure Rate <small>(tons/A or gallons/A) For N: (F ÷ I) For P: (F ÷ G)</small>				
K) Planned Manure Rate <small>(tons/A or gallons/A) Must be less than or equal to the appropriate Balanced Rate based on the plan basis being used</small>				
L) Nutrients Applied at Planned Rate <small>(lb/A) For N: (K x I) For P & K: (K x G)</small>				
M) Nutrient Balance at Planned Rate <small>(lb/A) (F - L) (Indicate short or excess)</small>				

¹ Completion of N column required for all options; P₂O₅ column is optional for N based rates; K₂O is optional for all rates.

Completing Nutrient Balance Worksheets

Completing the Information Section

Three questions need to be answered from input provided by the operator of the importing operation.

1. **What crop groups will receive the imported manure?** A separate worksheet must be completed for each crop group and may be used for multiple years.
2. **What manure plan basis will be used to determine application rates?** If option 1 is selected the option of P banking should be discussed with the operator. Option 2 and 3 will require soil tests.
3. **What application management will be used?** Specifically, when will the manure be applied and will it be incorporated?

Note: Late fall and winter applications of imported manure should be avoided if at all possible. Fields must have greater than 25% cover at the time of application. In the Act 38 program, cover is defined as living and dead plant material. If late fall or winter manure application is necessary, it is highly recommended that fields utilized are existing hay fields, or have been planted to a cover crop prior to manure application.

The information received from the importing operation and the manure analysis results obtained from the exporting operation will be used to complete the first section of the worksheet.

- List the crop group, expected yield, the fields that potentially could receive this imported manure, and the total combined acreage of those fields.
- Check the manure planning base option that will be used to determine manure application rates. For Option 1 complete the P banking information. For Options 2 and 3, list the soil test Mehlich 3 ppm P values for the fields listed on the worksheet. If there are too many fields to list on the worksheet, a separate summary sheet may be attached to the Nutrient Balance Sheet.
- Record the manure type and analysis and the application management information.

Completing the Manure Application Rate Section

In addition to the three questions above, the importing operator should also determine which of the three nutrient columns (N, P₂O₅ or K₂O) will be completed. The N column must be completed on all worksheets. The P₂O₅ column is optional for N based rates and the K₂O column is optional for all rates.

If soil test recommendations will be used as the basis of determining the manure rate, the nutrient balance numbers are valuable to the importing operator in determining supplemental fertilizer needs. However, if crop removal figures are used as the starting point, the nutrient balance numbers are not a reliable indicator of additional fertilizer needs. The information “Note” at the bottom of the worksheet should be explained to the importing operator.

Row A – Recommendation or Removal

- The recommendations are obtained from soil test reports. Crop removal figures come from Tables 1, 2 or 3. Soil test reports, if available, should be used instead of the nutrient removal tables. Complete the “Recommendation Basis” box. When using the P Banking Option, add the P removal values for each of the crops in the two or three year term.

Row B – Fertilizer Applied

- The fertilizer nutrients listed here are from fertilizer, such as starter or herbicide carrier that will be applied regardless of the amount of manure nutrients applied.

Row C – Other Organic Sources Applied

- In this row list the amount of nutrients from other sources such as other manure applications, biosolid applications, or uncollected manure on pastures. When other sources of nutrients are applied to a Crop Management Unit in addition to the imported manure, the following information must be included in the Nutrient Balance Sheet Summary Notes. For the application of other organic sources the notes must include the type of material and the application rate. For pastures, the specifics of the pasture management must be listed including the animal groups on the pasture, numbers in each animal group, grazing season, hours per day on pasture, and where animals are watered and fed (if applicable).

Row D – Residual Manure N

- This is an estimate of how much nitrogen will be available to the crop from previous manure applications. Use Table 4 to determine this value in the N column.

Row E – Previous Legume N

- This is an estimate of how much nitrogen will be available to the crop following a previous legume crop. Use Table 5 to determine this value in the N column.

Row F – Net Nutrient Requirement

- To obtain these values subtract the nutrient amounts from rows B, C, D and E from the recommendations in Row A.

Row G – Manure Nutrient Content

- Transfer the appropriate values from the manure analysis values of the imported manure listed in the upper section of the worksheet.

Row H – Nitrogen Availability Factor

- Only a portion of the total nitrogen is available to the crop in the year the manure is applied. Use Table 6 to select an N availability factor and list it in the N column. The table considers four aspects to determine this factor: the crop, season of application, application management with respect to incorporation, and the manure type use.

Row I – Available Nitrogen

- Multiply the nitrogen content of the manure (Row G) by the nitrogen availability factor (Row H) to obtain this number and list it in the N column.

Row J – Balanced Manure Rate

- Use the appropriate column to determine this manure rate. For P removal rates use the P_2O_5 column. For N requirement rates use the N column.
- For nitrogen divide the net N requirement (Row F) by the available nitrogen (Row I) and place in the N column.
- For P_2O_5 divide the net P_2O_5 requirement (Row F) by the P_2O_5 content of the manure (Row G) and place in P_2O_5 column.
- The balance rate is the maximum amount of this manure type that can be applied for the nutrient being considered.

Row K – Planned Manure Rate

- This is the actual planned manure rate. The planned rate cannot exceed the balanced rate. It should be based on the application equipment capabilities determined by calibration.

Row L – Nutrients Applied at Planned Rate

- For nitrogen multiply the planned rate (Row K) by the available nitrogen (Row I).
- For P_2O_5 and K_2O multiply the planned rate (Row K) by the manure nutrient content (Row G).

Row M – Nutrient Balance at Planned Rate

- Subtract the nutrients applied at the planned rate (Row L) from the net nutrients required (Row F).
- This will indicate if more fertilizer or other sources of nutrients are required to meet crop production (yield) goals. **Note:** Nutrient balances for P_2O_5 and K_2O based on crop removal (Row A) should not be used to determine additional fertilizer needs. Only recommendations based on soil tests should be used for this purpose.

Completing the Summary Sheets

The summary sheets are completed by transferring the required information from each of the worksheets included in the Nutrient Balance Sheet.

The Summary Notes sheet includes two required notes related to the use of the P banking option as part of Option 1 and the use crop removal values in Row A of the worksheet.

Nutrient Balance Worksheet Examples

Following the tables are two examples of completed Nutrient Balance Worksheets. In addition, the required information from the two worksheets is summarized in the Nutrient Balance Sheet Summary and Summary Notes.

The first example is for **Option 1, Manure Rates Based on P Removal.**

The second example is for **Option 2, Manure Rates Based on N Required.**

Additional Planning Guidance

Planning Double Crops

The planning approach for double crops requires using a separate Nutrient Balance Worksheet for both the first crop (winter crop) and the second crop (summer crop). The planning procedure is the same as for a single crop except for three specific aspects:

- The residual manure N is divided between both the first and second crops.
- The previous legume N is allocated only to the second crop.
- A proportion of the manure N and any excess P or K applied to the winter crop must be credited to the second crop.

Following is the guidance for planning a double crop using the Nutrient Balance Worksheets.

1. Complete a worksheet for the winter crop.
 - a. Use the appropriate manure residual N values for winter crops in a double crop system from Table 4 (Agronomy Guide Table 1.2-14B).
 - b. If the crop is following a legume crop, there is no allocation of the legume residual N to the winter crop. The total legume residual N value will be allocated to the summer crop.
2. After completing the worksheet for the winter crop, calculate the carryover N from the manure applied to the winter crop that must be credited to the summer crop as follows:
 - a. Look up the appropriate N availability factor in Table 6 (Agronomy Guide Table 1.2-14A). These availability factors are in the section of the table labeled: *Early fall - Additional N available to the summer crop in a double-crop system from manure applied in the fall for the winter crop.*
 - b. Multiply the *Planned Manure Rate* (Row K) times the *Manure Nitrogen Content* (Row G) times the availability factor determined above in a.

Example: Planned Rate = 6000 gal swine manure / A
Manure N Content = 30 lb / 1000 gal
Nitrogen Availability Factor = 0.20

$$6000 \text{ gal} / A \times 30 \text{ lb} / 1000 \text{ gal} \times 0.20 =$$

36 lb N/A Carryover N to the summer crop

- c. The N Carryover from the winter crop manure application should be entered in N column for *Other Organic Sources Applied* (Row C) in the second worksheet for the summer crop.

- d. In addition, any **excess P and/or K** that is applied at the planned rate (negative numbers in the P or K columns in Row M) should be entered as positive numbers in the appropriate column for *Other Organic Sources Applied* (Row C) in the worksheet for the summer crop.

3. Complete the worksheet for the summer crop.

- a. Use the appropriate manure residual N values for summer crops in a double crop system from Table 4 (Agronomy Guide Table 1.2-14B).
- b. If the crop is following a legume crop, allocate the total legume residual N value from Table 5 (Agronomy Guide Table 1.2-6) to the summer crop.

It is important to note that these two crops are now linked together. The carryover N, P, and K for the summer crop only applies if it is following this specific winter crop. That distinction needs to be clear in the CMU/Field ID and in the NBS Summary Notes.

There may be situations where the winter crop may be followed by different summer crops on different fields on the farm. In that case as long as the management used on the winter crop does not change, the winter crop only needs to be entered in the NBS Spreadsheet one time. The carryover nutrients from that winter crop may be applied to multiple summer crops that follow it.

Planning Multiple Applications

The planning approach for multiple manure applications requires using a separate Nutrient Balance Worksheet for each manure application to one field/crop group. The planning procedure is the same as for a single application except for one specific aspect:

- After planning the first application, the second application must then be based on the nutrient balance following the first manure application.

Following is the guidance for planning a multiple application using the Nutrient Balance Worksheets.

1. Plan the first application as you would any other field/crop group.
2. For the second application, enter the same Field, Crop, and Manure Planning Basis as for the first application.
3. The same or any other manure group can be chosen for the second application and the selected manure group information entered.
4. **Important>>>** For the second application, the *Nutrient Balance at the Planned Rate* (Row M) in the first application is entered into the *Net Nutrients Requirement* (Row F) line for the second application.

5. **Important>>>** For the second application, do not enter any other information in the *Fertilizer Applied* (Row B), *Other Organic Sources Applied* (Row C), *Residual Manure N* (Row D), or *Previous Legume N* (Row E).
6. Enter the *Planned Manure Rate* (Row K) for the second application.
7. Nutrient balances that are “Short” in the *Nutrient Balance at Planned Rate* (Row M) in the second application can be applied as supplemental fertilizer.

It is important to note that these two are now linked together. This scenario can be used on other fields that have the exact same situation. This needs to be clear in the CMU/Field ID and in the NBS Summary Notes.

Agronomy Guide Table 1.2-15 N Availability

Planning manure application rates for atypical manures must use Agronomy Guide Table 1.2-15 to determine the *Nitrogen Availability Factor* (Row H) in the Nutrient Balance Worksheet. Manure that has been treated in some way, in which the typical analysis has been altered, is considered atypical manure. Common examples are separated and composted manure.

The guidance below outlines how to calculate the *Nitrogen Availability Factor* (Row H) using Agronomy Guide Table 1.2-15.

1. Calculate the total Available N using the factors in Agronomy Guide Table 1.2-15.
 - Ammonium N x Ammonium N Availability Factor = Available Ammonium N
 - Organic N x Organic N Availability Factor = Available Organic N
 - Available Ammonium N + Available Organic N = Available N

Example: Composted manure (50 lb N / ton; 10 lb ammonium N / ton) applied in the spring for corn silage; incorporated in 2-4 days

Ammonium N x Ammonium N Factor for incorporation in 2 to 4 days
 $10 \times 0.40 = 4 \text{ lb ammonium N / ton}$

Organic N x Organic N Availability Factor for compost
 $40 \times 0.10 = 4 \text{ lb organic N / ton}$

Available Ammonium N + Available Organic N
 $4 \text{ lb ammonium N / ton} + 4 \text{ lb organic N / ton} = \mathbf{8 \text{ lb available N / ton}}$

2. Calculate the nitrogen availability factor for use in the Nutrient Balance Worksheet.
 - Available N (calculated using Table 1.2-15) / Total N

Example: $8 \text{ lb available N per ton} / 50 \text{ total N} = \mathbf{0.16}$

3. The calculated nitrogen availability factor is entered in *Nitrogen Availability Factor* (Row H) in the Nutrient Balance Worksheet.

Table 1. Nitrogen recommendations for agronomic crops. (Table 1.2-5, Penn State Agronomy Guide)

These are base recommendations and should be adjusted for previous crop, previous manure history, and planned manure applications (see “Manure Nutrient Management” section).

Crop	Recommendation (lb N/unit* of expected yield)	Comments
Corn grain (bu/A)*	1	For better N efficiency, delay application of the nitrogen until the corn is between 10 and 20 inches tall. If the field has a history of manure and/or legumes, delay all of the N. If there is no history of manure and/or legumes, split the N, applying one-third near to planting and delaying the balance. Adjust this recommendation for any previous legume in the rotation (see Table 1.2-7) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15). The PSNT or chlorophyll meter test can be used to refine N recommendations for corn, especially where manure is a major nutrient source.
Corn silage (ton/A)*	7	For better N efficiency, delay application of the nitrogen until the corn is between 10 and 20 inches tall. If the field has a history of manure and/or legumes, delay all of the N. If there is no history of manure and/or legumes, split the N, applying one-third near to planting and delaying the balance. Adjust this recommendation for any previous legume in the rotation (see Table 1.2-7) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15). The PSNT or chlorophyll meter test can be used to refine N recommendations for corn, especially where manure is a major nutrient source.
Grain sorghum (bu/A)*	0.75	Adjust this recommendation for any previous legume in the rotation (see Table 1.2-7) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Forage sorghum (ton/A)*	7	Adjust this recommendation for any previous legume in the rotation (see Table 1.2-7) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Oats (bu/A)*	0.8	Apply the N with any other fertilizer before planting. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Wheat/Rye (bu/A)*	1.0	If plants did not tiller well, apply N by mid-March; otherwise, apply any time up to growth stage 5. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Barley (bu/A)*	0.8	If plants did not tiller well, apply N by mid-March; otherwise, apply any time up to growth stage 5. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Small grain silage (ton/A)*	17	Apply at greenup in the spring.
Grass hay (ton/A)*	50	Split the nitrogen recommendation and apply it based on the expected yield for each cutting. For grass-legume mixtures, if the legume is more than 50% of the stand, the field should be managed as a legume; thus, no nitrogen is recommended. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).

Table 2. Nitrogen removal by legumes. (Table 1.2-7, Penn State Agronomy Guide)

Legume crop (no nitrogen application recommended)	Pounds of N removed/unit* of yield	Comments
Alfalfa (ton/A)*	50	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Clover (ton/A)*	40	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Trefoil (ton/A)*	50	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Soybeans (bu/A)*	3.2	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.

Table 3. Typical crop nutrient removal for phosphorus and potassium. (Table 1.2-8, Penn State Agronomy Guide)

Crop (units)	Per unit of yield		Typical yield/A	Removal for given yield	
	P ₂ O ₅	K ₂ O		P ₂ O ₅	K ₂ O
Corn (bu)	0.4	0.3	150 (bu)	60	45
Corn silage (T) ¹	5.0	11.0	25 (T)	125	275
Grain sorghum (bu)	0.6	0.8	125 (bu)	75	100
Forage sorghum (T) ¹	3.0	10.0	15 (T)	45	150
Sorghum/sudangrass ¹	7.0	7.0	15 (T)	105	105
Alfalfa (T) ^{2,3}	15.0	50.0	5 (T)	75	250
Red Clover (T) ^{2,3}	15.0	40.0	3.5 (T)	55	140
Trefoil (T) ^{2,3}	15.0	40.0	3.5 (T)	55	140
Cool-season grass (T) ^{2,3}	15.0	50.0	4 (T)	60	200
Bluegrass (T) ^{2,3}	10.0	30.0	2.5 (T)	25	75
Wheat/rye (bu) ⁴	1.0	1.8	60 (bu)	60	110
Oats (bu) ⁴	0.9	1.5	80 (bu)	70	120
Barley (bu) ⁴	0.6	1.5	75 (bu)	45	110
Soybeans (bu)	1.0	1.4	50 (bu)	50	70
Small grain silage (T) ¹	7.0	26.0	6 (T)	40	160

1. 65 percent moisture.

2. For legume-grass mixtures, use the predominant species in the mixture.

3. 10 percent moisture.

4. Includes straw.

Table 4. Manure nitrogen availability factors for use in determining manure application rates based on planning conditions. (Table 1.2-14B, Penn State Agronomy Guide)

B. Historical Frequency of Manure Application on the Field

To use this table, determine the frequency of manure application and move to the right in the row to determine the amount of residual N that is available from past manure applications. Deduct this amount of residual N from the basic N recommendation before determining any additional fertilizer or manure application rates.

	Pounds N available to a Summer Crop (corn, grass hay, oats, etc.)	Pounds N available to a Winter Crop (wheat, barley, rye, etc.)	Pounds N available to the Winter Crop in a Double Crop System	Pounds N available to the Summer Crop in a Double Crop System
Rarely received manure in the past (<2 out of 5 years) NOTE: If a field only received manure once out of 5 years, but this application was made the previous year, use the frequent credit for the following year.	0	0	0	0
Frequently received manure (2–3 out of 5 years)	20	7	7	13
Continuously received manure (4–5 out of 5 years)	35	11	11	24

Table 5. Residual nitrogen contributions from legumes. (Table 1.2-6 Penn State Agronomy Guide)

Previous crop ¹	Percent stand	High-productivity fields (Soil productivity group 1) ²	Moderate-productivity fields (Soil productivity groups 2 & 3) ²	Low-productivity fields (Soil productivity groups 4 & 5) ²
	Nitrogen credit (lbs/A)			
First year after alfalfa	>50 stand	120	110	80
	25–49 stand	80	70	60
	<25 stand	40	40	40
First year after clover or trefoil	>50 stand	90	80	60
	25–49 stand	60	60	50
	<25 stand	40	40	40
First year after soybeans harvested for grain	1 lb N/bu soybeans			

1. When a previous legume crop is checked on the Penn State soil test information sheet, the residual nitrogen for the year following the legume is calculated and given on the report. This credit should be deducted from the N recommendation given on the soil test report.
2. See Agronomy Guide Table 1.1-1 in the basic soils section for information on soil productivity groups.

Table 6. Manure nitrogen availability factors for use in determining manure application rates based on planning conditions. (Table 1.2-14A, Penn State Agronomy Guide)

A. Current Year

To use this table find the **planned manure application season** in the left column, then move to the right in that row and select the **target crop utilization**. Continue to the right in that row to find the **nitrogen availability factor** for the **planned manure application management**. The manure nitrogen availability factor is the fertilizer equivalence of the manure N or the lb of fertilizer N equivalent per pound of total manure N. For example, if the N Availability Factor = 0.50, effectively there is the equivalent of 0.50 lb of fertilizer N for every pound of total N in the manure.

Planned manure application season	Planned manure target crop utilization	Application management	Nitrogen availability factor ¹		
			Poultry manure	Swine manure	Other manure
Spring or summer	Spring utilization by grass hay and small grains. Summer utilization by corn, other summer annuals, and grass hay.	Incorporation the same day	0.75	0.70	0.50
		Incorporation within 1 day	0.50	0.60	0.40
		Incorporation within 2–4 days	0.45	0.40	0.35
		Incorporation within 5–7 days	0.30	0.30	0.30
		Incorporation after 7 days or no incorporation	0.15	0.20	0.20
Early fall ^{2,3}	Early spring utilization by small grains, small grain silage, and grass hay, including the winter crop in a double crop system.	Incorporated less than 2 days	0.50	0.45	0.40
		Incorporated 3-7 days	0.30	0.30	0.30
		Incorporated more than 7 days or no incorporation	0.15	0.20	0.20
Early fall Additional N available to the summer crop in a double crop system from manure applied in the fall for the winter crop (above) ^{2,4}	Summer utilization by the second crop, corn or other summer annuals in a double crop system.	All methods of incorporation	0.15	0.20	0.20
Early fall with a cover crop not harvested and used as a green manure ²	Summer utilization by corn, other summer annuals, and grass hay.	Incorporated less than 2 days	0.45	0.40	0.35
		Incorporated 3-7 days	0.25	0.25	0.25
		Incorporated more than 7 days or no incorporation	0.15	0.20	0.20

Early fall with no cover crop²	Summer utilization by corn, other summer annuals, and grass hay.	All methods of incorporation	0.15	0.20	0.20
Late Fall or Winter³	Spring utilization by small grains and grass hay.	All situations	0.50	0.45	0.40
	Following summer utilization by corn or other summer annuals.	No cover crop	0.15	0.20	0.20
		Cover crop harvested for silage	0.15	0.20	0.20
		Cover crop used as green manure	0.50	0.45	0.40
Grazing	Grazing anytime with nutrient uptake during growing season	Manure deposited more or less continuously by grazing cattle	0.15	0.20	0.20

1. Multiply this factor times the manure N content to estimate the manure N available for the planning conditions.
2. Early fall would be when it is still warm enough for plant growth and microbial activity to continue (soil temperature >50°F at 2").
3. When manure is applied in the early fall to the winter crop in a double crop system, use these factors to determine the N available to the winter crop.
4. Use these factors to determine the N available from the fall application in a double crop system to the summer crop. These factors would be applied to the same manure application that was used for the winter crop (See footnote 3 above).
5. Late fall and winter is when it is so cold that there is no plant growth or microbial activity (soil temperature <50°F at 2 inches).

Nutrient Balance Worksheet

CMU/Field Identification <small>(Area must be clearly identified on a map)</small>				Acres	Crop Group	Yield
Neighbor 1, 3, 4				50	Corn Silage	21 T/A
Manure Plan Basis <small>(check planning option)</small>	OPTION 1 P Removal		X	OPTION 2 N Requirement		OPTION 3 P Index
	<ul style="list-style-type: none"> • P removal rates • 150' application setback from streams, lakes or ponds 			<ul style="list-style-type: none"> • N requirement rates • 150' application setback from streams, lakes or ponds • Soil test < 200 ppm Mehlich 3 P 		<ul style="list-style-type: none"> • P Index evaluation (must be attached)
	Will P banking be used?			Soil Test Mehlich 3 P (ppm)		
	X	No				
		Yes, for _____ years.				
	(Use the P ₂ O ₅ column to determine acceptable rate)			(Use the N column to determine acceptable rate)		(Use appropriate column based on the P Index to determine acceptable rate)
Manure Type		Manure Analysis (lb/ton or 1000 gal) Total N P ₂ O ₅ K ₂ O		Application Timing		Application Method
Broiler Litter		65	54	49	Spring	Surface applied; 5-7 day incorporation
Notes	This farm receives manure annually and the farmer applies 100 lb/A of 10-20-10 starter fertilizer.					

	N ¹	P ₂ O ₅ ¹	K ₂ O ¹	Recommendation Basis	
A) Recommendation or Removal (lb/A) N – Soil Test or Tables 1 & 2 (AG Table 1.2-5;1.2-7) P ₂ O ₅ & K ₂ O – Soil Test or Table 3 (AG Table 1.2-8)	150	105			Soil Tests
				X	Crop Removal
B) Fertilizer Applied (lb/A) (Regardless of Manure e.g. Starter)	10	20		Application Record & Notes Record when the planned manure and fertilizer rates were applied or note changes.	
C) Other Organic Sources Applied (lb/A) (e.g. Biosolids, Other Manure)	0	0			
D) Residual Manure N (lb/A) Table 4 (AG Table 1.2-14B)	35				
E) Previous Legume N (lb/A) Table 5 (AG Table 1.2-6) or Soil Test Report	0				
F) Net Nutrient Requirement (lb/A) (A – B – C – D – E)	105	85			
G) Manure Nutrient Content (lb/ton or lb/1000gal)	65	54			
H) Nitrogen Availability Factor Table 6 (AG Table 1.2-14A)	.3				
I) Available Nitrogen (lb/ton or lb/1000gal) (G x H)	19.5				
J) Balanced Manure Rate (tons/A or gallons/A) For N: (F ÷ I) For P: (F ÷ G)	NA	1.6			
K) Planned Manure Rate (tons/A or gallons/A) Must be less than or equal to the appropriate Balanced Rate based on the plan basis being used	1.5 tons/A				
L) Nutrients Applied at Planned Rate (lb/A) For N: (K x I) For P & K: (K x G)	29	81		Note: Nutrient balances for P ₂ O ₅ and K ₂ O based on crop removal (Row A) should not be used to determine additional fertilizer needs. Only recommendations based on soil tests should be used for this purpose.	
M) Nutrient Balance at Planned Rate (lb/A) (F - L) (Indicate short or excess)	76 short	4 short			

¹ Completion of N column required for all options; P₂O₅ column is optional for N based rates; K₂O is optional for all rates.

Nutrient Balance Worksheet

CMU/Field Identification <small>(Area must be clearly identified on a map)</small>				Acres	Crop Group	Yield
Neighbor 2, 5, 6				50	Corn Silage	21 T/A
Manure Plan Basis <small>(check planning option)</small>	OPTION 1 P Removal		OPTION 2 N Requirement		X	OPTION 3 P Index
	<ul style="list-style-type: none"> • P removal rates • 150' application setback from streams, lakes or ponds 		<ul style="list-style-type: none"> • N requirement rates • 150' application setback from streams, lakes or ponds • Soil test < 200 ppm Mehlich 3 P 			<ul style="list-style-type: none"> • P Index evaluation (must be attached)
	Will P banking be used?		Soil Test Mehlich 3 P (ppm)			
		No		64, 78, 57		
		Yes, for years.				
	(Use the P ₂ O ₅ column to determine acceptable rate)		(Use the N column to determine acceptable rate)		(Use appropriate column based on the P Index to determine acceptable rate)	
Manure Type		Manure Analysis (lb/ton or 1000 gal) Total N P ₂ O ₅ K ₂ O		Application Timing		Application Method
Broiler Litter		65	54	49	Spring	Surface applied; 5-7 day incorporation
Notes	This farm receives manure annually and the farmer applies 100 lb/A of 10-20-10 starter fertilizer.					

	N ¹	P ₂ O ₅ ¹	K ₂ O ¹	Recommendation Basis	
A) Recommendation or Removal (lb/A) <small>N – Soil Test or Tables 1 & 2 (AG Table 1.2-5;1.2-7) P₂O₅ & K₂O – Soil Test or Table 3 (AG Table 1.2-8)</small>	150			X	Soil Tests
					Crop Removal
B) Fertilizer Applied (lb/A) <small>(Regardless of Manure e.g. Starter)</small>	10			Application Record & Notes Record when the planned manure and fertilizer rates were applied or note changes.	
C) Other Organic Sources Applied (lb/A) <small>(e.g. Biosolids, Other Manure)</small>	0				
D) Residual Manure N (lb/A) <small>Table 4 (AG Table 1.2-14B)</small>	35				
E) Previous Legume N (lb/A) <small>Table 5 (AG Table 1.2-6) or Soil Test Report</small>	0				
F) Net Nutrient Requirement (lb/A) <small>(A – B – C – D – E)</small>	105				
G) Manure Nutrient Content <small>(lb/ton or lb/1000gal)</small>	65				
H) Nitrogen Availability Factor <small>Table 6 (AG Table 1.2-14A)</small>	.3				
I) Available Nitrogen <small>(lb/ton or lb/1000gal) (G x H)</small>	19.5				
J) Balanced Manure Rate <small>(tons/A or gallons/A) For N: (F ÷ I) For P: (F ÷ G)</small>	5.4				
K) Planned Manure Rate <small>(tons/A or gallons/A) Must be less than or equal to the appropriate Balanced Rate based on the plan basis being used</small>	5 tons/A				
L) Nutrients Applied at Planned Rate <small>(lb/A) For N: (K x I) For P & K: (K x G)</small>	98			Note: Nutrient balances for P ₂ O ₅ and K ₂ O based on crop removal (Row A) should not be used to determine additional fertilizer needs. Only recommendations based on soil tests should be used for this purpose.	
M) Nutrient Balance at Planned Rate <small>(lb/A) (F - L) (Indicate short or excess)</small>	7 short				

¹ Completion of N column required for all options; P₂O₅ column is optional for N based rates; K₂O is optional for all rates.

Nutrient Balance Sheet Summary

	CMU/ Field ID	Crop Group	Manure Group	Application Season	Application Management	Planned Manure Rate	Starter/Other Fertilizer (lb/A)			Nutrient Balance @ Planned Rate (lb/A) ¹			Notes (check)
							N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
1	Neighbor 1, 3, 4	Corn Silage	Broiler Litter	Spring	Surface applied; 5-7 day incorp.	1.5 tons/A	10	20	10	76	4		✓
2	Neighbor 2, 5, 6	Corn Silage	Broiler Litter	Spring	Surface applied; 5-7 day incorp.	5 tons/A	10	20	10	7			✓
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													

¹ Positive numbers = nutrient deficit; negative numbers = nutrient excess

Nutrient Balance Sheet Summary Notes

	CMU/Field ID	Crop Group	Manure Group	Notes ^{1, 2}
1	Neighbor 1, 3, 4	Corn Silage	Broiler Litter	Planned manure rate is based on P removal. Nutrient balances for P ₂ O ₅ and K ₂ O are based on crop removal (Row A) and should not be used to determine additional fertilizer needs.
2	Neighbor 2, 5, 6	Corn Silage	Broiler Litter	Planned manure rate is based on nitrogen requirement.
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

¹ If crop removal values were used in Row A for P₂O₅ and K₂O, planners should use the following standard note: Nutrient balances for P₂O₅ and K₂O are based on crop removal (Row A) and should not be used to determine additional fertilizer needs.

² If the P banking option is used, planners should use the following standard note: The P banking option was used to develop the planned manure rate. No other phosphorus sources (manure and fertilizer) may be applied for the term of the multiple year rate.

Supplement 4

Sample Nutrient Balance Sheets

Supplement 4 provides samples of completed Nutrient Balance Sheets in the two available formats for Act 38 nutrient management planning.

1. Nutrient Balance Sheet using Microsoft Word.
2. Nutrient Balance Sheet using Microsoft Excel.

The sample Nutrient Balance Sheets were developed using Nutrient Balance Sheet Standard Format: Version 3.2 – October 2015.

Nutrient Balance Sheet

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Date of Development February 6, 2016

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Nutrient Balance Worksheet Appendices

The following appendices need to accompany the Nutrient Balance Worksheets if applicable:

- Maps of fields where manure is to be applied including required manure application setbacks
- Completed P-Index spreadsheet (or other similar information summary) listing the source and transport factors and final Index result for each crop management unit (if applicable)

Nutrient Balance Sheet Summary

	CMU/ Field ID	Crop Group	Manure Group	Application Season	Application Management	Planned Manure Rate	Starter/Other Fertilizer (lb/A)			Nutrient Balance @ Planned Rate (lb/A) ¹			Notes (check)
							N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
1	2-8	Corn Grain After Alfalfa	Broiler Litter	Spring	3-4 days	3 T/A	15	30	30	2	(215)	(133)	✓
2	2-8	Corn Grain After Corn	Broiler Litter	Spring	3-4 days	4 T/A	15	30	30	2	(277)	(207)	✓
3	1, 9	Grass Hay	Swine Liquid	Summer	None	6000 Gal/A	92	0	0	2	2		✓
4	10, 11	Corn Grain After Soybeans	Broiler Litter	Spring	3-4 days	3.5 T/A	0	0	0	5	(216)	(155)	✓
5													
6													
7													
8													
9													
10													
11													
12													

¹ Positive numbers = nutrient deficit; negative numbers = nutrient excess

Nutrient Balance Sheet Summary Notes

	CMU/Field ID	Crop Group	Manure Group	Notes ^{1, 2}
1	2-8	Corn Grain After Alfalfa	Broiler Litter	Fields 4 – 8 have a 150' manure application setback from the stream. If manure will be stacked on the farm, an area has been designated in field 3 for this stack. See the map for details.
2	2-8	Corn Grain After Corn	Broiler Litter	Fields 4 – 8 have a 150' manure application setback from the stream. If manure will be stacked on the farm, an area has been designated in field 3 for this stack. See the map for details.
3	1, 9	Grass Hay	Swine Liquid	Nutrient balances for P ₂ O ₅ and K ₂ O are based on crop removal (Row A) and should not be used to determine additional fertilizer needs. The P banking option was used to develop the planned manure rate. No other phosphorus sources (manure and fertilizer) may be applied for the term of the multiple year rate (next 2 years). Field 9 has a 100' manure application setback from a well and 150' manure application setback along the stream. See the map for details.
4	10, 11	Corn Grain After Soybeans	Broiler Litter	Field 11 has a 100' manure application setback from a sinkhole.
5				
6				
7				
8				
9				
10				
11				
12				

¹ If crop removal values were used in Row A for P₂O₅ and K₂O, planners should use the following standard note: Nutrient balances for P₂O₅ and K₂O are based on crop removal (Row A) and should not be used to determine additional fertilizer needs.

² If the P banking option is used, planners should use the following standard note: The P banking option was used to develop the planned manure rate. No other phosphorus sources (manure and fertilizer) may be applied for the term of the multiple year rate.

Nutrient Balance Worksheet

CMU/Field Identification <small>(Area must be clearly identified on a map)</small>				Acres	Crop Group	Yield
2-8				90	Corn Grain After Alfalfa	150 bu/A
Manure Plan Basis <small>(check planning option)</small>	OPTION 1 P Removal		OPTION 2 N Requirement		X	OPTION 3 P Index
	<ul style="list-style-type: none"> • P removal rates • 150' application setback from streams, lakes or ponds 		<ul style="list-style-type: none"> • N requirement rates • 150' application setback from streams, lakes or ponds • Soil test < 200 ppm Mehlich 3 P 			<ul style="list-style-type: none"> • P Index evaluation (must be attached)
	Will P banking be used?		Soil Test Mehlich 3 P (ppm)			
	<input type="checkbox"/> No		154, 154, 125, 137, 118, 142, 133			
	<input type="checkbox"/> Yes, for <input type="text"/> years.					
(Use the P ₂ O ₅ column to determine acceptable rate)		(Use the N column to determine acceptable rate)		(Use appropriate column based on the P Index to determine acceptable rate)		
Manure Type		Manure Analysis (lb/ton or 1000 gal) Total N P ₂ O ₅ K ₂ O		Application Timing		Application Method
Broiler Litter		54.3	61.8	44.3	Spring	3-4 day incorporation
Notes						

	N ¹	P ₂ O ₅ ¹	K ₂ O ¹	Recommendation Basis	
A) Recommendation or Removal (lb/A) <small>N – Soil Test or Tables 1 & 2 (AG Table 1.2-5;1.2-7) P₂O₅ & K₂O – Soil Test or Table 3 (AG Table 1.2-8)</small>	150	0	0	X	Soil Tests
					Crop Removal
B) Fertilizer Applied (lb/A) <small>(Regardless of Manure e.g. Starter)</small>	15	30	30	Application Record & Notes <small>Record when the planned manure and fertilizer rates were applied or note changes.</small>	
C) Other Organic Sources Applied (lb/A) <small>(e.g. Biosolids, Other Manure)</small>	0	0	0		
D) Residual Manure N (lb/A) <small>Table 4 (AG Table 1.2-14B)</small>	20				
E) Previous Legume N (lb/A) <small>Table 5 (AG Table 1.2-6) or Soil Test Report</small>	40				
F) Net Nutrient Requirement (lb/A) <small>(A – B – C – D – E)</small>	75	(30)	(30)		
G) Manure Nutrient Content (lb/ton or lb/1000gal)	54.3	61.8	44.3		
H) Nitrogen Availability Factor <small>Table 6 (AG Table 1.2-14A)</small>	.45				
I) Available Nitrogen (lb/ton or lb/1000gal) (G x H)	24.4				
J) Balanced Manure Rate (tons/A or gallons/A) <small>For N: (F ÷ I) For P: (F ÷ G)</small>	3.1	NA			
K) Planned Manure Rate (tons/A or gallons/A) <small>Must be less than or equal to the appropriate Balanced Rate based on the plan basis being used</small>	3 ton/A			Note: Nutrient balances for P ₂ O ₅ and K ₂ O based on crop removal (Row A) should not be used to determine additional fertilizer needs. Only recommendations based on soil tests should be used for this purpose.	
L) Nutrients Applied at Planned Rate (lb/A) For N: (K x I) For P & K: (K x G)	73	185	133		
M) Nutrient Balance at Planned Rate (lb/A) (F - L) (Indicate short or excess)	2 short	215 excess	163 excess		

¹ Completion of N column required for all options; P₂O₅ column is optional for N based rates; K₂O is optional for all rates.

Nutrient Balance Worksheet

CMU/Field Identification <small>(Area must be clearly identified on a map)</small>				Acres	Crop Group	Yield
2-8				90	Corn Grain After Corn	150 bu/A
Manure Plan Basis <small>(check planning option)</small>	OPTION 1 P Removal		OPTION 2 N Requirement		X	OPTION 3 P Index
	<ul style="list-style-type: none"> P removal rates 150' application setback from streams, lakes or ponds 		<ul style="list-style-type: none"> N requirement rates 150' application setback from streams, lakes or ponds Soil test < 200 ppm Mehlich 3 P 			<ul style="list-style-type: none"> P Index evaluation (must be attached)
	Will P banking be used?		Soil Test Mehlich 3 P (ppm)			
	No		154, 154, 125, 137, 118, 142, 133			
	Yes, for <input type="text"/> years.					
	<small>(Use the P₂O₅ column to determine acceptable rate)</small>		<small>(Use the N column to determine acceptable rate)</small>		<small>(Use appropriate column based on the P Index to determine acceptable rate)</small>	
Manure Type		Manure Analysis (lb/ton or 1000 gal) Total N P ₂ O ₅ K ₂ O		Application Timing		Application Method
Broiler Litter		54.3	61.8	44.3	Spring	3-4 day incorporation
Notes						

	N ¹	P ₂ O ₅ ¹	K ₂ O ¹	Recommendation Basis	
A) Recommendation or Removal (lb/A) N – Soil Test or Tables 1 & 2 (AG Table 1.2-5;1.2-7) P ₂ O ₅ & K ₂ O – Soil Test or Table 3 (AG Table 1.2-8)	150	0	0	X	Soil Tests
					Crop Removal
B) Fertilizer Applied (lb/A) (Regardless of Manure e.g. Starter)	15	30	30	Application Record & Notes Record when the planned manure and fertilizer rates were applied or note changes.	
C) Other Organic Sources Applied (lb/A) (e.g. Biosolids, Other Manure)	0	0	0		
D) Residual Manure N (lb/A) Table 4 (AG Table 1.2-14B)	35				
E) Previous Legume N (lb/A) Table 5 (AG Table 1.2-6) or Soil Test Report	0				
F) Net Nutrient Requirement (lb/A) (A – B – C – D – E)	100	(30)	(30)		
G) Manure Nutrient Content (lb/ton or lb/1000gal)	54.3	61.8	44.3		
H) Nitrogen Availability Factor Table 6 (AG Table 1.2-14A)	.45				
I) Available Nitrogen (lb/ton or lb/1000gal) (G x H)	24.4				
J) Balanced Manure Rate (tons/A or gallons/A) For N: (F ÷ I) For P: (F ÷ G)	4.1	NA			
K) Planned Manure Rate (tons/A or gallons/A) Must be less than or equal to the appropriate Balanced Rate based on the plan basis being used	4 tons/A				
L) Nutrients Applied at Planned Rate (lb/A) For N: (K x I) For P & K: (K x G)	98	247	177	Note: Nutrient balances for P ₂ O ₅ and K ₂ O based on crop removal (Row A) should not be used to determine additional fertilizer needs. Only recommendations based on soil tests should be used for this purpose.	
M) Nutrient Balance at Planned Rate (lb/A) (F - L) (Indicate short or excess)	2 short	277 excess	207 excess		

¹ Completion of N column required for all options; P₂O₅ column is optional for N based rates; K₂O is optional for all rates.

Nutrient Balance Worksheet

CMU/Field Identification <small>(Area must be clearly identified on a map)</small>				Acres	Crop Group	Yield
1, 9				25	Grass Hay	3T/A
Manure Plan Basis <small>(check planning option)</small>	OPTION 1 P Removal		X	OPTION 2 N Requirement		OPTION 3 P Index
	<ul style="list-style-type: none"> P removal rates 150' application setback from streams, lakes or ponds 			<ul style="list-style-type: none"> N requirement rates 150' application setback from streams, lakes or ponds Soil test < 200 ppm Mehlich 3 P 		<ul style="list-style-type: none"> P Index evaluation (must be attached)
	Will P banking be used?			Soil Test Mehlich 3 P (ppm)		
	<input type="checkbox"/> No					
	<input checked="" type="checkbox"/> Yes, for 3 years.					
	(Use the P ₂ O ₅ column to determine acceptable rate)			(Use the N column to determine acceptable rate)		(Use appropriate column based on the P Index to determine acceptable rate)
Manure Type		Manure Analysis (lb/ton or 1000 gal) Total N P ₂ O ₅ K ₂ O		Application Timing		Application Method
Swine Liquid		30.4	22.1	16.1	Summer	No Incorporation
Notes						

	N ¹	P ₂ O ₅ ¹	K ₂ O ¹	Recommendation Basis			
A) Recommendation or Removal (lb/A) N – Soil Test or Tables 1 & 2 (AG Table 1.2-5;1.2-7) P ₂ O ₅ & K ₂ O – Soil Test or Table 3 (AG Table 1.2-8)	150	135			Soil Tests		
				X	Crop Removal		
B) Fertilizer Applied (lb/A) (Regardless of Manure e.g. Starter)	92	0		Application Record & Notes Record when the planned manure and fertilizer rates were applied or note changes.			
C) Other Organic Sources Applied (lb/A) (e.g. Biosolids, Other Manure)	0	0					
D) Residual Manure N (lb/A) Table 4 (AG Table 1.2-14B)	20						
E) Previous Legume N (lb/A) Table 5 (AG Table 1.2-6) or Soil Test Report	0						
F) Net Nutrient Requirement (lb/A) (A – B – C – D – E)	38	135					
G) Manure Nutrient Content (lb/ton or lb/1000gal)	30.4	22.1					
H) Nitrogen Availability Factor Table 6 (AG Table 1.2-14A)	.2						
I) Available Nitrogen (lb/ton or lb/1000gal) (G x H)	6.08						
J) Balanced Manure Rate (tons/A or gallons/A) For N: (F ÷ I) For P: (F ÷ G)	NA	6109					
K) Planned Manure Rate (tons/A or gallons/A) Must be less than or equal to the appropriate Balanced Rate based on the plan basis being used	6000 gallons/A						
L) Nutrients Applied at Planned Rate (lb/A) For N: (K x I) For P & K: (K x G)	36	133				Note: Nutrient balances for P ₂ O ₅ and K ₂ O based on crop removal (Row A) should not be used to determine additional fertilizer needs. Only recommendations based on soil tests should be used for this purpose.	
M) Nutrient Balance at Planned Rate (lb/A) (F - L) (Indicate short or excess)	2 short	2 short					

¹ Completion of N column required for all options; P₂O₅ column is optional for N based rates; K₂O is optional for all rates.

Nutrient Balance Worksheet

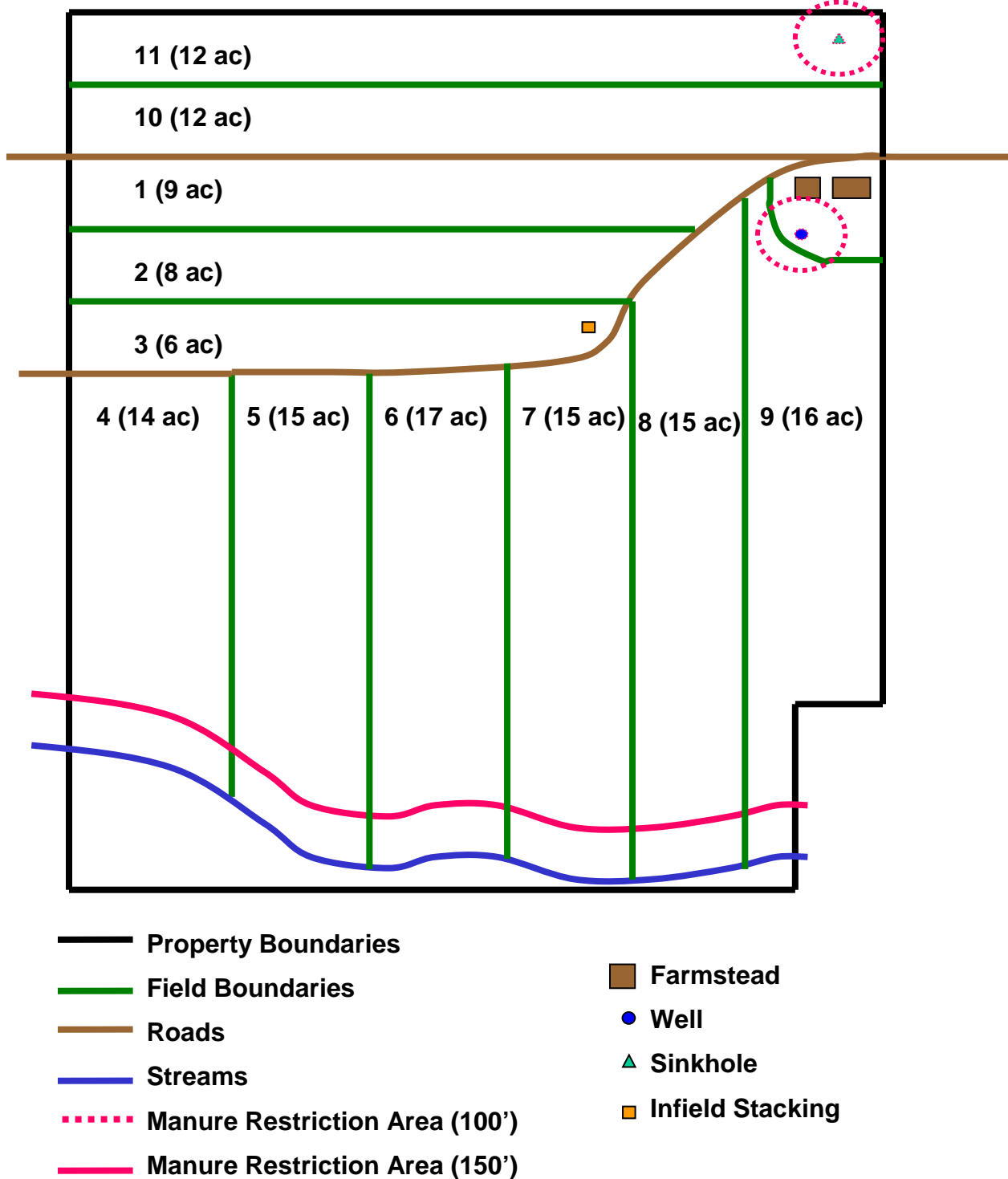
CMU/Field Identification <small>(Area must be clearly identified on a map)</small>				Acres	Crop Group	Yield
10, 11				24	Corn Grain After Soybeans	175 bu/A
Manure Plan Basis <small>(check planning option)</small>	OPTION 1 P Removal		OPTION 2 N Requirement		OPTION 3 P Index	X
	<ul style="list-style-type: none"> • P removal rates • 150' application setback from streams, lakes or ponds 		<ul style="list-style-type: none"> • N requirement rates • 150' application setback from streams, lakes or ponds • Soil test < 200 ppm Mehlich 3 P 		<ul style="list-style-type: none"> • P Index evaluation (must be attached) 	
	Will P banking be used?		Soil Test Mehlich 3 P (ppm)			
	No		315, 334			
	Yes, for years.					
	(Use the P ₂ O ₅ column to determine acceptable rate)		(Use the N column to determine acceptable rate)		(Use appropriate column based on the P Index to determine acceptable rate)	
Manure Type		Manure Analysis (lb/ton or 1000 gal) Total N P ₂ O ₅ K ₂ O		Application Timing		Application Method
Broiler Litter		54.3	61.8	44.3	Spring	3-4 Day Incorporation
Notes	P Index values for these fields were MEDIUM allowing an N based rate.					

	N ¹	P ₂ O ₅ ¹	K ₂ O ¹	Recommendation Basis	
A) Recommendation or Removal (lb/A) <small>N – Soil Test or Tables 1 & 2 (AG Table 1.2-5;1.2-7) P₂O₅ & K₂O – Soil Test or Table 3 (AG Table 1.2-8)</small>	175	0	0	X	Soil Tests
					Crop Removal
B) Fertilizer Applied (lb/A) <small>(Regardless of Manure e.g. Starter)</small>	0	0	0	Application Record & Notes Record when the planned manure and fertilizer rates were applied or note changes.	
C) Other Organic Sources Applied (lb/A) <small>(e.g. Biosolids, Other Manure)</small>	0	0			
D) Residual Manure N (lb/A) <small>Table 4 (AG Table 1.2-14B)</small>	35				
E) Previous Legume N (lb/A) <small>Table 5 (AG Table 1.2-6) or Soil Test Report</small>	50				
F) Net Nutrient Requirement (lb/A) <small>(A – B – C – D – E)</small>	90	0	0		
G) Manure Nutrient Content <small>(lb/ton or lb/1000gal)</small>	54.3	61.8	44.3		
H) Nitrogen Availability Factor <small>Table 6 (AG Table 1.2-14A)</small>	.45				
I) Available Nitrogen <small>(lb/ton or lb/1000gal) (G x H)</small>	24.4				
J) Balanced Manure Rate <small>(tons/A or gallons/A) For N: (F ÷ I) For P: (F ÷ G)</small>	3.69	NA			
K) Planned Manure Rate <small>(tons/A or gallons/A) Must be less than or equal to the appropriate Balanced Rate based on the plan basis being used</small>	3.5 ton/A			Note: Nutrient balances for P ₂ O ₅ and K ₂ O based on crop removal (Row A) should not be used to determine additional fertilizer needs. Only recommendations based on soil tests should be used for this purpose.	
L) Nutrients Applied at Planned Rate <small>(lb/A) For N: (K x I) For P & K: (K x G)</small>	85	216	155		
M) Nutrient Balance at Planned Rate <small>(lb/A) (F - L) (Indicate short or excess)</small>	5 short	216 excess	155 excess		

¹ Completion of N column required for all options; P₂O₅ column is optional for N based rates; K₂O is optional for all rates.

Appendix 1 Operation Maps

Maps (or aerial photographs) required in Nutrient Balance Sheets must identify: road and road names adjacent to and within the operation; field identification, boundaries and acreage; manure application setback areas and vegetated buffers and associated landscape features (streams and other water bodies, sinkholes, and active water wells or springs); and location of in-field manure stacking areas (including each site in stacking area rotation).



Appendix 2

Phosphorus Index

Include the current Pennsylvania Phosphorus Index Spreadsheet or paper worksheet for each field that required Part B of the P Index when using Manure Plan Basis Option 3.

	A	B	C	D	E	F	G	H
1	Pennsylvania P Index Version 2 (October 2003; Penn State, Dept. Crop & Soil Sciences & USDA-ARS, Pasture Systems & Watershed Mgmt. Research Unit)							
2								
3	FARM IDENTIFICATION		PART A: SCREENING TOOL			CMU/Field ID	10	11
4	Act 38 Technical Manual		Is the CMU in a Special Protection watershed?			If the answer is Yes to any of these questions, Part B must be used.	No	No
5	Supplement 4 - Sample NBS		Is there a significant farm management change as defined by Act 38? (see below)				No	No
6	P Index Example		Is the Soil Test Mehlich 3 P greater than 200 ppm P? (enter soil test value in ppm)				315	334
7			Is the Contributing Distance from this CMU to receiving water less than 150 ft.?				No	No
8			The following Act 38 criteria determine when there is a significant farm management change:				Part B	Part B
9			1. net increase of greater than 10% in AEs per acre					
10			2. a change in crop management that results in a farmwide reduction of greater than 20% in nitrogen necessary for realistic expected crop yield					
11			3. alternative organic sources will replace all or some of the nutrient sources listed in the plan					
12			4. additional lands are brought into the operation (purchased or rented)					
13	PART B: SOURCE FACTORS					CMU/Field ID	10	11
14	SOIL TEST		Mehlich 3 Soil Test P (ppm P)				315	334
15			Soil Test Rating = 0.20 * Mehlich 3 Soil Test P (ppm P)				63	67
16	FERTILIZER P RATE		Fertilizer P (lb P ₂ O ₅ /acre)				0	0
17			P Applied from multiple fertilizer applications, if any (From Multiple Applications Calculator)				0	0
18	FERTILIZER APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated >1 week or not incorporated following application in April - October	0.8 Incorporated >1 week or not incorporated following application in Nov. - March	1.0 Surface applied to frozen or snow covered soil		
19			Fertilizer Rating = Fertilizer Rate x Fertilizer Application Method				0	0
20	MANURE P RATE		Manure P (lb P ₂ O ₅ /acre)				216	216
21			P Applied from multiple manure applications, if any (From Multiple Applications Calculator)				0	0
22	MANURE APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated >1 week or not incorporated following application in April - October	0.8 Incorporated >1 week or not incorporated following application in Nov. - March	1.0 Surface applied to frozen or snow covered soil	0.4	0.4
23	P SOURCE COEFFICIENT	Refer to: Test results for P Source Coefficient OR Book values from P Index Fact Sheet Table 1					0.8	0.8
24			Manure Rating = Manure Rate x Manure Application Method x P Source Coefficient				63	63
25			Source Factor Sum				132	136
26	PART B: TRANSPORT FACTORS					CMU/Field ID	10	11
27	EROSION	Soil Loss (ton/acre/yr)					2	2
28	RUNOFF POTENTIAL	0 Drainage Class is Excessively	2 Drainage Class is Somewhat Excessively	4 Drainage Class is Well/Moderately Well	6 Drainage Class is Somewhat Poorly	8 Drainage Class is Poorly/Very Poorly	4	4
29	SUBSURFACE DRAINAGE	0 None or No direct outlet to receiving water	2 Random Drainage - Outlets directly to receiving water	4 Random Drainage - Outlets directly to receiving water	6 Patterned drainage - Outlets directly to receiving water	8 Patterned drainage - Outlets directly to receiving water	0	0
30	CONTRIBUTING DISTANCE	0 > 500 ft.	2 350 to 500 ft.	4 200 to 343 ft.	6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer	8 3* < 100 ft.	0	0
31			Transport Sum = Erosion + Runoff Potential + Subsurface Drainage + Contributing Distance				6	6
32	MODIFIED CONNECTIVITY	0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT	1.0 Grassed Waterway or None	1.1 Direct Connection APPLIES TO DIST > 100 FT			1.0	1.0
33			Transport Sum x Modified Connectivity / 24				0.25	0.25
34			P Index Value = 2 x Source x Transport				66	68

* OR rapidly permeable soil near a stream

* "9" factor does not apply to fields with a 35 ft. buffer receiving manure.

Nutrient Balance Sheets

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Nutrient Balance Worksheet Appendices

The following appendices need to accompany the Nutrient Balance Worksheets if applicable:

- Maps of fields where manure is to be applied including manure application setbacks.
- Completed P-Index spreadsheet (or other similar information summary) listing the source and transport factors and final Index result for each crop management unit (if applicable).

February 6, 2016

Nutrient Balance Sheet Summary

	CMU/Field ID	Crop Group	Manure Group	Application Season	Application Management	Planned Manure Rate ²	Starter/Other Fertilizer (lb/A)			Nutrient Balance @ Planned Rate (lb/A) ¹			See Notes
							N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅ ²	K ₂ O ²	
1	2-8	Corn Grain after Alfalfa	Broiler Litter	Spring	Incorporation within 2-4 days	3 ton/A	15	30	30	2	-215	-163	See notes
2	2-8	Corn Grain after Corn	Broiler Litter	Spring	Incorporation within 2-4 days	4 ton/A	15	30	30	2	-277	-207	See notes
3	1,9	Grass Hay	Swine	Summer	Incorporation after 7 days or none	6000 gal/A	92	0		2	2		See notes
4	10-11	Corn Grain after Soybeans	Broiler Litter	Spring	Incorporation within 2-4 days	3.5 ton/A	0	0	0	4	-216	-155	See notes

¹ Positive numbers = nutrient deficit;
Negative numbers = nutrient excess

² See NBS Summary Notes

February 6, 2016

Nutrient Balance Sheet Summary Notes

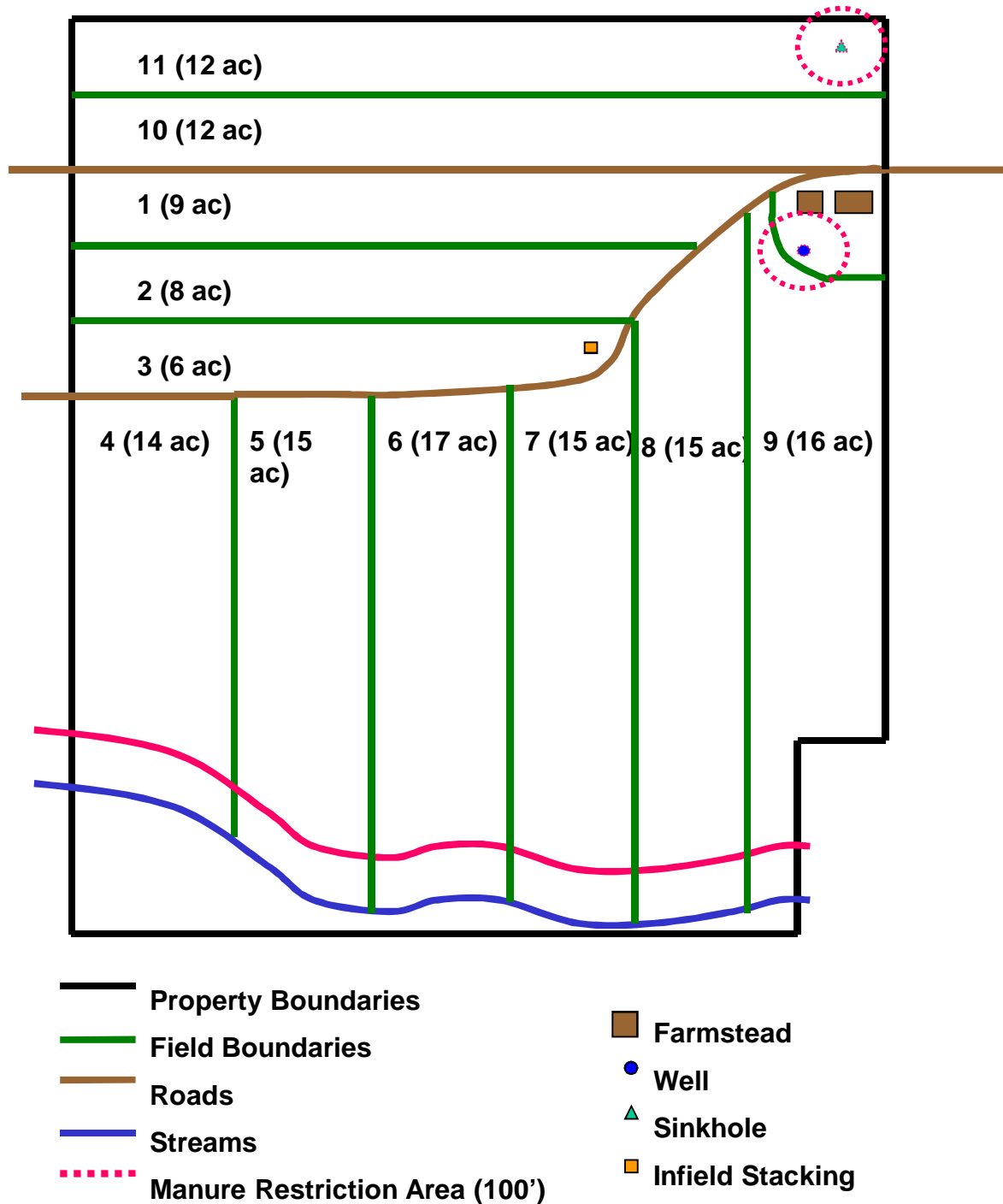
	CMU/Field ID	Crop Group	Manure Group	Planned Manure Rate Notes	Nutrient Balance @ Planned Rate Notes	Other Notes
1	2-8	Corn Grain after Alfalfa	Broiler Litter	Planned rate can be applied annually	Nutrient balances for P2O5 and K2O are based Soil Test Recommendations.	Fields 4 - 8 have a 150" manure application setback from the stream. If manure will be stacked on the farm, an area has been designated in field 3 for this stack. See the map for details.
2	2-8	Corn Grain after Corn	Broiler Litter	Planned rate can be applied annually	Nutrient balances for P2O5 and K2O are based Soil Test Recommendations.	Fields 4 - 8 have a 150" manure application setback from the stream. If manure will be stacked on the farm, an area has been designated in field 3 for this stack. See the map for details.
3	1,9	Grass Hay	Swine	Apply planned rate once every 3 years	Nutrient balances for P2O5 and K2O are based on crop removal (Row A) and should not be used to determine additional fertilizer needs.	Nutrient Balances for P2O5 and K2O are based on crop removal (Row A) and should not be used to determine additional fertilizer needs. The P banking option was used to develop the planned manure rate. No other phosphorous sources (manure and fertilizer) may be applied for the term of the multiple year rate (next two years). Field 9 has a 100" manure application setback from a well and 150" manure application setback along the stream. See map for details.
4	10-11	Corn Grain after Soybeans	Broiler Litter	Planned rate can be applied annually	Nutrient balances for P2O5 and K2O are based Soil Test Recommendations.	Field 11 has a 100' manure application setback from a sinkhole.

Nutrient Balance Worksheet February 6, 2016	2-8			2-8			1,9		
CMU/Field ID(s)									
Manure Plan Basis	Option 2 - N Requirement			Option 2 - N Requirement			Option 1 - P Removal		
Option 1 - P Removal 1. Will P banking be used?	<input type="checkbox"/>			<input type="checkbox"/>			<input checked="" type="checkbox"/> Yes - P Banking 3 years		
Option 2 - N Requirement 1. Calculate P Balance? 2. Enter Soil test Value(s) (ppm Mehlich-3 P)	<input checked="" type="checkbox"/> Yes 154, 154, 125, 137, 118, 142, 133			<input checked="" type="checkbox"/> Yes 154, 154, 125, 137, 118, 142, 133			<input type="checkbox"/>		
Option 3 - P Index evaluation must be completed.	<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>		
Acres	90			90			25		
Crop Group - To enter a Crop Group use the "Select" button.	Corn Grain after Alfalfa			Corn Crain after Corn			Grass Hay		
Yield	150 bu/A			150 bu/A			3 ton/A		
Manure Group - To enter a Manure Group use the "Select" button	Broiler Litter			Broiler Litter			Swine		
Manure Type	Poultry			Poultry			Swine		
G) Manure Nutrient Content (lb/ton or lb/1000 gal)	lb/ton			lb/ton			lb/1000 gal		
Total N	54.3			54.3			30.4		
P ₂ O ₅	61.8			61.8			22.1		
K ₂ O	44.3			44.3			16.1		
Application Timing and Method - To enter a Manure Application Timing and Method, use the "Select" button.	Spring Incorporation within 2-4 days			Spring Incorporation within 2-4 days			Summer Incorporation after 7 days or none		
1. Soil Test N Recommendation (lb N/A) ¹	150			150					
2. Soil Test P Recommendation (lb P ₂ O ₅ /A) ¹	0			0					
3. Soil Test K ₂ O Recommendation (lb K ₂ O/A) ¹	0			0					
4. Calculate K ₂ O balance?	Yes			Yes			No		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
A) Recommendation or Removal (lb/A) - Tables 1, 2 & 3	150	0	0	150	0	0	150	135	
B) Fertilizer Applied (lb/A)	15	30	30	15	30	30	92	0	
C) Other Organic Sources Applied (lb/A)	0	0	0	0	0	0			
D) Residual Manure N Management Residual Manure N Value (lb/A) - Table 4 (AG Table 1.2-14B)	Frequent 20			Continuous 35			Frequent 20		
E) Previous Legume N Management - To enter a previous legume N management, use the "Select" button. Previous Legume N Value (lb/A) - Table 5 (AG Table 1.2-7)	1st yr. after alfalfa <25% stand 40			No Previous Year Legume 0			No Previous Year Legume 0		
F) Net Nutrient Requirement (lb/A)	75	-30	-30	100	-30	-30	38	135	
H) N Availability Factor - Table 6 (AG Table 1.2-14A)	0.45			0.45			0.20		
I) Available Nitrogen (lb/ton, lb/1000 gal)	24.4			24.4			6.1		
J) Balanced Manure Rate (ton/A, gal/A)	3.1			4.1				6109	
K) Planned Manure Rate Enter Rate →	3 ton/A			4 ton/A			6000 gal/A Apply the planned rate once every 3 years.		
L) Nutrients Applied at Planned Rate (lb/A)	73	185	133	98	247	177	36	133	
M) Nutrient Balance at Planned Rate (lb/A)	2	-215	-163	2	-277	-207	2	2	
	Short	Excess	Excess	Short	Excess	Excess	Short	Short	
Note: Nutrient balances for P ₂ O ₅ and K ₂ O based on crop removal (Row A) should not be used to determine additional fertilizer needs. Only recommendations based on soil tests should be used for this purpose.	Nutrient balances for P ₂ O ₅ and K ₂ O are based on soil test recommendations.			Nutrient balances for P ₂ O ₅ and K ₂ O are based on soil test recommendations.			Nutrient balances for P ₂ O ₅ and K ₂ O are based on crop removal (Row A).		

Nutrient Balance Worksheet		10-11	
February 6, 2016			
CMU/Field ID(s)			
Manure Plan Basis	Option 3 - P Index evaluation required		
Option 1 - P Removal 1. Will P banking be used?	<input type="checkbox"/>		
Option 2 - N Requirement 1. Calculate P Balance? 2. Enter Soil test Value(s) (ppm Mehlich-3 P)	<input type="checkbox"/>		
Option 3 - P Index evaluation must be completed.	<input checked="" type="checkbox"/>		
Acres	24		
Crop Group - To enter a Crop Group use the "Select" button.	Corn Grain after Soybeans		
Yield	175 bu/A		
Manure Group - To enter a Manure Group use the "Select" button	Broiler Litter		
Manure Type	Poultry		
G) Manure Nutrient Content (lb/ton or lb/1000 gal)	lb/ton		
Total N	54.3		
P ₂ O ₅	61.8		
K ₂ O	44.3		
Application Timing and Method - To enter a Manure Application Timing and Method, use the "Select" button.	Spring Incorporation within 2-4 days		
1. Soil Test N Recommendation (lb N/A) ¹	175		
2. Soil Test P Recommendation (lb P ₂ O ₅ /A) ¹	0		
3. Soil Test K ₂ O Recommendation (lb K ₂ O/A) ¹	0		
4. Calculate K ₂ O balance?	Yes		
	N	P2O5	K2O
A) Recommendation or Removal (lb/A) - Tables 1, 2 & 3	175	0	0
B) Fertilizer Applied (lb/A)	0	0	0
C) Other Organic Sources Applied (lb/A)	0	0	0
D) Residual Manure N Management	Continuous		
Residual Manure N Value (lb/A) - Table 4 (AG Table 1.2-14B)	35		
E) Previous Legume N Management - To enter a previous legume N management, use the "Select" button.			
Previous Legume N Value (lb/A) - Table 5 (AG Table 1.2-7)	Soybeans, 50 bu/A 50		
F) Net Nutrient Requirement (lb/A)	90	0	0
H) N Availability Factor - Table 6 (AG Table 1.2-14A)	0.45		
I) Available Nitrogen (lb/ton, lb/1000 gal)	24.4		
J) Balanced Manure Rate (ton/A, gal/A)	3.7	0	
K) Planned Manure Rate Enter Rate →	3.5 ton/A		
	Planned rate and P Index must be consistent.		
L) Nutrients Applied at Planned Rate (lb/A)	86	216	155
M) Nutrient Balance at Planned Rate (lb/A)	4	-216	-155
	Short	Excess	Excess
Note: Nutrient balances for P ₂ O ₅ and K ₂ O based on crop removal (Row A) should not be used to determine additional fertilizer needs. Only recommendations based on soil tests should be used for this purpose.		Nutrient balances for P2O5 and K2O are based on soil test recommendations.	

Appendix 1
Operation Maps

Maps (or aerial photographs) required in Nutrient Balance Sheets must identify: road and road names adjacent to and within the operation; field identification, boundaries and acreage; manure application setback areas and vegetated buffers and associated landscape features (streams and other water bodies, sinkholes, and active water wells or springs); and location of in-field manure stacking areas (including each site in stacking area rotation).



Appendix 2
Phosphorus Index

Include the current Pennsylvania Phosphorus Index Spreadsheet or paper worksheet for each field that required Part B of the P Index when using Manure Plan Basis Option 3.

	A	B	C	D	E	F	G	H	
1	Pennsylvania P Index Version 2 (October 2009, Penn State, Dept. Crop & Soil Sciences & USDA-ARS, Pasture Systems & Watershed Mgmt. Research Unit)								
2	February 6, 2016								
3	FARM IDENTIFICATION		PART A: SCREENING TOOL			CMU/Field ID		10	11
4	Brown Farm		Is the CMU in a Special Protection watershed?			If the answer is Yes to any of these questions, Part B must be used.		Yes	No
5			Is there a significant farm management change as defined by Act 38? (see below)					No	Yes
6			Is the Soil Test Mehlich 3 P greater than 200 ppm P? (enter soil test value in ppm)					315	334
7			Is the Contributing Distance from this CMU to receiving water less than 150 ft.?					No	No
8			The following Act 38 criteria determine when there is a significant farm management change:			Part B		Part B	
9			1. net increase of greater than 10% in AEU's per acre						
10			2. a change in crop management that results in a farmwide reduction of greater than 20% in nitrogen necessary for realistic expected crop yield						
11			3. alternative organic sources will replace all or some of the nutrient sources listed in the plan						
12			4. additional lands are brought into the operation (purchased or rented)						
13	PART B: SOURCE FACTORS					CMU/Field ID		10	11
14	SOIL TEST		Mehlich 3 Soil Test P (ppm P)					315	334
15			Soil Test Rating = 0.20* Mehlich 3 Soil Test P (ppm P)					63	67
16	FERTILIZER P RATE		Fertilizer P (lb P ₂ O ₅ /acre)					0	0
17			P Applied from multiple fertilizer applications, if any (From Multiple Applications Calculator)					0	0
18	FERTILIZER APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April - October	0.8 Incorporated > 1 week or not incorporated following application in Nov. - March	1.0 Surface applied to frozen or snow covered soil			
19			Fertilizer Rating = Fertilizer Rate x Fertilizer Application Method					0	0
20	MANURE P RATE		Manure P (lb P ₂ O ₅ /acre)					216	216
21			P Applied from multiple manure applications, if any (From Multiple Applications Calculator)					0	0
22	MANURE APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	0.6 Incorporated > 1 week or not incorporated following application in April - October	0.8 Incorporated > 1 week or not incorporated following application in Nov. - March	1.0 Surface applied to frozen or snow covered soil		0.4	0.4
23	P SOURCE COEFFICIENT	Refer to: Test results for P Source Coefficient OR Book values from P Index Fact Sheet Table 1					0.8	0.8	
24			Manure Rating = Manure Rate x Manure Application Method x P Source Coefficient					69	69
25			Source Factor Sum					132	136
26	PART B: TRANSPORT FACTORS					CMU/Field ID		10	11
27	EROSION	Soil Loss (ton/acre/yr)					2	2	
28	RUNOFF POTENTIAL	0 Drainage Class is Excessively	2 Drainage Class is Somewhat Excessively	4 Drainage Class is Well/Moderately Well	6 Drainage Class is Somewhat Poorly	8 Drainage Class is Poorly/Very Poorly		4	4
29	SUBSURFACE DRAINAGE	0 None or No direct outlet to receiving water	1 Random Drainage - Outlets directly to receiving water	2 Patterned drainage - Outlets directly to receiving water				0	0
30	CONTRIBUTING DISTANCE	0 > 500 ft.	2 350 to 500 ft.	4 200 to 349 ft.	6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer	9 < 100 ft.		0	0
31			Transport Sum = Erosion + Runoff Potential + Subsurface Drainage + Contributing Distance					6	6
32	MODIFIED CONNECTIVITY	0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT	1.0 Grassed Waterway or None	1.1 Direct Connection APPLIES TO DIST > 100 FT				1.0	1.0
33	* OR rapidly permeable soil near a stream		Transport Sum x Modified Connectivity / 24					0.25	0.25
34	† "9" factor does not apply to fields with a 35 ft. buffer receiving manure.		P Index Value = 2 x Source x Transport					66	68
35	MANAGEMENT GUIDANCE			Optional Calculators					
36	P Index Rating: Values	Nutrient Application Guidance		User Inputs 1. Manure Units (gal/A or T/A)					
37	Low: 59 or less	Nitrogen based management		2. N plan manure rate (units above)					
38	Medium: 60 to 79	Nitrogen based management		3. Manure P analysis (units above lb P ₂ O ₅)					
39	High: 80 to 99	Phosphorus limited to crop removal		P Applied at N Rate listed above in (2) (lb P ₂ O ₅ /A)				0	0
40	Very High: 100 or greater	No Phosphorus applied							
41			User Input 4. Planned crop - P removal (lb P₂O₅/A)						
42			Actual total P applied based on values in PI above				216	216	
43									
44			User Input 5. Actual Planned Rate (units above)						
45			P Applied at Planned Rate (lb P ₂ O ₅ /A) Enter in MANURE P RATE above				0	0	
46									
47			Calculated Maximum Manure Rate (units above) (‡)				#DIV/0!	#DIV/0!	
48			P Applied at Calculated Maximum Rate (lb P ₂ O ₅ /A) (‡)				#DIV/0!	#DIV/0!	
49									
50									

‡ Missing data = Rate calculator requires all Manure Rating data be entered into the P Index.
NA = Rate calculator cannot determine a maximum rate with multiple manure applications.

Crop List Options

Crop List Options	Unit
Corn Grain	bu/A
Corn Silage	ton/A
Grain Sorghum	bu/A
Forage Sorghum	ton/A
Sorghum/Sudangrass	ton/A
Alfalfa	ton/A
Alfalfa with Manure	ton/A
Red Clover	ton/A
Red Clover with Manure	ton/A
Trefoil	ton/A
Trefoil with Manure	ton/A
CREP/CRP Cool Season Grasses	ton/A
CREP/CRP Warm Season Grasses	ton/A
Pasture	ton/A
Bluegrass	ton/A
Wheat	bu/A
Rye	bu/A
Oats	bu/A
Barley	bu/A
Soybeans	bu/A
Soybeans with Manure	bu/A
Small Grain Silage	ton/A
Grass Hay	ton/A
Corn Grain after Soybeans	bu/A
Corn Silage after Soybeans	ton/A
First year Alfalfa	ton/A
Corn Grain after Alfalfa	bu/A
Corn Silage after Alfalfa	ton/A
Mixed Vegetables	misc
Corn Grain after Corn	bu/A
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit
	Select Unit

Manure Group Summary - Enter Manure Group information into the chart below. All information will automatically be entered into the NBS when the Manure Group ID is selected.

Enter Manure Group ID	Manure Type	Unit of Analysis (lb/ton or lb/1000 gal)	Total N (N)	Total Phosphate (P ₂ O ₅)	Total Potash (K ₂ O)
Broiler Litter	Poultry	lb/ton	54.3	61.8	44.3
Swine	Swine	lb/1000 gal	30.4	22.1	16.1
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			
	Select	Select			

Table 1. Nitrogen recommendations for agronomic crops - Penn State Agronomy Guide Table 1.2-5.

[illegible]

Table 3. Typical crop nutrient removal for phosphorus and potassium-Penn State Agronomy Guide Table 1.2-8.

[illegible]

Supplement 5
Standard Animal Weights
 Agronomy Facts 54 – Table 1

Table 1. Standard animal weights used to calculate animal equivalent units to identify concentrated animal operations.

Type of Animal	Standard Weight (lbs) during Production (range)
Dairy	
<i>Holstein/Brown Swiss</i>	
Cow	1,300
Heifer: 1–2 yr.	900 (650–1,150)
Calf: 0–1 yr.	375 (100–650)
Bull	1,500
<i>Ayrshire/Guernsey</i>	
Cow	1,100
Heifer: 1–2 yr.	800 (575–1,025)
Calf: 0–1 yr.	338 (100–575)
Bull	1,250
<i>Jersey</i>	
Cow	900
Heifer: 1–2 yr.	600 (400–800)
Calf: 0–1 yr.	225 (50–400)
Bull	1,000
Swine	
Nursery pig	30 (15–45)
Wean to finish	140 (15–265)
Grow finish	155 (45–265)
Gestating sow	400
Sow and litter	470
Boar	450
Poultry	
Layer: 18–65 wk.	3.10 (2.75–3.45)
Layer: 18–105 wk.	3.15 weighted avg.
Layer, brown egg: 20–65 wk.	3.8 (3.3–4.3)

Type of Animal	Standard Weight (lbs) during Production (range)
Poultry (continued)	
Layer, brown egg: 20–105 wk.	4.00 (3.3–4.7)
Pullet: 0–18 wk.	1.42 (0.08–2.75)
Broiler, large: 0–53 days	3.0 (0.09–6.0)
Broiler, medium: 0–35 days	2.3 (0.090–4.5)
Roaster	3.54 (0.09–7)
Male: 0–7 wk.	
Female: 0–9 wk.	
Turkey, tom: 0–18 wk.	20.0 (0.12–40)
Turkey, hen: 0–12 wk.	7.1 (0.12–14)
Duck: 0–43 days	3.56 (0.11–7)
Guinea: 0–14 to 24 wk.	1.9 (0.06–3.75)
Pheasant: 0–13 to 43 wk.	1.53 (0.05–3)
Chukar: 0–13 to 43 wk.	0.52 (0.04–1)
Quail: 0–13 to 43 wk.	0.26 (0.02–0.5)
Beef	
Calf: 0–8 mo.	300 (100–500)
Finishing: 8–24 mo.	950 (500–1,400)
Cow	1,400
Bull	1,500
Veal	
Calf: 0–20 wk.	270 (95–445)
Larger Breed Sheep	
Lamb: 0–1 yr.	80 (10–150)
Ewe	175
Ram	225

Table 1. *continued.*

Type of Animal	Standard Weight (lbs) during Production (range)
Smaller Breed Sheep	
Lamb: 0–1 yr.	50 (10–90)
Ewe	150
Ram	185
Meat Goats	
Kid: 0–1 yr.	65 (5–125)
Doe	150
Buck	200
Dairy Goats	
Kid: 0–1 yr.	45 (5–85)
Doe	125
Buck	170
Miniature Horses & Miniature Donkeys	
Foal: 0–6 mo.	35 (25-45)
Weanling: 6-12 mo.	60 (45-75)
Yearling: 12-24 mo.	100 (75-125)
Two Year Old: 24-36 mo.	150 (125-175)
Mature	200
Ponies & Donkeys	
Foal: 0–6 mo.	65 (30-100)
Weanling: 6-12 mo.	150 (100-200)
Yearling: 12-24 mo.	300 (200-400)
Two Year Old: 24-36 mo.	400 (300-500)
Mature	600
Light Horses & Mules	
Foal: 0–6 mo.	190 (80-300)
Weanling: 6-12 mo.	450 (300-600)
Yearling: 12-24 mo.	700 (600-800)
Two Year Old: 24-36 mo.	900 (800-1000)
Mature	1100

Type of Animal	Standard Weight (lbs) during Production (range)
Draft Horses	
Foal: 0–6 mo.	360 (120-600)
Weanling: 6-12 mo.	800 (600-1000)
Yearling: 12-24 mo.	1150 (1000-1300)
Two Year Old: 24-36 mo.	1450 (1300-1600)
Mature	1800
Bison	
Calf: 0–1 yr.	525 (50-1000)
Cow	1200
Bull	2000
Deer	
Fawn: 0-6 mo.	36 (7-65)
Yearling Doe: 6-18 mo.	95 (65-125)
Yearling Buck: 6-18 mo.	110 (65-155)
Mature Doe	145
Mature Buck	200
Alpaca	
Young	80 (15-145)
Mature Female	145
Mature Male	170
Llama	
Cria: 0-1 yr.	85 (20-150)
Yearling: 1-3 yr.	225 (150-300)
Mature	325

Supplement 6 Density of Bedding Materials

Density of Bedding Materials	
Table 11. Manure Characteristics: Manure Management Systems Series MWPS-18, Section 1, 2 nd Edition	
a. Loose Bedding	
Material	Density (lbs per cu ft)
Straw	2.5
Wood Shavings	9
Sawdust	12
Sand	105
Non-legume Hay	4
Alfalfa	4
b. Baled Bedding	
Material	Density (lbs per cu ft)
Straw	5
Wood Shavings	20
Non-legume Hay	7
Alfalfa	8
c. Chopped Bedding	
Material	Density (lbs per cu ft)
Straw	7
Newspapers	14
Non-legume Hay	6
Alfalfa	6

Supplement 7

Rainfall, Runoff and Evaporation Data

Rainfall, Runoff and Evaporation Data for Pennsylvania Counties

Prepared by TJM, May 2000, Revised October 2007 by WHL

Use the factors in the following table to determine the contribution of rainfall to total manure production on the farm for any given manure collection period.

Rainfall Directly on the Storage

To estimate rainfall contributions directly on the storage the effects of evaporation must be accounted for in some situations. Follow the guidance below to determine whether to adjust for evaporation or not. Answer the three questions that follow to decide if evaporation should be included in your calculations for cattle manure. Hog manure almost always stays liquid on the surface, so evaporation can always be used. Poultry manure is usually not stored as a liquid, so this is not usually an issue.

1. Does the storage facility contain fibrous organic bedding (Straw bedding or a lot of waste hay)?
NO – Account for evaporation.
YES – Go to 2.
2. Is the manure loaded through a pipe near the bottom of the storage facility?
NO – Go to 3.
YES – Do NOT account for evaporation.
3. Is milking parlor (more than a pipeline milking system) wastewater added at or near the top of the storage facility?
NO – Do NOT account for evaporation.
YES - Account for evaporation.

Rainfall Directed to the Storage

To estimate rainfall contributions directed to the storage from barnyards, loafing areas, barn roofs, etc., the nature of the runoff surface must be accounted for. Runoff to a storage will differ depending on whether the surface where runoff is occurring is paved or not. Use the paved data for all hard compacted surfaces (A simple guide is if an animal does not leave a hoof print when the surface is walked on dry, consider it paved). Also, a roof would be considered a paved surface in this calculation.

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Adams	Directly on Storage - No Evaporation	2.98	2.72	3.22	3.42	3.73	3.53	2.96	3.30	3.60	2.97	3.23	3.15	38.81
	Directly on Storage - With Evaporation	1.99	1.73	1.57	1.11	0.43	0.00	0.00	0.00	0.00	0.00	1.25	2.16	10.24
	Directed to Storage - Paved	1.52	1.44	1.71	1.78	1.94	2.01	1.69	2.08	2.27	1.66	1.81	1.61	21.51
	Directed to Storage - Unpaved	0.60	0.60	0.71	0.72	0.78	0.92	0.77	1.06	1.15	0.74	0.81	0.63	9.48
Allegheny	Directly on Storage - No Evaporation	2.51	2.40	3.26	3.18	3.91	3.78	3.88	3.22	3.03	2.52	3.05	2.94	37.65
	Directly on Storage - With Evaporation	1.64	1.53	1.81	1.15	1.01	0.00	0.00	0.00	0.00	0.00	1.31	2.07	10.52
	Directed to Storage - Paved	1.03	1.08	1.47	1.49	1.84	2.00	2.05	1.74	1.64	1.21	1.46	1.21	18.21
	Directed to Storage - Unpaved	0.25	0.34	0.46	0.51	0.63	0.83	0.85	0.74	0.70	0.43	0.52	0.29	6.54
Armstrong	Directly on Storage - No Evaporation	2.68	2.61	3.47	3.36	4.11	4.36	4.32	4.09	3.70	2.98	3.34	3.14	42.13
	Directly on Storage - With Evaporation	1.84	1.77	2.07	1.40	1.31	0.72	0.12	0.17	0.34	0.46	1.66	2.30	14.13
	Directed to Storage - Paved	1.10	1.17	1.56	1.58	1.93	2.31	2.29	2.21	2.00	1.43	1.60	1.29	20.46
	Directed to Storage - Unpaved	0.27	0.36	0.49	0.54	0.66	0.96	0.95	0.94	0.85	0.51	0.57	0.31	7.40
Beaver	Directly on Storage - No Evaporation	2.32	2.12	3.25	3.16	3.92	3.48	4.08	3.15	3.07	2.37	2.93	2.94	36.79
	Directly on Storage - With Evaporation	1.45	1.25	1.80	1.13	1.02	0.00	0.00	0.00	0.00	0.00	1.19	2.07	9.91
	Directed to Storage - Paved	0.90	0.93	1.43	1.45	1.80	1.81	2.12	1.67	1.63	1.11	1.38	1.15	17.39
	Directed to Storage - Unpaved	0.19	0.28	0.42	0.47	0.59	0.73	0.86	0.69	0.68	0.38	0.47	0.24	5.98
Bedford	Directly on Storage - No Evaporation	2.23	2.45	2.96	3.26	3.50	3.52	3.70	2.85	2.97	2.89	2.91	2.66	35.87
	Directly on Storage - With Evaporation	1.39	1.61	1.56	1.30	0.70	0.00	0.00	0.00	0.00	0.37	1.23	1.82	9.97
	Directed to Storage - Paved	1.05	1.20	1.45	1.63	1.75	1.94	2.03	1.65	1.72	1.50	1.51	1.25	18.68
	Directed to Storage - Unpaved	0.36	0.44	0.53	0.62	0.66	0.84	0.89	0.77	0.80	0.61	0.61	0.43	7.56
Berks	Directly on Storage - No Evaporation	3.11	2.63	3.10	3.62	4.36	3.75	4.34	3.93	3.91	2.89	3.71	3.32	42.67
	Directly on Storage - With Evaporation	2.09	1.61	1.40	1.24	0.96	0.00	0.00	0.00	0.00	0.00	1.67	2.30	11.27
	Directed to Storage - Paved	1.62	1.42	1.68	1.92	2.31	2.18	2.52	2.52	2.50	1.65	2.11	1.72	24.14
	Directed to Storage - Unpaved	0.65	0.60	0.71	0.80	0.96	1.01	1.17	1.30	1.29	0.75	0.96	0.70	10.91

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blair	Directly on Storage - No Evaporation	2.60	2.43	3.27	3.59	4.63	4.43	4.25	3.67	4.00	3.65	3.61	3.16	43.29
	Directly on Storage - With Evaporation	1.80	1.63	1.87	1.59	1.83	0.83	0.05	0.00	0.70	1.15	1.91	2.36	15.72
	Directed to Storage - Paved	1.20	1.17	1.57	1.76	2.27	2.39	2.30	2.06	2.24	1.86	1.84	1.45	22.10
	Directed to Storage - Unpaved	0.39	0.41	0.56	0.65	0.83	1.02	0.98	0.92	1.00	0.73	0.72	0.47	8.68
Bradford	Directly on Storage - No Evaporation	1.94	2.19	2.40	2.90	3.48	3.52	3.02	2.91	3.14	2.58	3.04	2.40	33.52
	Directly on Storage - With Evaporation	1.14	1.39	1.00	0.90	0.68	0.00	0.00	0.00	0.00	0.08	1.34	1.60	8.13
	Directed to Storage - Paved	0.87	1.03	1.13	1.39	1.67	1.87	1.60	1.60	1.73	1.32	1.55	1.08	16.83
	Directed to Storage - Unpaved	0.27	0.35	0.38	0.49	0.59	0.77	0.66	0.70	0.75	0.52	0.61	0.34	6.44
Bucks	Directly on Storage - No Evaporation	3.43	3.08	3.89	4.02	4.51	4.11	5.59	4.66	4.41	3.20	3.92	3.79	48.61
	Directly on Storage - With Evaporation	2.41	2.06	2.19	1.64	1.11	0.00	0.49	0.00	0.33	0.14	1.88	2.77	15.02
	Directed to Storage - Paved	1.82	1.69	2.14	2.21	2.48	2.47	3.35	3.03	2.87	1.92	2.35	2.01	28.34
	Directed to Storage - Unpaved	0.75	0.74	0.93	0.96	1.08	1.19	1.62	1.58	1.50	0.93	1.14	0.83	13.27
Butler	Directly on Storage - No Evaporation	2.55	2.32	3.30	3.39	4.14	4.47	4.37	3.90	3.71	2.98	3.40	3.22	41.72
	Directly on Storage - With Evaporation	1.71	1.48	1.90	1.43	1.34	0.83	0.17	0.00	0.35	0.46	1.72	2.38	13.74
	Directed to Storage - Paved	1.02	1.02	1.45	1.56	1.90	2.32	2.27	1.95	1.85	1.43	1.63	1.29	19.69
	Directed to Storage - Unpaved	0.23	0.30	0.43	0.51	0.62	0.94	0.92	0.74	0.70	0.51	0.58	0.29	6.76
Cambria	Directly on Storage - No Evaporation	3.74	3.45	4.14	3.98	4.60	4.50	5.03	4.08	3.97	3.31	3.87	3.68	48.31
	Directly on Storage - With Evaporation	2.90	2.61	2.74	2.02	1.80	0.86	0.83	0.16	0.61	0.79	2.19	2.84	20.31
	Directed to Storage - Paved	1.68	1.62	1.94	1.91	2.21	2.43	2.72	2.28	2.22	1.65	1.93	1.65	24.25
	Directed to Storage - Unpaved	0.52	0.55	0.66	0.68	0.78	1.03	1.16	1.02	0.99	0.63	0.73	0.51	9.27
Cameron	Directly on Storage - No Evaporation	2.26	2.52	3.10	2.99	4.12	5.22	4.28	3.86	3.83	3.37	3.51	3.16	42.20
	Directly on Storage - With Evaporation	1.42	1.68	1.70	1.03	1.32	1.58	0.08	0.00	0.47	0.85	1.83	2.32	14.26
	Directed to Storage - Paved	0.90	1.13	1.40	1.37	1.89	2.71	2.23	1.93	1.91	1.58	1.65	1.26	19.98
	Directed to Storage - Unpaved	0.20	0.35	0.43	0.45	0.62	1.10	0.90	0.73	0.73	0.54	0.56	0.28	6.89

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Carbon	Directly on Storage - No Evaporation	2.63	2.33	3.04	3.18	4.01	3.75	3.96	3.48	3.55	2.73	2.92	2.81	38.37
	Directly on Storage - With Evaporation	1.63	1.33	1.44	0.98	0.81	0.00	0.00	0.00	0.00	0.00	1.02	1.81	9.01
	Directed to Storage - Paved	1.32	1.17	1.52	1.59	2.00	2.06	2.18	2.09	2.13	1.50	1.61	1.41	20.55
	Directed to Storage - Unpaved	0.50	0.44	0.58	0.60	0.76	0.90	0.95	1.01	1.03	0.65	0.70	0.53	8.66
Centre	Directly on Storage - No Evaporation	2.31	2.54	3.05	2.92	3.73	4.24	3.83	3.33	3.48	2.93	3.27	2.56	38.17
	Directly on Storage - With Evaporation	1.51	1.74	1.65	0.92	0.93	0.64	0.00	0.00	0.18	0.43	1.57	1.76	11.31
	Directed to Storage - Paved	1.06	1.22	1.46	1.43	1.83	2.29	2.07	1.86	1.95	1.49	1.67	1.18	19.51
	Directed to Storage - Unpaved	0.35	0.43	0.52	0.53	0.67	0.98	0.88	0.83	0.87	0.59	0.65	0.38	7.67
Chester	Directly on Storage - No Evaporation	3.35	2.96	3.52	3.77	4.01	3.94	4.47	3.58	4.09	2.99	3.79	3.62	44.09
	Directly on Storage - With Evaporation	2.30	1.91	1.77	1.32	0.51	0.00	0.00	0.00	0.00	0.00	1.69	2.57	12.06
	Directed to Storage - Paved	1.78	1.66	1.97	2.03	2.17	2.36	2.68	2.36	2.70	1.77	2.24	1.92	25.63
	Directed to Storage - Unpaved	0.74	0.74	0.88	0.87	0.92	1.14	1.30	1.25	1.43	0.84	1.06	0.80	11.97
Clarion	Directly on Storage - No Evaporation	2.77	2.46	3.30	3.67	4.09	5.06	4.55	4.29	4.29	3.31	3.80	3.27	44.86
	Directly on Storage - With Evaporation	1.93	1.62	1.90	1.71	1.29	1.42	0.35	0.37	0.93	0.79	2.12	2.43	16.86
	Directed to Storage - Paved	1.11	1.11	1.49	1.69	1.88	2.63	2.37	2.15	2.15	1.56	1.79	1.31	21.21
	Directed to Storage - Unpaved	0.25	0.34	0.46	0.55	0.61	1.06	0.96	0.82	0.82	0.53	0.61	0.29	7.30
Clearfield	Directly on Storage - No Evaporation	1.80	2.09	2.91	3.12	3.95	4.48	4.37	3.79	3.46	2.63	2.74	2.11	37.45
	Directly on Storage - With Evaporation	0.96	1.25	1.51	1.16	1.15	0.84	0.17	0.00	0.10	0.11	1.06	1.27	9.58
	Directed to Storage - Paved	0.77	0.96	1.34	1.50	1.90	2.37	2.32	2.05	1.87	1.29	1.34	0.91	18.61
	Directed to Storage - Unpaved	0.22	0.31	0.44	0.53	0.67	0.99	0.96	0.87	0.80	0.47	0.49	0.25	7.00
Clinton	Directly on Storage - No Evaporation	1.82	2.53	2.95	3.17	3.66	4.04	3.47	3.34	2.99	2.72	3.41	2.47	36.57
	Directly on Storage - With Evaporation	0.82	1.53	1.25	0.87	0.36	0.00	0.00	0.00	0.00	0.00	1.41	1.47	7.71
	Directed to Storage - Paved	0.82	1.19	1.39	1.52	1.76	2.14	1.84	1.84	1.64	1.36	1.71	1.11	18.31
	Directed to Storage - Unpaved	0.25	0.40	0.47	0.54	0.62	0.89	0.76	0.80	0.72	0.52	0.31	0.35	6.63

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Columbia	Directly on Storage - No Evaporation	2.52	2.42	2.97	3.27	4.03	4.56	3.87	3.51	3.69	3.17	3.40	3.00	40.41
	Directly on Storage - With Evaporation	1.62	1.52	1.47	1.17	1.03	0.66	0.00	0.00	0.09	0.47	1.60	2.10	11.73
	Directed to Storage - Paved	1.21	1.21	1.49	1.67	2.06	2.46	2.09	2.04	2.14	1.68	1.80	1.44	21.28
	Directed to Storage - Unpaved	0.43	0.46	0.56	0.65	0.81	1.05	0.89	0.95	1.00	0.70	0.75	0.51	8.75
Crawford	Directly on Storage - No Evaporation	2.19	2.29	2.87	3.21	4.04	4.62	4.24	4.19	4.16	3.46	3.86	3.26	42.36
	Directly on Storage - With Evaporation	1.35	1.45	1.47	1.25	1.24	0.98	0.04	0.27	0.80	0.94	2.18	2.42	14.36
	Directed to Storage - Paved	0.79	0.94	1.18	1.44	1.82	2.35	2.16	1.97	1.95	1.59	1.77	1.17	19.14
	Directed to Storage - Unpaved	0.11	0.23	0.29	0.45	0.57	0.92	0.85	0.67	0.66	0.52	0.58	0.16	6.01
Cumberland	Directly on Storage - No Evaporation	2.75	2.62	3.14	3.25	3.79	3.80	3.55	3.01	3.57	3.08	3.22	2.92	38.66
	Directly on Storage - With Evaporation	1.85	1.72	1.54	1.05	0.59	0.00	0.00	0.00	0.00	0.28	1.32	2.02	10.34
	Directed to Storage - Paved	1.37	1.36	1.63	1.66	1.93	2.13	1.99	1.83	2.17	1.69	1.77	1.46	20.99
	Directed to Storage - Unpaved	0.52	0.55	0.66	0.65	0.76	0.95	0.89	0.90	1.07	0.74	0.77	0.55	9.01
Dauphin	Directly on Storage - No Evaporation	2.84	2.93	3.28	3.24	4.26	3.85	3.59	3.31	3.51	2.93	3.53	3.24	40.51
	Directly on Storage - With Evaporation	1.88	1.97	1.68	1.00	1.06	0.00	0.00	0.00	0.00	0.05	1.61	2.28	11.53
	Directed to Storage - Paved	1.45	1.52	1.71	1.68	2.22	2.16	2.01	2.05	2.18	1.61	1.94	1.65	22.18
	Directed to Storage - Unpaved	0.57	0.62	0.69	0.68	0.89	0.96	0.90	1.03	1.09	0.70	0.85	0.65	9.62
Delaware	Directly on Storage - No Evaporation	2.88	3.03	3.81	3.63	4.13	3.73	4.14	3.71	3.88	2.86	3.64	3.40	42.84
	Directly on Storage - With Evaporation	1.83	1.98	2.06	1.18	0.63	0.00	0.00	0.00	0.00	0.00	1.54	2.35	11.57
	Directed to Storage - Paved	1.53	1.70	2.13	2.00	2.27	2.28	2.53	2.45	2.56	1.72	2.18	1.80	25.14
	Directed to Storage - Unpaved	0.63	0.76	0.95	0.87	0.99	1.12	1.24	1.30	1.36	0.83	1.06	0.75	11.86
Elk	Directly on Storage - No Evaporation	2.43	2.39	3.30	3.43	4.39	4.69	4.60	3.85	3.63	3.09	3.55	3.05	42.40
	Directly on Storage - With Evaporation	1.59	1.55	1.90	1.47	1.59	1.05	0.40	0.00	0.27	0.57	1.87	2.21	14.47
	Directed to Storage - Paved	1.00	1.05	1.45	1.61	2.06	2.44	2.39	2.00	1.89	1.48	1.70	1.25	20.33
	Directed to Storage - Unpaved	0.24	0.31	0.43	0.55	0.70	0.98	0.97	0.81	0.76	0.53	0.60	0.31	7.19

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Erie	Directly on Storage - No Evaporation	2.68	2.51	3.25	3.45	3.63	4.36	4.05	4.26	4.33	3.82	4.22	3.99	44.53
	Directly on Storage - With Evaporation	1.85	1.68	1.87	1.52	0.88	0.78	0.00	0.41	1.03	1.34	2.57	3.16	17.07
	Directed to Storage - Paved	0.94	1.00	1.30	1.52	1.60	2.18	2.03	1.91	1.95	1.76	1.94	1.40	19.51
	Directed to Storage - Unpaved	0.11	0.23	0.29	0.45	0.47	0.83	0.77	0.60	0.61	0.57	0.63	0.16	5.71
Fayette	Directly on Storage - No Evaporation	2.71	2.58	3.68	3.81	4.25	4.02	4.61	3.76	3.43	2.81	3.37	3.12	42.15
	Directly on Storage - With Evaporation	1.87	1.74	2.28	1.85	1.45	0.38	0.41	0.00	0.07	0.29	1.69	2.28	14.31
	Directed to Storage - Paved	1.22	1.21	1.73	1.83	2.04	2.17	2.49	2.07	1.89	1.41	1.69	1.40	21.14
	Directed to Storage - Unpaved	0.38	0.41	0.59	0.65	0.72	0.92	1.06	0.90	0.82	0.53	0.64	0.44	8.07
Forest	Directly on Storage - No Evaporation	2.49	2.22	3.27	3.51	3.87	4.56	4.52	4.05	3.94	3.33	3.54	3.18	42.48
	Directly on Storage - With Evaporation	1.65	1.38	1.87	1.55	1.07	0.92	0.32	0.13	0.58	0.81	1.86	2.34	14.48
	Directed to Storage - Paved	0.92	0.95	1.41	1.61	1.78	2.33	2.31	1.94	1.89	1.57	1.66	1.18	19.55
	Directed to Storage - Unpaved	0.15	0.27	0.39	0.53	0.58	0.91	0.90	0.69	0.67	0.53	0.57	0.19	6.38
Franklin	Directly on Storage - No Evaporation	2.66	2.71	3.56	3.50	3.91	3.95	3.55	3.46	3.29	3.19	3.39	3.12	40.26
	Directly on Storage - With Evaporation	1.73	1.78	2.01	1.33	0.81	0.00	0.00	0.00	0.00	0.40	1.53	2.19	11.77
	Directed to Storage - Paved	1.33	1.38	1.82	1.82	2.03	2.21	1.99	2.07	1.97	1.75	1.86	1.56	21.79
	Directed to Storage - Unpaved	0.51	0.54	0.71	0.74	0.82	0.99	0.89	1.00	0.95	0.76	0.81	0.59	9.31
Fulton	Directly on Storage - No Evaporation	2.27	2.53	3.15	3.44	3.81	3.72	3.49	3.30	3.32	3.22	3.19	2.83	38.24
	Directly on Storage - With Evaporation	1.37	1.63	1.65	1.34	0.81	0.00	0.00	0.00	0.00	0.52	1.39	1.93	10.62
	Directed to Storage - Paved	1.11	1.27	1.58	1.75	1.94	2.04	1.92	1.94	1.96	1.70	1.69	1.38	20.29
	Directed to Storage - Unpaved	0.41	0.48	0.60	0.69	0.76	0.89	0.84	0.92	0.93	0.71	0.70	0.51	8.43
Greene	Directly on Storage - No Evaporation	2.47	2.23	3.41	3.32	4.00	3.80	4.14	3.62	3.08	2.47	3.13	2.78	38.45
	Directly on Storage - With Evaporation	1.57	1.33	1.91	1.22	1.00	0.00	0.00	0.00	0.00	0.00	1.33	1.88	10.24
	Directed to Storage - Paved	1.06	1.05	1.60	1.59	1.92	2.01	2.19	1.99	1.69	1.21	1.53	1.20	19.06
	Directed to Storage - Unpaved	0.30	0.36	0.55	0.56	0.68	0.84	0.91	0.87	0.74	0.44	0.56	0.33	7.14

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Huntingdon	Directly on Storage - No Evaporation	2.39	2.42	3.13	3.27	4.37	4.17	4.17	3.42	3.64	3.32	3.41	2.98	40.67
	Directly on Storage - With Evaporation	1.59	1.62	1.73	1.27	1.57	0.57	0.00	0.00	0.34	0.82	1.71	2.18	13.38
	Directed to Storage - Paved	1.12	1.19	1.53	1.64	2.18	2.25	2.25	1.98	2.11	1.72	1.77	1.40	21.15
	Directed to Storage - Unpaved	0.38	0.44	0.56	0.62	0.83	0.96	0.96	0.92	0.98	0.70	0.72	0.48	8.54
Indiana	Directly on Storage - No Evaporation	3.22	3.09	4.02	3.88	4.44	4.70	4.91	4.08	4.08	3.08	3.82	3.54	46.83
	Directly on Storage - With Evaporation	2.38	2.25	2.62	1.92	1.64	1.06	0.71	0.16	0.72	0.56	2.14	2.70	18.83
	Directed to Storage - Paved	1.38	1.42	1.85	1.86	2.13	2.49	2.60	2.24	2.24	1.51	1.87	1.52	23.12
	Directed to Storage - Unpaved	0.39	0.46	0.60	0.66	0.75	1.03	1.08	0.98	0.98	0.55	0.69	0.42	8.60
Jefferson	Directly on Storage - No Evaporation	2.73	2.58	3.48	3.31	4.21	4.87	4.28	4.08	3.81	3.03	3.43	3.48	43.25
	Directly on Storage - With Evaporation	1.89	1.74	2.08	1.35	1.41	1.23	0.08	0.16	0.45	0.51	1.75	2.64	15.25
	Directed to Storage - Paved	1.12	1.13	1.53	1.55	1.98	2.53	2.23	2.12	1.98	1.45	1.65	1.42	20.69
	Directed to Storage - Unpaved	0.27	0.33	0.45	0.53	0.67	1.02	0.90	0.86	0.80	0.51	0.58	0.35	7.28
Juniata	Directly on Storage - No Evaporation	2.35	2.53	3.10	3.10	4.12	3.82	3.84	3.35	3.54	3.15	3.37	2.98	39.23
	Directly on Storage - With Evaporation	1.51	1.69	1.70	1.14	1.32	0.18	0.00	0.00	0.18	0.63	1.69	2.14	12.16
	Directed to Storage - Paved	1.13	1.27	1.55	1.55	2.06	2.10	2.11	1.94	2.05	1.67	1.79	1.43	20.64
	Directed to Storage - Unpaved	0.40	0.48	0.59	0.59	0.78	0.92	0.92	0.90	0.96	0.69	0.74	0.51	8.48
Lackawanna	Directly on Storage - No Evaporation	2.58	2.52	2.98	3.57	4.24	4.45	3.91	3.82	3.81	3.36	3.63	3.13	41.99
	Directly on Storage - With Evaporation	1.68	1.62	1.48	1.47	1.24	0.65	0.00	0.00	0.31	0.66	1.83	2.23	13.17
	Directed to Storage - Paved	1.26	1.29	1.52	1.82	2.16	2.45	2.15	2.29	2.29	1.81	1.96	1.53	22.53
	Directed to Storage - Unpaved	0.46	0.50	0.60	0.71	0.85	1.07	0.94	1.11	1.10	0.77	0.83	0.56	9.51
Lancaster	Directly on Storage - No Evaporation	2.79	2.43	2.92	3.66	3.72	4.10	4.20	3.51	3.35	3.14	3.34	3.17	40.32
	Directly on Storage - With Evaporation	1.74	1.38	1.17	1.21	0.22	0.00	0.00	0.00	0.00	0.00	1.24	2.12	9.08
	Directed to Storage - Paved	1.48	1.31	1.58	1.94	1.97	2.38	2.43	2.28	2.18	1.79	1.90	1.68	22.92
	Directed to Storage - Unpaved	0.61	0.56	0.67	0.80	0.82	1.11	1.13	1.19	1.14	0.82	0.87	0.70	10.42

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Lawrence	Directly on Storage - No Evaporation	2.16	2.14	3.08	3.03	3.50	4.08	3.96	3.38	3.40	2.70	3.08	2.80	37.31
	Directly on Storage - With Evaporation	1.32	1.30	1.68	1.07	0.70	0.44	0.00	0.00	0.04	0.18	1.40	1.96	10.09
	Directed to Storage - Paved	0.82	0.92	1.32	1.39	1.61	2.08	2.02	1.69	1.70	1.27	1.45	1.06	17.34
	Directed to Storage - Unpaved	0.15	0.26	0.37	0.45	0.53	0.82	0.79	0.64	0.65	0.43	0.49	0.20	5.77
Lebanon	Directly on Storage - No Evaporation	3.10	2.42	3.01	3.67	4.86	4.23	4.74	3.62	4.13	3.02	3.66	3.34	43.80
	Directly on Storage - With Evaporation	2.11	1.43	1.36	1.36	1.56	0.00	0.00	0.00	0.17	0.05	1.68	2.35	12.07
	Directed to Storage - Paved	1.58	1.28	1.60	1.91	2.53	2.37	2.65	2.28	2.60	1.69	2.05	1.70	24.24
	Directed to Storage - Unpaved	0.62	0.53	0.66	0.77	1.02	1.06	1.19	1.16	1.32	0.76	0.92	0.67	10.67
Lehigh	Directly on Storage - No Evaporation	3.16	2.95	3.28	3.52	4.20	3.75	4.14	4.28	3.93	2.94	3.88	3.49	43.52
	Directly on Storage - With Evaporation	2.14	1.93	1.58	1.14	0.80	0.00	0.00	0.00	0.00	0.00	1.84	2.47	11.90
	Directed to Storage - Paved	1.64	1.59	1.77	1.87	2.23	2.14	2.36	2.74	2.52	1.68	2.21	1.81	24.55
	Directed to Storage - Unpaved	0.66	0.68	0.75	0.77	0.92	0.98	1.08	1.41	1.30	0.76	1.01	0.73	11.06
Luzerne	Directly on Storage - No Evaporation	2.37	2.49	2.79	3.51	4.16	4.46	4.24	4.00	3.95	3.23	3.57	2.91	41.69
	Directly on Storage - With Evaporation	1.47	1.59	1.29	1.41	1.16	0.56	0.00	0.00	0.35	0.53	1.77	2.01	12.15
	Directed to Storage - Paved	1.16	1.27	1.42	1.79	2.12	2.45	2.33	2.40	2.37	1.75	1.93	1.42	22.43
	Directed to Storage - Unpaved	0.43	0.50	0.56	0.70	0.83	1.07	1.02	1.16	1.15	0.74	0.82	0.52	9.50
Lycoming	Directly on Storage - No Evaporation	2.53	2.81	3.28	3.16	3.78	4.30	3.78	3.13	3.33	3.14	3.59	2.96	39.76
	Directly on Storage - With Evaporation	1.73	2.01	1.88	1.16	0.98	0.70	0.00	0.00	0.00	0.64	1.89	2.16	13.13
	Directed to Storage - Paved	1.14	1.35	1.57	1.55	1.85	2.28	2.00	1.75	1.86	1.60	1.83	1.33	20.11
	Directed to Storage - Unpaved	0.35	0.48	0.56	0.57	0.68	0.94	0.83	0.78	0.83	0.63	0.72	0.41	7.79
Mc Kean	Directly on Storage - No Evaporation	2.81	2.62	3.39	3.44	3.99	5.15	4.27	4.11	4.22	3.45	3.87	3.73	45.06
	Directly on Storage - With Evaporation	1.97	1.78	1.99	1.48	1.19	1.51	0.07	0.19	0.86	0.93	2.19	2.89	17.06
	Directed to Storage - Paved	1.04	1.10	1.42	1.55	1.80	2.62	2.18	1.97	2.03	1.62	1.82	1.38	20.53
	Directed to Storage - Unpaved	0.17	0.29	0.37	0.48	0.56	1.03	0.85	0.70	0.72	0.55	0.62	0.22	6.57

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County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mercer	Directly on Storage - No Evaporation	2.26	2.28	3.20	3.33	3.77	4.47	3.96	3.64	3.87	2.91	3.68	3.03	40.37
	Directly on Storage - With Evaporation	1.42	1.44	1.80	1.37	0.97	0.83	0.00	0.00	0.51	0.39	2.00	2.19	12.90
	Directed to Storage - Paved	0.84	0.96	1.34	1.50	1.69	2.28	2.02	1.74	1.86	1.37	1.73	1.12	18.44
	Directed to Storage - Unpaved	0.14	0.25	0.35	0.47	0.53	0.89	0.79	0.62	0.66	0.47	0.59	0.18	5.93
Mifflin	Directly on Storage - No Evaporation	2.17	2.41	2.99	2.95	4.10	3.91	4.09	3.17	3.28	2.98	3.20	2.80	38.05
	Directly on Storage - With Evaporation	1.37	1.61	1.59	0.95	1.30	0.31	0.00	0.00	0.00	0.48	1.50	2.00	11.11
	Directed to Storage - Paved	1.02	1.18	1.47	1.48	2.05	2.11	2.21	1.71	1.90	1.73	1.66	1.32	19.83
	Directed to Storage - Unpaved	0.35	0.43	0.54	0.56	0.78	0.90	0.94	0.73	0.89	0.80	0.67	0.45	8.04
Monroe	Directly on Storage - No Evaporation	3.41	3.21	3.66	4.03	4.65	4.16	4.24	4.18	4.22	3.60	4.37	3.81	47.51
	Directly on Storage - With Evaporation	2.41	2.21	2.06	1.83	1.45	0.00	0.00	0.00	0.42	0.70	2.47	2.81	16.34
	Directed to Storage - Paved	1.74	1.70	1.94	2.10	2.42	2.33	2.37	2.59	2.61	2.01	2.44	1.94	26.20
	Directed to Storage - Unpaved	0.68	0.71	0.81	0.85	0.98	1.04	1.06	1.30	1.31	0.90	1.09	0.76	11.47
Montgomery	Directly on Storage - No Evaporation	3.20	2.79	3.33	3.72	4.00	3.32	4.28	3.94	3.90	2.79	3.87	3.36	42.46
	Directly on Storage - With Evaporation	2.18	1.77	1.63	1.34	0.60	0.00	0.00	0.00	0.00	0.00	1.83	2.34	11.66
	Directed to Storage - Paved	1.69	1.56	1.86	2.01	2.16	1.99	2.57	2.60	2.57	1.65	2.28	1.78	24.71
	Directed to Storage - Unpaved	0.70	0.70	0.83	0.85	0.92	0.96	1.24	1.38	1.37	0.78	1.08	0.74	11.55
Montour	Directly on Storage - No Evaporation	2.52	2.42	2.97	3.27	4.03	4.56	3.87	3.51	3.69	3.17	3.40	3.00	40.41
	Directly on Storage - With Evaporation	1.62	1.52	1.47	1.17	1.03	0.66	0.00	0.00	0.09	0.47	1.60	2.10	11.73
	Directed to Storage - Paved	1.21	1.21	1.49	1.64	2.02	2.51	2.13	2.04	2.14	1.68	1.80	1.44	21.29
	Directed to Storage - Unpaved	0.43	0.46	0.56	0.62	0.77	1.09	0.93	0.95	1.00	0.70	0.75	0.51	8.76
Northampton	Directly on Storage - No Evaporation	3.42	3.08	3.69	3.94	4.77	4.21	4.23	4.27	4.28	3.48	4.23	3.95	47.55
	Directly on Storage - With Evaporation	2.43	2.09	2.04	1.63	1.47	0.00	0.00	0.00	0.32	0.51	2.25	2.96	15.70
	Directed to Storage - Paved	1.78	1.66	1.99	2.09	2.53	2.40	2.41	2.73	2.74	1.98	2.41	2.05	26.78
	Directed to Storage - Unpaved	0.72	0.71	0.85	0.87	1.05	1.09	1.10	1.41	1.41	0.90	1.10	0.83	12.04

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Northumberland	Directly on Storage - No Evaporation	2.50	2.45	2.83	3.53	4.20	4.26	4.03	3.84	3.39	3.64	3.68	2.81	41.16
	Directly on Storage - With Evaporation	1.60	1.55	1.33	1.43	1.20	0.36	0.00	0.00	0.00	0.94	1.88	1.91	12.20
	Directed to Storage - Paved	1.20	1.23	1.42	1.77	2.10	2.34	2.22	2.23	1.97	1.93	1.95	1.35	21.69
	Directed to Storage - Unpaved	0.43	0.47	0.54	0.67	0.80	1.02	0.97	1.04	0.92	0.80	0.81	0.48	8.93
Perry	Directly on Storage - No Evaporation	2.53	2.65	3.20	3.24	4.13	3.73	3.59	3.52	3.80	3.31	3.54	3.16	40.40
	Directly on Storage - With Evaporation	1.63	1.75	1.70	1.14	1.13	0.00	0.00	0.00	0.20	0.61	1.74	2.26	12.16
	Directed to Storage - Paved	1.24	1.35	1.63	1.65	2.11	2.05	1.97	2.11	2.28	1.79	1.91	1.55	21.65
	Directed to Storage - Unpaved	0.46	0.53	0.64	0.65	0.83	0.90	0.86	1.02	1.10	0.76	0.81	0.57	9.12
Philadelphia	Directly on Storage - No Evaporation	3.21	2.79	3.46	3.62	3.75	3.74	4.28	3.80	3.42	2.62	3.34	3.38	41.41
	Directly on Storage - With Evaporation	2.16	1.74	1.71	1.17	0.25	0.00	0.00	0.00	0.00	0.00	1.24	2.33	10.60
	Directed to Storage - Paved	1.70	1.56	1.94	1.99	2.06	2.28	2.61	2.51	2.26	1.57	2.00	1.79	24.28
	Directed to Storage - Unpaved	0.71	0.70	0.87	0.87	0.90	1.12	1.28	1.33	1.20	0.76	0.97	0.74	11.44
Pike	Directly on Storage - No Evaporation	3.12	2.90	3.42	3.69	4.30	3.80	4.30	3.70	3.87	3.08	3.88	3.35	43.41
	Directly on Storage - With Evaporation	2.22	2.00	1.82	1.49	1.20	0.00	0.00	0.00	0.17	0.28	1.98	2.45	13.61
	Directed to Storage - Paved	1.59	1.51	1.78	1.92	2.24	2.09	2.37	2.26	2.36	1.72	2.17	1.71	23.71
	Directed to Storage - Unpaved	0.62	0.61	0.72	0.77	0.90	0.91	1.03	1.11	1.16	0.77	0.97	0.67	10.25
Potter	Directly on Storage - No Evaporation	2.38	2.40	2.91	3.20	3.69	5.29	3.92	3.69	3.78	3.19	3.79	2.97	41.21
	Directly on Storage - With Evaporation	1.54	1.56	1.51	1.24	0.89	1.65	0.00	0.00	0.42	0.67	2.11	2.13	13.72
	Directed to Storage - Paved	1.00	1.08	1.31	1.50	1.73	2.75	2.04	1.88	1.78	1.50	1.78	1.25	19.60
	Directed to Storage - Unpaved	0.26	0.34	0.41	0.51	0.59	1.11	0.82	0.74	0.60	0.51	0.61	0.33	6.83
Schuylkill	Directly on Storage - No Evaporation	2.71	2.52	2.95	3.61	4.43	4.24	4.43	4.07	4.10	3.20	3.79	3.17	43.23
	Directly on Storage - With Evaporation	1.71	1.52	1.35	1.41	1.23	0.04	0.00	0.00	0.30	0.30	1.89	2.17	11.93
	Directed to Storage - Paved	1.38	1.31	1.53	1.88	2.31	2.38	2.48	2.52	2.54	1.79	2.12	1.62	23.86
	Directed to Storage - Unpaved	0.54	0.53	0.62	0.76	0.93	1.06	1.11	1.26	1.27	0.80	0.95	0.63	10.46

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Snyder	Directly on Storage - No Evaporation	2.50	2.45	2.83	3.53	4.20	4.26	4.03	3.84	3.39	3.64	3.68	2.81	41.16
	Directly on Storage - With Evaporation	1.60	1.55	1.33	1.43	1.20	0.36	0.00	0.00	0.00	0.94	1.88	1.91	12.20
	Directed to Storage - Paved	1.20	1.23	1.42	1.77	2.10	2.34	2.22	2.27	2.00	1.93	1.95	1.35	21.76
	Directed to Storage - Unpaved	0.43	0.47	0.54	0.67	0.80	1.02	0.97	1.08	0.95	0.80	0.81	0.48	9.00
Somerset	Directly on Storage - No Evaporation	3.07	2.72	3.80	3.93	4.30	4.00	5.00	3.67	3.71	3.07	3.46	3.53	44.26
	Directly on Storage - With Evaporation	2.23	1.88	2.40	1.97	1.50	0.36	0.80	0.00	0.35	0.55	1.78	2.69	16.51
	Directed to Storage - Paved	1.41	1.31	1.82	1.93	2.11	2.16	2.70	2.09	2.11	1.57	1.76	1.62	22.60
	Directed to Storage - Unpaved	0.46	0.46	0.65	0.71	0.77	0.92	1.15	0.95	0.96	0.61	0.69	0.53	8.87
Sullivan	Directly on Storage - No Evaporation	2.81	2.85	2.54	3.88	3.71	4.83	4.25	3.67	3.53	3.62	4.22	3.12	43.03
	Directly on Storage - With Evaporation	2.01	2.05	1.14	1.88	0.91	1.23	0.05	0.00	0.13	1.12	2.52	2.32	15.36
	Directed to Storage - Paved	1.32	1.37	1.22	1.90	1.82	2.61	2.30	2.09	2.01	1.88	2.19	1.47	22.18
	Directed to Storage - Unpaved	0.45	0.48	0.43	0.70	0.67	1.11	0.98	0.95	0.92	0.76	0.89	0.50	8.84
Susquehanna	Directly on Storage - No Evaporation	2.90	2.84	3.23	3.62	4.00	4.22	3.88	3.81	3.60	3.41	3.84	3.31	42.66
	Directly on Storage - With Evaporation	2.00	1.94	1.83	1.62	1.10	0.52	0.00	0.00	0.20	0.81	2.14	2.41	14.57
	Directed to Storage - Paved	1.36	1.36	1.55	1.77	1.96	2.24	2.06	2.17	2.05	1.77	2.00	1.56	21.85
	Directed to Storage - Unpaved	0.46	0.48	0.55	0.65	0.72	0.93	0.85	0.99	0.94	0.72	0.81	0.53	8.63
Tioga	Directly on Storage - No Evaporation	1.68	1.78	2.14	2.35	3.33	4.09	3.36	2.82	3.14	2.64	2.62	2.19	32.14
	Directly on Storage - With Evaporation	0.88	0.98	0.74	0.39	0.53	0.45	0.00	0.00	0.00	0.12	0.94	1.35	6.38
	Directed to Storage - Paved	0.72	0.82	0.98	1.13	1.60	2.17	1.78	1.55	1.73	1.32	1.31	0.94	16.05
	Directed to Storage - Unpaved	0.20	0.27	0.32	0.40	0.57	0.90	0.74	0.68	0.75	0.50	0.50	0.26	6.09
Union	Directly on Storage - No Evaporation	2.58	2.88	3.34	3.21	4.39	4.54	4.29	3.41	4.27	3.66	3.82	3.17	43.56
	Directly on Storage - With Evaporation	1.68	1.98	1.84	1.21	1.49	0.74	0.00	0.00	0.77	1.06	2.12	2.27	15.16
	Directed to Storage - Paved	1.21	1.41	1.64	1.61	2.20	2.45	2.32	1.98	2.48	1.90	1.99	1.49	22.66
	Directed to Storage - Unpaved	0.41	0.52	0.60	0.61	0.83	1.04	0.99	0.92	1.15	0.77	0.80	0.51	9.16

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Venango	Directly on Storage - No Evaporation	2.46	2.39	3.25	3.53	3.79	4.69	4.79	4.08	3.88	3.16	3.77	3.25	43.04
	Directly on Storage - With Evaporation	1.62	1.55	1.85	1.57	0.99	1.05	0.59	0.16	0.52	0.64	2.09	2.41	15.04
	Directed to Storage - Paved	0.91	1.03	1.40	1.62	1.74	2.44	2.49	2.04	1.94	1.86	1.77	1.20	28.70
	Directed to Storage - Unpaved	0.15	0.29	0.39	0.53	0.57	0.98	1.01	0.78	0.74	0.51	0.60	0.20	6.73
Warren	Directly on Storage - No Evaporation	2.67	2.40	3.19	3.53	3.97	4.88	4.13	4.26	4.12	3.44	3.92	3.70	44.21
	Directly on Storage - With Evaporation	1.83	1.56	1.79	1.57	1.17	1.24	0.00	0.34	0.76	0.92	2.24	2.86	16.28
	Directed to Storage - Paved	0.99	1.03	1.37	1.62	1.83	2.49	2.11	2.04	1.98	1.62	1.84	1.37	20.29
	Directed to Storage - Unpaved	0.16	0.29	0.38	0.42	0.60	0.98	0.83	0.72	0.70	0.55	0.63	0.22	6.48
Washington	Directly on Storage - No Evaporation	2.37	2.26	3.33	3.24	3.83	3.65	3.87	3.64	3.08	2.63	3.00	2.70	37.58
	Directly on Storage - With Evaporation	1.47	1.36	1.83	1.14	0.83	0.00	0.00	0.00	0.00	0.00	1.20	1.80	9.61
	Directed to Storage - Paved	1.00	1.01	1.50	1.52	1.80	1.93	2.05	1.97	1.66	1.26	1.44	1.13	18.27
	Directed to Storage - Unpaved	0.26	0.32	0.47	0.52	0.61	0.80	0.85	0.84	0.71	0.45	0.51	0.30	6.62
Wayne	Directly on Storage - No Evaporation	2.87	2.77	3.13	3.71	4.33	4.28	3.73	3.95	3.81	3.40	3.85	3.39	43.19
	Directly on Storage - With Evaporation	1.97	1.87	1.63	1.71	1.43	0.48	0.00	0.00	0.31	0.80	2.15	2.49	14.82
	Directed to Storage - Paved	1.38	1.39	1.56	1.86	2.16	2.31	2.01	2.29	2.21	1.84	2.08	1.63	22.70
	Directed to Storage - Unpaved	0.49	0.53	0.59	0.70	0.82	0.98	0.86	1.07	1.03	0.78	0.89	0.58	9.31
Westmoreland	Directly on Storage - No Evaporation	2.81	2.78	3.66	3.96	4.32	4.63	4.65	4.03	3.88	3.03	3.64	3.27	44.66
	Directly on Storage - With Evaporation	1.97	1.94	2.26	2.00	1.52	0.99	0.45	0.11	0.52	0.51	1.96	2.43	16.66
	Directed to Storage - Paved	1.21	1.31	1.72	1.90	2.07	2.45	2.46	2.22	2.13	1.48	1.79	1.40	22.15
	Directed to Storage - Unpaved	0.34	0.45	0.59	0.67	0.73	1.02	1.02	0.97	0.93	0.54	0.66	0.39	8.31
Wyoming	Directly on Storage - No Evaporation	2.28	2.39	2.51	3.28	3.67	4.16	3.69	3.30	3.38	3.01	3.42	2.69	37.78
	Directly on Storage - With Evaporation	1.38	1.49	1.01	1.28	0.77	0.36	0.00	0.00	0.00	0.41	1.72	1.79	10.22
	Directed to Storage - Paved	1.10	1.17	1.23	1.64	1.83	2.25	1.99	1.91	1.96	1.60	1.81	1.29	19.78
	Directed to Storage - Unpaved	0.39	0.43	0.45	0.62	0.70	0.96	0.85	0.89	0.91	0.66	0.75	0.46	8.07

Rainfall, Runoff and Evaporation for Pennsylvania counties.

County		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
York	Directly on Storage - No Evaporation	2.90	2.80	3.21	3.42	3.91	3.88	3.39	3.33	3.48	2.98	3.40	3.20	39.91
	Directly on Storage - With Evaporation	1.91	1.81	1.56	1.11	0.61	0.00	0.00	0.00	0.00	0.01	1.42	2.21	10.64
	Directed to Storage - Paved	1.51	1.48	1.70	1.81	2.07	2.25	1.97	2.13	2.23	1.70	1.94	1.67	22.46
	Directed to Storage - Unpaved	0.61	0.62	0.71	0.75	0.86	1.05	0.92	1.10	1.15	0.77	0.88	0.67	10.09

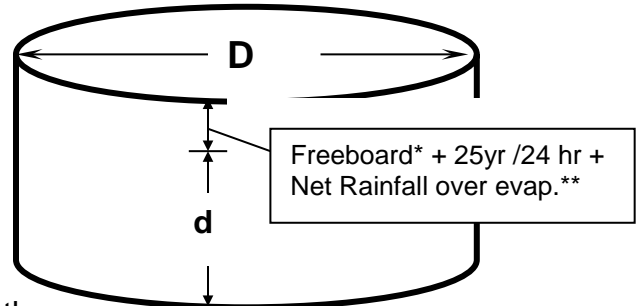
Supplement 8 Manure Storage Volume Calculations

1. To determine the useable volume (V) in a circular storage facility, use the following equation:

$$V \text{ (ft}^3\text{)} = d \times (3.14 \times (D^2/4))$$

D = tank diameter (ft)

d = useable depth of tank for liquid storage requires deducting freeboard, the 25-year 24-hour storm depth, and net rainfall over evap.** (Assumes sump or ramp for total cleanout)



V = Volume in ft³ of available storage (convert to gallons by multiplying by 7.48)

* Freeboard for all exposed vertical walled facilities is 6" except CAFO's >1,000 AEUs that are new or expanded after January 29, 2000, those would need 24" of freeboard.

** This value may be zero if included in Appendix 3, volume needed.

a. **Example determination of available storage:**

- A storage tank is 92 feet in diameter and 12 feet of total deep. It is located in Fulton County where the 25-year 24-hour rainfall is 5.1" or 0.43'. (Supplement 9).
- Storage period is from December 1 to May 31. Net rainfall over evaporation is 1.93 + 1.37 + 1.63 + 1.65 + 1.34 + 0.81 = 8.73" or 0.73'. (Supplement 7).
- Freeboard requirement for a vertical walled facility is 6" or 0.5'.
- The useable depth (d) = total depth – freeboard – 25-year 24-hour depth – net rainfall = 12' - 0.5' - 0.43' – 0.73' = 10.3'.
- Substitute into the above formula and solve for the available storage in ft³

$$V = 10.3' \times (3.14 \times (92^2 / 4)) = 68,436 \text{ ft}^3$$

2. To determine the usable volume (V) of a sloping sided storage facility with known sideslope ratio (ss), total depth (TD) and bottom or top dimensions use the following equation for a prismoidal volume, after calculating useable depth (d).

$$V = (d/3) \times (A_{tas} + A_b + (A_{tas} \times A_b)^{0.5})$$

Where **d** = useable depth between A_{tas} and A_b .

ss = side slope ratio. (typically 2, 2.5, or 3)

A_{tas} = area at top of available storage depth (**d**) in ft²

A_b = area at bottom of available storage depth (**d**) in ft²

*** Freeboard for all exposed, sloped waste storages is 1', including CAFO's < 1,000 AEU and 2' for CAFO's > 1,000 AEU's built or expanded after January 29, 2000.

Use the following formulas for sites when the bottom dimension, sideslope ratio (ss), and total depth (D) are known:

$$A_b = (\text{bottom length (ft.)}) \times (\text{bottom width (ft.)})$$

Now determine the useable depth (**d**)

$$d \text{ (depth)} = \text{total depth (TD)} - \text{freeboard} - 25\text{-year 24-hour depth} - \text{net rainfall}$$

Then substitute to find A_{tas}

$$A_{tas} = (\text{bottom length} + (2 \times ss \times d)) \times (\text{bottom width} + (2 \times ss \times d))$$

Use the following formulas for sites when the top dimensions, sideslopes (ss), and total depth (D) are known:

Determine the useable depth (**d**)

$$d \text{ (depth)} = \text{total depth} - \text{freeboard} - 25\text{yr /24hr depth} - \text{Net Rainfall}$$

Determine bottom length, bottom width and then A_b

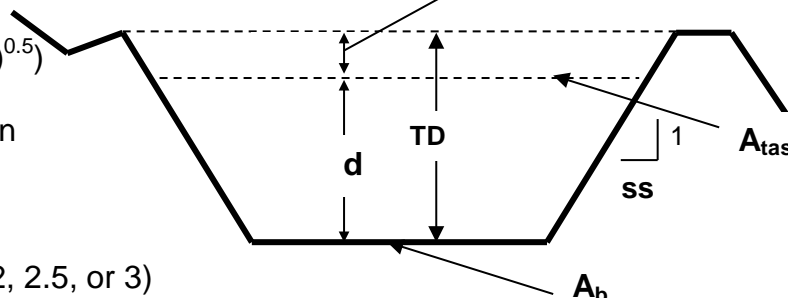
$$\text{Bottom length} = (\text{top length} - (2 \times ss \times D))$$

$$\text{Bottom width} = (\text{top width} - (2 \times ss \times D))$$

$$A_b = \text{Bottom length} \times \text{Bottom width}$$

Then substitute to find A_{tas}

Freeboard***+ 25yr /24hr +
Net Rainfall over evap.**



$$A_{tas} = ((\text{bottom length} + (2 \times ss \times d)) \times ((\text{bottom width} + (2 \times ss \times d)))$$

Finish by substituting into the formula for **V**, as shown above.

a. Example determination of available storage volume (V) on a sloped storage with known bottom dimensions, sideslope (ss), and total depth (D):

- A non-CAFO storage pond located in Centre County has a total depth of 10' from top of embankment to bottom.
- The bottom dimensions are 60' x 80'.
- Storage period of 6 months from December 1 through May 31.
- The side slopes are 2.5:1.
- The 25-year 24-hour rainfall depth for this site is 5.5" or 0.46' (Supplement 9).
- Net rainfall over evaporation $1.76 + 1.51 + 1.74 + 1.65 + .92 + .93 = 8.51"$ or 0.71' (Supplement 7).
- This assumes that this volume not included in Appendix 3. By rule the freeboard is 1' for non-CAFO site.

$$d = 10' - 1.0' - 0.46' - 0.71' = 7.8'$$

A_{tas}, **A_b**, and **V** by substitution into formulas from above.

$$A_b = 60 \times 80 = 4800 \text{ ft}^2$$

$$A_{tas} = (60 + (2 \times 2.5 \times 7.8)) \times (80 + (2 \times 2.5 \times 7.8)) = 99 \times 119 = 11,781 \text{ ft}^2$$

$$V = (7.8 / 3) \times (11,781 + 4,800 + (11,781 \times 4,800)^{0.5})$$

$$V = 2.6 \times (11,781 + 4,800 + 7,520)$$

$$V = 62,663 \text{ ft}^3 \text{ or } 468,719 \text{ gallons } (62,663 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3)$$

b. Example determination of available storage on a sloped storage with known top dimensions, sideslope, and total depth :

- A CAFO storage pond has a total depth (**TD**) of 12'.
- The top dimensions are 120' x 130'. The side slopes ratio (**ss**) of 2.5.
- Location and storage period the same as previous example, however it has > 1,000 CAOs and was built in 2002.
- The 25-year 24 hour rainfall depth for this site is 5.5" (0.46').
- Net rainfall over evaporation = $1.76 + 1.51 + 1.74 + 1.65 + .92 + .93 = 8.51"$ or 0.71' (Supplement 7).
- This assumes that this volume not included in Appendix 3. By rule the freeboard requirement for a CAFO site is 2'.

$$d = 12' - 2.0' - 0.46' - 0.71' = 8.8'$$

Determine **A_b**, **A_{tas}**, and **V** by substitution into formulas from above.

$$\text{Bottom length} = (120' - (2 \times 2.5 \times 12')) = 60'$$

$$\text{Bottom width} = (130' - (2 \times 2.5 \times 12')) = 70'$$

$$A_b = 60' \times 70' = 4,200 \text{ ft}^2$$

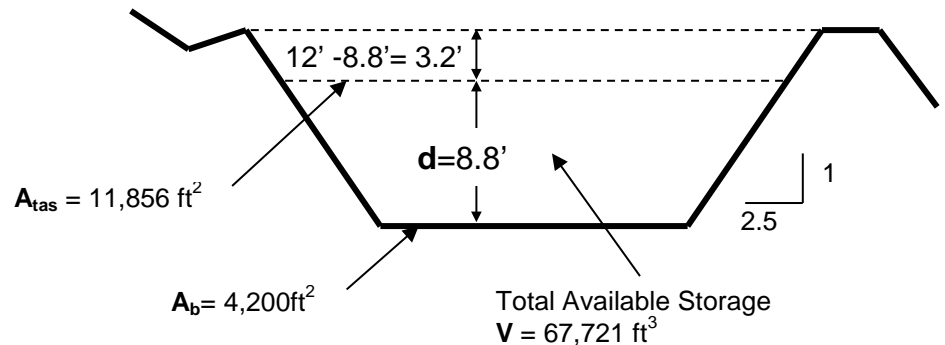
$$A_{tas} = (60 + (2 \times 2.5 \times 8.8')) \times (70 + (2 \times 2.5 \times 8.8)) = 11,856 \text{ ft}^2$$

$$V = (8.8 / 3) \times (11,856 + 4,200 + (11,856 \times 4,200)^{0.5})$$

$$V = 2.93 \times (11,856 + 4,200 + 7,057)$$

$$V = 67,721 \text{ ft}^3 \text{ or } 506,553 \text{ gallons } (67,721 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3)$$

Solution:



3. To determine adequate storage.

After determining **V** (total storage available) compare against the required storage Volume, **V_r**. The required storage volume is an output of Appendix 3: Manure Group Information. It includes all manure, washwater, bedding, net rainfall volume over the storage, and offsite runoff (includes net rainfall and the 25-year 24-hour for that area). It does not include the required freeboard or 25-year 24-hour volume over the actual storage area. Note in some cases, the net rainfall over the storage is not included and would be subtracted out during the **V** computation as shown in the examples.

- If **V** \geq **V_r**, storage is adequate
- If **V** $<$ **V_r**, additional storage is needed and/or the plan must identify alternate storage or available land for application at times when capacity would be reached.

P. Vanderstappen & W.H. Latshaw

Supplement 9

Pennsylvania 25-Year 24-Hour Storm Rainfall Data

Pennsylvania 24-Hour Storm Rainfalls in Inches*

County	25-Yr	County	25-Yr
Adams	6.0	Lackawanna	5.8
Allegheny	4.0	Lancaster	6.0
Armstrong	4.2	Lawrence	4.0
Beaver	4.0	Lebanon	5.7
Bedford	4.8	Lehigh	6.0
Berks	6.0	Luzerne	6.2
Blair	4.8	Lycoming	5.4
Bradford	4.3	McKean	4.3
Bucks	6.2	Mercer	4.1
Butler	4.1	Mifflin	5.3
Cambria	4.8	Monroe	6.0
Cameron	4.4	Montgomery	6.1
Carbon	6.3	Montour	5.1
Centre	5.5	Northampton	5.9
Chester	6.0	Northumberland	5.5
Clarion	4.2	Perry	5.3
Clearfield	4.4	Philadelphia	6.1
Clinton	5.4	Pike	5.7
Columbia	5.7	Potter	4.5
Crawford	4.3	Schuylkill	6.3
Cumberland	5.9	Snyder	5.7
Dauphin	5.6	Somerset	4.7
Delaware	6.0	Sullivan	5.5
Elk	4.4	Susquehanna	5.3
Erie	4.5	Tioga	4.4
Fayette	4.3	Union	5.5
Forest	4.1	Venango	4.1
Franklin	6.0	Warren	4.3
Fulton	5.1	Washington	4.0
Greene	4.1	Wayne	5.7
Huntingdon	4.9	Westmoreland	4.6
Indiana	4.5	Wyoming	5.2
Jefferson	4.3	York	6.1
Juniata	5.6		

* From NOAA14. Other Storm Frequencies can be found in the NRCS Engineering Field Handbook Chapter.

Supplement 10

Winter Manure Application Matrix

A nutrient management plan including planned winter manure application must include, with Appendix 10: Supporting Information and Documentation, a completed Winter Manure Application Matrix. When using the Nutrient Management Plan spreadsheet for plan development, the Winter Manure Application Matrix is included and can be printed with the nutrient management plan report.

A paper version of the Winter Manure Application Matrix and guidance for the use of the Winter Manure Application Matrix is provided in this Supplement.

An Excel version of the Winter Manure Application Matrix is available at:

1. <http://extension.psu.edu/plants/nutrient-management/planning-resources/alternative-tech-manual/spreadsheets-and-forms>
2. As a part of the Nutrient Management Plan spreadsheet.

Additional information relating to the winter manure application requirements under Act 38 can be found in the Nutrient Management Plan Summary and Appendix 10: Supporting Information and Documentation.

Guidance for the use of the Winter Application Matrix

When to evaluate a field/CMU using the Winter Manure Application Matrix.

(For additional information see the NMP Summary section)

All fields planned for winter manure application must be assessed using the most recent version of the Winter Manure Application Matrix. Also, these fields need to be evaluated for winter application in the Phosphorus Index (P Index) (see Appendix 5 for additional information).

1. Winter is defined as any time any one of the following conditions exists:
 - the date is on or between December 15 and February 28
 - the ground is frozen at least 4 inches
 - or the ground is snow covered
2. All Act 38 setbacks including those specific to winter manure application must be followed.

Year-round:

- 100 feet from streams (intermittent and perennial), lakes, ponds, and open existing sinkholes; unless less there is a permanent vegetative buffer at least 35 feet in width next to the stream, in which case there will be a 35 foot manure application setback.
- 100 feet from active private water wells
- 100 feet from active public water wells unless other state or federal programs require a larger setback

Winter:

- No winter manure application within 100 ft. of an above ground agricultural drainage inlet where surface flow is toward the inlet.
 - No winter manure application within 100 ft. of a wetland (identified on National Wetland Inventory Maps) within the 100 year floodplain of an Exceptional Value stream segment if surface flow is toward the wetland.
3. Fields receiving winter manure applications must have 25% cover or an established cover crop.

Using the Winter Manure Application Matrix results.

(For additional information see the NMP Summary section)

The Winter Manure Application Matrix is a guidance tool developed to evaluate the field characteristics that are most relevant for assessing the potential for manure runoff during the winter season. The results provided by the Winter Manure Application Matrix are recommendations to assist nutrient management planners in selecting and prioritizing fields for winter manure application. If based upon specific historic understanding of a particular farm site, the planner or plan reviewer questions the Winter Manure Application Matrix evaluation recommendations, the results should be discussed with SCC staff to determine how the fields should be considered for winter manure application.

For farms proposing to apply manure in the winter, the Winter Manure Application Matrix inputs and associated recommendations are to be submitted with Appendix 10 of the nutrient management plan. If using the Nutrient Management Plan spreadsheet, the Winter Manure Application Matrix is to be selected to be included with the nutrient management plan report.

Using the Winter Manure Application Matrix to evaluate a field/CMU

The following describes the process for evaluating a field/CMU with the Winter Manure Application Matrix.

All yellow shaded areas require information input. All un-shaded areas include information calculated by the spreadsheet.

1. Enter the field/CMU planned to receive the winter manure application.
When using the Nutrient Management Plan spreadsheet when "Winter" is selected for the Season of Application the field/CMU ID will automatically be entered into the Winter Application Matrix.
2. Indicate whether or not the field/CMU has 25% cover or a cover crop.
This is a "Yes" or "No" answer and is completed by selecting from a drop-down menu.
If "No" is selected the inputs for the Winter Manure Application Matrix will be shaded gray and the recommendation will read "Not Allowed".
See item 3 of "When to Evaluate a field/CMU using the Winter Manure Application Matrix" above for additional information.
3. Enter the weighting factor 1, 2, 3 or 4 for the category that best represents the field slope(%).
4. Enter the weighting factor 1, 2, 3 or 4 for the category that best represents the field distance from water bodies.
Water bodies include Perennial and Intermittent streams with defined bed and bank, Lakes, Ponds, Open sinkholes, and Active private and public water sources.
5. Enter the weighting factor 1, 2, 3 or 4 for the category that best represents the field drainage class.
This is the same Drainage Class determination used for the P Index.
Therefore, the P Index County Runoff Potential Tables can be used in determining the appropriate Drainage Class.
6. Enter the weighting factor 1, 2, 3 or 4 for Runoff Control category that best represents the field's conservation practices.

The Winter Manure Application Matrix Ranking Value and Ranking Category

When all Winter Manure Application Matrix inputs have been entered (Steps 1 to 6 above), a Ranking Value will be calculated for the field/CMU. The Ranking Value will correspond to a Ranking Category of either Good, Fair or Poor. See the "Recommended Winter Manure Application Prioritization Table" at the bottom of the Winter Manure Application Matrix. The Ranking Value and Ranking Category provide recommendations for selecting and prioritizing fields/CMUs for winter application. See "Using the Winter Manure Application Matrix Results" section above for additional information on using the results as part of the nutrient management planning process.

In assessing which fields are appropriate to use for winter manure application, the following general guidance can be used, along with specific historic and additional on-farm knowledge of the assessed CMUs:

- 1) Fields receiving a ranking of "Poor" should not be used for winter manure application.
- 2) Fields receiving a ranking of "Fair" should only be proposed for winter manure application if significant additional protective measures are incorporated into the plan for these fields to minimize the potential for manure runoff during these winter conditions. These additional measures could include actions such as only applying solid, heavily bedded manure, no application during snow or ice covered conditions, applying very low rates of manure, etc.

- 3) Fields receiving a ranking of "Good" are the fields most relevant to consider for winter manure application. These fields still need to have further assessment based on historic and farm specific characteristics to ensure that runoff from these fields is unlikely. Receiving a "Good" ranking for a field does not ensure that the field will not create runoff problems, but only indicates that these fields are most appropriate for consideration for winter manure application.

It is important to note that a field/CMU receiving a:

1. With the exception of Drainage Class, a "1" weighting factor for any one evaluation category will automatically receive a Ranking Category of "Poor". The Winter Manure Application Matrix will display "Poor" for both the Ranking Value and the Ranking Category. These CMU's should not be used for winter manure application.
2. With the exception of Drainage Class, a "2" weighting factor for any two evaluation categories will automatically receive a Ranking Category of "Poor". The Winter Manure Application Matrix will display "Poor" for both the Ranking Value and the Ranking Category. These CMU's should not be used for winter manure application.

Supplement 10: Winter Manure Application Matrix (October 2009)

User Notes for the Winter Manure Application Matrix

- Under Act 38, any one of the following conditions meets the "winter" definition .
 - December 15 to February 28
 - Frozen ground (4 inch depth)
 - Snow-covered ground
- All Act 38 setbacks including those specific to winter manure application must be followed.

Year-round:

 - 100 feet from streams (intermittent and perennial), lakes, ponds, and open existing sinkholes; unless less there is a permanent vegetative buffer at least 35 feet in width next to the stream, in which case there will be a 35 foot manure application setback.
 - 100 feet from active private water wells
 - 100 feet from active public water wells unless other state or federal programs require a larger setback

Winter:

 - No winter manure application within 100 ft. of an above ground agricultural drainage inlet where surface flow is toward the inlet.
 - No winter manure application within 100 ft. of a wetland (identified on National Wetland Inventory Maps) within the 100 year floodplain of an Exceptional Value stream segment if surface flow is toward the wetland.
- Fields receiving winter manure applications must have 25% cover or an established cover crop.

To begin for each CMU/Field ID, 1. Enter the CMU/Field ID and 2. Verify the CMU/Field meets the required cover conditions described in User Note 3.

CMU ID		
Does the CMU/Field have 25% cover or an established cover crop?		

To continue for each CMU/Field, 1. Choose the appropriate Evaluation Criteria Description and 2. Enter the corresponding Ranking Value.

	Evaluation Criteria Descriptions and Ranking Values					
	4	3	2 ^b	1 ^c		
Field Slope	< 4 %	4 - 8%	9 - 15%	> 15%		
Distance from Water Bodies ^a	> 350 ft.	350 - 200 ft	199 - 100 ft	<100 ft		
Drainage Class Determined using Phosphorus Index Drainage Class Determination	Somewhat Excessively OR Excessively	Well OR Moderately Well	Somewhat Poorly	Poorly OR Very Poorly		
Runoff Control	Recommended conservation practices are in place. Very low potential for concentrated flow.	Some conservation practices are in place. Low potential for concentrated flow.	Some conservation practices are in place. Moderate potential for concentrated flow.	No conservation practices are in place. High potential for concentrated flow.		

^a Includes Perennial and Intermittent streams with defined bed and bank, Lakes, Ponds, Open sinkholes, and Active private and public water sources.

^b With the exception of "Drainage Class", a field receiving a rating of "2" in any two categories is not recommended for winter application.

^c With the exception of "Drainage Class", a field receiving a rating of "1" in any one category is not recommended for winter application.

Recommended Winter Manure Application Prioritization

Ranking Value	Ranking Category	Recommendation for Winter Manure Spreading Prioritization
Greater than 12	Good	These fields should receive first priority for winter manure application.
8 to 12	Fair	These fields should receive second priority for winter manure application.
Less than 8	Poor	These fields are not recommended for winter manure application.

Supplement 11
Exporter Agreements

Supplement 11 provides the following agreements for operations exporting manure:

1. Exporter/Importer Agreement - Manure Used for Agricultural Land Application.
2. Exporter/Importer Agreement - Manure Used for Other Than Agricultural Land Application.
3. Exporter/Importer Agreement - Manure Exported Out of Pennsylvania.
4. Exporter/Broker Agreement.

These Exporter Agreements are also available and posted as Word documents with the Supplement 11 materials on the PA Nutrient Management Program web site:

<http://extension.psu.edu/plants/nutrient-management/planning-resources/alternative-tech-manual/spreadsheets-and-forms>

For additional information about the Exporter Agreements see Appendix 8: Importer/Broker Agreements and NBSs.

Exporter/Importer Agreement

Manure Used For Agricultural Land Application

Developed consistent with the PA Nutrient and Odor Management Act Program

- 1) This agreement is entered into on _____, by _____
(the “exporter”) who will supply manure, and _____ (the “importer”), who
will receive the manure from the exporter.
- 2) The purpose of this agreement is to set forth the mutual responsibilities and understanding of the
parties with respect to the export of manure from the exporter to the importer.
- 3) The exporter is located at (county, twp, and address): _____

- 4) The exporter will, as the supply of manure allows, provide the following amounts of manure during
the seasons outlined below:

Tons of (Species) manure, per season:

Spring _____ **Summer** _____ **Fall** _____ **Winter** _____

Gallons of (Species) manure, per season:

Spring _____ **Summer** _____ **Fall** _____ **Winter** _____

Total planned manure exported: (supply of manure may be less than what is planned)

Tons of (Species) manure: _____

Gallons of (Species) manure: _____

If multi-species are planned, please add additional lines:

- 5) The importer's location and other relevant information as it relates to this manure export, is as follows
(maps indicating the location of importing fields must be attached to the supporting Nutrient Balance
Sheets if manure is to be land applied at the importing site):
 - a) **Phone number:** _____
 - b) **County(s):** _____
 - c) **Address:** _____
 - d) **Township(s):** _____
 - d) **Owner(s) of the property receiving manure:** _____
 - e) **Total cropland acres managed by the importer:** _____
 - f) **Number and type of animals raised by the importer:** _____

 - g) **Number of acres available for this imported manure:** _____
 - h) **Other manures (type, amount) imported to the site AND/OR utilized on the site:** (Note- this
would include manure that is generated on the site by the importers animals, etc.)

- **If other manure is imported and/or utilized , is it applied to the same acres as indicated in item “g” above (relating to “acres available”): Yes or No**
- 6) The exporter will use a Manure Export Sheet to record all manure exported to the importer. These Manure Export Sheets are available from the county conservation district or the State Conservation Commission. Computer generated forms other than the manure export sheet may be used if they contain the same information as, and are reasonably similar in format to, the forms available from the State Conservation Commission or the conservation district.
 - 7) Records relating to the export of manure shall be prepared by the exporter in accordance with the following requirements of the Nutrient and Odor Management Act regulations:
 - a) A Manure Export Sheet shall be used to document all manure exports for their records
 - A copy of the Manure Export Sheet shall be provided to the importer
 - A copy of the Manure Export Sheet shall be retained on site by the exporter
 - b) When the exporter (or someone working for, or contracted by the exporter) applies the exported manure, the exporter shall maintain the following exported manure records:
 - Application dates, areas, rates and methods
 - c) Records shall be maintained by the exporter for a minimum of 3 years
 - d) A manure export informational packet (as supplied by the conservation district or State Conservation Commission) shall be provided to the importer by the time of the manure export. This information only needs to be provided once to the importer.

The manure export informational packet must include the following:

 - i. Exported Manure Informational Packet Guidance Sheet
 - ii. Nutrient Management Planning an Overview (Agronomy Facts 60)
 - iii. Manure Management for Environmental Protection
 - iv. Land Application of Manure- A supplement to the Manure Management Manual Plan Guidance
 - v. Manure Export Sheet
 - vi. Manure Transfer Summary Sheets
 - vii. Manure Field Stacking Requirements Fact Sheet
 - 8) Where applicable, the importer shall properly store manure received from the exporter in accordance with the provisions of the Manure Management Manual and the Pa Technical Guide and shall not cause contamination of surface or ground water. This shall include manure stacked in application fields which may not be retained in fields for > 120 days unless covered or otherwise protected .
 - 9) Manure received by the importer shall be applied to the land at the rate(s) and method(s) provided in the attached “Nutrient Balance Sheet(s)”, or in accordance with a Nutrient Management Plan approved for the importing operation. If the importer wishes to change the lands used for imported manure, the nutrient balance sheet must be revised to reflect the changes and be submitted to the conservation district or State Conservation Commission (and DEP if the exporter is a CAFO) prior to implementing the changes.
 - 10) The importer shall comply with applicable manure application setbacks for the imported manure, as outlined in the Nutrient Balance Sheet map(s).
 - 11) For any lands not owned by the importer where the manure will be applied (i.e., rented lands), the importer hereby confirms that the importer has the authority to apply manure on those lands.

- 12) This agreement shall remain in full effect unless terminated by either party upon thirty days prior written notice to the other party. If this agreement is terminated, the exporter shall notify the county conservation district office that approved their nutrient management plan, of the termination.

Exporter Signature, Name and Date

_____(signature)
_____(name)
_____(date)

Importer Signature, Name and Date

_____(signature)
_____(name)
_____(date)

Exporter/Importer Agreement

Manure Used For Other Than Agricultural Land Application

Developed consistent with the PA Nutrient and Odor Management Act Program

- 1) This agreement is entered into on _____, by _____
(the “exporter”) who will supply manure, and _____ (the
“importer”), who will receive the manure from the exporter.
- 2) The purpose of this agreement is to set forth the mutual responsibilities and understanding of the parties with respect to the export of manure from the exporter to the importer.
- 3) The exporter is located at (county, twp, and address): _____

- 4) The exporter will, as the supply of manure allows, provide the following amounts of manure during the seasons outlined below:

Tons of (*Species*) manure, per season:

Spring _____ **Summer** _____ **Fall** _____ **Winter** _____

Gallons of (*Species*) manure, per season:

Spring _____ **Summer** _____ **Fall** _____ **Winter** _____

Total planned manure exported: (supply of manure may be less than what is planned)

Tons of (*Species*) manure: _____

Gallons of (*Species*) manure: _____

If multi-species are planned, please add additional lines:

- 5) The importer’s location and other relevant information as it relates to this manure export, is as follows:
 - a) **Phone number:** _____
 - b) **County(s):** _____
 - c) **Address:** _____
 - d) **Owner of the property receiving manure:** _____
 - e) **Proposed usage of the imported manure:** _____

- 6) The exporter will use a Manure Export Sheet to record all manure exported to the importer. These Manure Export Sheets are available from the county conservation district or the State Conservation Commission. Computer generated forms other than the manure export sheet may be used if they

contain the same information as, and are reasonably similar in format to, the forms available from the State Conservation Commission or the conservation district.

- 7) Records relating to the export of manure shall be prepared by the exporter in accordance with the following requirements of the Nutrient and Odor Management Act regulations:
 - a) A Manure Export Sheet shall be used to document all manure exports for their records
 - A copy of the Manure Export Sheet shall be provided to the importer
 - A copy of the Manure Export Sheet shall be retained on site by the exporter
 - b) Records shall be maintained by the exporter for a minimum of 3 years
- 8) Where applicable, the importer shall properly store manure received from the exporter in accordance with the provisions of the Manure Management Manual and the Pa Technical Guide and shall not cause contamination of surface or ground water. This shall include manure stacked in application fields which may not be retained in fields for greater than 120 days unless covered or otherwise protected.
- 9) This agreement shall remain in full effect unless terminated by either party upon thirty days prior written notice to the other party. If this agreement is terminated, the exporter shall notify the county conservation district office that approved their nutrient management plan, of the termination.

Exporter Signature, Name and Date

_____(signature)
_____(name)
_____(date)

Importer Signature, Name and Date

_____(signature)
_____(name)
_____(date)

Exporter/Importer Agreement

Manure Exported Outside of Pennsylvania

Developed consistent with the PA Nutrient and Odor Management Act Program

- 1) This agreement is entered into on _____, by _____
(the “exporter”) who will supply manure, and _____ (the
“importer”), who will receive the manure from the exporter.
- 2) The purpose of this agreement is to set forth the mutual responsibilities and understanding of the parties with respect to the export of manure from the exporter to the importer.
- 3) The exporter is located at (state, county, twp, and address): _____

- 4) The exporter will, as the supply of manure allows, provide the following amounts of manure during the seasons outlined below:

Tons of (Species) manure, per season:

Spring _____ **Summer** _____ **Fall** _____ **Winter** _____

Gallons of (Species) manure, per season:

Spring _____ **Summer** _____ **Fall** _____ **Winter** _____

Total planned manure exported: (supply of manure may be less than what is planned)

Tons of (Species) manure: _____

Gallons of (Species) manure: _____

If multi-species are planned, please add additional lines:

- 5) The importer's location and other relevant information as it relates to this manure export, is as follows:
 - a) **Phone number:** _____
 - b) **County(s):** _____
 - c) **Address:** _____
 - d) **Proposed usage of the imported manure (include acres where relevant):** _____

- 6) The exporter will use a Manure Export Sheet to record all manure exported to the importer. These Manure Export Sheets are available from the county conservation district or the State Conservation Commission. Computer generated forms other than the manure export sheet may be used if they contain the same information as, and are reasonably similar in format to, the forms available from the State Conservation Commission or the conservation district.

- 7) Records relating to the export of manure shall be prepared by the exporter in accordance with the following requirements of the Nutrient and Odor Management Act regulations:
- a) A Manure Export Sheet shall be used to document all manure exports for their records
 - A copy of the Manure Export Sheet shall be provided to the importer
 - A copy of the Manure Export Sheet shall be retained on site by the exporter
 - b) Records shall be maintained by the exporter for a minimum of 3 years
- 8) The importer agrees to store, handle and apply the manure in accordance with appropriate state, federal and local requirements relevant to the importing operation. Where applicable, the importer shall properly store manure received from the exporter in accordance with the provisions of the Manure Management Manual and the Pa Technical Guide and shall not cause contamination of surface or ground water. This shall include manure stacked in application fields which may not be retained in fields for >120 days unless covered or otherwise protected; unless regulations exist that would supersede these requirements.
- 9) This agreement shall remain in full effect unless terminated by either party upon thirty days prior written notice to the other party. If this agreement is terminated, the exporter shall notify the county conservation district office that approved their nutrient management plan, of the termination.

Exporter Signature, Name and Date

_____(signature)
_____(name)
_____(date)

Importer Signature, Name and Date

_____(signature)
_____(name)
_____(date)

Exporter/Broker Agreement

Developed consistent with the PA Nutrient and Odor Management Act Program

- 1) This agreement is entered into on _____, by
_____ (the “exporter”) who will supply manure, and
_____ (the “broker”) who will receive the manure from the
exporter.
- 2) The purpose of this agreement is to set forth the mutual responsibilities and understanding of
the parties with respect to the export of manure from the exporter to the broker.
- 3) The exporter is located at (county, twp, and address): _____

- 4) The exporter will, as the supply of manure allows, provide the following amounts of manure during
the seasons outlined below:

Tons of (*Species*) manure, per season:

Spring _____ **Summer** _____ **Fall** _____ **Winter** _____

Gallons of (*Species*) manure, per season:

Spring _____ **Summer** _____ **Fall** _____ **Winter** _____

Total planned manure exported: (supply of manure may be less than what is planned)

Tons of (*Species*) manure: _____

Gallons of (*Species*) manure: _____

If multi-species are planned, please add additional lines:

- 5) The broker's contact information is as follows:
 - a) **Name:** _____
 - b) **Address:** _____

 - c) **Telephone number:** _____
 - d) **PDA Manure Broker Certification number:** _____
- 6) The Broker agrees to maintain their status as a certified Commercial Manure Broker as provided
under Pa's Commercial Manure Hauler and Broker Certification Program (7 Pa Code Chapter 130e).
- 7) The Broker agrees to comply with all requirements established by section 5 of the
Commercial Manure Hauler and Broker Certification Act regarding the development and

distribution of nutrient balance sheets to importing operations and conservation districts when handling manure from a CAO, CAFO or volunteer operation. Specifically, where a broker under this agreement, makes arrangements for land application of the manure on an importing agricultural operation, the broker must:

- a. Provide a NBS to all importing operations receiving manure for land application, no later than the time of manure transfer
- b. Provide copies of the NBS, no later than the time of manure transfer, to the county conservation district where the manure originated (exporting operation county)
- c. Provide copies of the NBS, no later than the time of manure transfer, to the county conservation district where the manure is being applied (importing operation county)

Where a broker under this agreement, arranges for the use of manure for purposes other than land application, the broker is not required to supply a NBS to the importing operation

- 8) The exporter will use a Manure Export Sheet to record all manure exported to the broker. These Manure Export Sheets are available from the county conservation district or the State Conservation Commission. Computer generated forms other than the manure export sheet may be used if they contain the same information as, and are reasonably similar in format to, the forms available from the State Conservation Commission or the conservation district.
- 9) This agreement shall remain in full effect unless terminated by either party upon thirty days prior written notice to the other party. If this agreement is terminated, the exporter shall notify the county conservation district office that approved their nutrient management plan, of the termination.
- 10) By signing this agreement, the broker accepts full responsibility for the manure received from the exporter as long as the manure is under the broker's control, including handling, storage and land application.

Exporter Signature, Name and Date

_____(signature)
_____(name)
_____(date)

Broker Signature, Name and Date

_____(signature)
_____(name)
_____(date)

Supplement 12

Manure Export Sheet

Supplement 12 provides the Manure Export Sheet. The Manure Export Sheet is also available and posted as a Word document on the PA Nutrient Management Program web site: <http://extension.psu.edu/plants/nutrient-management/planning-resources/alternative-tech-manual/spreadsheets-and-forms>

For additional information about the exporter requirements see Section IV: Record Keeping and Informational Requirements.

Manure Export Sheet

Section 1

Name of Operation Exporting Manure _____

Name of Manure Importer/Broker _____

Address of Importer/Broker _____

County _____ Township _____

Type of Manure Transferred _____ (animal type)

Check here if manure will not be land applied ☐

Analysis of Manure N: _____ P₂O₅: _____ K₂O: _____

(Units: lbs/ton ☐ lbs/100 gal ☐ lbs/1,000 gal ☐ other _____)

	Planned	Actual	
Total Amount of Manure Transferred	_____	_____	(tons or gal)

Date(s) Manure was Transferred _____

Check here if Importer has received manure informational packet ☐

Section 2

(To be completed when the exporter, or a person working under the direction of the exporter, applies the manure.)

Applied to: _____ (field or crop group)

Number of Acres _____

Rate of Application _____

Notes:

1. Use a separate Manure Export Sheet for each separate manure type
2. All manure applications within Pennsylvania shall be in accordance with the accepted practices described in the Pennsylvania Department of Environmental Protection Manure Management Manual. When manure application practices do not conform to those described in the Manual, DEP approval is required.

Supplement 13

Emergency Response Plan

Any operation submitting an Act 38 plan for approval must have an Emergency Response Plan (ERP), acceptable to the Act 38 program guidelines, at the farm site. This ERP does not need to be submitted with the plan, but must be on the farm site at all times. In addition to the Commission's standardized Emergency Response Plan format, the program accepts PPC plans called for by DEP for CAFO operations.

The Commission's standardized ERP format is provided in this Supplement.

Additional information relating to the ERP requirement under Act 38 can be found in Appendix 1: Nutrient Management Plan Agreement and Responsibilities.

Emergency Response Plan

Developed for _____ Farm

If an emergency manure spill or leak should occur you need to take the following actions:

- 1) Ensure you and other people are safe, if the spill or leak involves a public road:
 - a. Contact police for traffic control
_____ **Police Department @** _____
 - b. Use flares, safety cones, etc. to warn approaching motorists
- 2) Stop the leak or spill
 - a. If the leak or spill happens while emptying the storage:
 - Stop pumps, close valves, and/or stop siphoning of manure
 - Park on top of flexible piping to pinch it closed
 - If necessary, direct manure to another storage structure
 - Plug holes in the impoundment, build dams to capture the leak and either pump the manure back into storage or spread it on fields
 - b. If the leak or spill happens while on the road:
 - Pull off the side of the road
 - Plug the leak or otherwise stop the flow of manure from the tank
 - Build a berm or dike to keep manure from flowing into streams, ditch, etc.
 - Call the police to direct traffic
_____ **Police Department @** _____
- 3) Contain and control the leak or spill:
 - a. Build containment dam to capture the manure. Use soil, gravel, hay bales, etc. Provide an area for the impounded manure to run into and be temporarily stored. Limit the area in contact with the manure. Use a contractor if necessary. Some local contractors or others with equipment in the area are:
Contractor _____ **@** _____
Contractor _____ **@** _____
 - b. Prevent manure from running into streams, ditches, etc.
 - c. Use absorbent material to soak up the manure, such as straw, hay, sawdust, animal feed, or soil to limit or stop the flow
 - d. Check for contaminated subsurface tile lines and divert flow from tile inlets
- 4) Notify the proper authorities:
Pa DEP, Emergency Response number @ _____ **or**
http://www.portal.state.pa.us/portal/server.pt/community/report_an_incident/6010
_____ **County Conservation District @** _____
PA Fish and Boat Commission @ _____
Your nutrient management planner @ _____
 - a. Make a record of details of the spill and actions you took. Take pictures of the extent of the spill and your containment and cleanup practices.
 - b. If a spill enters a sinkhole or otherwise has the potential to enter groundwater, notify adjacent landowners who use private wells for their water supply.
- 5) Clean up the leak or spill:
 - a. This may be directed by the authorities listed above.
 - b. Pick up absorbent material you used and properly dispose of the material
 - c. Restore the damaged area if necessary

Supplement 14

New Waste Storage Facility Certification

Supplement 14 provides the New Waste Storage Facility Certification. The New Waste Storage Facility Certification is also available and posted as a Word document with on the PA Nutrient Management Program web site:

<http://extension.psu.edu/plants/nutrient-management/planning-resources/alternative-tech-manual/spreadsheets-and-forms>

For additional information about the Waste Storage Facility Certification see Section III: Minimum Standards for Manure Storage Facilities.

New Waste Storage Facility (WSF) Certification

State Conservation Commission
Nutrient Management Program

Farm Name: _____ County: _____

Operator Name: _____

Address: _____

Operator's Signature: _____ Date: _____

This WSF Certification Sheet covers the following practice(s):

WSF and Components	PATG Code	Farm Field	Inst. Date

I, the undersigned Professional Engineer, certify that the above WSF has been designed in accordance with the appropriate PA Technical Guide standards.

Engineering Firm/Agency: _____

Name/Title: _____ License No: PE _____

Signature: _____ Date: _____

We, the undersigned Contractor of Record and Engineer of Record, certify that the above WSF has been installed in accordance with the appropriate design and construction standards outlined in the PA Technical Guide, and as specified in the site-specific project design.

Contracting Firm: _____

Name/Title: _____

Signature: _____ Date: _____

Engineering Firm/Agency: _____

Name/Title: _____ License No: PE _____

Signature: _____ Date: _____

Supplement 15

Waiver Request for Manure Storage Setback Requirements

Supplement 15 provides the Waiver Request for Manure Storage Setback Requirements. The Waiver Request for Manure Storage Setback Requirements is also available and posted as a Word document on the PA Nutrient Management Program web site: <http://extension.psu.edu/plants/nutrient-management/planning-resources/alternative-tech-manual/spreadsheets-and-forms>

For additional information about the Waiver Request for Manure Storage Setback Requirements see Section III: Minimum Standards for Manure Storage Facilities.

Waiver Request for Manure Storage Setback Requirements

Date: _____

Name: _____

Address: _____

City, State, ZIP: _____

County: _____ Township: _____

Directions to Farm: _____

I hereby request the setback of 100 feet from a perennial stream, river, spring, private well, lake, pond or reservoir required by the Nutrient Management Act be waived for the construction of a manure storage facility on the above farm. I have included a sketch of the operation showing the proposed location of the manure storage facility, farm buildings and the body of water in question.

I understand that a delegated conservation district or the State Conservation Commission can grant a waiver only for agricultural operations that existed prior to October 1, 1997. I further understand that the following criteria will be used by the reviewing agency in consideration of the requested waiver:

- ☐ The placement of the manure storage facility outside the setback area is found to be physically impractical or economically unreasonable. (Increase cost \$5,000 or 50%, whichever is less)
- ☐ The placement of the manure storage facility within the setback area has been determined to adequately protect the surrounding area from off-site migration of manure, or, the placement of the facility outside the setback area would increase the probability of off-site migration of manure.
- ☐ The design and construction of the facility shall meet PA Technical Guide standards and be certified by the contractor and the Engineer of Record.
- ☐ The operator shall allow for annual inspection of the manure storage facility when empty
- ☐ Where applicable, the loading/unloading area shall be designed to retain, or divert from off-site migration, 3,000 gallons of manure. If required, the retention area shall be designed for recollection of the manure for field application.
- ☐ The manure storage facility shall not utilize a gravity unloading system.
- ☐ The foundation, floor and walls of the manure storage facility shall be protected against erosion and flotation from the 25-year flood event.
- ☐ The top of the manure storage facility shall be above the 100-year flood elevation.
- ☐ A written Operation & Maintenance plan, to include a site-specific contingency plan, shall be developed, reviewed and implemented for the facility.
- ☐ Where appropriate, a secondary check valve shall be installed in loading/unloading equipment, to assure that manure cannot freely flow out of the storage if there is a primary valve or equipment failure.
- ☐ If applicable, the private water well construction meets the criteria that the Commission, in consultation with NRCS, deems necessary to protect water quality.

Operator's Signature: _____

Supplement 16
Sample Manure Storage Setback Waiver
(From Neighboring Landowner)

Supplement 16 provides a Sample Manure Storage Setback Waiver (From Neighboring Landowner). This Sample Manure Storage Setback Waiver (From Neighboring Landowner) is also available and posted as a Word document on the PA Nutrient Management Program web site: <http://extension.psu.edu/plants/nutrient-management/planning-resources/alternative-tech-manual/spreadsheets-and-forms>

For additional information about the Sample Manure Storage Setback Waiver (From Neighboring Landowner) see Section III: Minimum Standards for Manure Storage Facilities.

Manure Storage Setback Waiver

(From Neighboring Landowner)

To Whom It May Concern:

I hereby consent to waive the required setback distance of _____ feet from my property line for the proposed manure storage facility to be built on the parcel of property with tax # _____ currently owned by _____.

My property is identified by parcel # _____.

I understand that this manure storage facility will be closer to my property line than required setbacks provided under §83.351(a)(2)(vi)(H) of the regulations developed to implement Act 38 of 2005. This manure storage facility has my consent to be no closer than _____ feet from my adjoining property line. I understand that such a waiver is acceptable to the Pennsylvania State Conservation Commission under §83.351(a)(2)(vi)(H) of the aforementioned regulations.

Landowner Name (print)

Landowner Signature

Date

Landowner Address

Telephone Number

State of

County of

On this, the ____ day of _____, 20____, before me, the undersigned notary public, personally appeared _____, known to me (or satisfactorily proven) to be the person whose name is subscribed to the within instrument, and acknowledged that he/she executed the same for the purposes therein contained.

In witness whereof, I hereunto set my hand and official seal.

Notary Public

Supplement 17

Manure Stacking Requirements

This guidance applies to non-emergency related manure stacks that will remain in a field for an extended period of time. This guidance applies to farms planning under Act 38, as well as the farms that import manure from these planned farms (i.e. the Act-38 requirements stay with the manure independent of the final user's animal density classification).

The regulations call for the implementation of BMPs relating to in-field manure stacking. Guidance on how to meet that requirement is as follows:

1. The regulation states that the land application of the stacked manure shall occur within 120 days of stacking or by the next growing season, whichever is less.
 - For situations where stacks will be placed in fields with the expectation that it will be there for longer than 120 days, the stack shall be covered with an impermeable cover within 3 weeks of placing the stack in the field. Covering of manure stacks with an impermeable cover will eliminate the need to apply the manure within the 120 day, or by the next growing season, limitation.
2. The regulation also states that the location of in-field manure stacking sites must be identified on the nutrient management plan and nutrient balance sheet maps.
3. The stacks should be rotated so that stacking will only occur once every 4 years on a specific manure stacking pile footprint.
4. Stacked piles should be stacked in a cone or windrow shape so as to shed rainwater. This shape limitation would not be necessary if, upon stacking, the stack will be covered with an impermeable cover.
5. Stacks should be setback 100 feet from streams (intermittent and perennial), lakes, ponds, open existing sinkholes, and active water wells.
6. Stacks should not be located in water concentration areas, such as a swale, ditch, or waterway.
7. Stacks should not be located on areas that have excessively drained soils. This limitation would not be necessary if, upon stacking, the stack will be covered with an impermeable cover.
8. Stacks should not be located within 3 feet of the seasonal high water table.
9. Stacks should not be located above subsurface drain tiles. This limitation would not be necessary if, upon stacking, the stack will be covered with an impermeable cover.
10. Stacking sites should not have a slope of greater than 8%.

11. Stacking sites with slopes between 3 and 8% should not be located further than 100 feet from the top of the slope unless a diversion is constructed of soil above the stack.
12. The manure must be dry enough to allow for stacking at least 4 feet in height. When stacking on the application field, the volume needs to be limited to the amount that can be spread on the fields nearby to the stack.

The above criteria only address situations where manure is stacked in a field in order to facilitate manure application to those fields where the manure is being stacked (as allowed for in §83.294(h)). This guidance does not pertain to areas used for the composting of manure or dead animals.

Supplement 18

Nutrient Management Education Program Resource List

The Pennsylvania Nutrient Management Education Program provides a wide array of resources to nutrient management specialists. These resources serve two purposes:

- **Education.** These factsheets and publications are selected to supplement the material presented in the certification trainings and to cover aspects of nutrient management and related issues not fully addressed in the trainings.
- **Planning.** These references and tools are used consistently in the development and review of nutrient management plans.

There are two comprehensive sources of these resources.

- **Pennsylvania's Nutrient Management Program Website.** The program website (<http://panutrientmgmt.cas.psu.edu>) provides the most up-to-date and comprehensive source of information about Pennsylvania's Nutrient Management Act (Act 38, 2005) Program. **It is also the most complete source of key planning references, planning tools, and educational factsheets and publications.** Included is regulatory, technical, educational and financial information. It also provides limited information concerning related programs and links to manure and nutrient management information from other states. Many of the publications are downloadable and printable.
- **Nutrient Management Resource CD.** The resource CD is distributed at the Nutrient Management Orientation training and contains all the vital publications used or referenced in the certification trainings. In addition, most references listed in the Nutrient Management Examination Competency Areas are included on the resource CD.

In addition to this Pennsylvania's Nutrient Management Act **Program Technical Manual**, each specialist should have the following planning tools or become familiar with their use on the internet.

Nutrient Management Rules and Regulations (25 PA. CODE CH. 83 Subchapter D 83.201)

This document contains the regulations to be followed for implementation of Pennsylvania's Nutrient Management Act (Act 38, 2005).

Penn State Agronomy Guide

The Agronomy Guide is the standard agronomic reference for Pennsylvania. The current edition is the official reference for Pennsylvania's Nutrient Management Program. The Soil Fertility Management section provides essential background information for nutrient management planning in Pennsylvania. Topics addressed include soil testing, fertilizer recommendations, and nutrient requirements for agronomic crops, fertilizer materials, manure nutrient management, and manure spreader calibration.

Spreadsheet Planning Tools

The Act 38 Nutrient Management Program has produced several Excel spreadsheet planning tools for the development of nutrient management plans and balance sheets.

- **Nutrient Management Plan Spreadsheet** – all Act 38 nutrient management *plans must be developed using this spreadsheet.*
- **Nutrient Balance Sheet Spreadsheet** – in addition to the spreadsheet, Word and PDF versions are available for the development of Act 38 nutrient balance sheets.
- **Pennsylvania Phosphorus Index Spreadsheet** – all Act 38 nutrient management plans must address phosphorus using this spreadsheet. It has been integrated into the Nutrient Management Plan Spreadsheet and is also available as a standalone spreadsheet.
- **Pasture Nutrient Calculator Spreadsheet** – this spreadsheet is useful for making quick assessments of nitrogen and phosphorus balances on pastures and if necessary adjusting stocking rates to meet required nutrient balances.

Soil Test Recommendations Handbook: For Agronomic Crops

The [Soil Test Recommendations Handbook: For Agronomic Crops](http://agsci.psu.edu/aasl/soil-testing/soil-fertility-testing/handbooks) is the standard reference for determining crop nutrient recommendations for Pennsylvania's Nutrient Management Program. The handbook, along with handbooks for commercial vegetables, small fruits, tree fruits and turf, can be accessed at:

<http://agsci.psu.edu/aasl/soil-testing/soil-fertility-testing/handbooks>.

Electronic Field Office Technical Guide

The electronic Field Office Technical Guide (eFOTG) is the primary scientific reference for the Pennsylvania Natural Resources Conservation Service (NRCS). It consists of five sections. Section IV contains NRCS standards and specifications for each conservation practice for Pennsylvania. The eFOTG can be accessed at:

<http://extension.psu.edu/plants/nutrient-management/planning-resources/pa-technical-guide>.

County Soil Survey

The Soil Survey for each county in Pennsylvania contains descriptions of soil types, their characteristics, potentials, limitations, the impact of selected land uses, and recommended improvements to overcome limitations. Included are soil information tables and maps showing soil types and land features. (Available from county NRCS or Conservation District offices)

Soil Survey information is also available on the web through the NRCS Web Soil Survey at: <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>.

On-line Mapping and Soils Information

PAOneStop (<http://www.paonestop.org/>) provides online tools to help farmers meet regulatory requirements for Conservation and Nutrient Management Planning. PAOneStop has a Nutrient Management Mapping Module that provides a tool to extract data and generate high quality maps that are required for completion of Nutrient Balance Sheets and Nutrient Management Plans.

Supplement 19

Small Quantity Manure Importer List

Supplement 19 provides a recordkeeping sheet for listing Small Quantity Manure Importers. The Small Quantity Manure Importers recordkeeping sheet is also available and posted as a Word document with the Supplement 19 materials on the PA Nutrient Management Program web site: <http://extension.psu.edu/plants/nutrient-management/planning-resources/alternative-tech-manual/spreadsheets-and-forms>

For additional information about the Small Quantity Manure Importers recordkeeping sheet see Appendix 8: Importer/Broker Agreements and NBSs.

Small Quantity Manure Importer List

Name of operator exporting manure: _____

Time frame for this list: From _____ to _____

[illegible]

* i.e. dairy, beef, broiler, swine, horse, etc.

Common Best Management Practices

Basic Operation and Maintenance Guidelines

The purpose of this document is to provide basic operation and maintenance guidelines for common Best Management Practices (BMPs) that may be used in Act 38 Nutrient Management Plans (NMPs) to provide adequate manure and stormwater management to prevent pollution of surface and groundwater. For the purpose of this guidance document, the term “BMPs” is understood broadly to encompass the following:

- Required BMPs – Practices that are listed in the NMP that must be implemented to address identified Manure Management and Critical Runoff Problem Areas.
- Existing BMPs – Practices implemented to PA Technical Guide standards prior to securing an Act 38 NMP.
- Adequate “BMPs” – This includes sites, conditions, or practices that adequately address manure and stormwater management but have not been designed or implemented to PA Technical Guide standards.

Some operations obtaining NMPs, such as horse operations, are often not familiar with common agricultural BMPs and the required operation and maintenance associated with them. Nutrient Management Specialists writing and reviewing NMPs can provide these basic operation and maintenance guidance lists to these operators for the existing or planned BMPs on their operation.

It is understood that design packages and existing operation and maintenance guidelines provided for BMPs by the PA Natural Resources Conservation Service (NRCS) or a Professional Engineer supersede the general operation and maintenance bullets listed below. Likewise, when issues arise, the Act 38 program only recognizes the PA Technical Guide as the official source of information and guidelines for BMPs.

Access Road (560)

Maintain the existing access roads used for vehicles and farm equipment. Follow these basic operation and maintenance guidelines:

- Inspect the access road and associated culverts, water bars, and outlets after each major storm event, and make necessary repairs.
- Mow vegetated areas along the access road annually between August 1 and August 15 to control weedy vegetation or more frequently if needed.
- Maintain width of the access road and resurface as needed.

Animal Mortality Facility (316)

Maintain the existing facility for the treatment or disposal of animal carcasses for routine animal mortalities. Catastrophic mortality should be done with guidance from the state veterinarian, USDA APHIS, or other appropriate authority. For normal, non-catastrophic events follow these basic operation and maintenance guidelines:

- Maintain practices to divert upslope surface water runoff around/away from site.
- Maintain the site surface to provide positive drainage. Fill and compact surface using appropriate surface material as needed to avoid ponding.

- Maintain dense vegetation downslope of the site.
- Use sufficient bulking material or cover to prevent leachate.
- Stack in single pile or windrow, up and down hill, to shed water and avoid ponding.
- Turn piles at least one time and re-compost prior to application or exporting.

Composting Facility (317)

Maintain the existing composting facility. Follow these basic operation and maintenance guidelines:

- Inspect after all significant storm events to identify repair and maintenance needs.
- Re-grade, reshape and/or resurface earthen or improved surface as needed to maintain positive drainage.
- Maintain structures to divert upslope surface water runoff around/away from the area, if applicable.
- Build piles in windrows, up and down the hill, to avoid ponding water.
- Properly remove and land apply unsuitable materials.
- Maintain a Vegetated Treatment Area to handle liquid runoff unless collected and stored in a Waste Storage Facility.
- Follow your approved NMP for the handling and application of finished compost.
- Maintain appropriate local, state and federal permits, as applicable.

Contour Farming (330)

Maintain established contour farming areas throughout the cropping system. Follow these basic operation and maintenance guidelines:

- Maintain established contour lines.
- Perform all tillage and planting operations parallel to contour lines, minimizing headrows as much as possible.
- Evaluate annually for signs of erosion or deviation from contour. Re-establish or devise alternate plan to meet erosion control.
- Maintain sod turn strips on sharp ridge points or other odd areas where contour row curvature is too sharp for machinery alignment.

Cover Crop (340)

Plant a cover crop on row crop fields where manure application is planned or needed to meet Act 38 fall and winter application requirements or Ag E&S Ch. 102 sediment control regulations. Follow these basic operation and maintenance guidelines:

- Seed in time to ensure adequate establishment to meet nutrient management plan or Ag E&S plan requirements.
- Record rates and timing of nutrient application consistent with your NMP requirements.
- Completely terminate the cover crop to prevent crop competition.
- Evaluate the cover crop to determine if the cover crop is meeting the planned purposes(s). If not change species, use shorter season row-crops, or choose a different technology.

Critical Area Planting (342)

Maintain re-vegetated areas that were previously devoid of vegetation due to high rates of erosion by surface water runoff, lack of topsoil, and/or high access by animals. These areas are typically steep, devoid of topsoil and require extra preparation for establishment of vegetation. Areas within 100' of a stream and some others will require additional best management practices such as erosion control blankets, mulching, silt fence, etc. Follow a plan approved by the local conservation district or DEP for these unique situations. Species, seeding rates, fertility rates and timing, mulching requirements, and establishment methods can be found in the current Penn State Agronomy Guide and/or the Critical Area Planting Practice Guide. Follow these basic operation and maintenance guidelines:

- Maintain additional best management practices until vegetation established.
- Monitor initial plantings for water stress. If seeding fails, reseed. Best results can be obtained by seeding in early spring through the end of April or late summer from August through late September.
- Control undesirable plants by means of mowing and/or spot spraying herbicides if their presence threatens the establishment or persistence of the stand. This includes invasive species.
- Limit animal access when vegetation is drought stressed and to avoid having stand heights under 3". Allow no access during initial establishment.
- Continue to keep animals out of sites that can't withstand any animal activity.
- Inspect weekly during initial establishment, followed by semi-annual inspections to identify bare spots or eroded areas that will need reestablished.
- Inspect periodically to identify insect and diseases that could threaten stand survival and control as appropriate.

Diversion (362)

Maintain a diversion or grassed channel constructed across the slope. Follow these basic operation and maintenance guidelines:

- Inspect after all significant storm events to identify and repair maintenance needs.
- Maintain existing width and cross-sectional shape.
- Mow at least annually between August 1 and August 15 to control weedy vegetation.
- Re-grade, reshape and/or resurface earthen channel surface as needed to maintain positive drainage.
- Reseed and mulch or protect with erosion control blanket during early spring or early fall if erosion occurs.
- Significant gullies may require professional assistance to repair.
- Inspect frequently for burrowing animals. Eradicate burrowing animals and close burrows as soon as practical.

Fence (382)

Maintain existing fence associated with **pastures, streams and stream crossings**. Follow these basic operation and maintenance guidelines:

- Inspect fence, particularly those located adjacent to streams or in flood zones, after each major storm event to identify and make necessary repairs.

- Maintain gates in working condition.
- Maintenance and repair must be performed in a timely manner to maintain the desired control.
- Maintain fence free of vegetation, annually clearing of weeds and brush under and near the fence.

Fence (382)

Maintain existing fence around **waste storage facilities or concrete heavy use areas**. Follow these basic operation and maintenance guidelines:

- Maintain gates and associated safety devices in working condition. Replace as needed.
- Maintain fence free of weeds and woody vegetation.
- Maintenance and repair must be performed in a timely manner to maintain the desired control or safety benefits they provide.
- Inspect safety fence on waste storages bi-annually.
- Maintain safety signs and replace when signs are missing or no longer legible.

Filter Strip (393)

Maintain a strip of permanent herbaceous vegetation in the location where installed. Follow these basic operation and maintenance guidelines:

- All overland flow reaching the filter strip must be sheet flow. Concentrated flow must be dispersed prior to reaching the filter strip and any adjacent rills or gullies must be addressed upslope of the filter strip.
- Annually mow between the dates of August 1 and August 15 to control undesired weed species and all state-listed noxious weeds.
- Regularly inspect following all major storm events when located along a stream corridor.
- Repair immediately when gullies or uneven sedimentation occur in filter strip.
- Major gullies require addressing the source of concentrated flow.

Forage and Biomass Planting (512)

Maintain re-vegetated areas that were previously devoid of vegetation due to overgrazing and/or high animal usage or traffic in all or part of a designated pasture area. Species, seeding rates, fertility rates and timing, mulching requirements, and establishment methods can be found in the current Penn State Agronomy Guide or in the associated practice standard. Severely disturbed areas will need extra seed bed preparation. Areas within 100' of streams will need a cover crop and/or mulching.

Follow these basic operation and maintenance guidelines:

- Monitor initial plantings for water stress. If seeding fails, reseed. Best results can be obtained by seeding in early spring through the end of April or late summer from August through late September.
- Control undesirable plants by means of mowing and/or spot spraying of herbicides if their presence threatens the establishment or persistence of the stand. This includes invasive species.
- Limit animal access when vegetation is drought stresses and to avoid having stand heights under 3". Allow no access during initial establishment.

- Inspect annually or more frequently to identify bare spots or eroded areas that will need reestablished.
- Inspect periodically to identify insect and diseases that could threaten stand survival and control as appropriate.

Grade Stabilization Structure (410)

Maintain the grade stabilization structure used to reduce grade in waterways or watercourses. Follow these basic operation and maintenance guidelines:

- Inspect structure annually and repair or replace as needed.
- Inspect after all significant storm events to identify and repair maintenance needs.
- Significant issues may require professional design assistance.

Grassed Waterway (412)

Maintain existing grassed waterway or plow skip waterways. Follow these basic operation and maintenance guidelines:

- Maintain the original width and profile.
- Inspect after all significant storm events to identify and repair maintenance needs.
- Mow annually between August 1 and August 15 to control weedy vegetation.
- If minor repairs are needed, reseed and mulch or protect with erosion control blanket during early spring or early fall.
- Significant gullies or sedimentation issues may require professional assistance to resolve.
- Gullies must be repaired and vegetation must be re-established and maintained to provide erosion control. Vegetative repairs should be done during early spring or fall.
- Turn off sprayers before crossing waterway to ensure that herbicides are not applied to vegetation in the waterway.

Heavy Use Area Protection (561)

Maintain existing heavy use area. Follow these basic operation and maintenance guidelines:

- Remove solids, typically daily for dairy cows and horses and weekly for beef or more frequently as needed for slotted curb or screen box liquid control systems. Solids on stoned equine pads should be collected weekly.
- Scrape or remove solids prior to predicted rainfall to reduce maintenance issues.
- Provide extra bedding or waste hay if solids to be stacked.
- Frozen manure and/or snow should not be scraped into a reception pit. If possible, safely load directly into a storage, stockpile on the lot, or stockpile in areas suitable for temporary in-field stacking as located on the NMP maps.
- Maintain and repair any damage to concrete floor and openings in curbing.
- Maintain associated practices that keep off-site/upslope water out of area.
- Maintain and clean devices used to screen solids from liquid run-off after all rainfall events. Can include slotted curb, screen box, etc.
- Maintain any safety fence and signs.
- Animal access to pastures should follow guidance found under Prescribed Grazing (528).

- Animal movement from this area to the pasture should follow guidance under Trails and Walkways (575).

Lined Waterway or Outlet (468)

Maintain rock lined (or turf reinforced mat) outlet at end of waterway or transition into diversion. Follow these basic operation and maintenance guidelines:

- Inspect after all significant storm events to identify and repair maintenance needs.
- Minor rock movement may be resolved by moving rock back and resetting.
- Major rock movement and washouts may indicate undersized materials or lack of capacity. It is recommended that professional assistance be obtained to resolve these issues.

Prescribed Grazing (528)

Maintain pastures included in the grazing system. Follow these basic operation and maintenance guidelines:

- Pastures must be managed to minimize bare spots and to maintain dense vegetation at average height of at least 3 inches throughout the growing season.
- Animals need to be restricted from the pasture during the winter, as well as when soil conditions are too wet or muddy to support hooved animals without causing damage to the soil structure or pasture vegetation. Grazing animals will be removed from the pasture when heat or drought conditions cause pastures to dry up and forage regrowth shuts down. During these conditions use an improved heavy use area (concrete or stoned).
- If an improved heavy use area (concrete or stoned) is not available to move animals off pasture, use a temporary sacrifice area that is located away from surface water, wetlands, poorly drained soil, exposed bedrock and areas subject to flooding. Temporary fencing may be needed to isolate the area. Follow additional guidance for Animal Concentration Areas under Heavy Use Area Protection (561).
- Areas within pastures associated with feed bunks, waterers, and shade should follow the guidelines outlined in the Heavy Use Area Protection (561) guidance.
- Mow, at least annually, to control weeds and promote even forage production.

Pumping Plant for Water Control (533)

The pump or pumps associated with manure transfer, water supply, or irrigation. Follow these basic operation and maintenance guidelines:

- Regular inspection and testing of all components.
- Routine maintenance of all mechanical components in accordance with manufacturer's recommendations.
- Operate all valves at least one time per year.
- Perform regular checks, and as needed, remove debris or sediment.
- Periodic inspection of all safety features.

Residue and Tillage Management Mulch Till (345)

Maintain residue and tillage management on fields as detailed in the Ag E&S or Conservation Plan. Follow these basic operation and maintenance guidelines:

- No moldboard plowing and heavy one-way disk plow usage is allowed.

- Crop residue cannot be burned.
- Maintain minimum amount residue as prescribed in the AG E&S or Conservation Plan. If residue levels are not achieved, adjust management accordingly by planning a new residue amount; adjusting the planting, tillage, or harvesting equipment; decreasing secondary tillage passes; or not removing crop residue / fodder.
- In areas of heavy residue, uniformly spread the residue prior to planting.

Riparian Forest Buffer (391)

Maintain existing riparian forested buffer. Follow these basic operation and maintenance guidelines:

- All livestock will be permanently excluded from this area.
- Spot apply herbicide, following all herbicide label recommendations, or mow as necessary to control noxious weeds, to prevent the invasion of undesirable vegetation, and to provide habitat for a variety of wildlife species.
- Vehicular traffic is limited to only what is necessary to perform required operation and maintenance.
- Replace dead trees or shrubs and control competing vegetation until the buffer is fully functional.

Roof Runoff Structure (558)

Maintain existing structures, typically roof gutters and downspouts, drip line drains, etc. Follow these basic operation and maintenance guidelines:

- Keep roof runoff structures clean and free of obstructions that reduce flow.
- Inspect the roof regularly and after all significant storm events, to identify repair and maintenance needs and make needed repairs.
- Maintain devices to protect downspouts from livestock and equipment damage, and outlets from small animal access.

Roofs and Covers (367)

Maintain the existing roof or cover over associated facility such as waste stacking facility, heavy use area, mortality facility, etc. Follow these basic operation and maintenance guidelines:

- Inspect roof after high wind or significant storm events and make needed repairs.
- Do not add additional loads to members (including adding sides to enclose the structure) without professional review.
- Consider snow load removal if loads exceed structural limits.
- Inspect for mechanical damage and replace or reinforce as needed.
- Inspect all structural connections (bolts, gusset plates, etc.) and repair or replace as needed.
- Significant structural issues or questions should be referred to a building professional or PA registered engineer.

Short Term Storage of Animal Waste and Byproducts (318)

Maintain short term storage areas or in-field stacking areas at location(s) shown on plan maps. **The location of these sites must meet the Act 38 nutrient management plan and DEP manure management plan requirements.** Follow these basic operation and maintenance guidelines:

- Apply stacked manure within 120 days or cover.
- Add additional bedding if manure does not stack at least 4 feet.
- Rotate site location and re-vegetate area.
- Stack in single pile or windrow, up and down hill, to shed water and avoid ponding.
- Divert offsite/upslope water.
- Certain manure types more subject to runoff should be located above vegetated areas.

Sprinkler System (442)

Maintain the existing system (stationary, overhead, pulse jet, traveling gun, etc.) used to land apply liquid wastes. Follow these basic operation and maintenance guidelines:

- Maximum one time application must not exceed 9,000 gallons/acre.
- Rates above 9,000 gallons/acre need to be approved by the SCC and must not exceed infiltration rate and water holding capacity.
- No application within 100' of stream unless permanent vegetated buffer of at least 35 feet.
- Total application during the winter period must not exceed 5,000 gallons per acre provided soils are not frozen.

Stormwater Runoff Control (570)

Maintain practices associated with stormwater runoff. These could include, but are not limited to inlets, piping, stormwater basins, infiltration areas, etc. Follow these basic operation and maintenance guidelines:

- Maintain practices, unless impervious structures are converted back to prior conditions.
- Inspect after all significant storm events to identify repair and maintenance needs.
- Inspect all practices on an annual basis.
- Mow vegetated areas annually between August 1 and August 15 to control weedy vegetation or more frequently as desired.
- Inspect frequently for burrowing animals. Eradicate burrowing animals and close burrows as soon as practical.

Stream Crossing (578)

Maintain existing stream crossing(s). Follow these basic operation and maintenance guidelines:

- Inspect after all significant storm events to identify and repair maintenance needs.
- Replace damaged or lost materials with similar products.
- Maintain associated practices such as gates, fencing, stabilized trails etc.
- Relocation or significant changes will typically require obtaining local, state, and federal permits.

- Minimize erosion on access ramps by diverting up-slope surface water runoff away from the crossing, as much as practical. Waterbars may be necessary to deflect water off to the sides of the access ramps.
- Continuous repairs may signal a need for professional assistance in resolving issues.

Stripcropping (585)

Maintain stripcropping in designated fields. Follow these basic operation and maintenance guidelines:

- Follow conservation plan crop rotation as outlined in the Ag E&S or Conservation Plan, and the associated maximum allowed tillage.
- Maintain required width and alignment.
- Adjacent strips may be similar if both are close growing, sediment trapping, erosion-resistant crops like hay or small grains.
- Establish a cover crop with rotations having corn silage and requiring manure application.
- Strips done within 100' of a stream with tillage require additional practices to maintain Act 38 compliance, such as no-till or cover crops, to maintain a minimum of 25% crop residue.

Structure for Water Control (587)

Maintain existing screen box(s), level lip spreader(s), waterbar(s), grated channel, dropbox(s), etc. Follow these basic operation and maintenance guidelines:

- Inspect after all significant storm events to identify and repair maintenance needs.
- Clean and remove debris, built up manure, etc. as needed on screens, grates, inlet holes, etc.
- Re-grade, reshape, and /or resurface area around the structure as needed to maintain grade and flow of surface water into structure.
- All practices should be checked at least twice a year.

Subsurface Drain (606)

Maintain existing drainage systems. Follow these basic operation and maintenance guidelines:

- Inspect outlet annually to verify outlet clear of obstructions and animal guard in place.
- Repair areas with blowouts or washed out outlets.
- Discharges with manure odor or organic material require collection and redirection. Report to appropriate agencies if discharging into a stream.

Terrace (600)

Maintain the existing terrace or terrace system. Follow these basic operation and maintenance guidelines:

- Inspect after all significant storm events to identify and repair maintenance needs.
- Keep inlet for piped terraces free of debris. Replace if damaged.
- Keep manure application at least 100' away from inlet.
- Remove accumulated sediment when needed.

- Inspect associated underground piping for blowouts.
- Inspect outlet annually. Verify free of debris and outlet stable for both pipe outlet and gradient terraces.
- Mow vegetated areas at least annually between August 1 and August 15 to control weedy vegetation or more frequently as desired.
- Inspect frequently for burrowing animals. Eradicate burrowing animals and close burrows as soon as practical.

Trails and Walkways (575)

Maintain the existing animal walkways. Follow these basic operation and maintenance guidelines:

- Livestock should not be confined, fed or watered in these areas.
- Inspect after all significant storm events to identify repair and maintenance needs.
- Re-grade, reshape and/or resurface walkways as needed to maintain grade and dimensions.
- Continue to divert runoff away from walkway or maintain waterbars to deflect water off.
- Manage manure accumulation. Clean heavily used sites yearly or more frequently.
- Maintain all supporting practices, such as fence, gates, crossings, subsurface drainage, waterbars, and geotextile as originally installed.

Underground Outlet (620)

Maintain existing outlets associated with other practices such as roof runoff, waste storage facilities, structure for water control, etc. Follow these basic operation and maintenance guidelines:

- Inspect after all significant storm events to identify repair and maintenance needs.
- Keep all inlets and outlets free of trash and debris.
- Repair damage caused by construction or farm equipment or loss of cover due to erosion.
- Maintain adequate backfill over all pipes.
- Maintain all supporting practices, such as riser pipes, drop boxes, downspouts, water and sediment control basins and rock-lined outlets as originally installed.

Vegetated Treatment Area (635)

Maintain the existing area of vegetation to treat runoff. Follow these basic operation and maintenance guidelines:

- The filter area will only work properly when the flow is spread uniformly across the design flow width. The exception would be sites using sprinklers to achieve uniform application.
- Any visible erosion must be filled with topsoil and reseeded as soon as possible.
- Dense, uniform vegetation is needed for optimum performance.
- Harvest/remove treatment area vegetation as appropriate to encourage dense growth. Do not harvest too short (not less than 4 inches) or too late in the growing season to prevent sufficient regrowth for practice function.

- Flash grazing shall only be done when surface is able to support hooved animals without damaging the soil structure or destroying vegetation. Grazing must be managed to avoid overgrazing.
- Maintain 4 to 12 inches of vegetation at all times.
- Control weed species, especially state-listed noxious weeds.
- Inspect and repair treatment strips after storm events to fill in gullies, remove flow disrupting sediment accumulation, reseed disturbed areas, maintain distribution system, and take other measures to prevent concentrated flow.

Waste Separation Facility (632)

Maintain the existing waste separation facility. Follow these basic operation and maintenance guidelines:

- Follow instruction manuals for mechanical separation equipment such as manure or sand separation equipment.
- Inspect facilities annually and repair as needed.
- Maintain inlet and outlet structures.
- Remove sediment and wastes as needed.
- Maintain any associated safety fencing, warning signs, and gates.

Waste Storage Facility (313)

Maintain the existing waste storage facility or facilities. Follow these basic operation and maintenance guidelines:

- All facilities must be inspected on an annual basis. Outside and open top facilities should be inspected when empty. Interiors of enclosed or covered facilities should be inspected if there are indications of leakage and only after proper ventilation and use of SCBA equipment before accessing the facility.
- Maintain any associated safety fencing, warning signs, and gates, keeping the gates locked when not in use.
- Facilities using gypsum products require additional safety precautions during agitation of both covered and open storage facilities. Deadly gases can develop around the agitation area.
- Inspect perimeter drain outlets or check observation wells to verify no leakage. Manure odors or colored liquids require additional investigation. Discharges to a watercourse or stream require collection and storage. Report to appropriate local or state authorities.
- Structural repairs, leakage areas, and rehabilitation plans require assistance from a professional engineer.
- Facilities storing manure with sand will require additional agitation and extra effort to remove to maintain storage capacity at each cleanout.
- Maintain required freeboard plus 25 year-24 hour storm event. Typically 6 inches for vertical walled storages or 12 inches for sloped storages plus 6 inches. Additional depth is needed for CAFO facilities.
- When loading or unloading storage collect and clean up all spillage of manure around the facility.
- Divert all stormwater from entering manure storage facilities, including dry stacking facilities.

- Filter or treat all stormwater that is comes off a manure stacking facility.
- Restrict and/or limit animal access to manure storage and stacking facility.
- New storages or expansion of existing semi-solid or liquid storages require a design and certification from a PA registered professional engineer.

Waste Transfer (634)

Maintain all components associated with the movement of manure, both liquid and solid fraction from the point of origin to short or long term storage or final land application. Items include cross channels, scrape alleys, pushoff, milkhouse collection and transfer, reception pit, etc. Follow these basic operation and maintenance guidelines:

- All facilities must be inspected on an annual basis.
- Repair concrete floors and curbs and any other materials used to control or direct manure.
- Maintain any associated safety fencing, warning signs, and gates, keeping the gates locked when not in use.
- Structural repairs and rehabilitation plans require assistance from a PA professional engineer.
- Conversion of gravity flow collection channels to storage will require certification for water tightness by a PA professional engineer.

Water and Sediment Control Basin (638)

Maintain the existing water and sediment control basin. Follow these basic operation and maintenance guidelines:

- Inspect after all significant storm events to identify repair and maintenance needs.
- Keep all inlets and outlets free of trash and debris.
- Repair concrete walls and floors as needed.
- Repair earthen fill.
- Repair stabilized overflow channels. Replace rock or other materials as needed.
- Mow vegetated areas annually between August 1 and August 15 to control weedy vegetation or more frequently as desired.
- Inspect frequently for burrowing animals. Eradicate burrowing animals and close burrows as soon as practical.

Watering Facility (614)

Maintain the existing watering facility that consists of a system for collection of water, tanks, and outlets. Follow these basic operation and maintenance guidelines:

- Check entire system regularly for leaks and repair as necessary.
- Monitor to ensure regular inflow and outflow.
- Ensure that areas adjacent to the watering facility are stable.
- Regularly clean the facility, removing any algae or iron sludge accumulation.
- Seasonal systems must have waterlines and troughs drained to prevent damage from freezing.