Appendix D – Nitrogen Balance Check

A quick nitrogen balance check compares the amount of nitrogen available at the site (animal manure estimate) to the nitrogen need of the crop (average crop nitrogen need). To complete the quick nitrogen balance check, ask the farm operator to help by providing the following information.

The type of animals The current number and size of the animals The average number of animals on site annually, The number of days the animals are confined versus out on pasture The manure management practices (e.g. daily spreading, storage) A nitrogen analysis of the animal manure, if available The County Soil Survey or extension information on crop yields The method of land application (surface vs. soil incorporated)

Use Worksheet 1, Nitrogen Balance -- Animal Manure Estimate to quickly estimate the number of pounds of nitrogen supplied from animal manure. If there are more than one type of animal at the site producing manure, complete an additional worksheet for each type of livestock.
Part 1 of the worksheet establishes the average number of animal units (AU) at the site (an AU is equivalent to 1,000 pounds of animal weight). Part 2 identifies the number of days the animals are confined. Only manure that is stored and later spread on fields should be considered. (Manure generated while animals are out to pasture is not included.) In Part 3, the number of AUs and the days confined are used to estimate the annual amount of manure produced and stored. Daily manure production per AU can be obtained from your county extension office or state land grant university. In Part 4, you will estimate the available nitrogen from manure. If the farmer has a manure analysis, use this to identify how much nitrogen is available per pound of manure. If not, the county extension office or state land grant university can provide an average value for nitrogen per pound of various manures. If the manure will be surface applied and not immediately worked into the soil, you must allow for loss of nitrogen that will volatilize as ammonia. Use information from the county extension office or state land grant university to make this adjustment.

Once the annual amount of manure nitrogen is estimated, it must be compared to the amount of nitrogen needed by the crops to be grown at the site. To estimate the nitrogen needs of the site, ask the farm operator to help by providing the following information.

The typical crops grown The number of acres of each crop typically planted The predominant soil type on each field The average crop yields from the farmer or from the county Soil Survey Land Grant College informational guidance, if available.

Worksheet 2, Balance of Crop Nitrogen, provides a rough estimate of the annual fertilizer needs at the site. In column 1, enter the type of crop. In column 2, enter the predominant soil type. In column 3, enter the expected crop yield (this can be based on the farmer's records, the county Soil Survey, or extension office). In column 4, enter the nitrogen removed by the crop per unit yield. Next multiply column 3 by column 4 to get the nitrogen removal per acre for the crop and write it in column 5. In column 6, enter the number of acres that will be planted with this crop. Multiply Column 5 by column 6 to get the total nitrogen requirement per field and enter it in column 7. Repeat this process for each crop to be grown. Add up the figures in column 7 to get

an estimate of the total nitrogen needed at the site.

The information needed to compare the pounds of nitrogen available from manure (Worksheet 1) to the total pounds of crop nitrogen removed (Worksheet 2) is now complete. With this information, decide whether sufficient quantities of additional nutrients are needed to make biosolids land application at this site worthwhile.

The biosolids capacity of the site (in dry tons of biosolids) can be determined by dividing the additional nitrogen needed by the crop (over what is supplied by the manure) by the pounds of nitrogen available per dry ton of your biosolids. If the biosolids capacity at this agricultural site meets your needs, this site should be considered for inclusion in your program.

Worksheet 1
Nitrogen Balance
Animal Manure Estimate

1. Number of animal units
   a. Total animal weight = average # animals X weight of animals _____ lbs.
   b. Animal units (AU) = total animal weight/1000 lbs. _____AU

2. Animal manure stored
   a. full days animals confined _____days
   b. partial days animals conf'd (hours confined x 24 hrs. x days) _____days
   c. total equivalent days stored = (2a) + (2b) _____days

3. Tons of manure produced and stored
   a. daily production = AU lb x manure prod. Lb/AU/Day [1] _____lbs/day
   b. total production = (3a) x (2c) _____lbs
   c. manure produced and stored = (3b)/2000 lbs/ton _____tons

4. Nitrogen available from manure
   a. tons manure (3c) x nitrogen content of manure _____lbs N
   b. available manure nitrogen = (4a) x N availability factor [2] _____lbs N

Total nitrogen available from manure _____lbs. N

1. See Table 2-12 "Average daily production and total nutrient content of manure" from the *Penn State Agronomy Guide*
2. See Table 2-13 "Percentage of total manure nitrogen remaining available to crops after storage and handling, as affected by application method and field history" from the *Penn State Agronomy Guide*

Worksheet 2: Balance of Crop Nitrogen

Crop Type/ Field No.	Predominant Soil Type	Expected Yield Per Acre	# Crop N Removal per unit of yield[2]	N removal per Acre (lb/acre)	# of Ac. planted per Field	Total N Needed per Field
				Total Crop Nitrogen Removal (lbs.)		

1 See Table 6 "Yields per acre of crops and pasture" from the *County Soil Survey*

2 See Table 2-8, "Typical crop nutrient removal" from the *Penn State Agr*