Appendix E Table 1 to Rule 901:10-2-14; Phosphorus Index (P Index) Risk Assessment Procedure

The P Index is a procedure that combines well-established factors that influence the runoff of phosphorus to surface waters. Each of the factors is evaluated based on site-specific data and weighted according to its overall effect on phosphorus transport. Each of the site subvalues are added together to establish an overall site rating of low, moderate, high, or very high risk.

Purpose:

The P Index is a planning tool designed to help identify fields or areas of fields on a farm that have a higher or lower risk of phosphorus runoff from manure or other organic materials. Based on the risk assessment the appropriate land treatment and nutrient application treatments can be planned to minimize phosphorus transport from the site.

Procedure:

Use the P Index Assessment Procedure Worksheet to determine the site's overall P Index. Use the following guidance to determine each of the site's subvalues. The subvalues are added together to determine the overall site P Index. The worksheet can be photocopied as needed. A "Field Summary Worksheet" is also available with this procedure to record a series of site/field values for a given farm. It can be photocopied as needed.

1. **SOIL EROSION** – Sheet and rill erosion as measured by the Revised Universal Soil Loss Equation (RUSLE) [USDA-NRCS (2010) National Soil Survey handbook, Section 618.55] or Wind Erosion Prediction Procedure (where wind erosion is the primary concern) [USDA-NRCS (2010) National Soil Survey handbook, Section 618.72]. Determine the predicted soil loss and multiply by (1) to determine the "soil loss" site subvalue.

2. **CONNECTIVITY TO WATER** – Defines the vulnerability of P to be transferred from the site to a perennial stream or water body. The more closely connected the runoff is from the field via concentrated flow (from a defined grassed waterway or surface drain) to a perennial stream or water body the higher the vulnerability of P transport. To determine the "connectivity to water" site sub factor ask the question: Does concentrated flow (via a defined waterway, tile inlet, or surface drain) leave the site? Read the value definitions to determine the site's "connectivity to water" subvalue.

3. **RUNOFF CLASS** – This represents the effect of the Hydrologic Soil Group (A, B, C, D) combined with the effect of slope. This factor represents the site's runoff vulnerability. Use the table below to determine the runoff class. The runoff class is the site's subvalue.

Runoff Class Matrix – Phosphorus Index Values

	Hydrologic Soil Group			
Slope Range	**A**	**B**	**C**	**D**
<1%	0	1	3	6
1-3%	1	2	4	7
4-6%	2	3	5	8
7-10%	3	5	7	10
11-15%	4	6	9	12
>15%	6	8	11	15

4. **SOIL "P" TEST (BRAY-KURTZ P1)** – The soil test procedure using the Bray P1 extraction, or other extraction test calibrated to Bray P1, that provides an index of plan available P expressed in either ppm or lbs/ac (ppm x 2 = lbs/ac). Determine the Bray P1 value in ppm and multiply the ppm by (0.07) to determine the "soil P test site subvalue".

5. **FERTILIZER P_2O_5 APPLICATION RATE** – the amount of manufactured (commercial) phosphate fertilizer applied expressed in lbs/ac of **P_2O_5**. To determine the site's subvalue multiply the year's P fertilizer application rate by (0.05).

6. **FERTILIZER P_2O_5 APPLICATION METHOD** – Defines if the phosphate (**P_2O_5**) fertilizer is actually incorporated into the soil and the time interval between application and incorporation or if the fertilizer is applied over a given amount of crop residue. Incorporation or injection with the fertilizer application equipment or using a tillage tool operated a minimum of 3-4 inches deep to incorporate the **P_2O_5** fertilizer. To determine the site's subvalue select the description that most closely describes the method of application. The value with that description is the site's subvalue.

7. **ORGANIC P_2O_5 APPLICATION RATE** – The amount of phosphate applied (expressed in lbs/ac of **P_2O_5**) from manure, sludge, or other bio-solids. To determine the site's subvalue multiply the year's P fertilizer application rate by (0.06).

8. **ORGANIC P_2O_5 APPLICATION METHOD** – Defines if the phosphate (**P_2O_5**) from the manure, sludge, or other bio-solids is actually incorporated into the soil, the time interval between application and incorporation, or if the manure/bio-solids are applied over a given amount of crop residue. Incorporation or injection with the application equipment or by using a tillage tool operated a minimum of 3-4 inches deep to incorporate the manure, sludge, or other bio-solids. To determine the site's subvalue select the description that most closely describes the method of application. The value with the description is the site's subvalue.

9. **BUFFER STRIP** – Deduct 2 points if field runoff flows via sheet flow through a designed filter strip – minimum 35 feet wide. For the type of buffer strip that is limited to the use of filter strips only, it is critical that sheet flow crosses the filter strip, not concentrated flow, to credit a 2 point deduction.

Phosphorus Index Risk Assessment Procedure Worksheet

Site Characteristic	**Phosphorus Vulnerability Values**				
1. **Soil Erosion**	**Soil Loss (Tons/Acre/Year) x 1.0**				
2. **Connectivity to Water.** Does concentrated flow (via a defined waterway, tile inlet, or surface drain) leave the site?	NO, and the site is not adjacent to an intermittent or perennial stream. **Value = 0**	NO, but the site is adjacent to an intermittent or perennial stream. **Value = 4.0**	Yes, but the site is not adjacent to an intermittent or perennial stream. **Value = 8.0**	Yes, and the site is adjacent to and/or the concentrated flow outlets into an intermittent stream or through a tile inlet. **Value = 12.0**	Yes, and the site is adjacent to and/or the concentrated flow outlets into a perennial stream or through a tile inlet; **or** outlets to a pond or lake within 1 mile. **Value = 16.0**
3. **Runoff Class**	**See Runoff Class Matrix**				
4. **Soil Test Bray-Kurtz P1 ppm**	**Bray – Kurtz P1 (ppm) X (0.07)**				
5. **Fertilizer P_2O_5 Application Rate**	**Fertilizer P_2O_5 Applied (Lbs/Acre) X (0.05)**				
6. **Fertilizer P_2O_5 Application Method**	0 Applied **Value = 0**	Immediate Incorporation **Or** Applied on 80% Cover **Value = 0.75**	Incorporation < 1 Week **Or** Applied on 50-80% Cover **Value = 1.5**	Incorporation > 1 Week & < 3 Months **Or** Applied on 30-49% Cover **Value = 3.0**	No Incorporation **Or** Incorporation > 3 Months **Or** Applied on < 30% Cover **Value = 6.0**
7. **Organic P_2O_5 Application Rate**	**Available – Manure/Biosolids P_2O_5 Applied (Lbs/Acre) X (0.06)**				
8. **Organic P_2O_5 Application Method**	0 Applied **Value = 0**	Immediate Incorporation **Or** Applied on 80% Cover **Value = 0.5**	Incorporation < 1 Week **Or** Applied on 50-80% Cover **Value = 1.0**	Incorporation >1 Week & <3 Months **Or** Applied on 30-49% Cover **Value = 2.0**	No Incorporation **Or** Incorporation > 3 Months **Or** Applied on < 30% Cover **Value = 4.0**
Buffer Strip Factor (Deduct 2 points if field runoff flows through a designed filter strip – minimum 35 feet wide)					
Total Site Index Value					
Field Vulnerability for Phosphorus Loss to Surface Water					
LOW < 15	LOW potential for P movement from the field. If farming practices are maintained at the current level there is a low probability of an adverse impact to surface waters from P loss. Manure or other bio-solids can be applied to meet the recommended nitrogen for the next crop or nitrogen removal of the next legume crop.				
MEDIUM 15-30	MEDIUM potential for P movement from the field. The chance of				

	organic material and nutrients getting into surface water exists. Runoff reduction practices such as buffers, setbacks, lower manure/bio-solid rates, cover crops, and crop residue practices alone or in combination should be considered to reduce P loss impacts. Manure or other bio-solids can be applied to meet the recommended nitrogen for the next crop or nitrogen removal of the next legume crop. Applications of P at the crop removal rate should be considered.
HIGH 31-45	HIGH potential for P movement from the field and for an adverse impact on surface waters unless remedial action is taken. Runoff reduction practices such as buffers, setbacks, lower manure/bio-solid rates, cover crops, and crop residue practices alone or in combination should be considered to reduce P loss impacts. Limit application of P to crop removal rates for one year.
VERY HIGH >45	VERY HIGH potential for P movement from the field and an adverse impact on surface water. Remedial action is required to reduce the risk of P loss. A complete soil and water conservation system is needed. Apply no additional P.