

Chesapeake Bay Stewardship Fund

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Controlling P in Animal Waste Management Systems with Mine Drainage Residuals

Organization: Trout Unlimited **Project Partners:** Iron Oxide Recovery, Inc; Oklahoma State University **Grant Award:** \$254,034 **Matching Funds:** \$255,654

Project Description. This project will fielddemonstrate the ability and cost-effectiveness of using mine drainage residuals (MDRs) to decrease water extractable phosphorus (P^{we}) in manure management systems located in the West Branch Susquehanna River watershed. Successful implementation of this science will augment efforts to reduce the non-point phosphorous loadings received in the Chesapeake Bay while enhancing efforts to remediate abandoned mine drainage in the West Branch Susquehanna River basin, which contains more than 1,200 stream miles polluted with abandoned mine drainage.

Innovative cost-effective practices for substantially decreasing phosphorus in manure management systems are needed, as these systems are a significant source of non-point pollution to the Chesapeake Bay. Solids produced in the treatment of mine drainage have a high capacity for phosphorus-sorption and have significantly decreased P^{we} when added experimentally to animal manures. By utilizing this phosphorous-soprtion capability, this project promotes the concept of resource recovery by determining the economic benefits of mine drainage treatment wastes, which is key to the continued and successful reclamation of abandoned mine drainage in the West Branch Susquehanna River basin, as well throughout the Bay watershed.





Goals and Outcomes.

Short-term

- 1. Demonstrate an innovative method for decreasing P^{we} in manure management
- 2. Establish a novel use for residual solids produced by mine drainage treatment
- 3. Demonstrate the feasibility of a linkage between mine drainage treatment and nutrient pollution in the Chesapeake Bay

Long-term

- 1. Contribute to meeting the goals of the Chesapeake Bay Program
- 2. Contribute to improved quality of coldwater fisheries throughout the Chesapeake Bay watershed

Status. This past year, the project was developed to full-scale at a dairy farm in Clearfield County. MDR was blended with dairy manure immediately before manure field-application. Two test plots and a control plot received two different MDR amended manures and were then planted with corn. No phosphorus deficiencies were observed in either the test or control plots.

The MDR addition impacts on phosphate levels were then evaluated in the manure management system. A dosing curve was developed that indicated that a 12 gram/gallon amendment of the MDRs lessened the approximate 300mg/L of P^{we} by 50%. Investigations were continued to evaluate the possible environmental consequences of extensive adoption of MDR for P^{we} control. Concerns about toxic metal contents of MDR were investigated by reviewing detailed chemical analyses of numerous MDRs from additional sources in Pennsylvania. The investigation focused on the application limits of the metals detailed in EPA's Section 503 Biosolids Rule. The review established that most MDRs had metal concentrations well below EPA's 503 limits and would subsequently not cause metal loading problems. However, the review also established that excessive metal concentrations were present in a fraction of MDRs analyzed and that the most common contaminant was arsenic (As). The presence of As was not unexpected because iron-rich MDRs are known to be particularly effective sorbants of this metal, but the review reinforced the need to screen MDRs before their use in agricultural applications.

The effectiveness of MDR for P^{we} control in poultry manure was assessed by blending MDR with poultry laying house manure and partially weathered poultry manure. The results from these tests were inconclusive. The laying house manure produced results similar to P^{we} control in dairy manure, but P^{we} control in the partially weathered poultry manure was ineffective. These results suggest that poultry manure may be too dry and too heterogeneous for P^{we} control with MDR. In addition, the need for P^{we} control in swine manure was evaluated at a swine operation in Clinton County. The manure at this operation contained very low solids content and it was determined that its phosphorus concentrations were too low to be of environmental concern.

Challenges and Lessons Learned. Moving forward, the challenges will include the formal approval by the PA State Conservation Commission and the USDA-NRCS of the use of MDRs as a best management practice for reduction of P^{we} in dairy manure management. Another challenge may include finding a source of funding that would provide for a cost-share incentive to encourage dairy farmers and/or manure handlers to adopt and implement this new and innovative best management practice.

Readiness for Scale Up. This project is ready for "scale up," pending support through new funding. Future plans include the development of an MDR availability list through the evaluation of MDR sources throughout the Chesapeake Bay for suitability as a best management practice to reduce P^{we} in dairy manure management. It will be necessary to obtain formal approval from the USDA-NRCS and other appropriate bay state authorities for the use of MDRs as a best management practice. Next steps also include pursuing and obtaining a source of funding that would provide for a cost-share incentive to encourage dairy farmers and/or manure handlers to adopt and implement this new and innovative best management practice.

For more information, contact:

Amy G. Wolfe Trout Unlimited Eastern Abandoned Mine Program Email: awolfe@tu.org Phone: (570) 748-4901 Dr. Robert Hedin Iron Oxide Recovery, Inc. Email: bhedin@hedinenv.com Phone: (412) 571-2204

	A	В	C	D	E	F	G	н		J	K
1	Pennsylvania P Ind	ex Version 2 (Octo	ber 2009; Penn State, Dept. 0	Crop & Soil Sciences & USDA-ARS	, Pasture Systems & Watershed	Mgmt. Research Unit)					
2									-		
3	FARM IDENTIFICATION		PART A: SCREENING T	OOL		CMU/Field ID	baseline	increase buffer	decrease manure	restrict spreading	MDR addition
4			Is the CMU in a Special I	Protection watershed?		If the answer is Yes to any	Yes	Yes	Yes	Yes	Yes
5			Is there a significant farm	n management change as de	efined by Act 38? (see belo	of these questions, Part B	No	No	No	No	No
6			Is the Soil Test Mehlich 3	3 P greater than 200 ppm P?	enter soil test value in pp	must be used.	210	210	210	210	210
7			Is the Contributing Distar	nce from this CMU to receive	ng water less than 150 ft.?		Yes	Yes	Yes	Yes	Yes
8			The following Act 38 crite	eria determine when there is	a significant farm manage	ment change:	Part B	Part B	Part B	Part B	Part B
9			 net increase of greate 	r than 10% in AEUs per acro	Э						
10			2. a change in crop mana	agement that results in a fari	mwide reduction of greater	than 20% in nitrogen nece	ssary for realis	tic expected crop	yields		
11			3. alternative organic sol	irces will replace all or some	of the nutrient sources list	ted in the plan					
12		000	4. additional lands are br	ought into the operation (put	rchased or rented)	OMU/E-LUD	h a a a llur a				
13	PART B: SOURCE FAC	UKS		Moblish 2 Soil Tost B (nom B	1	CIVIU/FIEId ID	baseline	Increase buffer	decrease manure	restrict spreading	MDR addition
14	SUIL TEST			Soil Test P (pph) P) Tost Pating – 0 20* Mobil	ich 3 Soil Test D (nnm D)	210	210	210	210	210
15				Fertilizer P (lb P ₂ O ₂ /acre)	Test Rating = 0.20 Wern	ich 5 30h fest r (pphrr)	20	20	20	20	20
17	FERTILIZER P RATE		P Applied	from multiple fortilizer applic	ations if any (From Multir	ale Applications Calculator	0	0	0	0	0
17		0.2	0.4				0	Ū	0	0	0
	FERTILIZER APPLICATION METHOD	Placed or injected 2" or more deep	Incorporated <1 week following application	Incorporated > 1 week or not incorporated following application in April - October	Incorporated >1 week or not incorporated following application in Nov March	Surface applied to frozen or snow covered soil	0.2	0.2	0.2	0.2	0.2
18											
19				Fertilizer Ratin	g = Fertilizer Rate x Ferti	lizer Application Method	4	4	4	4	4
20	MANURE P RATE			Manure P (lb P ₂ O ₅ /acre)			90	90	45	90	90
21		0.3	P Applied	trom multiple manure applic	cations, if any (From Multip	ple Applications Calculator)	0	0	0	0	0
22	MANURE APPLICATION METHOD	0.2 Placed or injected 2" or more deep	0.4 Incorporated <1 week following application	Incorporated > 1 week or not incorporated following application in April - October	0.8 Incorporated >1 week or not incorporated following application in Nov March	Surface applied to frozen or snow covered soil	0.8	0.8	0.8	0.6	0.8
23	P SOURCE COEFFICIENT	Refer to: Test results for P Source Coefficient OR Book values from P Index Fact Sheet Table 1				neet Table 1	0.65	0.65	0.65	0.65	0.3
24			Manure	Rating = Manure Rate x M	anure Application Metho	d x P Source Coefficient	47	47	23	35	22
25						Source Easter Sum	93	93	69	81	68
						Source Factor Suin			00	÷.	
26	PART B: TRANSPORT F	ACTORS				CMU/Field ID	baseline	increase buffer	decrease manure	restrict spreading	MDR addition
26 27	EROSION	ACTORS		Soil Loss (ton/acre/yr)		CMU/Field ID	baseline 3	increase buffer 3	decrease manure	restrict spreading	MDR addition
26 27 28	EROSION	0 Drainage Class is Excessively	2 Drainage Class is Somewhat Excessively	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well	6 Drainage Class is Somewhat Poorly	CMU/Field ID Brainage Class is Poorly/Very Poorly	baseline 3 4	increase buffer 3 4	decrease manure 3 4	restrict spreading 3 4	MDR addition 3 4
26 27 28 29	EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE	O Drainage Class is Excessively 0 None or No direct outlet to receiving water	2 Drainage Class is Somewhat Excessively	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water	6 Drainage Class is Somewhat Poorly	Bounce Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Pattermed drainage - Outlets directly to receiving water	baseline 3 4 0	increase buffer 3 4 0	decrease manure 3 4 0	restrict spreading 3 4 0	MDR addition 3 4 0
26 27 28 29 30	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE	O Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft.	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft.	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft.	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer	Bounce Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2* Pattermed drainage - Outlets directly to receiving water g [‡] < 100 ft.	baseline 3 4 0 6	increase buffer 3 4 0 4	decrease manure 3 4 0 6	restrict spreading 3 4 0 6	MDR addition 3 4 0 6
26 27 28 29 30 31	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE	O Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft.	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum =	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage	Burice Factor Sum CMU/Field ID B Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 * < 100 ft. + Contributing Distance	baseline 3 4 0 6 13	increase buffer 3 4 0 4 11	decrease manure 3 4 0 6 13	restrict spreading 3 4 0 6 13	MDR addition 3 4 0 6 13
26 27 28 29 30 31 32	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft. 0 0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum =	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage	Bounce Factor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2* Patterned drainage - Outlets directly to receiving water 9 [‡] < 100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT	baseline 3 4 0 6 13 1.0	increase buffer 3 4 0 4 11 1.0	decrease manure 3 4 0 6 13 1.0	restrict spreading 3 4 0 6 13 1.0	MDR addition 3 4 0 6 13 1.0
26 27 28 29 30 31 32 33	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY OR rapidly permeable s	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft. 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT oil near a stream	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum =	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M	Source Factor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Pattermed drainage - Outlets directly to receiving water 9 * <100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT odified Connectivity / 24	baseline 3 4 0 6 13 1.0 0.54	increase buffer 3 4 0 4 11 1.0 0.46	decrease manure 3 4 0 6 13 1.0 0.54	restrict spreading 3 4 0 6 13 1.0 0.54	MDR addition 3 4 0 6 13 1.0 0.54
26 27 28 29 30 31 32 33 34	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 >500 ft. 0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT oil near a stream to fields with a 35 ft. b	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum =	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x	Build Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 [‡] < 100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT odified Connectivity / 24 Source x Transport	baseline 3 4 0 6 13 1.0 0.54 100	increase buffer 3 4 0 4 11 1.0 0.46 86	decrease manure 3 4 0 6 13 1.0 0.54 75	restrict spreading 3 4 0 6 13 1.0 0.54 87	MDR addition 3 4 0 6 13 1.0 0.54 73
26 27 28 29 30 31 33 33 34 35	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN	ACTORS	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum =	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators	Build Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water g ‡ < 100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT Odified Connectivity / 24 Source x Transport	baseline 3 4 0 6 13 1.0 0.54 100	increase buffer 3 4 0 4 11 1.0 0.46 86	decrease manure 3 4 0 6 13 1.0 0.54 75	restrict spreading 3 4 0 6 13 1.0 0.54 87	MDR addition 3 4 0 6 13 1.0 0.54 73
26 27 28 29 30 31 32 33 34 35 36	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft. 0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT oil near a stream to fields with a 35 ft. b ICE Nutrient Application G	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum =	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Manure Units (gal/A	Build Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 ‡ < 100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT Iodified Connectivity / 24 Source x Transport	baseline 3 4 0 6 13 1.0 0.54 100 cal/A	increase buffer 3 4 0 4 11 1.0 0.46 86 gal/A	decrease manure 3 4 0 6 13 1.0 0.54 75 mal/A	restrict spreading 3 4 0 6 13 1.0 0.54 87 gal/A	MDR addition 3 4 0 6 13 1.0 0.54 73
26 27 28 29 30 31 33 34 35 36 37	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s f "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values	ACTORS	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum =	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Manure Units (gal/A 2. N plan manure refe	Burice Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2* Patterned drainage - Outlets directly to receiving water 9 [‡] < 100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT Iodified Connectivity / 24 Source x Transport or T/A) (units above)	baseline 3 4 0 6 13 1.0 0.54 100 gal/A 10000	increase buffer 3 4 0 4 11 1.0 0.46 86 20000	decrease manure 3 4 0 6 13 1.0 0.54 75 gal/A 5000	restrict spreading 3 4 0 6 13 1.0 0.54 87 	MDR addition 3 4 0 6 13 1.0 0.54 73 gal/A 10000
26 27 28 29 30 31 33 34 35 36 37	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less	ACTORS	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = uffer receiving manure.	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia Grassed Waterway or None 1.0 Grassed Waterway or None User Inputs	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Manure Units (gal/A 2. Manure Parabesia	Burice Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 * < 100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT Iodified Connectivity / 24 Source x Transport o or T/A) (units above)	baseline 3 4 0 6 13 1.0 0.54 100 gal/A 1000	increase buffer 3 4 0 4 11 1.0 0.46 86 gal/A 10000	decrease manure 3 4 0 6 13 1.0 0.54 75 gal/A 5000	restrict spreading 3 4 0 6 13 1.0 0.54 87 gal/A 10000	MDR addition 3 4 0 6 13 1.0 0.54 73 gal/A 100000 0
26 27 28 29 30 31 32 33 34 35 36 37 38	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft. 0 0 0 0 0 0 0 0 0 0 0 0 0	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = uffer receiving manure.	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Dptional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis	Build Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 * < 100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT IDIST >	baseline 3 4 0 6 13 1.0 0.54 100 gal/A 10000 9	increase buffer 3 4 0 4 11 1.0 0.46 86 gal/A 10000 9 9	decrease manure 3 4 0 6 13 1.0 0.54 75 9 1/A 5000 9	restrict spreading 3 4 0 6 13 1.0 0.54 87 9 10000 9	MDR addition 3 4 0 6 13 1.0 0.54 73 gal/A 10000 9
26 27 28 29 30 31 32 33 34 35 36 37 38 39	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99	ACTORS	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = uffer receiving manure. uidance ment op removal	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Dptional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste	Build Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 * < 100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT Iodified Connectivity / 24 Source x Transport or T/A) (units above) (units above lb P ₂ O ₅) ed above in (2) (lb P ₂ O ₅ /A)	baseline 3 4 0 6 13 1.0 0.54 1000 gal/A 10000 9 90	increase buffer 3 4 0 4 11 1.0 0.46 86 9 90 90	decrease manure 3 4 0 6 13 1.0 0.54 75 9 45	restrict spreading 3 4 0 6 13 1.0 0.54 87 90 90	MDR addition 3 4 0 6 13 1.0 0.54 73 9 90
26 27 28 29 30 31 33 33 34 35 36 37 38 39 40	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = utfler receiving manure. utfler receiving manure.	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft. OR < 100 tt. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste	Build Pactor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 * < 100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT Indified Connectivity / 24 Source x Transport or T/A) (units above) (units above lb P ₂ O ₅) ed above in (2) (lb P ₂ O ₅ /A)	baseline 3 4 0 6 13 1.0 0.54 100 9 90 90	increase buffer 3 4 0 4 11 1.0 0.46 86 2 2 3 4 10000 9 90	decrease manure 3 4 0 6 13 1.0 0.54 75 gal/A 5000 9 45	restrict spreading 3 4 0 6 13 1.0 0.54 87 9 90	MDR addition 3 4 0 6 13 1.0 0.54 73 gal/A 10000 9 90
26 27 28 29 30 31 33 33 34 35 36 37 38 39 40 41	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = utfler receiving manure. utfler receiving manure.	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs User Inputs	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste 4. Planned crop - P rer	Source Factor Sum CMU/Field ID R Brainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water g * <100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT odified Connectivity / 24 Source x Transport or T/A) (units above) (units above) (units above lb P ₂ O ₅) ed above in (2) (lb P ₂ O ₅ /A)	baseline 3 4 0 6 13 1.0 0.54 1000 9 90 50	increase buffer 3 4 0 4 11 1.0 0.46 86 9 90 50	decrease manure 3 4 0 6 13 1.0 0.54 75 gal/A 5000 9 45	restrict spreading 3 4 0 6 13 1.0 0.54 87 9 90 50	MDR addition 3 4 0 6 13 1.0 0.54 73 9 90 50
26 27 28 29 30 31 33 33 34 35 36 37 38 39 40 41 42	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = utfer receiving manure. uidance ment rop removal	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Noderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs User Input	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR < 100 th. with 35 ft. buffer 1 + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste 4. Planned crop - P rer Actual total P applied ha	Source Factor Sum CMU/Field ID R Brainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water g * <100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT odified Connectivity / 24 Source x Transport or T/A) (units above) (units above) (units above lb P ₂ O ₅) ed above in (2) (lb P ₂ O ₅ /A) sed on values in PI above	baseline 3 4 0 6 13 1.0 0.54 1000 9 90 50 110	increase buffer 3 4 0 4 11 1.0 0.46 86 9 90 90 50 110	decrease manure 3 4 0 6 13 1.0 0.54 75 gal/A 500 9 45	restrict spreading 3 4 0 6 13 1.0 0.54 87 90 90 50 110	MDR addition 3 4 0 6 13 1.0 0.54 73 9 90 90 50 110
26 27 28 29 30 31 31 32 33 34 35 36 37 38 39 40 41 41 42 43	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft. 0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT oil near a stream to fields with a 35 ft. b ICE Nutrient Application G Nitrogen based manage Phosphorus limited to cr No Phosphorus applied	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = utfer receiving manure. uidance ment rop removal	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs User Input	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste 4. Planned crop - P rer Actual total P applied ba	Source Factor Sum CMU/Field ID 8 Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 * < 100 ft. • + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT odified Connectivity / 24 Source x Transport . or T/A) (units above) (units above lb P ₂ O ₅) ed above in (2) (lb P ₂ O ₅ /A) moval (lb P ₂ O ₅ /A) Ised on values in PI above	baseline 3 4 0 6 13 1.0 0.54 100 9 90 50 110	increase buffer 3 4 0 4 11 1.0 0.46 86 2 30 30 30 30 30 30 30 30 30 30	decrease manure 3 4 0 6 13 1.0 0.54 75 gal/A 5000 9 45 50 65	restrict spreading 3 4 0 6 13 1.0 0.54 87 90 90 50 110	MDR addition 3 4 0 6 13 1.0 0.54 73 9 90 90 50 110
26 27 28 29 30 31 33 33 34 35 36 37 38 39 40 41 41 42 43 44	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft. 0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT oil near a stream to fields with a 35 ft. b ICE Nutrient Application G Nitrogen based manage Nitrogen based manage Phosphorus limited to cr No Phosphorus applied	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = utfler receiving manure. uidance ement rop removal	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs User Input	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft OR 100 to 199 ft OR 100 to xwith 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste 4. Planned crop - P rer Actual total P applied ba	Source Factor Sum CMU/Field ID	baseline 3 4 0 6 13 1.0 0.54 1000 9 90 50 110	increase buffer 3 4 0 4 11 1.0 0.46 86 gal/A 10000 9 90 50 110	decrease manure 3 4 0 6 13 1.0 0.54 75 gal/A 5000 9 45 50 65	restrict spreading 3 4 0 6 13 1.0 0.54 87 gal/A 10000 9 90 50 110	MDR addition 3 4 0 6 13 1.0 0.54 73 gal/A 10000 9 90 50 110
26 27 28 29 30 31 33 33 34 35 33 34 35 36 37 38 39 40 41 42 43 44 45	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft. 0 0 0 0 0 0 0 0 0 0 0 0 0	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = uffer receiving manure. uffer receiving manure.	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia Grassed Waterway or None 1.0 Grassed Waterway or None User Inputs User Input Decemposite User Input	6 Drainage Class is Somewhat Poorty 6 100 to 199 ft. OR < 100 tr. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Mapter Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste 4. Planned crop - P rer Actual total P applied ba 5. Actual Planned Rate Bate (ID P.O./A)	Source Pactor Sum CMU/Field ID B Drainage Class is Poorly/Very Poorly 2 * Patterned drainage Outlets directly to receiving water 9 * <100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT odified Connectivity / 24 Source x Transport . or T/A) (units above) (units above) dabove in (2) (Ib P2O ₅ /A) moval (Ib P2O ₅ /A) moval (Ib P2O ₅ /A) sed on values in PI above (units above) (units above) (units above)	baseline 3 4 0 6 13 1.0 0.54 100 9 90 50 110	increase buffer 3 4 0 4 11 1.0 0.46 86 gal/A 10000 9 90 50 110	decrease manure 3 4 0 6 13 1.0 0.54 75 9 45 500 65	restrict spreading 3 4 0 6 13 1.0 0.54 87 90 90 50 110	MDR addition 3 4 0 6 13 1.0 0.54 73 gal/A 10000 9 90 50 110
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS 0 Drainage Class is Excessively None or No direct outlet to receiving water 0 > 500 ft. 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT oil near a stream to fields with a 35 ft. b ICE Nutrient Application G Nitrogen based manage Phosphorus limited to cr No Phosphorus applied	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = uffer receiving manure. uidance ement rop removal	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia Grassed Waterway or None 1.0 Grassed Waterway or None User Inputs User Input User Input	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR <100 tr. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Dptional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste 4. Planned crop - P rer Actual total P applied ba 5. Actual Planned Rate Rate (lb P ₂ O ₅ /A) Enter in	Source Pactor Sum CMU/Field ID R Brainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 * <100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT odified Connectivity / 24 Source x Transport or T/A) (units above) (units above lb P ₂ O ₅) ed above in (2) (lb P ₂ O ₅ /A) used on values in PI above (units above) (uni	baseline 3 4 0 6 13 1.0 0.54 1000 9 90 50 110 0 0	increase buffer 3 4 0 4 11 1.0 0.46 86 (gal/A 10000 9 90 50 110 50 100 0 0 0 0 0 0 0 0 0 0 0 0	decrease manure 3 4 0 6 13 1.0 0.54 75 9 45 500 9 45 50 65	restrict spreading 3 4 0 6 13 1.0 0.54 87 90 90 50 110 0	MDR addition 3 4 0 6 13 1.0 0.54 73 gal/A 10000 9 90 50 110
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft. 0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT bil near a stream to fields with a 35 ft. b ICE Nutrient Application G Nitrogen based manage Phosphorus limited to cr No Phosphorus applied	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = uffer receiving manure. uidance ement rop removal	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs User Inputs User Input	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR <100 to 199 ft. OR <100 tt. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Dptional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste 4. Planned crop - P rer Actual total P applied ba 5. Actual Planned Rate Rate (lb P ₂ O ₅ /A) Enter in	Source Factor Sum CMU/Field ID R Brainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water g * <100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT Iodified Connectivity / 24 Source x Transport or T/A) (units above) (units above lb P ₂ O ₅) ed above in (2) (lb P ₂ O ₅ /A) Ised on values in PI above (units above) (u	baseline 3 4 0 6 13 1.0 0.54 1000 9 90 50 110 0 50 110	increase buffer 3 4 0 4 11 1.0 0.46 86 9 90 90 50 110 50 110 00 1000 9 90 10000 9 90 10000 10000 9 90 1000 100000 10000 10000 10000 10000	decrease manure 3 4 0 6 13 1.0 0.54 75 9 45 9 45 500 65 50 65	restrict spreading 3 4 0 6 13 1.0 0.54 87 90 90 50 110 00 1000 90 10000 90 100000 1000 100000 10000	MDR addition 3 4 0 6 13 1.0 0.54 73 9 90 90 50 110 10000 9 90 10000 9 90 10000 90 100000 10000 10000 10000 10000 10
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 44 45 46 47 42	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium; 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS 0 Drainage Class is Excessively 0 None or No direct outlet to receiving water 0 > 500 ft. 0.85 50 ft. Riparian Buffer APPLIES TO DIST < 100 FT oil near a stream to fields with a 35 ft. b ICE Nutrient Application G Nitrogen based manage Phosphorus limited to cr No Phosphorus applied	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = uffer receiving manure. uidance ement rop removal	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Moderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs User Inputs User Input	6 Drainage Class is Somewhat Poorly 6 1000 199 ft. OR < 100 ft. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Dptional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure P analysis P Applied at N Rate liste 4. Planned crop - P rer Actual total P applied ba 5. Actual Planned Rate Rate (lb P ₂ O ₅ /A) Enter in Calculated Maximum Mar	Source Factor Sum CMU/Field ID R Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water g * <100 ft. + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT Iodified Connectivity / 24 Source x Transport or T/A) (units above) (units above) (b P ₂ O ₅ /A) sed on values in PI above (units above) MANURE P RATE above hure Rate (units above) (‡)	baseline 3 4 0 6 13 1.0 0.54 1000 9 90 90 500 110 0 500 110 0 500 110 500 50	increase buffer 3 4 0 4 11 1.0 0.46 86 9 90 90 50 110 0 8519 0 8519	decrease manure 3 4 0 6 13 1.0 0.54 75 2 2 3 4 3 1.0 0.54 5000 9 45 5000 5000 65 0 13 10 10 10 10 10 10 10 10 10 10	restrict spreading 3 4 0 6 13 1.0 0.54 87 90 90 90 50 110 0 0 110 0 0 110 0 0 110 0 0 110 0 0 0 0 0 0 0 0 0 0 0 0 0	MDR addition 3 4 0 6 13 1.0 0.54 73 90 90 90 50 110 0 10000 9 90
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 45	PART B: TRANSPORT F EROSION RUNOFF POTENTIAL SUBSURFACE DRAINAGE CONTRIBUTING DISTANCE MODIFIED CONNECTIVITY * OR rapidly permeable s * "9" factor does <u>not</u> apply MANAGEMENT GUIDAN P Index Rating: Values Low: 59 or less Medium: 60 to 79 High: 80 to 99 Very High: 100 or greater	ACTORS	2 Drainage Class is Somewhat Excessively 2 350 to 500 ft. Transport Sum = utfer receiving manure. uidance ment rop removal	Soil Loss (ton/acre/yr) 4 Drainage Class is Well/Noderately Well 1 Random Drainage - Outlets directly to receiving water 4 200 to 349 ft. Erosion + Runoff Potentia 1.0 Grassed Waterway or None User Inputs User Inputs User Input P Applied at Planned	6 Drainage Class is Somewhat Poorly 6 100 to 199 ft. OR < 100 tt. with 35 ft. buffer al + Subsurface Drainage Transport Sum x M P Index Value = 2 x Optional Calculators 1. Manure Units (gal/A 2. N plan manure rate 3. Manure D analysis P Applied at N Rate liste 4. Planned crop - P rer Actual total P applied ba 5. Actual Planned Rate Rate (lb P ₂ O ₂ /A) Enter in Calculated Maximum Mar Applied at Calculated Maximum Mar	Source Pactor Sum CMU/Field ID B Drainage Class is Poorly/Very Poorly 2 * Patterned drainage - Outlets directly to receiving water 9 ‡ < 100 ft. P + Contributing Distance 1.1 Direct Connection APPLIES TO DIST > 100 FT Iodified Connectivity / 24 Source x Transport outlets above) (units above) (units above) (b P2O5/A) ised on values in PI above (units above) (units above) (t) (units above) (t) (units above) (t) (units above) (t) (units above) (t) (units above) (t) (units above) (t) (units above) (t) (units above) (t) (units above) (t) (t) (t) (t) (t) (t) (t) (t	baseline 3 4 0 6 13 1.0 0.54 1000 gal/A 10000 9 90 50 110 0 1000 0 500 1100 0 500 500 500 500 500 52	increase buffer 3 4 0 4 11 1.0 0.46 86 9 90 90 90 50 110 0 0 8519 77	decrease manure 3 4 0 6 13 1.0 0.54 75 9 45 500 65 0 0 10 13 1.0 10 13 1.0 10 13 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	restrict spreading 3 4 0 6 13 1.0 0.54 87 90 90 90 90 90 90 90 90 90 90	MDR addition 3 4 0 6 13 1.0 0.54 73 90 90 90 90 90 90 90 90 90 90

Element	Units	503 Limit	Brandy	Farmington "Farm"					
Fe	%	None	13.1	50.0					
Ca	%	None	19.6	0.1					
Si	%	None	2.3	3.6					
Al	%	None	2.0	0.4					
S	%	None	1.4	0.8					
As	ppm	75	17	12					
Cd	ppm	85	0.8	1.8					
Cr	ppm	3,000	14	16					
Cu	ppm	43,000	22	<1					
Мо	ppm	75	<5	<5					
Ni	ppm	420	373	50					
Pb	ppm	840	<5	14					
Se	ppm	100	<3	<3					
Zn	ppm	7,500	434	40					
Hg	ppm	57	na	na					

Chemical composition of MDRs and EPA's 503 metal limits for land applied biosolids