Missouri
Nutrient Management Plan
For

DOUBLE D SWINE, LLC

The objective of this document is to verify compliance with Missouri's state nutrient management requirements found in state regulation at 10 CSR 20-6.300 (3) (G)1. and the MDNR Concentrated Animal Feeding Operation Technical Standard. The owner or operator of a permitted CAFO is required to maintain a copy of a complete and up-to-date Nutrient Management Plan at all times.

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Plan Period: November 2016 - October 2021

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SECTION A
General Site Information

1. Farm Contact Information

Farm Contact Information:

Name: Dale Dunlap
Address: 10216 Rt. O
Perry, MO 63462

Home Phone:
Office Phone: (573)721-1882
Email:

2. Technical Service Provider Contact Information

Nutrient Management Planner

Name: Jeff E. Browning
Title: Professional Engineer
Certification Credentials: Professional Engineer MO Number: E-28664, IL Number 062-051954
NRCS TSP 05-4871
E-mail: jeff@alliedengineering.us

3. Plan Narrative:

This facility is located in the SW ¼, Section 25, Township 53N, Range 8W, in Monroe County Missouri.

The farm will include the construction of two new 2,480 head wean-finish hog barns. Total animal units on this farm will be 1,984, this will be a class IC CAFO as defined by the Missouri Department of Natural Resources.

The new barns will be slatted "deep-pit" type buildings where hog manure generated from production falls beneath the floor into an eight-foot deep concrete pit. The concrete pits store the manure laden wastewater until it can be pumped to nearby farm fields. The deep pits will have approximately 471 days of storage at the 7' level.

The Missouri Department of Natural Resources "Missouri Concentrated Animal Feeding Operation Nutrient Management Technical Standard" will be utilized for guidance for the Land Application of wastewater from the barn pits. Exact land requirements and total application rates will be calculated using laboratory analysis on a year-to-year basis.

Dead animals will be disposed of in accordance with the Missouri Department of Agriculture regulations. Dead animals from this site will be removed to a rendering facility.

Clean Water Diversion

This farm will be graded to divert storm water away from buildings, animal confinement areas and manure storage areas.

A potential source of unplanned waste from animal confinement facilities is from storm water coming into contact with pollutants. The pollutants that could potentially contaminate the water are the hogs, manure, feed, diesel fuel, and oils and lubricants for farm equipment. All of these potential pollutants are kept under roof at this farm. They do not come into contact with clean rain water or add to the contaminated waste on the farm.

A common way for clean water to become contaminated is by contacting ventilated dust on the ground around the barn. To treat rainwater that becomes contaminated by this dust, the barn will be surrounded by grass. The grass acts as a filter and helps prevent erosion around the barns reducing suspended solids in the runoff.

Other operations at this farm that could potentially contribute to exposed pollutants are the loading and unloading of pigs, feed, manure, and mortality compost. When these sources are handled messes can occur. Care should be taken to not create a mess around the door of the barns, the manure pumping ports, the skirt to the composter or at the base of the feed bins. When messes occur during these operations they will be cleaned up immediately.

Prevention of Direct Contact of Confined Animals to Waters of the State

All confined animals are housed under roof in buildings with no outside access. They have no direct access to waters of the state.

PLAN STARTING DATE: November, 2016 **PLAN DURATION:** 5 YEARS

SECTION B
Livestock Production System and Land Description

1. Manure Storage and Animal Inventory

Table B-1-1. Manure Storage Descriptions.

Storage ID	Type of Storage	Pumpable or Spreadable Capacity	Estimated Annual Manure Collected	Units Manure Storage	Estimated Maximum Days of Storage
Barn	Underfloor liquid storage	1,930,526	1,495,162	Gal	471

Table B-1-2. Animal Inventory.

Animal Group	Type or Phase of Production	Number of Animals	Average Wt. (lbs)	Confinement Period	Manure Collected (%)	Storage ID where Manure will be Stored
Hogs	Wean-to-finish pig	4,960	150	Early Jan - Late Dec	100	Barn

(1) Number of Animals is the average number of animals that are present in the production facility at any one time.
(2) If Manure Collected is less than 100%, this indicates that the animals spend a portion of the day outside of the production facility or that the production facility is unoccupied one or more times during the confinement period.

2. Manure Exports, Imports and Transfers

Table B-2-1. Planned manure exports off the Farm.

Export Month	Export Year	Manure Source Storage ID	Target Export Amount	Export Units	Receiving Operation
4	2017	Barn	700,000	Gal	Export Farms
11	2017	Barn	700,000	Gal	Export Farms
4	2018	Barn	700,000	Gal	Export Farms
11	2018	Barn	700,000	Gal	Export Farms
4	2019	Barn	750,000	Gal	Export Farms
11	2019	Barn	700,000	Gal	Export Farms
4	2020	Barn	700,000	Gal	Export Farms
11	2020	Barn	700,000	Gal	Export Farms
4	2021	Barn	750,000	Gal	Export Farms

Table B-2-2. Planned manure imports onto the Farm.

Import Month	Import Year	Originating Operation	Manure Animal Type	Target Import Amount	Import Units	Receiving Storage ID
No planned manure imports onto the Farm.						

Table B-2-3. Planned internal manure transfers.

Transfer Month	Transfer Year	Manure Source Storage ID	Target Transfer Amount	Transfer Units	Receiving Storage ID
No planned internal manure transfers.					

3. Land Application Equipment

It is currently planned to have all land application contracted to a commercial applicator company until Dale can get his own tankwagon and application equipment purchased.

Table B-3-1. Summary of manure applicators.

Equipment ID	Spreader or Pump Capacity	Capacity Units	Effective Application Width (ft.)	Land Application Travel Speed (min-max)	Speed Units	Minimum Application Rate	Rate Units	Owned? (Y or N)
Tankwagon	8,000	Gal	12		mph	1,000	Gal/Acre	N

4. Mortality Handling Narrative

Table B-4-1. Estimated annual amount of animal mortalities.

Animal Group	Type or Phase of Production	Number of Animals[1]	Annual Mortality (%)[2]	Total Animals per Year[3]	Estimated Average Annual Mortality (tons)
Hogs	Wean-to-finish pig	4960	4	397	28
Total	-	4960	-	-	28

[1] Number of Animals is the typical number of animals that are present in the operation during the confinement period.
[2] As a percentage of number of animals.
[3] Calculate as Number of Animals X Annual Mortality.

Mortalities from this facility will be removed to a rendering facility.

In the event a catastrophic death loss event would result in mass mortalities the action of choice will be shipping all carcasses to a rendering plant. The pig owners field representative will aid in locating an approved rendering plant. In the event rendering is not an option the carcasses will be composted with sawdust via a mass compost facility constructed of round hay bales.

SECTION C
Sustainability/Feasibility Evaluation

1. Farm Nutrient Balances

Table C-1-1. Whole-farm manure nutrient balance accounting for nutrients in manure exported, imported or used for land application.

	N	P_2O_5	K_2O
	(lbs.)	(lbs.)	(lbs.)
Manure Nutrients On-Hand at Start of Plan	0	0	0
Manure Nutrients Collected	268,382	223,527	191,381
Manure Nutrients Imported	0	0	0
Manure Nutrients Exported	229,760	191,360	163,840
Manure Nutrients Applied On-Farm	9,391	7,822	6,697
Manure Nutrients on Hand at End of Plan (calc)	29,230	24,345	20,844

Table C-1-2. Nutrient balance on spreadable acres accounting for plant-available nutrients applied in manure and other fertilizers and removed by crops.

	N	P_2O_5	K_2O
Plant-Available Manure Nutrients Applied[1] (lbs.)	16,649	16,682	14,240
Commercial Fertilizer Nutrients Applied (lbs.)	0	0	4,762
Available Nutrients Applied (all sources) (lbs.)	16,649	16,682	19,002
Nutrient Utilization Capacity of Crops[2] (lbs.)	23,684	9,457	16,432
Nutrient Balance on Spreadable Acres[3] (lbs.)	-7,035	7,225	2,571
Nutrient Balance on Spreadable Acres (lbs./acre)	-217	223	79
Nutrient Balance on Spreadable Acres (lbs./acre/yr.)	-43	45	16

1. Available manure nutrients applied on the farm accounting for state-specific nutrient losses due to time and method of application.
2. Values indicate nutrient utilization potential of crops grown. For N the value generally is based on crop N recommendation for non-legume crops and crop N uptake or other state-imposed limit for N application rates for legumes. P_2O_5 and K_2O values generally are based on fertilizer recommendations or crop removal (whichever is greatest).
3. Interpretation:
   For N,
   - Non-trivial positive values indicate the plan was not developed properly;
   - Negative numbers may or may not be intentional. For example plans that have legume crops will typically not utilize the full nitrogen removal capacity resulting in negative numbers.

   For P_2O_5 and K_2O,
   - Positive numbers may indicate build up of P_2O_5 and K_2O above agronomic need and/or removal.

Negative numbers indicate applications below recommended rates or depletion of P_2O_5 and/or K_2O from the soil on some fields. This may be beneficial on fields with high or very high soil test phosphorus.

2. Projected Land Requirements for N-based Versus P-based Management

Farm Attributes:

Table C-2-1. Crop land summary.

Crop and Forage Acres	Acres Suitable for Manure Application (Spreadable Acres)
39.0	32.4

Table C-2-2. Average annual land requirements for N-based versus P-based management of manure.

Calculation Basis	N-based Management	P-based Management
	acres/year	
Projection based on total nutrients collected	306.7	765.8
Projection based on plant available nutrients applied	22.8	57.2

All estimates assume plant nutrient availability in manure and nutrient utilization by the crop is similar to how manure and crops are managed in the plan.

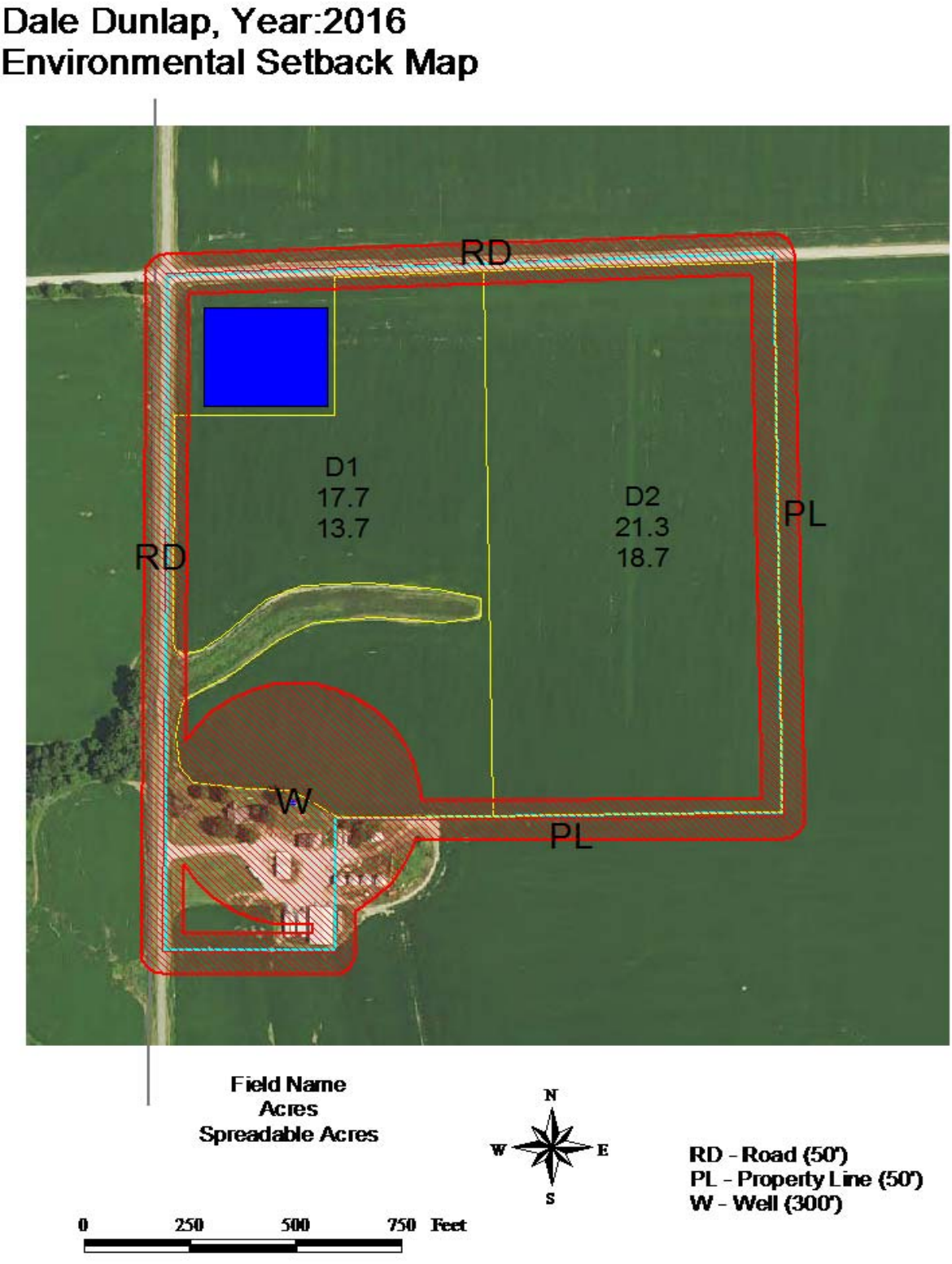
For these calculations:
Manure nitrogen availability was calculated to be 83.5%
Crop N utilization was calculated to be 146.2 lbs. N/acre/year
Crop P_2O_5 utilization was calculated to be 58.4 lbs. P_2O_5/acre/year.

SECTION D
Land Application Site Information

1. Field Maps

Map D-1-1. Field delineation map showing field and sub-field ID with aerial photo background.

Map D-1-2. Manure application sensitive feature map including manure application setbacks. Map lists field ID, sub-field ID, field size and spreadable acres for each field.



2. Other Field Information

Table D-2-1. Soil survey data.

Field ID	Subfield ID	Predominant Soil Map Unit	Predominant Soil Type Description (name, texture, slope range)	Soil Hydrologic Group	RUSLE T Factor (tons/A)
D1		137_50012_1	Putnam SIL 0-1%	D	3
D2		137_50012_1	Putnam SIL 0-1%	D	3

Table D-2-2. Other field information.

Field ID	Subfield ID	Land Tenure[1]	This Field Can Receive Manure? (Yes or No)	Note
D1		Own	Yes	
D2		Own	Yes	

[1]Land Tenure: Owned = Own, Rented = Rent, Spreading Agreement = SA, Other = O.

3. Land Treatment Practices Needed to Meet Manure Management Objectives

Table D-3-1. Land treatment practices (conservation practices) used on a field to meet manure management objectives. List those practices required to reduce erosion and runoff as part of properly implementing the manure management plan.

Field ID	Subfield ID	Plan Year	Erosion/Runoff Reduction Practice
D1		2017	No till beans/ Minimum till corn
D1		2018	No till beans/ Minimum till corn
D1		2019	No till beans/ Minimum till corn
D1		2020	No till beans/ Minimum till corn
D1		2021	No till beans/ Minimum till corn
D2		2017	No till beans/ Minimum till corn
D2		2018	No till beans/ Minimum till corn
D2		2019	No till beans/ Minimum till corn
D2		2020	No till beans/ Minimum till corn
D2		2021	No till beans/ Minimum till corn

SECTION E:
Recurring Activities and Data Related to Land Application of Manure

1. Soil Testing Results

Table E-1-1. Soil test results used to develop the nutrient management plan.

Field ID	Subfield ID	Year of Soil Test	OM (%)	P Test Used	P	K	Mg	Ca	Soil Test Units	Soil pH	Buffer pH[1]	CEC[2] (meq/ 100g)
D1		2016	1.7	Bray P1	21	191	414	4,407	Lb/A	5.5	na	16.0
D2		2015	2.0	Bray P1	58	116	332	4,194	Lb/A	6.3	na	13.0

1. In Missouri Neutralizable Acidity (N.A.) is entered under Buffer pH in MMP. Used in developing Lime Recommendations.
2. CEC=Cation Exchange Capacity.

2. Crop Fertilizer Recommendations and Crop Removal Values

Table E-2-1. Recommended fertilizer rate and crop removal rate for each crop in each rotation for each field.

Field ID	Sub-Field ID	Crop Year	Planned Crop	Yield Goal	Yield Goal Units	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Used?[1] (Y or N)
D1		2017	Soybeans	42	Bu	0	65	95	147	35	60	N
D1		2018	Corn grain	140	Bu	145	90	75	126	63	42	N
D1		2019	Soybeans	42	Bu	0	65	95	147	35	60	N
D1		2020	Corn grain	140	Bu	145	90	75	126	63	42	N
D1		2021	Soybeans	42	Bu	0	65	95	147	35	60	N
Total						**290**	**375**	**435**	**693**	**231**	**264**	
D2		2017	Soybeans	42	Bu	0	15	120	147	35	60	N
D2		2018	Corn grain	140	Bu	145	25	100	126	63	42	N
D2		2019	Soybeans	42	Bu	0	15	120	147	35	60	N
D2		2020	Corn grain	140	Bu	145	25	100	126	63	42	N
D2		2021	Soybeans	42	Bu	0	15	120	147	35	60	N
Total						**290**	**95**	**560**	**693**	**231**	**264**	

1. When yes, please provide a table of the fields receiving custom fertilizer rate recommendations and listing the source of the custom recommendation.

3. Manure Test Values Used for Planning Purposes

Table E-3-1. Manure test values used in calculating manure application rates for planning purposes.

Provide justification for the selection of manure test values in Appendix 5.

Storage ID	Storage Type	DM (%)	Total N	Ammonia N	Phosphate (P_2O_5)	Potash (K_2O)	Units	Analysis Source (date)
Barn	Underfloor liquid storage		50.0	33.0	42.0	30.0	lbs/1000Gal	MWPS 18

4. Phosphorus Loss Assessment

Table E-4-1. Supporting information for fields assessed with the Missouri P Index – other supporting data and results.

Field ID	Subfield ID	Hydrologic Soil Group (A,B,C or D)	Hydrologic Condition (good, fair, poor)	Distance from center of field to sensitive water feature (feet)	P Index Particulate P Value	P Index Soluble P Value	P Index Total P Value	P Index Loss Assessment Rating
D1		D	good	1129	.7	.2	.9	Low
D2		D	good	1827	.6	.6	1.2	Low

Table E-4-2. Report steps that will be taken to reduce phosphorus loss from fields rated high or very high by phosphorus loss assessment.

Field ID	Subfield ID	P Index Loss Assessment Rating	Anticipated actions to reduce phosphorus loss
D1		Low	No till beans/ Minimum till corn
D2		Low	No till beans/ Minimum till corn

SECTION F
Field-by-Field Planned Manure and Fertilizer Applications and Projected Nutrient Balances

1. Planned Manure and Fertilizer Applications

Table F-1-1. Manure and fertilizer applications – focus on nutrient application rate.

Field	Sub-Field ID	App Month	App Year	Target Crop	Nutrient Source (Storage ID/ Fertilizer Product	Equipment Type/ Application Method	Rate/Acre	Total Amount Applied	Applied Units	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
D1		Apr	2017	Soybeans	Barn	Tankwagon	1,100	15,200	Gal	13.8	65	70	60
D1		Apr	2018	Corn grain	Barn	Tankwagon	2,400	33,600	Gal	14.0	141	153	131
D1		Apr	2019	Soybeans	Barn	Tankwagon	1,100	15,200	Gal	13.8	65	70	60
D1		Apr	2020	Corn grain	Barn	Tankwagon	2,400	33,600	Gal	14.0	141	153	131
D1		Apr	2021	Soybeans	Barn	Tankwagon	1,100	15,200	Gal	13.8	65	70	60
D1		Apr	2017	Soybeans	0-23-30	Surface broadcast	316	0	Lb	0.0	0	73	95
D1		Apr	2017	Soybeans	0-0-60	Surface broadcast	58	1,026	Lb	17.7	0	0	35
D1		Apr	2018	Corn grain	0-23-30	Surface broadcast	356	0	Lb	0.0	0	82	107
D1		Apr	2018	Corn grain	82-0-0	Inject	177	0	Lb	0.0	145	0	0
D1		Apr	2019	Soybeans	0-23-30	Surface broadcast	282	0	Lb	0.0	0	65	85
D1		Apr	2020	Corn grain	82-0-0	Inject	177	0	Lb	0.0	145	0	0
D1		Apr	2020	Corn grain	0-23-30	Surface broadcast	391	0	Lb	0.0	0	90	117
D1		Apr	2021	Soybeans	0-23-30	Surface broadcast	282	0	Lb	0.0	0	65	85
D2		Apr	2017	Soybeans	Barn	Tankwagon	1,000	19,200	Gal	19.2	59	64	54
D2		Apr	2018	Corn grain	Barn	Tankwagon	2,400	45,600	Gal	19.0	141	153	131
D2		Apr	2019	Soybeans	Barn	Tankwagon	1,000	19,200	Gal	19.2	59	64	54
D2		Apr	2020	Corn grain	Barn	Tankwagon	2,400	45,600	Gal	19.0	141	153	131

Field	Sub-Field ID	App Month	App Year	Target Crop	Nutrient Source (Storage ID/ Fertilizer Product	Equipment Type/ Application Method	Rate/Acre	Total Amount Applied	Applied Units	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
D2		Apr	2021	Soybeans	Barn	Tankwagon	1,000	19,200	Gal	19.2	59	64	54
D2		Apr	2017	Soybeans	0-0-60	Surface broadcast	108	2,300	Lb	21.3	0	0	65
D2		Apr	2017	Soybeans	0-23-30	Surface broadcast	400	0	Lb	0.0	0	92	120
D2		Apr	2018	Corn grain	82-0-0	Inject	177	0	Lb	0.0	145	0	0
D2		Apr	2018	Corn grain	0-0-60	Surface broadcast	366	0	Lb	0.0	0	0	220
D2		Apr	2019	Soybeans	0-0-60	Surface broadcast	53	1,128	Lb	21.3	0	0	32
D2		Apr	2020	Corn grain	0-0-60	Surface broadcast	366	0	Lb	0.0	0	0	220
D2		Apr	2020	Corn grain	82-0-0	Inject	177	0	Lb	0.0	145	0	0
D2		Apr	2021	Soybeans	0-0-60	Surface broadcast	220	4,685	Lb	21.3	0	0	132

2. Field Nutrient Balance

Table F-2-1. Field nutrient balance based on crop removal. Note that nitrogen crop values based on fertilizer recommendations for non-legume crops. Note that manure cannot be applied on a field with a phosphate balance greater than 500 lbs/acre.

			Applied Manure Nutrients (lbs/acre)			Total Applied Nutrients (lbs/acre)			Crop Removal[1] (lbs/acre)			Nutrient Balance Based on Crop Removal (lbs/acre)			Running P_2O_5 balance (lbs/acre)
Field	**Sub-Field ID**	**Crop Year**	**N**	**P_2O_5**	**K_2O**	**N**	**P_2O_5**	**K_2O**	**N**	**P_2O_5**	**K_2O**	**N**	**P_2O_5**	**K_2O**	**P_2O_5**
D1		2017	65	70	60	65	143	190	147	35	60	-82	108	130	108
D1		2018	141	153	131	286	235	238	126	63	42	160	172	196	280
D1		2019	65	70	60	65	135	145	147	35	60	-82	100	85	380
D1		2020	141	153	131	286	243	248	126	63	42	160	180	206	560
D1		2021	65	70	60	65	135	145	147	35	60	-82	100	85	660
D2		2017	59	64	54	59	156	239	147	35	60	-88	121	179	121
D2		2018	141	153	131	286	153	351	126	63	42	160	90	309	211
D2		2019	59	64	54	59	64	86	147	35	60	-88	29	26	240
D2		2020	141	153	131	286	153	351	126	63	42	160	90	309	330
D2		2021	59	64	54	59	64	186	147	35	60	-88	29	126	359

3. Annual Summary of Projected Manure Inventory

Table F-3-1. Summary of projected manure collection, imports, exports and transfers and end-of-year totals.

Manure Source	Plan Period	On Hand at Start of Period	Total Generated	Total Imported	Total Trans-ferred In	Total Applied	Total Exported	Total Trans-ferred Out	On Hand at End of Period	Units
Barn	Nov '16 - Oct '17	0	1,495,162	0	0	34,400	700,000	0	760,762	Gal
Barn	Nov '17 - Oct '18	760,762	1,495,162	0	0	79,200	1,400,000	0	776,724	Gal
Barn	Nov '18 - Oct '19	776,724	1,495,162	0	0	34,400	1,450,000	0	787,486	Gal
Barn	Nov '19 - Oct '20	787,486	1,495,162	0	0	79,200	1,400,000	0	803,448	Gal
Barn	Nov '20 - Oct '21	803,448	1,495,162	0	0	34,400	1,450,000	0	814,210	Gal

Document Source Information

Report based on information from Manure Management Planer MMP 0.3.5.0

Plan:

File:	C:\Projects\2016\16-3384 Dale Dunlap\dunlap.mmp
Initialized:	3/24/2015
Last Saved:	9/29/2016 2:56:48 PM
Exported:	9/29/2016 2:56:55 PM
Title:	
Years in Plan:	5
Plan Start Year:	2016
Plan Start Month:	11

Operation:

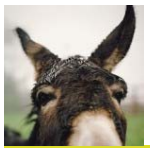
Name: Dale Dunlap

Operation Contact:

Dale Dunlap
10216 Rt. O
Perry MO 63462
(573)721-1882 (office)
(home)

Appendix 1

AFO Site Report



AgSite Report

Version 1.0
Report prepared Sep 30, 2016

UNIVERSITY OF MISSOURI Extension

Evaluation Site

Geographic Summary More info: Map | Page

Evaluation Site Area	58.0 Acres
County	Monroe (MO)
Legal Description (Central Section)	Sec. 25, T53N, R8W, 5th PM
Center of Site Latitude/Longitude (Degrees)	39D 20' 37" N 91D 45' 15" W
Center of Site Latitude/Longitude (Decimal Degrees)	39.34375 N -91.75433 W

Demographics

Population Map | Page

Distance	Number of Persons	Persons per Square Mile
Within 1 Mile	7	2.2
Within 5 Miles	458	5.8

Source: U.S. Census Bureau, 2010 Decennial Census

Communities within 5 miles Map | Page

Incorporated Area	Population (2013 estimate)	Distance from site (mi.)
No Incorporated Areas	0	0

Source: U.S. Census Bureau, 2013 American Community Survey Geographic Boundaries

Hydrologic Summary

Streams (length in feet)

Page

Total Streams	Perennial	Intermittent	Canal or Ditch	Pipelines Carrying Water	Other Streams
0	0	0	0	0	0

Source: USGS National Hydrography Dataset (NHD), 2014

Waterbodies (area in acres)

Page

Total Waterbodies	River	Lake / Pond	Swamp / Marsh	Other Waterbody
0.5	0	0.5	0	0

Source: USGS National Hydrography Dataset (NHD), 2014

Wetlands

Map | Page

Wetland Description	Acres
Freshwater Pond	0.0

Source: U.S. Fish & Wildlife Service, National Wetlands Inventory, accessed November 2014. (metadata)

12-Digit Hydrologic Units

Map | Page

HU ID	Watershed (HU Name)	Farm Acres in HU	Total HU Acreage
071100070103	West Lick Creek	7.9	24,974
071100060509	Elm Branch-South Fork Salt River	50.1	16,211

Source: USGS Watershed Boundary Dataset, 2015

Slope and Landscape Features

Soils

Map | Page

Map Unit Symbol	Map Unit Name	Acres	Percent of Area	Hydrologic Group
50012	Putnam silt loam, 0 to 1 percent slopes	46.1	79.5	D
50059	Mexico silt loam, 1 to 4 percent slopes, eroded	7.1	12.2	D
50058	Mexico silt loam, 0 to 2 percent slopes	3.6	6.2	D
50035	Leonard silt loam, 5 to 9 percent slopes, eroded	1.2	2.1	C/D

Source: USDA NRCS SSURGO Database, accessed January 2015 via the Geospatial Data Gateway

Environmental Concerns

Threatened and Endangered Species

Page

Species	County	Group	Status
Gray bat	Monroe (MO)	Mammals	Endangered
Indiana bat	Monroe (MO)	Mammals	Endangered
Northern Long-Eared Bat	Monroe (MO)	Mammals	Threatened

Source: U.S. Fish & Wildlife Service Environmental Conservation Online System (ECOS), obtained by request, July 31, 2015. Note: the listing of endangered species in your county does not indicate that they are present on your land.

Flood Hazards

Map | Page

Acres in Floodway	Acres in 100-Year Floodplain	Acres in 500-Year Floodplain	Notes
0	0	0	None

Source: FEMA National Flood Hazard Layer, June 2015

Karst Geology

Map | Page

Karst Type	Geologic Unit	Acres
Carbonate rocks buried under ≤50 ft of glacially derived insoluble sediments in a humid climate	MARMATON GROUP	58.0

Source: Weary, D.J., and Doctor, D.H., 2014, Karst in the United States: A digital map compilation and database: U.S. Geological Survey Open-File Report 2014–1156

Climate Summary

30-Year Normal Precipitation (Inches)

Map | Page

Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
41.2	1.9	2.1	2.8	3.9	5.0	4.6	4.5	3.9	3.8	3.1	3.2	2.4

Source: PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, created July 2015 for the period 1981-2010.

30-Year Normal Temperatures (Fahrenheit)

Map | Page

	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	64.4	37.3	42.4	53.8	65.6	74.8	83.6	87.8	87.0	79.4	67.4	53.9	40.2
Mean	54.0	28.4	32.5	43.0	54.2	63.9	73.0	77.3	76.0	67.7	56.0	44.3	31.5
Low	43.5	19.5	22.7	32.3	42.9	52.9	62.4	66.7	64.9	56.0	44.6	34.7	22.8

Source: PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, created July 2015 for the period 1981-2010.

Predicted Maximum 24-Hour Precipitation (inches)

Map | Page

25-Year	100-Year
5.7	7.2

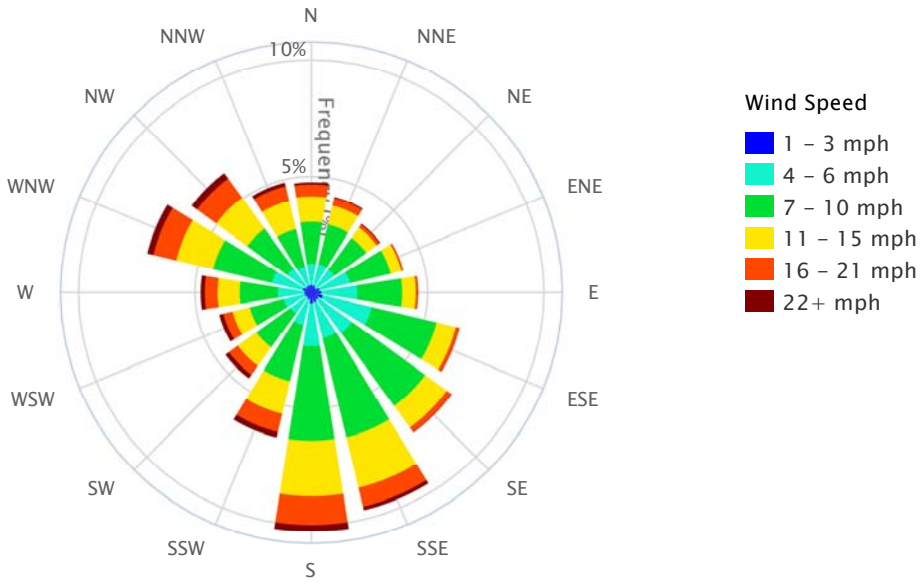
Source: NOAA National Weather Service NOAA Atlas 14, Volumes 1,2,6,8,9,10 (2004-2015).

Wind Rose Page

Nearest Climate Station - 44.1 Miles SW

COLUMBIA REGIONAL AIRPORT (KCOU), MO

Calm winds: 5.20%, Variable direction winds:1.36%, Data period: 2008-2015



Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec

Chart indicates the frequency of winds blowing FROM a direction.
Source: NOAA NCEI Quality Controlled Local Climatological Data (QCLCD)

Other Nearby Stations

Station Name	Distance	Direction
QUINCY RGNL-BLDWN FLD ARPT (KUIN), IL	50.7 Miles	NE
JEFFERSON CITY MEMO ARPT (KJEF), MO	56.3 Miles	SSW
KIRKSVILLE REGIONAL ARPT (KIRK), MO	66.8 Miles	NW
SPIRIT OF ST LOUIS AIRPORT (KSUS), MO	75.8 Miles	ESE

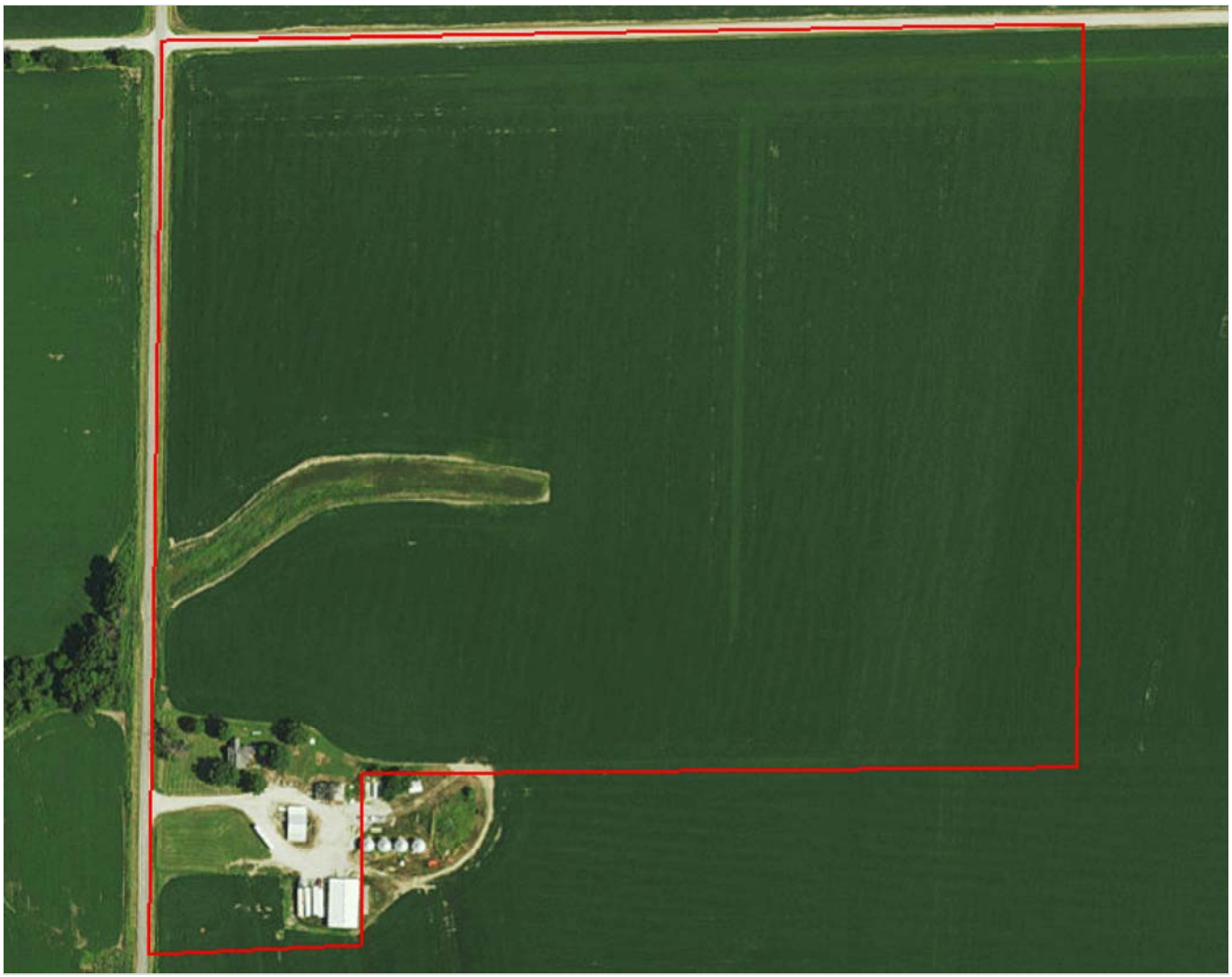
Land Use

Average land cover within 3 miles of center (years 2013, 2014, 2015; appr. total 18,097 ac.) Map | Page

Land Cover	Acres	Percent of Area
Soybeans	5,274	29
Grass/Pasture	3,588	20
Corn	3,390	19
Other	2,566	15
Deciduous Forest	2,576	14
Developed	596	3
Water	56	0
Wetlands	51	0

Source: US Department of Agriculture National Agricultural Statistics Service Cropland Data Layer

Assessment Area



Imagery from ESRI's World Imagery

Legend

Default Ag Site Assessment Area

The Ag Site Assessment Tool was designed by University of Missouri Extension for educational purposes.
The initial funding for this tool was provided by USDA-NIFA under Award Number 2012-49200-20032.

NORTH CENTRAL EXTENSION RISK MANAGEMENT EDUCATION

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

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This report prepared on Sep 30, 2016 by Community Commons for the University of Missouri College of Agriculture, Food and Natural Resources Extension.
For questions regarding content, contact Ray Massey. For problems with the site, contact Kevin Atherton at CARES.

Appendix 2

Example Record Keeping Documents

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM

CAFO RECORD KEEPING FORMS CHECKLIST

INSTRUCTIONS

1. Use the checklist to determine which of the record keeping forms are required for your operation and include them in your record keeping file. Forms for all record keeping requirements of the MOG01 (NPDES) and MOGS1 (State No Discharge) operating permits are included.
2. There will be multiple copies of some pages due to the unique characteristics of each operation. The forms can be filled out on a computer or they can be printed or copied and kept in a binder.
3. Information on the forms can be used to complete the annual report, which must be submitted by Feb. 15, of each year. Only specified forms need to be submitted with the annual report
4. All records must be retained for five years along with your operating permit, and nutrient management plan.

CHECKLIST

OPERATION NAME:	**PERMIT NUMBER**: MO**-**	**YEAR**
MANURE STORAGE		
1A. Spills and Overflows		
1B. Liquid Manure Storage Level Readings		
1C. Transfers Off-Farm		
1D. Rainfall Records (Required only for operations with open liquid storage)		
1E. Mortality Management		
TESTING RESULTS		
2A. Manure		
2B. Soils		
INSPECTIONS		
3A. Production Area Visual Inspections		
3B. Land Application Area Visual Inspections		
3C. Problems and Repairs		
LAND APPLICATION		
4A. Operational Monitoring		
4B. Nitrogen		
4C. Phosphorus		

1A - MANURE STORAGE. Spills and Overflows (List any corrective actions taken in 3B.)

PERMIT NUMBER **MO-**				YEAR		
Date	**Time**	**Cause of Discharge**	**Location**	**Discharge Rate** gallons or cu. ft./Sec	**Discharge Duration**	**Estimated Volume Discharged**[1] gallons or cu. ft.

Notes

[1] Estimated volume = discharge rate in gallons per second or cubic feet per second x duration (seconds). See record keeping requirements of your MOG01 or permit, for additional guidance.

Measure discharge or release of spills from manure handling and overflows from manure storages at the property line or immediately prior to entering the receiving stream.

Any discharge of manure, litter, process wastewater, or mortality by-products to surface waters of the state or release that crosses property boundaries shall be reported to the department as soon as practicable, but no later than 24 hours after the permittee becomes aware of the discharge. MOGS1 permitees see additional reporting requirements in Non-compliance reporting requirements of your permit.

If a discharge or release occurs, submit this page with the annual report.

1B - MANURE STORAGE. Liquid Manure Storage Level Readings

MANURE SOURCE	PERMIT NUMBER	YEAR
	MO	

Week	Date	Level Reading - Feet Below Overflow
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
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42		
43		
45		
46		
47		
48		
49		
50		
52		

Instructions: Record the liquid level weekly for each unique liquid manure storage structure. Use a separate sheet for each separate structure.

1C - MANURE STORAGE. Transfers (Off-farm)

PERMIT NUMBER	YEAR
MO	

Source[1]	Date of Transfer	Amount Transferred (gal. or ton)	Info to Buyer (check)		Name of Buyer	Address
			Current Manure Test Results	NMTS[3]		

Notes

[1] Deep pit, lagoon, basin, tank, sludge, separated solids, litter, mortality compost.

[2] Agitated, unagitated, cake litter, with or without bedding, composted litter.

[3] The current version of the Missouri CAFO Nutrient Management Technical Standard published by the Department of Natural Resources.

1D - MANURE STORAGE. Rainfall (Required for open liquid storage only)

PERMIT NUMBER

MO

YEAR

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1												
2												
3												
4												
5												
6												
7												
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26												
27												
28												
29												
30												
31												
Monthly Total												
YTD												

Instructions: Collect rainfall data for operations with open liquid manure storages only.

1E - MANURE STORAGE. Method of Mortality Management

PERMIT NUMBER **MO**	YEAR

Composting	Rendering	Sent to Landfill	Incineration	Burial[1]	Other

Records[2]:

Notes

[1] In accordance with 10 CSR 20-8.300(14), Class I operations shall not use burial as a method of disposing of routine mortalities. Burial is allowed for disposal for mass mortalities.

[2] Information recorded here can include weekly/monthly mortality numbers, mortality and composting procedures, mortality by-product management, or rendering facilities information.

2A - TESTING RESULTS. Manure Test Results (Annual manure analysis is required for all CAFO's, including export only operations.)

PERMIT NUMBER	YEAR
MO	

Source of Manure[1]	Type of Manure[2]	Sample Date	Moisture/Dry Matter (%) (Circle one)	Units lbs./1000 gal lbs/ton	TKN	NH_3-N	P_2O_5	K_2O	NO_3-N [3]

Notes

[1] Deep pit, lagoon, basin, litter, tank, sludge, separated solids, mortality compost.

[2] Agitated liquid pit/tank manure, unagitated lagoon/basin effluent, agitated lagoon/basin manure, poultry litter, poultry litter cake, bedded pack manure, stacked manure with or without bedding, composted litter, mortality compost or other composted manure.

[3] Report nitrate nitrogen only when applicable.

MOG01 permittees must submit a copy of the lab analysis sheets or this form with the annual report.

2B - TESTING RESULTS. Soil Test

PERMIT NUMBER	YEAR
MO	

Field ID[1]	**Soil Sampling Date**	**Units** ppm or lbs/ac (circle one)	**Soil Test P**[2]	**Soil Test P Rating**	**CEC** (meq/100g)	**Organic Matter** (%)

Notes

[1] Name of field as identified in nutrient management plan; only include fields under control (owned, rented, or leased) of the CAFO owner or operator.

[2] Samples should be analyzed using the Bray-1 P soil extraction procedure. If another procedure is used by the soil testing lab, this must be noted on this sheet.

MOG01 permittees must submit a copy of the lab analysis sheet(s) or this form with the Annual Report if soil samples were taken during the year.

3A - INSPECTIONS. Production Area Visual Inspections (List any deficiencies and corrective actions taken in 3C.)

PERMIT NUMBER	YEAR
MO	

Week	Stormwater [1] Date and Initial	Water Lines [2] Date and Initial	Manure Containment Structure [3] Date and Initial
1			
2			
3			
4			
5			
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50			
52			

Notes

[1] Record the weekly inspections of all stormwater diversion devices directing clean water away from the production area and channeling contaminated water to manure storages.

[2] Record each week the daily inspections of all wastewater lines within the production area and all drinking or cooling water lines that have the potential to leak into manure, litter or process wastewater structures. Record weekly that you inspected daily.

[3] Record weekly inspections of all manure, litter and process wastewater storage structures.

3B - LAND APPLICATION. Land Application Area Visual Inspections (List any deficiencies and corrective actions taken in 3C.)

PERMIT NUMBER **MO**		YEAR	
Land Application Equipment[1] Date and Initial	**Perimeter of Field[2]** Date and Initial	**Drifting of Spray[3]** Date and Initial	**Aboveground Irrigation Pipelines[4]** Date and Initial

Notes

[1] Periodically inspect land application equipment for leaks.
[2] Monitor the perimeter of application field to ensure wastewater does not run off.
[3] Monitor for drifting of spray irrigation.
[4] Hourly inspections of aboveground pipelines for leaks when in use.

3C - INSPECTIONS. Problems and Repairs

PERMIT NUMBER **MO**		YEAR	
Inspection Date	**Deficiencies Noted**	**Date of Repair[1]**	**Corrective Actions Taken**

Notes

[1] Deficiencies not corrected within 30 days shall have an explanation as to why corrective actions were delayed.

4A - LAND APPLICATION. Operational Monitoring

PERMIT NUMBER	YEAR	DATE LAND APPLICATION EQUIPMENT WAS CALIBRATED
MO		

Source of Manure[1]	**Type of Manure**[2]	**Field ID**[3]	**Date of Application**	**Weather**[4]	**Rainfall**[5]	**Soil Condition**[6]	**Application Method**[7]	**Rate** gal/ac or tons/ac	**Basis**[8] N or P	**PAN**[9] (lbs/ac)	**P_2O_5** (lbs/ac)	**Spreadable Acres**	**Total applied** (gal or tons) Circle one

Notes

[1] Deep pit, lagoon/basin, litter, tank, separated solids, compost.

[2] Agitated liquid pit/tank manure, unagitated lagoon/basin effluent, agitated lagoon, basin manure, lagoon/basin sludge, separated solids, poultry litter, poultry litter cake bedded pack manure, stacked manure with or without bedding, composted litter, mortality compost, other composted manure.

[3] Name of field receiving manure as identified in nutrient management plan; only include fields under control (owned, rented or leased) of the CAFO owner or operator.

[4] Record the weather conditions at the time of application; insert the codes that apply: CL – clear sky, RN – rain, SN – snowing, OV - overcast, FR – temperature below 32 degrees F.

[5] Record “Before” or “After” if a rainfall event occurred 24 hours prior to or after application.

[6] Soil condition at time of application: Dry, saturated, muddy, snow-covered or frozen.

[7] Injection, partial injection, surface application and incorporated (indicate number of days to incorporation), or surface application only.

[8] Write N or P to indicate if the application rate of the field is nitrogen based or phosphorus based.

[9] Plant Available Nitrogen.

4B - LAND APPLICATION MONITORING. Nitrogen Summary

PERMIT NUMBER

MO

YEAR

Field ID[1]	Spreadable Acres	Planned Crop	Projected Yield (bu. or ton/ac)	Planned N Recommendation[2] (lbs/ac)	Actual Applied N (lbs N/ac)			Actual Crop	Actual Yield (bu. or ton/ac)	Actual N Removal[4] (lbs/ac)	N Surplus (+) or Deficit (-)[4] (lbs N/ac)
					Manure PAN	Other N Sources[3]	Total PAN				

Notes

[1] Name of field receiving manure as identified in nutrient management plan; only include fields under control of the CAFO owner or operator.
[2] University of Missouri fertilizer recommendations should be used.
[3] Includes credits from previous legume crops and residual N from previous application.
[4] Crop N usage rate X actual crop yield, for legumes crop N content X crop yield.
[5] Total applied PAN minus actual N removal.

4C - LAND APPLICATION MONITORING. Phosphorus Summary

PERMIT NUMBER	YEAR
MO	

Field ID[1]	MO Soil Test P Rating	P Index Rating	Planned P Removal Rate[2] (lbs P_2O_5 /ac)	Actual Applied P (lbs P_2O_5 /ac)[3]			Actual P Removal[4] (lbs P_2O_5 /ac)	*Multi-year P Applications	
				P_2O_5 From Manure	Other P_2O_5 Sources	Total P_2O_5		Previous Balance[5]	Current Balance[6]

Notes

[1] Name of field as identified in nutrient management plan that is restricted to a P based application, which received manure or is utilizing a "multi-year phosphorus application;" only include fields under control of the CAFO owner or operator.

[2] Crop P usage rate X crop yield goal (University of Missouri fertilizer recommendations should be used).

[3] Enter amount applied for a yearly application or amount applied for a multi-year phosphorous application.

[4] Crop P usage rate X actual crop yield.

[5] Enter value from the current balance column from last year's form.

[6] For initial year of a multi-year phosphorous application this is the "Total P_2O_5" - Planned P Removal Rate. For subsequent years it is the previous balance - Planned P Removal Rate. If the difference is a negative number enter "0".

***In accordance with 10 CSR 20-6.300(1)(B)13, fields utilizing a "Multi-year phosphorous application" cannot receive additional applications of manure, litter, or process wastewater until the applied phosphorous has been removed. The amount applied in a multi-year phosphorous application cannot exceed that year's crop N recommendation.**

Appendix 3

Operation & Maintenance Plan

DALE DUNLAP FARM

OPERATION AND MAINTENANCE PLAN

INSPECTION PROCEDURE

FARM FACILITIES

FREQUENCY: Once per day.

1. Check cleanout risers to be sure that caps are present and secure and that there are no holes or cracks in the caps or pipe, and no signs of leaks. If you see a leak, follow the Emergency Response Procedure posted in the farm office.

2. Walk around the barns and check for leaks or unusual conditions. If you see a problem, follow the Emergency Response Procedure posted in the farm office.

3. Inspect the recycle lines and pump to be sure they are running properly. If you see a problem, follow the Emergency Response Procedure posted in the farm office.

4. Once per day, check general conditions around the Lagoon. If a problem is noted, follow the Emergency Response Procedure posted in the farm office.

5. Visually inspect Concrete Pits for condition and concrete integrity. Concrete shall be evaluated to ensure the following:
    a. No cracks
    b. No leaning of walls
    c. The presence of rodent burrows/signs of rodent activities
    d. Signs of erosion (around basin foundation)

INSPECTION PROCEDURE

LAGOON & CONCRETE PIT

In order to ensure continuing lagoon integrity, the following monitoring procedures will be conducted:

FREQUENCY: Once per week.

1. Visually inspect lagoon for condition and berm integrity. Grass cover on the lagoon berm shall be evaluated to ensure the following:
    e. Adequate coverage – no bare spots
    f. Grass is of appropriate height (under 12")
    g. The presence of rodent burrows/signs of rodent activities
    h. The presence of encroaching woody species
    i. Signs of erosion (inside and outside slopes)

2. Inspect emergency spillway to be sure that is clear and free from obstruction.

3. Check for the presence of debris in the lagoon. If debris is present, make arrangements for removal.

4. **On A Weekly Basis:** Check lagoon levels. Read level from the permanent measuring marker in the lagoon. Measure the level to the nearest ¼ foot below the bottom of the emergency spillway.

5. **On A Weekly Basis:** Check Concrete Pit levels. Read level from the measuring marker stick by dropping the stick to the pit bottom and then removing the stick to read water level. Measure the level to the nearest .1 foot above the pit floor.

MAINTENANCE

FARM FACILITIES

When problems (e.g. broken clean out caps, etc.) are noted that require follow up but are not considered emergency situations (i.e. no immediate threat to the environment), the following steps shall be taken to ensure the problem is corrected in a timely fashion:

1. Record repairs made to gravity sewers, recycle lines, irrigation lines, as well as other equipment associated with land and nutrient management activities. Record the following information:

   Description of problem
   Date repair made
   Material used to complete repair
   Personnel involved

2. In the event that a maintenance problem occurs which constitutes an immediate threat to the environment, employees are instructed to follow the Emergency Response Plan immediately.

MOWING

Periodic mowing is necessary at various locations on the farm to prevent potential environmental problems, and to improve aesthetics.

Lagoon

Exposed front slopes, berm tops, and back slopes on the lagoon are maintained with a cool season grass cover. The primary objectives of the lagoon vegetation maintenance program are to:

1. Mow the grass as often as necessary to maintain it at 12" or less in height and to prevent the "heading out" of any grass or weed species that are present.

2. Maintain the grass at as even level as possible.

Lagoon berms are mowed a minimum of three times per year to provide ready access to the lagoon, control weeds and brush, and maintain a pleasing

appearance. The lagoon berms shall be kept free of burrowing animals so as not to jeopardize integrity of the berms or clay liner.

DEBRIS REMOVAL

During inspections, the Lagoon and basin shall be checked for the presence of floating debris. If debris is noted in the Lagoon or basin, measures shall be taken to remove the debris in a timely fashion.

1. Determine what personnel should be enlisted to assist in debris removal. If an outside contractor is needed, contact Bob Zeysing for making the appropriate arrangements.

2. Remove debris using appropriate actions and personnel.

3. Dispose of removed debris in a proper location.

EMERGENCY MAINTENANCE

If a problem is discovered that requires immediate attention, take the following actions:

1. If work can be completed in-house, mobilize the appropriate personnel to rectify the problem.

2. If work cannot be completed in-house, enlist any necessary outside service directly to repair the problem.

In situations posing a potential threat to the integrity of the Lagoon or basin operation or any of the land and nutrient management program refer to the **Emergency Response Plan** for guidance in formulating appropriate follow-up actions.

NUTRIENT MANAGEMENT PLANNING

OVERVIEW

Manure is a by-product of any type of livestock operation. At The DALE DUNLAP FARM, the barn pits are drained routinely to keep the barn free of animal waste and to ensure a healthy environment for the employees and animals. Manure and associated wastewater (including flush water) is transported via buried PVC pipe to the anaerobic Lagoon and Concrete Pit.

Manure components collected in the concrete pit at the nursery site, namely, nitrogen, phosphorus, and potassium, (as well as trace minerals and nutrients) are beneficial to crops and can be effectively used as replacements for chemical fertilizer in normal farming activities.

The anaerobic lagoon provides basic treatment to the animal waste, breaking it down (via the activity of anaerobic bacteria) into its primary components. These components, namely, nitrogen, phosphorus, and potassium, (as well as trace minerals and nutrients) are beneficial to crops and can be effectively used as replacements for chemical fertilizer in normal farming activities.

Typical crops raised on the farm include but may not be limited to: corn and soybeans.

WASTEWATER NUTRIENTS

The primary nutrients found in Hog manure are nitrogen, phosphorus and potassium. Nitrate nitrogen (nitrate is NO3-N, a water soluble, negatively charged ion) in water can be harmful to humans. Excessive nutrients and decomposing organic nutrients (N, P, K, S) can be responsible for algae blooms and weed growth in water, which can reduce available oxygen for aquatic species. Along with the nutrients, manure may increase salinity on some soils. Hog manure does benefit soil quality. Along with nitrogen, phosphorus and potassium, several trace minerals are also found in manure. If properly managed, the nutrients can reduce or eliminate commercial fertilizer needs for many crops. Along with the nutrient value, Hog manure can increase microorganisms and improve soil organic matter, soil tilth, and soil structure. These improvements in soil quality can reduce erosion, improve drainage, and increase soil productivity.

Nitrogen: Nitrogen is important for all plants and animals; the nitrogen in manure is no different than the nitrogen found in synthetic fertilizers. Nitrogen comes from many sources and in many different forms. The nutrient and pollution potential of manure nitrogen depends on the form and amount in the environment. Understanding the different forms allows you to better manage this important nutrient.

The two main forms of nitrogen (N) in Hog manure are organic N (proteins, amino acids and urea, which are unavailable to plants) and inorganic N (ammonium, nitrates, ammonia). Ammonium N is the predominant component of available nitrogen in manure.

When manure is applied to soil, the organic N begins to break down to inorganic N, which is available to plants. This process is called ammonification or mineralization, and is affected by temperature, moisture, and time. These same processes occur in an anaerobic storage lagoon, which is why nitrogen values are reduced in these systems. Warm conditions have a higher rate of organic N conversion than cooler temperatures. Approximately 33-55% of organic N is converted to ammonium or available N each year after the manure is land applied.

When organic N is converted to available N, it starts as ammonium N. Ammonium N is available for plant uptake and is not mobile in the soil. The process of nitrification eventually converts ammonium N to nitrate N. While nitrate N is available to plants, it is also susceptible to denitrification (loss to the air) and to leaching. Ammonia N can be quickly lost by being converted to ammonium and volatilized.

Phosphorus and Potassium: Phosphorus and potassium are also important nutrient components of manure. Both nutrients are needed for proper plant and root growth. While they generally bind tightly with soil, they can move into surface waters by moving on eroded soil particles. Phosphorus may move directly into surface waters in areas with extremely high phosphorus levels. Excessive concentrations of phosphorus in water can contribute to excessive aquatic plant growth and depletion of oxygen. However, phosphorus and potassium have little potential for leaching and have no direct toxic effects on humans or wildlife. By using proper conservation techniques (such as conservation tillage, terraces, filter strips, etc.) movement of phosphorus or potassium into surface water can be reduced.

DEVELOPING A NUTRIENT MANAGEMENT PLAN

Several factors are considered in the development of a sound nutrient management plan, including: separated solids analysis, lagoon water analysis, the amount of plant available nitrogen (PAN), amount of land available, cropping program, and application procedures.

WASTEWATER ANALYSIS

Current regulations dictate that nutrient management plans be based on nitrogen levels, therefore land requirements to fulfill land application goals are based partially on the concentration of nitrogen in the lagoon water and solid manure to be land applied. More than the other two primary nutrients in manure (phosphorus and potassium) the concentration of nitrogen in lagoon water varies with water temperature and weather

conditions. In order to develop the best overall estimate of total nitrogen levels in the Lagoon, they must be sampled annually.

SAMPLING PROTOCOL

It is recommended that UMC Science and Technology Guide "Collecting and Preserving Waste and Wastewater Samples for Analysis" and University Extension Water Quality publication "Laboratory Analysis of Manure" be followed. A copy of each is included with this manual.

LAGOON AND CONCRETE PIT WATER

1. Using plastic bottles, collect samples of lagoon water at 12 – 24 inches below surface. Collect samples from the Concrete Pit at 12 – 72 inches below surface.

2. Pour 50 ml of liquid into a second sample bottle. Discard the remainder of the first sample into the lagoon or basin.

3. Repeat this process at six more spots, each time pouring approximately 50 ml into the second sample bottle so that the second bottle consist of 350 ml of liquid more or less, collected from a minimum of seven different locations.

4. Secure the lid for each sample bottle and fill out and attach the appropriate sample identification label and date each bottle.

5. Deliver samples directly to laboratory.

SAMPLE ANALYSIS

Each sample shall be analyzed by a qualified analytical laboratory for the constituents identified in the following table:

Table of Analysis Constituents

Constituent	Unit
Kjeldahl Nitrogen	mg/l
Ammonia Nitrogen as N	mg/l
Nitrate Nitrogen as N	mg/l
Total phosphorus as P	mg/l

A copy of the analysis shall be used in the preparation and modification of the annual cropping plans.

DETERMINING LAND NEEDS

Nutrient management plans using DNR recommended methodologies shall be prepared each year for each field in the operation to achieve the best program for even distribution of nutrients from the manure.

It is recommended that University Extension Water Quality Guide "Reduce Environmental Problems with Proper Land Application of Animal Waste" and "Land Application Considerations for Animal Waste" be reviewed by all Land Application personnel. A copy of each is included with this manual.

Crops

Plants have different capacities to utilize nutrients, in particular nitrogen. Current state regulations dictate that cropping plans be developed to account for nitrogen loading and uptake by crops. Several references are recommended by the DNR to determine nutrient uptake potential of different crops. They are:

Midwest Plan Service. 1993. **Livestock Waste Facilities Handbook**.

Buchholz, D. 1983, Reprinted 1989. **Soil Test Interpretations and Recommendations Handbook**. University of Missouri; College of Agriculture.

Natural Resources Conservation Service. **Soil Interpretation Manual**.

Tables from these sources which identify nutrient uptake rates by various crops are included in this report.

Soil Sampling

In order to correctly estimate the available nutrients in the soil, soil tests should be conducted every year.

Sampling locations should be determined based on soil type and statistically sound sampling methods. A standard soil sampling protocol (MU Guide: "How To Get A Good Soil Sample") should be followed. A copy of the sampling protocol is included with this document.

Lagoon Pumpdown Levels

Pumping operations will be initiated before the water level reaches the upper pumpdown marker. As a precautionary safety measure, the lagoon has been designed with a safety volume depth of 1 feet below the full pool level. The lagoon shall be pumped down as close as possible to the lower pumpdown markers prior to permanent ground freezing each year to insure that full lagoon storage is available during the winter and spring months.

DETERMINING PLANT AVAILABLE NITROGEN

Plant Available Nitrogen (PAN) is a measurement of the amount of nitrogen in the soil which is in a form which is readily available for use by vegetation. As previously stated, nitrogen exists in many forms, however some forms are more easily accessed by plants than others. Nitrate nitrogen (NO) is the form most commonly used by plants. PAN calculations take into consideration the amount of nitrogen present in all forms-the amount of nitrogen available in the manure, nitrogen from "native/soil" sources {sRON} and from previous manure or applications {mRON} – and compares these values with the nitrogen needs of the crop to be grown. The Missouri DNR has developed a worksheet to determine PAN. This worksheet should be used in the formulation of a nutrient management plan. A copy of the worksheet is provided. A professional agronomist or engineer should be employed on an annual basis to aid in completing the calculations.

The procedure for determining PAN follows (Also see enclosed Missouri DNR Concentrated Animal Feeding Operation Plant Available Nitrogen Procedure):

Procedure to Determine Plant Available Nitrogen

1. One Missouri DNR PAN worksheet shall be used for each field on each farm.

2. Fill out worksheet on a field by field basis, using the crop that is planed to be grown the following year in the calculation.

3. Use soil sample analysis to fill in Soil Residual Organic Nitrogen (sRON).

4. Use Lagoon analysis to determine Manure Plant Available Nitrogen (mPAN).

5. Use past pumping records, water use records, and rainfall data to calculate total volume of wastewater to be pumped in upcoming growing season.

6. Using DNR worksheet and crop to be grown, calculate nutrient loading for every field. In no case should nutrient loading projections exceed land use capacity. If PAN requirements exceed nutrient loading capacity of pumping acreage,

modifications shall be made to the cropping plan to incorporate crops with a heavier nutrient loading capacity.

7. If modifications to cropping scenario do not alleviate nutrient loading concerns, then additional land shall be secured to apply waste on.

SCHEDULING APPLICATION ACTIVITIES

Several conditions (mostly weather-related) may require modification and adjustment of application schedules. These are described below.

Determining Number of Days Suitable for Application

Application is permitted to occur during seasons when the ground is not frozen, typically from March 1 through December 15 (approximately 285 days). If conditions remain favorable for application beyond the duration of the permitted pumping schedule, then application may continue.

Land application is not permitted during rain events, The normal occurrence of rainy days must be included in the preparation of application schedules for this time period. In order to develop an accurate estimate of the number of non-rainy days during the season, the following shall be conducted, prior to commencing the land application season every year.

1. Review the land application history for the three previous growing seasons.

2. Total up the number of days on which land application occurred during the previous three seasons.

3. Divide by three to determine the number of days available for the current growing season.

4. Include the estimated available land application days in upcoming year's nutrient management plan.

Adjusting Application Rates

The PAN procedure is recommended by DNR to estimate the nutrient loading capacity of each field. Land application procedures, as outlined in this manual detail proper procedures for application. In addition to following proper procedures, the applicator must be capable of modifying the application program to accommodate a number of variables. Methods of addressing several of these variables are detailed below:

Soil Conditions

Precipitation events will reduce soil infiltration capacity while increasing soil moisture content. Overall soil field capacity (to reach saturation) will be reduced as well. Land Application procedures must take into account precipitation events, so that wastewater is not over-applied to an already saturated field. Application rates must be reduced on fields that have received (or are about to receive) significant (0.5") amounts of rainfall. When planning land application activities, the Applicator must consider the following conditions:

Conditions Requiring Adjustment of Application Rates

1. No land application shall be conducted while it is raining.

2. If land application is being conducted and it starts to rain, immediately cease all land application activities.

3. Check the local weather forecast for current weather data every morning before commencing land application activities. If a greater than 80% chance of rainfall is forecast for the next 24 hours, limit land application activities locations which can be quickly stopped should rainfall begin.

4. If a significant chance of rain is forecast, continue checking storm patterns throughout the day to determine if an imminent threat for rain still remains.

5. Following a significant rainfall (>0.5") or prolonged rainfall events, visually inspect the field before commencing land application. Signs of ponding water or saturated soils, should be noted. If these are present, no land application shall be commenced on the field. Continue to check the field to determine when conditions are appropriate to commence land application.

6. Consider the previous long-term weather and site conditions (i.e has it been several days of rain?, are soils already saturated?, or has it been a prolonged dry spell with one large rain event?) when determining the appropriate time to commence pumping following a heavy rain storm.

7. Consider the prevailing wind, both in terms of intensity and direction. If wind is such that application on specific fields upwind of neighbors could result in unusual level of odor reaching that neighbor's property, than another field shall be selected for application, if possible

Neighbor Considerations

The following program is recommended to insure that pumping activities do not unduly impose on neighbors.

1. No pumping is conducted over Holidays/Holiday weekends unless **absolutely** necessary to meet management standards.

2. If neighbors contact the Farm to inform of a special outdoor event they are planning, then no land application will be conducted upwind of that neighbor's property on the given day.

3. Land application should be minimized on lands upwind of neighbors on those days when winds are excessively strong.

NUTRIENT APPLICATION EQUIPMENT

Traveling Gun
Injection Unit with Drag Hose.
Aerway Unit with Drag Hose.
Tankwagons
Manure Spreader

Prior to commencing land application, equipment shall be inspected to ensure that it is in proper working order. If repairs to the equipment are needed, the applicator shall make the repair. It the repair is such that the integrity of land application operations will be jeopardized until it is completed, then no land application shall be conducted using the broken piece of equipment. If land application can be safely continued before the repair is made, then land application may commence. In any case, equipment should be repaired in a timely fashion.

START-UP PROCEDURES
The following general process shall be used every day before beginning land application operations:

LAND APPLICATION

1. Every morning, check the local weather forecast to be sure conditions are right for land application.

2. Select a field for land application, check pumping summary to be sure that the selected field has not yet reached its maximum application nutrient application rate.

3. If field is still able to receive manure, then continue with start up procedures. If field has already reached its maximum loading rate, then repeat selection process to pick another field.

RECORDKEEPING

Careful record keeping is essential to the success of the Nutrient Management program. The following information shall be recorded with each land application event.

- Date
- Field location
- Pump rating
- Estimated total application

The pumping summaries will provide a detailed overview of pumping activities; specifically which fields were applied on, total manure applied per field, and a running total of manure applied per field in relation to its total projected application rate in the Land and Nutrient Management Plan developed for the crop year. The summary reports will enable the applicator to apply the proper amount of manure to fields, while properly spacing applications over an appropriate period in the growing season.

Dead Animal Disposal

Dead animal carcasses from the Hog operation will be managed according to the Missouri Department of Agriculture's requirements for dead animal disposal. Dead animals from this site will be composted.

If in the event it is necessary to bury any animals, the following Missouri Department of Agriculture regulations shall be followed:

1) For areas defined by the Department of Natural Resources, Division of Geology and Land Survey, as not having major groundwater contamination potential (Note: this area is defined as such), the maximum loading rate shall be limited to:

a) Seven cattle, **44 swine**, forty seven sheep, and beginning July 1, 1995, four hundred turkey carcasses or 2000 poultry carcasses on any given acre per year; or

b) All other species and immature cattle, **swine**, sheep, and beginning July 1,

1995, turkeys or poultry shall be limited to 7000 ponds of animals on any given acre per year;

2) The maximum amount of land that shall be used for on-site burial of animals on any person's property during a given year shall be limited to ten percent of the total land owned by that person or one acre, whichever is greater; and

3) Burial sites shall not be located in low-lying areas subject to flooding; and

4) The lowest elevation of the burial pits shall be six feet or less below the surface of the ground; and

5) The dead animals shall be immediately covered with a minimum of six inches of soil and a final cover of a minimum of thirty inches of soil; and

6) Carcasses shall not be placed on the ground, in a ditch, at the base of a hill, or in a cavern and covered with soil; and

7) The abdominal cavity of carcasses over 150 pounds shall be punctured to allow escape of putrefactive gasses; and

8) The location of dead animal burial sites shall be in accordance with the following separation distances:

a) At least 300 feet from any wells, surface water intake structures, public water supply lakes, springs or sinkholes; and
b) At least 50 feet from adjacent property lines; and
c) At least 300 feet from any existing neighboring residence; and
d) More than 100 feet from any body of surface water such as a stream, lake pond, or intermittent stream.

Calibrating Manure Spreaders

Charles D. Fulhage
Department of Agricultural Engineering

Land application is the primary means of using livestock wastes in Missouri. Properly spreading manure on cropland is an environmentally acceptable means of managing wastes and, at the same time, realizing a benefit from the manure's fertilizer value.

With the increased environmental concern and the need to closely match the fertilizer needs of the crop, farmers can no longer afford to just "spread manure." The land application operation should be given the same attention as spreading commercial fertilizer.

With knowledge of crop type, yield goal, soil tests and manure analysis, you can determine the needed rate of manure application. However, another critical step in obtaining this rate in the field is the correct spreader setting, operating speed and travel lane spacing.

Determining these factors is called "calibrating" the manure spreader. Calibrating a manure spreader requires measuring the weight of manure spread on a given ground area with a given travel speed, spreader setting, power take-off speed, lane spacing and other factors.

Determining manure spreader capacity

If the capacity of a manure spreader is known and the land area over which this amount of manure is spread is measured, then the application rate can be calculated by dividing the weight of manure spread by the area covered. It is important to understand the units of measurement used for manure application.

Solid or semisolid manure is usually handled in box-type or open-tank spreaders, and manure application rate is expressed in tons per acre. Nutrient concentrations in pounds per ton can be estimated, or calculated, from the laboratory analysis. Then, the nutrient application rate in pounds per acre is determined because tons per acre of manure application is known.

Liquid, or slurry, manure is usually handled by tank wagons, and the application rate is expressed in gallons per acre. Nutrient concentrations in pounds per gallon (or pounds per 1,000 gallons) are estimated, or obtained, from the laboratory analysis and used with the application rate in gallons per acre to obtain pounds per acre nutrient applied.

For calibration purposes, the capacity of a spreader in tons (for solid manure), or in gallons (for liquid manure) must be known. The volumetric capacity of spreaders is generally provided by the manufacturer. This capacity may be given as a typical "heaped" load condition or as a "struck" load condition. The struck load condition is the volume contained in the level-full box.

Caution should be exercised in using manufacturer's data for spreader volume. The standard used by most manufacturers in calculating spreader volume assumes a 60-degree angle of repose of the heaped load in the spreader. This may not be attainable with your particular type of manure or loading equipment.

A more accurate approach may be to calculate the volume from measurements of the appropriate dimensions of the spreader box and the height of a typical heaped load. Calculate rectangular box-type spreader capacities by multiplying length by width by height and adding the volume of the heaped portion to obtain total volume (Figure 1).

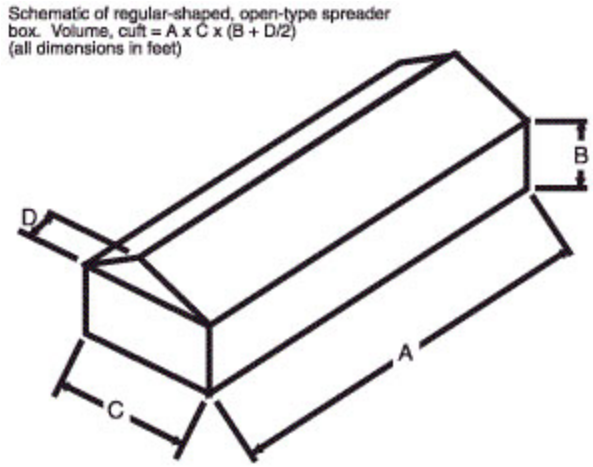

Figure 1
Three-dimensional view of a heaped-box spreader with dimensions and volume calculations.

Spreaders with irregular cross sections are somewhat more complicated. However, volume can be obtained rather easily by calculating volume segments separately and adding them together for the total (Figure 2).

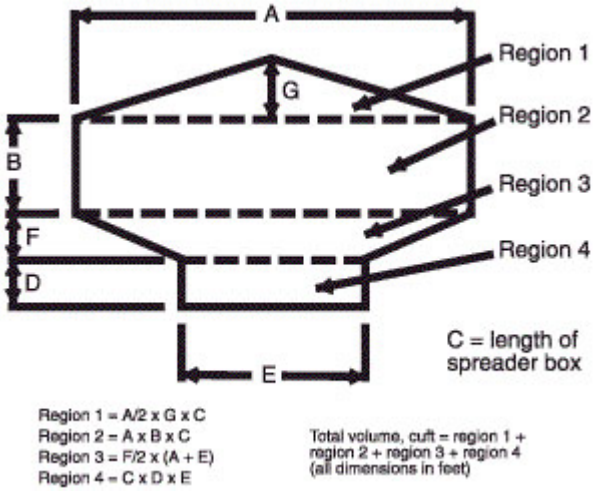

Figure 2
Three-dimensional view of a heaped-irregular shaped spreader with dimensions and volume calculations.

Closed-tank liquid manure spreaders generally have the shape of a cylindrical horizontal tank, and volume is expressed by the manufacturer in gallons. If manufacturer's data is not available, tank volume can be calculated as follows:

Tank volume, gallons = 5.87 x (tank length, feet) x (tank diameter, feet) x (tank diameter, feet)

Open-tank liquid manure spreaders may have an irregular cross section similar to some open-box solid manure spreaders. In these cases, volume is calculated in a manner similar to that shown in Figure 2. Obviously, open-box liquid manure spreaders will not have a "heaped" volume.

All liquid manure information is calculated on a per gallon basis. The computation of pounds of nutrients per load is found by multiplying the number of gallons per load by the pounds of nutrients per gallon.

All solid and semisolid manure information is calculated on a per ton basis, which requires converting from volume measure to weight measure. In order to make this conversion, the bulk density (weight per cubic foot) of manure must be known, estimated or measured. Bulk density is largely dependent on moisture content of the manure. For example, a spreader load of poultry litter at 20 percent moisture content will be considerably heavier than the same spreader load at 10 percent moisture content. Yet, volume is approximately the same in both cases.

One way to determine bulk density is to weigh the loaded spreader, then divide this weight by the spreader volume. If access to scales is available, some percentage of the loads can be weighed -- one or two of every 10 loads -- and all loads assumed equal to the average of the weighed loads. However, scales are usually not available on-site, and another means of obtaining bulk density is needed.

An alternate method of obtaining bulk density involves weighing a known manure volume then using this information with volumetric spreader capacity to obtain spreader capacity in tons. A five-gallon bucket is usually available, has a volume of about two-thirds cubic feet, and is a convenient known volume to use for this measurement. The following steps outline the proper procedure for obtaining manure bulk density.

- Weigh the empty bucket and write the weight on the side.
- Fill the bucket with manure. Do not compact the manure any more than might occur in the spreader.

- Weigh the full bucket and subtract the empty bucket weight. The result is the manure weight.
- Multiply the manure weight by three, then divide the answer by two. This gives the manure bulk density in pounds per cubic foot.
- Multiply the manure bulk density (in pounds per cubic foot) by the spreader volume (in cubic feet) to get the weight of the spreader load in pounds. Divide by 2,000 to get tons.
- Repeat this procedure several times. Sample the manure at different places. Average the values to obtain a representative composite of the manure.

The pounds of nutrients per load of manure are then found by multiplying the tons of manure per load by the pounds of nutrients per ton (from a laboratory analysis).

Determining application rate

Method A

The average application rate in gallons or tons per acre can be calculated if the area over which one or more loads of manure has been spread is measured.

- To measure the area covered by one spreader load:
    - Mark the tractor tire by tying a piece of rope around some point on the tire. Move the tractor forward until the rope is on the ground. Mark the ground below the rope. Drive forward until the rope on the tire is on the ground again. Mark this point. Measure the distance in feet between the two marks on the ground. This is the travel distance for one tire revolution.
    - Count the number of times the tire mark comes to the top of the tire while spreading a load of manure in a straight line. Multiply this number by the distance found for one revolution in Step 1a. The result is the total length of manure spreader travel while unloading one load.
    - Measure the width of the spread manure path or travel lane spacing in feet.
    - Multiply the width of the path by the length of travel and divide by 43,560 to get the acres covered in spreading one load.
- Calculate the manure application rate as follows:
    - Divide the tons or gallons of manure applied by the area covered (in acres) to get tons, or gallons per acre. Also, divide the pounds of nutrients per load by the area covered to get pounds of nutrients per acre.
    - If more than one load is spread and the areas of coverage overlap, then use the net width of the coverage between the first and last path. Use the average length of a travel path multiplied by the net width to find the area.

Method B

This method can be used to measure or adjust the application rate of a spreader without measuring the entire area of application or knowing the capacity of the manure spreader. With this method, a sheet of plastic is placed on the ground in the spreader path. The spreader is passed over the sheet at the normal operating speed. The manure is collected on the sheet and weighed. The application rate is the collected manure weight divided by the sheet area.

- Collect the spread manure.
    - Select a sheet of plastic 8-by-8 feet, or larger.
    - Weigh the sheet.
    - Lay the sheet on the ground.
    - Drive over the sheet while spreading manure at the normal operating speed. Start spreading at least 50 feet away from the sheet.
    - Pick up the sheet and fold it so that you do not lose any manure.
    - Weigh the sheet and manure. Subtract the empty sheet weight to determine the manure weight.
- Calculate the application rate.
    - Determine the area of the plastic sheet by multiplying the width by the length in feet to obtain area in square feet.
    - Multiply the pounds of manure collected by 21.78, then divide the answer by the area of the sheet (in square feet) to obtain the manure application rate in tons per acre.

Repeat the process several times and develop an average to be used as the application rate of the spreader. By conducting Method B at different travel speeds and spreader settings, the proper spreader settings and travel speeds can be determined to obtain the desired application rate.

This method does not account for overlap or space missed between spreader paths and will only give a true picture of the application rate when the manure is uniformly distributed over the field.

Table 1 shows a method of collecting data to determine manure spreader capacity.

Table 1
Manure spreader capacity

A. Description of spreader			
Make_____		Model_____	
Type	Box	Open Tank	Liquid Tank
Capacity (from dealer or measured)			
Box- or open-tank	cubic feet struck load_____	cubic feet heaped load _____	
Liquid tank	gallons_____		
B. For open-tank or box-spreaders, determine the pounds per cubic foot of manure and the weight capacity of the spreader.			
Type of manure		**solid**	**semi solid**
1. Determine manure density			

	Trial 1	Trial 2	Trial 3
a. Empty container weight in pounds			
b. Container filled with water weight in pounds			
c. Net weight of water in pound (b minus a)			
d. Container volume in cubic feet (c ÷ 62.4)			
e. Container filled with manure weight in pounds			
f. Net weight of manure in pounds (e minus a)			
g. Manure density in pounds per cubic foot (f ÷ d)			
h. Average of three trials in pounds per cubic foot			
2. Weight capacity of the spreader			
	Struck load	Heaped load	
Spreader volume in cubic feet			
Multiplied by manure density in pounds per cubic foot			
Equals load weight in pounds			
Divided by 2,000 (pounds per ton)	_____tons	_____tons	

Table 2 is a similar method of collecting data to measure application rate using Method A.

Table 2
Determining the application rate -- Method A

1. Tie a rope around a section of the tractor tire. Drive forward and mark the ground where the rope is directly underneath the tire. Continue forward until the rope is again at the bottom. Measure the distance between the two points on the ground representing the forward travel for one tire revolution. Feet per revolution _____. 2. During the spreading of a full load of manure at normal speed, count the number of times the rope on the tire comes to the top. Number of revolutions per load _____. 3. Multiply Step 1 by Step 2 to get the total distance traveled. _____feet. 4. Measure the average width of the spread manure path. _____feet.					
Forward speed or gear/throttle setting					
PTO speed					
Spreader setting					

Width of spread manure in feet (travel lane)					
Number of revolutions (Step 2)					
Times distance (Step 1 = length of spread) Step 3					
Width X distance in feet÷ 43,560 = acres					
Spreader capacity in tons or gallons					
Amount ÷ area = tons of gallons per acre					
Nutrient application rate = tons per acre X pound nutrient per ton					
Or gallons per acre X pounds nutrient per gallon					

Table 3 shows the proper calculations for determining application rate using Method B.

Table 3
Determining the application rate -- Method B

1. Plastic sheet Width _____feet x length _____feet = area _____square feet 2. Tare weight of plastic sheet and container _____pounds					
Forward speed or gear/throttle setting					
PTO speed					
Spreader setting					
Gross weight of plastic, manure and container					
Minus tare weight					
= net weight of manure					
Divided by area of plastic					
= rate in pounds per square foot					
Solid and semi-solid tons per acre-rate X 21.78					
Liquid gallons per acre = rate X 5,445					
Nutrient application rate = tons per acre X pounds nutrient per ton					
Or gallons per acre X pounds nutrient per gallon					

Once a spreader is calibrated, travel speed can be adjusted to give the desired application rate as illustrated in the following example.

Example
A farmer has determined by Method A that a spreader applies manure nitrogen at the rate of 170 pounds per acre for a given spreader setting and travel speed of 3.5 miles per hour. Soil tests recommend a nitrogen application rate of 120 pounds of nitrogen per acre. How should travel speed be adjusted to obtain the desired rate?

Application rate is inversely proportional to travel speed, hence the faster the travel the lower the application rate with other factors such as spreader setting and power take-off speed remaining the same. The proper travel speed to obtain an application rate of 120 pounds of nitrogen per acre is calculated as follows:

Speed, mph = 170 x 3.51 ÷ 50 = 4 miles per hour.

Hence, a travel speed of 4 miles per hour results in the desired application rate of 120 pounds of nitrogen per acre. This method of adjusting ground travel speed to obtain a given application rate obviously would not apply to ground-driven spreaders.

Summary

Anyone spreading manure can be more certain of the amount of fertilizer being applied if a calibrated spreader is used and the nutrient content of the manure is known. Such a practice ensures that manure is being managed in an environmentally sound manner and that maximum benefit from the fertilizer nutrients in the manure is being realized.

References

- Brodie, H. L., and G. L. Smith. *Calibrating Manure Spreaders.* Fact Sheet 419. Cooperative Extension Service, University of Maryland.

WQ213, reviewed May 1994

Chemical Handling

If checked, the indicated measures will be taken to prevent chemicals and other contaminants from contaminating process waste water or storm water storage and treatment systems.

	This is not a regulatory-agency permitted facility. This section does not apply.

	Measure
X	All chemicals are stored in proper containers. Expired chemicals and empty containers are properly disposed of in accordance with state and federal regulations.
X	Chemical storage areas are self-contained with no drains or other pathways that will allow spilled chemicals to exit the storage area.
X	Chemical storage areas are covered to prevent chemical contact with rain or snow.
	Emergency procedures and equipment are in place to contain and clean up chemical spills.
	Chemical handling and equipment wash areas are designed and constructed to prevent contamination of surface waters and waste water and storm water storage and treatment systems.

Appendix 4

P Index Worksheets

Phosphorus Index Worksheet Dale Dunlap
Version 0.2 April 20, 2005

	1	2		
County	Monroe	Monroe	Ripley	Ripley
Soil test P level	**21**	**58**	**79**	**50**
Units	lbs/acre	lbs/acre	lbs/acre	lbs/acre
Extraction Procedure	Bray-I	Bray-I	Bray-I	Bray-I
Sampling depth	6 to 8 inches	6 to 8 inches	6 to 8 inches	6 to 8 inches
Tillage	Tilled	Tilled	Notill or Forage	Notill or Forage
RUSLE value - average annual (tons/ac)	**0.9**	**0.9**	**1.6**	**1.6**
Land cover	Row crop - straight row with residue	Row crop - straight row with residue	Pasture	Pasture
Hydrologic soil group	D	D	C	C
Hydrologic condition	Good	Good	Good	Good
Distance from center of field to water feature	1129	1827	228	393
Particulate P value	0.7	0.6	2.0	1.7
Soluble P value	0.2	0.6	2.0	1.3
Total P value	0.9	1.2	4.0	2.9
P index rating	LOW	LOW	MEDIUM	MEDIUM
Agronomic P rating (Opt.= 45 lbs/a)	LOW	HIGH	VERY HIGH	HIGH
Sensitivity value	2.3	2.3	2.2	2.2

Appendix 5

Emergency Response Plan

EMERGENCY ACTION PLAN

In Case of an Emergency Storage Facility Spill, Leak or Failure

Implement the following first containment steps:

1. Stop all other activities to deal with the spill. Turn off the tractor or pumps that may be running.
2. Care for any personal injuries.
3. Assess the extent of the emergency.
    -determine how much help is needed.
    -call for help.
4. Contact appropriate emergency, environmental, or county authorities if assistance is needed.
5. Use a tractor with a blade to contain the spill.
6. Pump spilled manure into the manure spreader and land-apply to an open pasture or into the second pit.
7. Pump the manure in the pit down below the point of the leak or failure. Complete the clean-up and repair the necessary components.
8. File required reports.

In Case of an Emergency Spill, Leak or Failure During Transport or Land Application

Implement the following first containment steps:

1. Stop all other activities to deal with the spill. Turn off the pumps, applicator, or transport vehicle.
2. Care for any personal injuries.
3. Assess the extent of the emergency.
    -determine how much help is needed.
    -call for help.
4. Contact appropriate emergency or traffic control authorities if assistance is needed.
5. Use a tractor with a blade to contain the spill.
6. Pump spilled manure into the tank wagon or any available storage vehicle. Complete the clean-up and repair the necessary components.
7. File required reports.

The land application equipment will be constantly monitored by the person conducting the land application of manure. In order to prevent an accident or spill during land application, Mike Ramer should complete an inspection of the land application equipment to ensure proper function prior to performing land application. In addition, weather conditions (wind speed and direction, precipitation, etc.) and field conditions (proper setbacks noted, soil moisture, etc.) should be verified prior to land application.

Table 3-1. Emergency Contacts

Department / Agency	Phone Number
Fire	911
Ambulance	911
Sheriff	660-327-4060

Table 3-2. Available equipment/supplies for responding to emergency

Equipment Type	Contact Person	Phone Number
Nearby excavation equipment	Mike Luebrecht	(573)470-4081

Table 3-3. Contacts to be made by the owner or operator within 24 hours

Organization	Phone Number
EPA Region 7 Emergency Spill Hotline	(913) 281-0991
MO Emergency Spill Hotline	(573) 634-2436
Monroe County Health Department	(660) 327-4259
Monroe County Emergency Management	(660) 327-5106

Be prepared to provide the following information:

a. Your name and contact information.
b. Farm location and other pertinent identification information.
c. Description of the emergency.
d. Estimate of the amounts, area covered, and distance traveled.
e. Whether manure has reached surface waters or major field drains.
f. Whether there is any obvious damage; i.e., employee injury, fish kill, or property damage.
g. Current status of containment efforts.

Plan for Catastrophic Death Animal Disposal

If the cause of catastrophic loss is from disease, quarantine and euthanize all sick animals.

When catastrophic mortalities do occur contact MO-DNR and the MO state veterinarian for guidance. It is planned that the carcasses will be rendered. Follow the farm Operation and Maintenance Plan for guidance.

Appendix 6

Yield Goals

Aaron Verseman
Average Yields
Crop Yield Goals

	Monroe Co	Monroe Co
Year	Corn	Beans
2015	140.5	
2014	187.2	49.9
2013	123	28.8
2012	22.3	24.3
2011	91.7	29
2010	102.5	43.5
2009	137	45
2008	127	31.5
2007	131	39
2006	131	38
Average	119.3	36.6
Avg. +15%	137.2	42.0
Target	140	42

USDA United States Department of Agriculture
National Agricultural Statistics Service

2007 CENSUS of AGRICULTURE

Quick Stats

Home Recent Statistics Developers Help

Program	Year	Period	Week Ending	Geo Level	State	State ANSI	Ag District	Ag District Code	County	County ANSI	Zip Code	Region	watershed_code	Watershed	Commodity	Data Item	Domain	Domain Category	Value	CV (%)
SURVEY	2015	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	140.5	
SURVEY	2014	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	187.2	
SURVEY	2013	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	123	
SURVEY	2012	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	22.3	
SURVEY	2011	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	91.7	
SURVEY	2010	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	102.5	
SURVEY	2009	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	137	
SURVEY	2008	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	127	
SURVEY	2007	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	131	
SURVEY	2006	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		CORN	CORN, GRAIN - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	131	

USDA United States Department of Agriculture
National Agricultural Statistics Service

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Quick Stats

Home Recent Statistics Developers Help

Program	Year	Period	Week Ending	Geo Level	State	State ANSI	Ag District	Ag District Code	County	County ANSI	Zip Code	Region	watershed_code	Watershed	Commodity	Data Item	Domain	Domain Category	Value	CV (%)
SURVEY	2014	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		SOYBEANS	SOYBEANS - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	49.9	
SURVEY	2013	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		SOYBEANS	SOYBEANS - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	28.8	
SURVEY	2012	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		SOYBEANS	SOYBEANS - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	24.3	
SURVEY	2011	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		SOYBEANS	SOYBEANS - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	29	
SURVEY	2010	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		SOYBEANS	SOYBEANS - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	43.5	
SURVEY	2009	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		SOYBEANS	SOYBEANS - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	45	
SURVEY	2008	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		SOYBEANS	SOYBEANS - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	31.5	
SURVEY	2007	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		SOYBEANS	SOYBEANS - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	39	
SURVEY	2006	YEAR		COUNTY	MISSOURI	29	NORTHEAST	30	MONROE	137			00000000		SOYBEANS	SOYBEANS - YIELD, MEASURED IN BU / ACRE	TOTAL	NOT SPECIFIED	38	