

Nutrient Management Plan

For

Ratio LLC Site

(Producer)

Hand

(County)

Nutrient Management Plan

Comprehensive Nutrient Management Plans (CNMP)

The objective of a CNMP is to provide AFO owners/operators with a plan to manage manure and organic by-products by combining conservation practices and management activities into a conservation system that, when implemented, will control soil erosion.

A CNMP is a conservation plan for an AFO that must include the production area including the animal confinement, feed and other raw materials storage areas, animal mortality facilities, and the manure handling containment or storage areas, and the land treatment area, including any land under control of the AFO owner or operator, whether it is owned, rented, or leased, and to which manure or process wastewater is, or might be, applied for crop, hay, pasture production, or other uses.

Meets Natural Resources Conservation Service (NRCS) FOTG Section III quality criteria for Water Quality (nutrients, organics, and sediments in surface and groundwater) and Soil Erosion (sheet and rill, wind, ephemeral gully, classic gully, and irrigation induced natural resource concerns on the production area and land treatment area).

Mitigates, if feasible, any excessive air emissions and/or negative impacts to air quality resource concerns that may result from practices identified in the CNMP or from existing on-farm areas/activities.

Complies with Federal, State, tribal, and local laws, regulations, and permit requirements.

Signature Page

Farmstead (Production Area)

Crop and Pasture (Land Treatment)

Nutrient Management Plan (590)

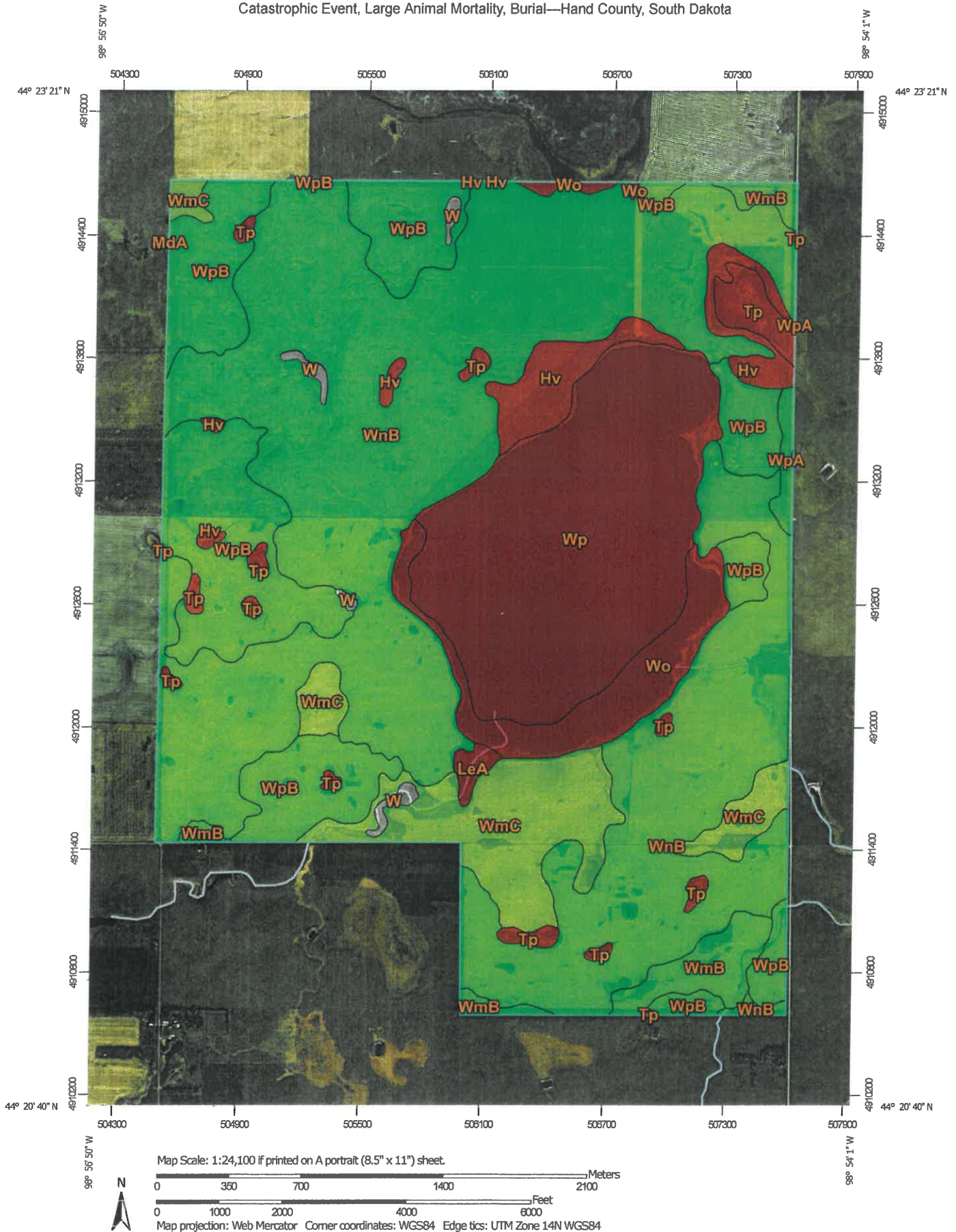
Section 1

Farmstead (Production Area)

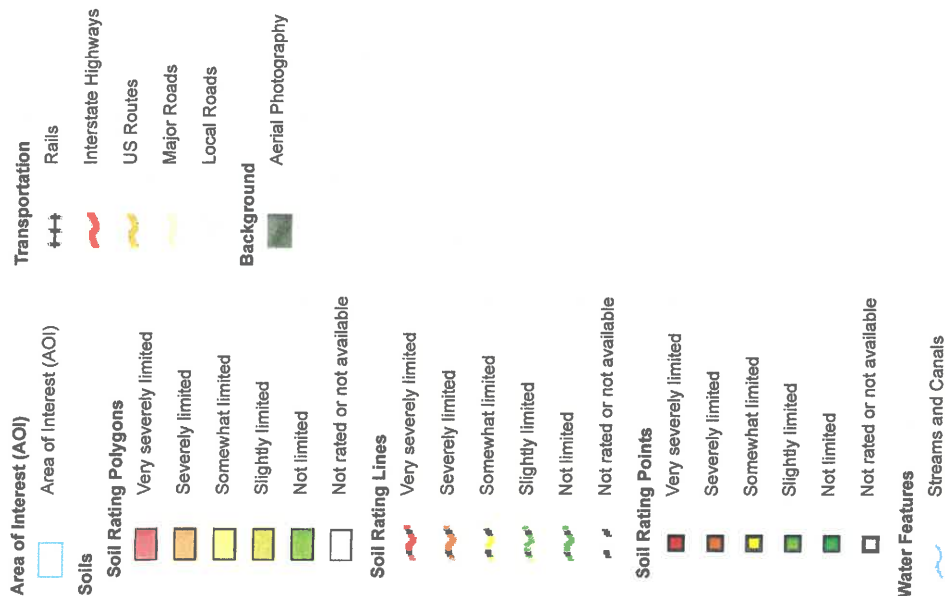
- 1.1 Maps of Farmstead, Existing and Planned Conservation Practices
- 1.2 Farmstead Conservation Practices – Record of Decision
- 1.3 Farmstead Conservation Practices – Implementation Requirements
- 1.4 Animal Inventory
- 1.5 Manure Storage Information
- 1.6 Planned Manure Exports
- 1.7 Planned Manure Imports
- 1.8 Planned Internal Transfers of Manure
- 1.9 Brief Description of, or Additional Information about Animal Feeding Operation (Optional)
- 1.10 Air Quality Assessment

Developed by SD-DENR, SD-NRCS, and SDSU.

Catastrophic Event, Large Animal Mortality, Burial—Hand County, South Dakota



MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hand County, South Dakota
 Survey Area Data: Version 20, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 16, 2010—Feb 6, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Catastrophic Event, Large Animal Mortality, Burial

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
Hv	Hoven silt loam, 0 to 1 percent slopes	Very severely limited	Hoven (90%)	Ponding (1.00)	82.9	2.9%
				Wetness (1.00)		
				Water gathering surface (0.50)		
			Tetonka, undrained (10%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		
LeA	Bon-Northville complex, nearly level	Very severely limited	Bon (79%)	Wetness (1.00)	8.9	0.3%
				Flooding (0.30)		
				Seepage (0.21)		
			Northville (20%)	Wetness (1.00)		
				Flooding (0.30)		
			Durrstein (1%)	Wetness (1.00)		
MdA	Dudley-Jerauld silt loams, 0 to 2 percent slopes	Slightly limited	Dudley (55%)	Water gathering surface (0.20)	0.1	0.0%
			Jerauld (35%)	Water gathering surface (0.20)		
Tp	Tetonka silt loam, 0 to 1 percent slopes	Very severely limited	Tetonka, undrained (90%)	Ponding (1.00)	54.6	1.9%
				Wetness (1.00)		
				Water gathering surface (0.50)		
			Hoven (3%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		
			Worthing, undrained (2%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		
			Crossplain (2%)	Wetness (1.00)		
				Flooding (0.70)		
				Water gathering surface (0.33)		
W	Water	Not rated	Water (100%)		12.9	0.5%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
WmB	Glenham loam, undulating	Not limited	Glenham (99%)		67.5	2.4%
WmC	Glenham loam, rolling	Slightly limited	Glenham (99%)	Slope (0.16)	202.8	7.2%
WnB	Glenham-Propser loams, 1 to 6 percent slopes	Not limited	Glenham (65%)		1,393.6	49.5%
Wo	Worthing silty clay loam, 0 to 1 percent slopes	Very severely limited	Worthing, undrained (90%)	Ponding (1.00)	107.4	3.8%
				Wetness (1.00)		
				Water gathering surface (0.50)		
			Hoven (5%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		
			Tetonka, undrained (2%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		
Wp	Worthing silty clay loam, ponded, 0 to 1 percent slopes	Very severely limited	Worthing, ponded (90%)	Ponding (1.00)	445.1	15.8%
				Wetness (1.00)		
				Water gathering surface (0.50)		
			Tetonka, undrained (5%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		
			Hoven (2%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		
WpA	Glenham-Cavo loams, nearly level	Not limited	Glenham (50%)		12.9	0.5%
WpB	Glenham-Cavo loams, undulating	Not limited	Glenham (50%)		427.6	15.2%
Totals for Area of Interest					2,816.2	100.0%

Rating	Acres in AOI	Percent of AOI
Not limited	1,901.5	67.5%
Very severely limited	698.9	24.8%

Rating	Acres in AOI	Percent of AOI
Slightly limited	202.9	7.2%
Null or Not Rated	12.9	0.5%
Totals for Area of Interest	2,816.2	100.0%

Description

"Catastrophic Event, Large Animal Mortality, Burial", is a method of disposing of deceased animals as a result of a large scale natural disaster such as a hurricane. The animals are disposed of by placing the carcasses in successive layers in an excavated and sloped pit. The carcasses are spread, compacted, and covered daily with a thin layer of soil that is excavated from the pit. When the pit is full, a final cover of soil material at least 2 feet thick is placed over the burial pit.

Soils are rated based on their limitation for burial of large animals following a catastrophic event. Catastrophic events include, but are not limited to, hurricanes, wildfires, flooding, and tornados. Limitations for burial of large animals during a catastrophic event are based primarily on contamination of groundwater, trafficability of excavation equipment, site selection, and site reclamation.

While some general observations may be made, onsite evaluation is required before the final site is selected. Improper site selection, design, or installation may cause contamination of ground water, seepage, and contamination of stream systems from surface drainage or floodwater. Potential contamination may be reduced or eliminated by installing systems designed to overcome or reduce the effects of the limiting soil property. The rating is for soils in their present condition and does not consider present land use.

Ratings are based on properties and qualities to the depth normally observed during soil mapping (approximately 6 or 7 feet). However, because pits may be as deep as 15 feet or more, geologic investigations are needed to determine the potential for pollution of ground water as well as to determine the design needed. These investigations, which are generally arranged by the pit developer, include the examination of stratification, rock formations, and geologic conditions that might lead to the conducting of leachates to aquifers, wells, watercourses, and other water sources. The presence of hard, nonrippable bedrock, bedrock crevices, or highly permeable strata in or immediately underlying the proposed pit bottom is undesirable because of the difficulty in excavation and the potential contamination of underground water.

Properties that influence the risk of contamination of groundwater, ease of excavation, trafficability, and revegetation are major considerations. Soils that flood or have a water table within the depth of excavation present a potential contamination hazard and are difficult to excavate. Slope is an important consideration because it affects the work involved in road construction, the performance of the roads, and the control of surface water around the pit. It may also cause difficulty in constructing pits for which the pit bottom must be kept level and oriented to follow the contour.

The ease with which the pit is dug and with which a soil can be used as daily and final covers is based largely on texture and consistence of the soil. The texture and consistence of a soil determine the degree of workability of the soil both when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and difficult to place as a uniformly thick cover over

a layer of carcasses. The uppermost part of the final cover should be soil material that is favorable for the growth of plants. It should not contain excess sodium or salt and should not be too acid. In comparison with other horizons, the A horizon in most soils has the best workability and the highest content of organic matter. Thus, for a Large Animal Disposal, Burial operation it may be desirable to stockpile the surface layer for use in the final blanketing of the filled pit area.

Numerical ratings indicate the severity of the individual limitations. The ratings are shown in decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses.

Not limited (rating index equals 0) - The limitation for large animal disposal during a catastrophic event is insignificant. This soil is able to support standard excavation equipment, the soil has minimal contamination of groundwater, and soil reclamation using conventional processes is possible. Not limited soils have features that are very favorable for the specified use. Very good performance and very low maintenance can be expected of a properly designed and installed system.

Slightly limited (rating index greater than 0 but less than 0.30) - The limitation for large animal disposal during a catastrophic event is slightly limited. There are one or more soil properties that pose a slight limitation for contamination of groundwater, site reclamation, or excavation equipment. Slightly limited indicates the soil has features that are favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Good performance and low maintenance can be expected.

Somewhat limited (greater than 0.30 but less than 0.80) - The limitation for large animal disposal during a catastrophic event is somewhat limited. There are more than one soil properties that pose a limitation for contamination of groundwater, site reclamation, or excavation equipment. Any corrective measures taken to overcome these limitations are considered economical however, special care must be taken to overcome limitations. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected.

Severely limited (greater than 0.80 but less than 0.99) - The limitation for large animal disposal during a catastrophic event is severely limited. There are many soil properties that pose a limitation for contamination of groundwater, site reclamation, or excavation equipment. Additionally, corrective measures will be needed to overcome these limitations. Corrective measures taken may be costly to overcome limitations that pose a severely limited rating. Severely limited indicates that the soil has features that are unfavorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation however, it is costly to do so. Poor performance and high maintenance can be expected.

Very severely limited (rating index equals 1.0) - The limitation for large animal disposal during a catastrophic event is severely limited. There are one or more soil properties that pose a very severe limitation for contamination of groundwater, site reclamation, or excavation equipment. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Very poor performance and very high maintenance can be expected.

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Section 2

Crop and Pasture (Land Treatment)

2.1 Maps of Fields, Soils, Application Setbacks, Existing and Planned Crop and Pasture Conservation Practices

2.2 Crop and Pasture Conservation Practices – Record of Decision

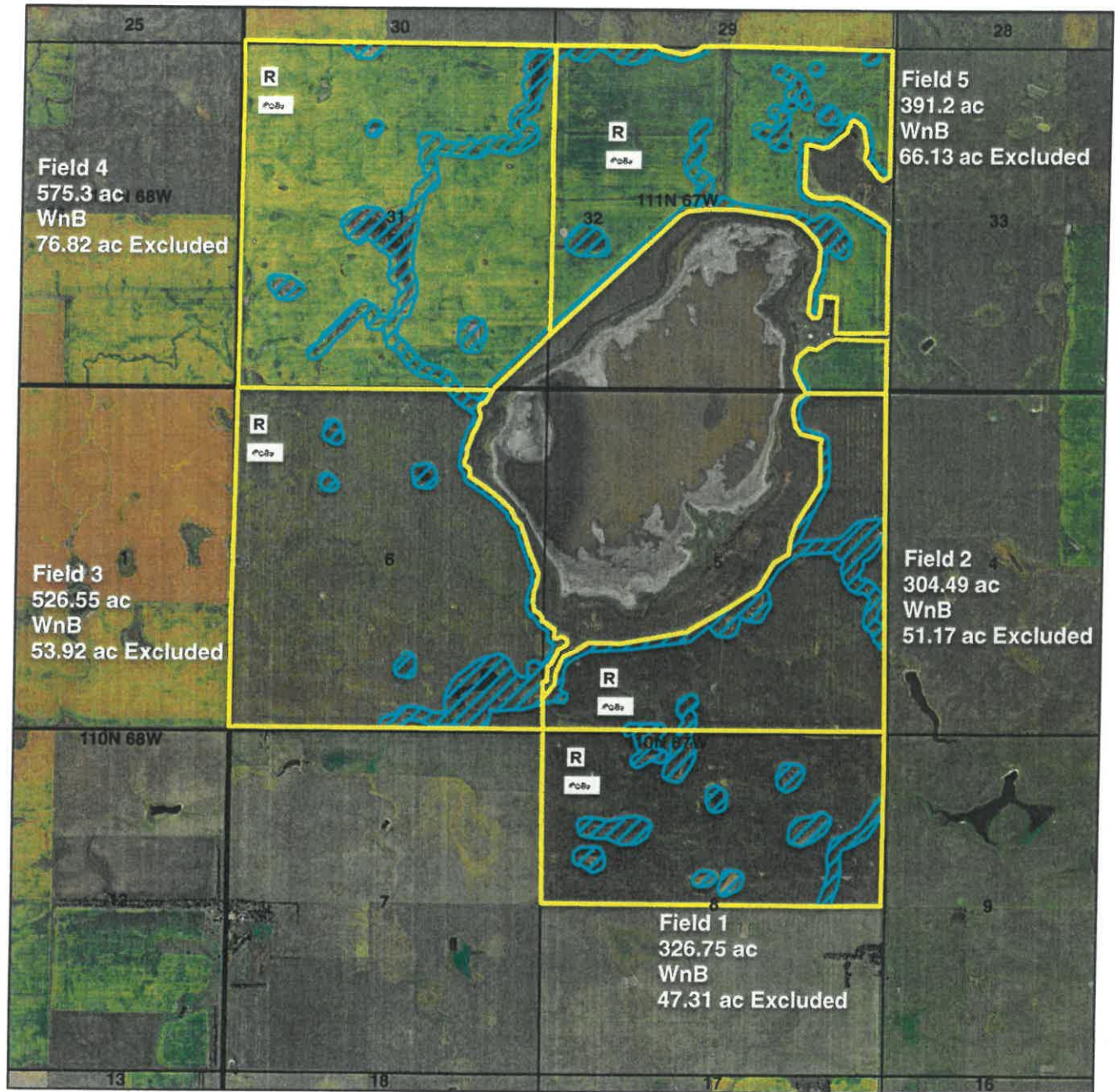
2.3 Crop and Pasture Conservation Practices – Implementation Requirements

2.4 Predicted Soil Erosion



Water Quality Risk Assessment Map

Aughenbaugh Site

5,6,8-110N-67W & 31,32-111N-67W



Legend

-  Aughenbaugh Borders
-  Excluded Acres

 Manure Application Field

R Runoff High Risk

L Leaching High Risk

0 0.15 0.3 0.6 0.9 1.2 Miles



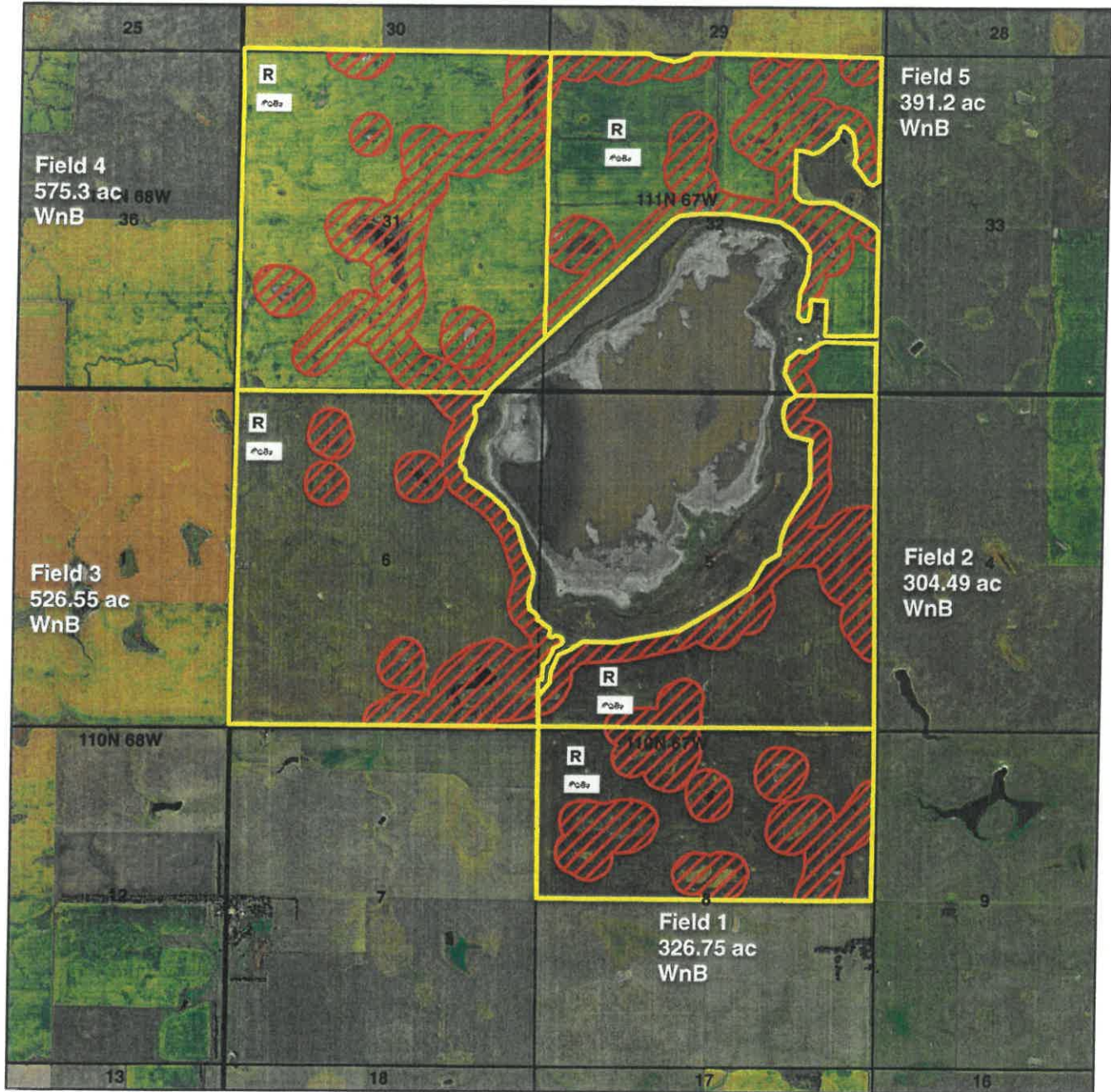
CENTROL[®]
CROP CONSULTING

Water Quality Risk Assessment Map

Frozen and Snow Covered Ground

Aughenbaugh Site

5,6,8-110N-67W & 31,32-111N-67W



Legend

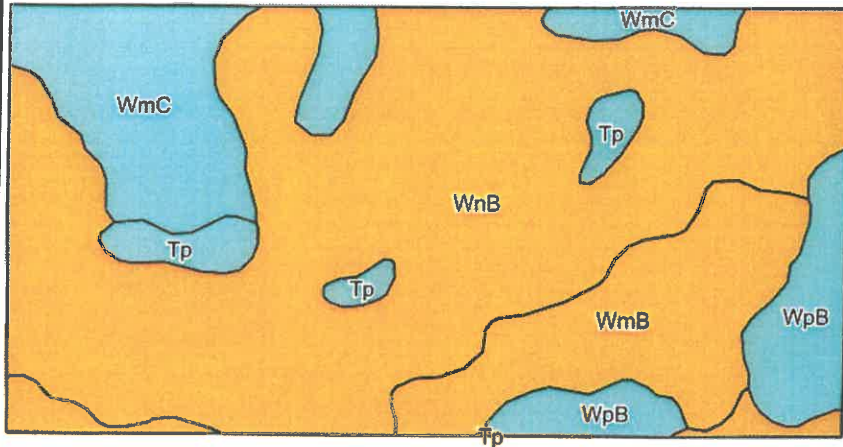
- Aughenbaugh Borders
- Frozen_Snow Covered Exclusions
- Manure Application Field
- R** Runoff High Risk
- L** Leaching High Risk

0 0.15 0.3 0.6 0.9 1.2 Miles



CENTROL[®]
CROP CONSULTING

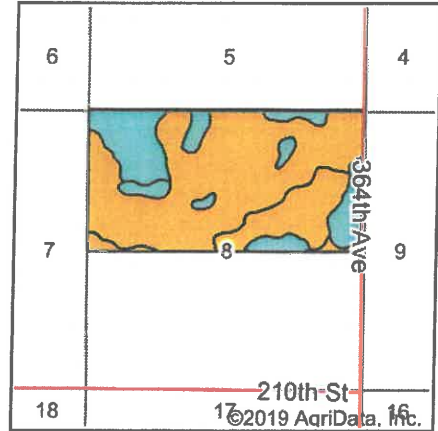
Soils Map



©2019 AgriData, Inc.

Soils data provided by USDA and NRCS.

Field 1



State: **South Dakota**
 County: **Hand**
 Location: **8-110N-67W**
 Township: **Hiland**
 Acres: **326.75**
 Date: **6/3/2019**

CENTROL
 CROP CONSULTING

Maps Provided By:

surety
 CUSTOMIZED ONLINE MAPPING

© AgriData, Inc. 2019

www.AgriDataInc.com



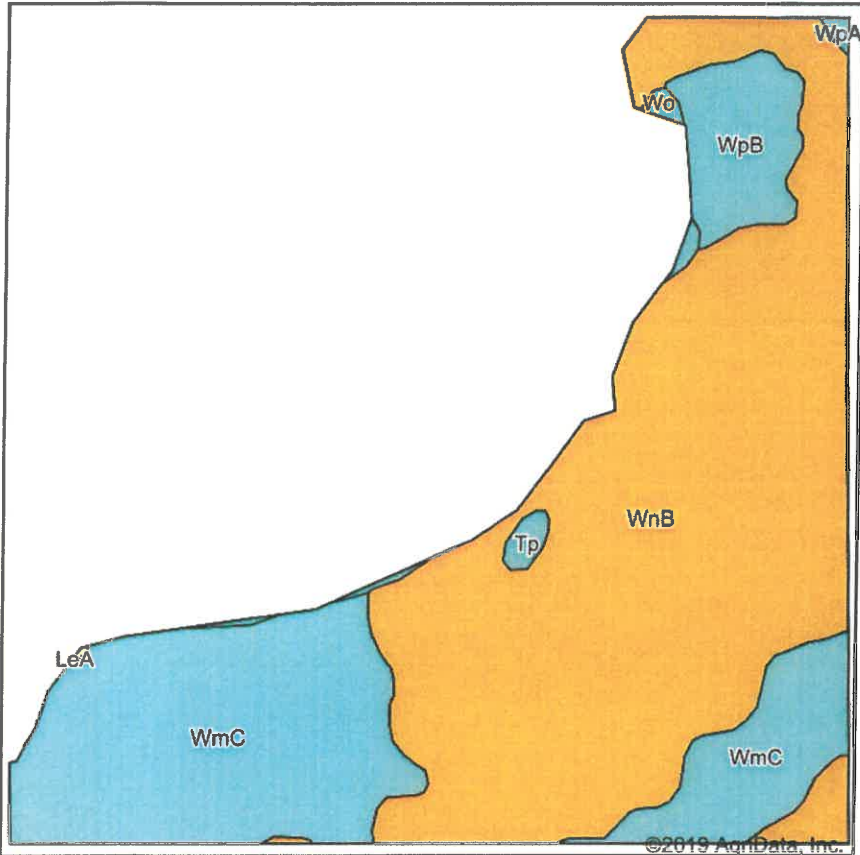
Area Symbol: SD059, Soil Area Version: 20

Code	Soil Description	Acres	Percent of field	PI Legend	Non-Irr Class *c	Productivity Index	*n NCCPI Soybeans
WnB	Glenham-Propser loams, 1 to 6 percent slopes	198.32	60.7%		Ile	82	54
WmB	Glenham loam, undulating	47.67	14.6%		Ile	82	56
WmC	Glenham loam, rolling	46.43	14.2%		IIle	64	56
WpB	Glenham-Cavo loams, undulating	23.53	7.2%		Ile	58	49
Tp	Tetonka silt loam, 0 to 1 percent slopes	10.80	3.3%		IVw	56	13
Weighted Average						76.9	*n 52.9

*n: The aggregation method is "Weighted Average using major components"

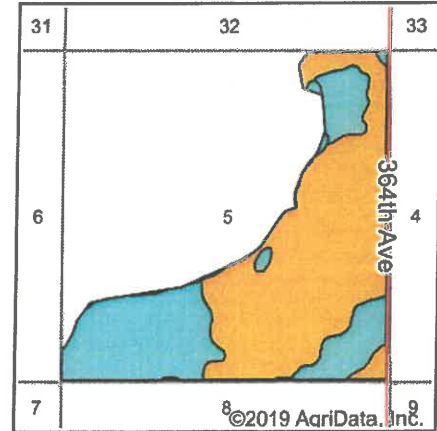
*c: Using Capabilities Class Dominant Condition Aggregation Method

Soils Map



Soils data provided by USDA and NRCS.

Field 2



State: South Dakota
County: Hand
Location: 5-110N-67W
Township: Hiland
Acres: 303.83
Date: 6/6/2019

CENTROL
CROP CONSULTING

Maps Provided By:



surety
CUSTOMIZED ONLINE MAPPING

© AgriData, Inc. 2019

www.AgriDataInc.com



Area Symbol: SD059, Soil Area Version: 20

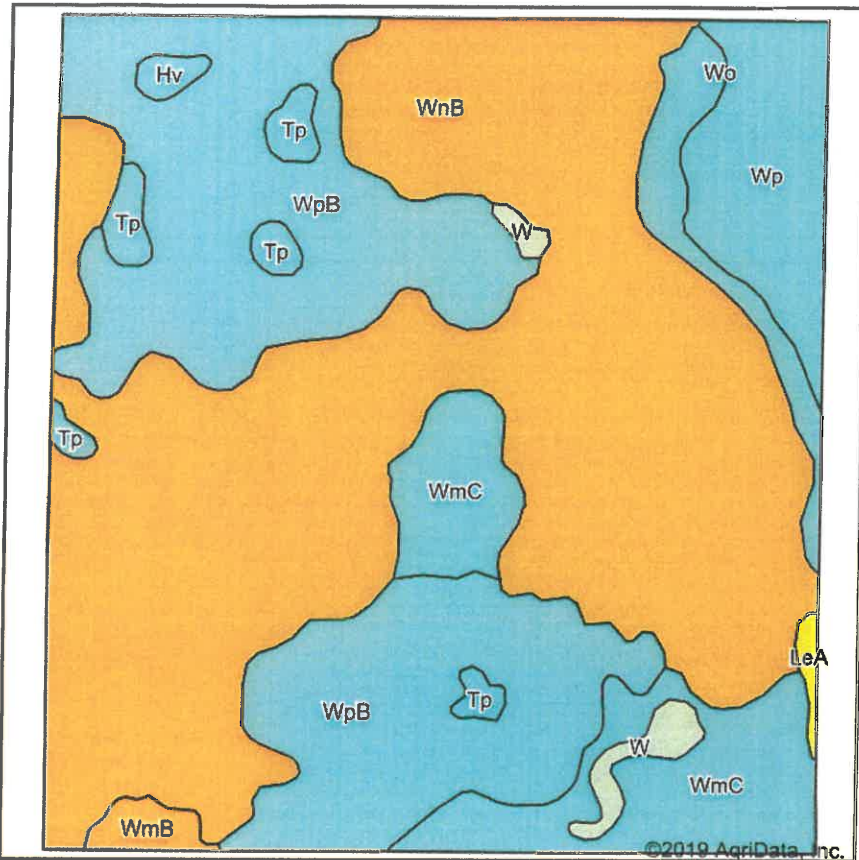
Code	Soil Description	Acres	Percent of field	PI Legend	Non-Irr Class *c	Productivity Index	*n NCCPI Soybeans
WnB	Glenham-Propser loams, 1 to 6 percent slopes	188.99	62.2%		Ile	82	54
WmC	Glenham loam, rolling	93.09	30.6%		IIle	64	56
WpB	Glenham-Cavo loams, undulating	17.34	5.7%		Ile	58	49
Wo	Worthing silty clay loam, 0 to 1 percent slopes	2.15	0.7%		Vw	30	2
Tp	Tetonka silt loam, 0 to 1 percent slopes	1.61	0.5%		IVw	56	13
WpA	Glenham-Cavo loams, nearly level	0.56	0.2%		Ilc	63	50
LeA	Bon-Northville complex, nearly level	0.09	0.0%		Ilc	91	54
Weighted Average						74.6	*n 53.7

*n: The aggregation method is "Weighted Average using major components"

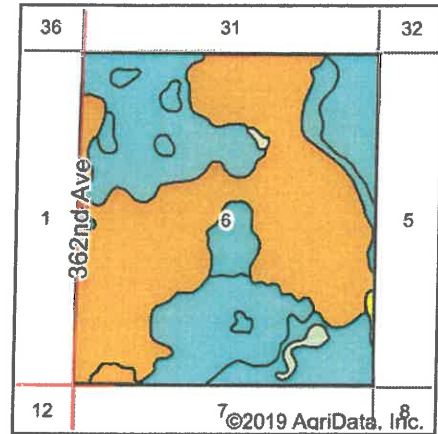
*c: Using Capabilities Class Dominant Condition Aggregation Method

Soils Map

Field 3



Soils data provided by USDA and NRCS.



State: **South Dakota**
 County: **Hand**
 Location: **6-110N-67W**
 Township: **Hiland**
 Acres: **576.07**
 Date: **6/3/2019**

CENTROL
 CROP CONSULTING

Maps Provided By:

 CUSTOMIZED ONLINE MAPPING
 © AgriData, Inc. 2019 www.AgriDataInc.com



Area Symbol: SD059, Soil Area Version: 20

Code	Soil Description	Acres	Percent of field	PI Legend	Non-Irr Class *c	Productivity Index	*n NCCPI Soybeans
WnB	Glenham-Propser loams, 1 to 6 percent slopes	290.23	50.4%		Ile	82	54
WpB	Glenham-Cavo loams, undulating	158.95	27.6%		Ile	58	49
WmC	Glenham loam, rolling	53.39	9.3%		IIle	64	56
Wp	Worthing silty clay loam, ponded, 0 to 1 percent slopes	32.89	5.7%		VIIIw	10	2
Wo	Worthing silty clay loam, 0 to 1 percent slopes	15.36	2.7%		Vw	30	2
Tp	Tetonka silt loam, 0 to 1 percent slopes	10.77	1.9%		IVw	56	13
W	Water	6.22	1.1%		VIII	0	0
WmB	Glenham loam, undulating	4.41	0.8%		Ile	82	56
Hv	Hoven silt loam, 0 to 1 percent slopes	2.16	0.4%		VIIs	15	4
LeA	Bon-Northville complex, nearly level	1.69	0.3%		IIc	91	54
Weighted Average						66.6	*n 46.9

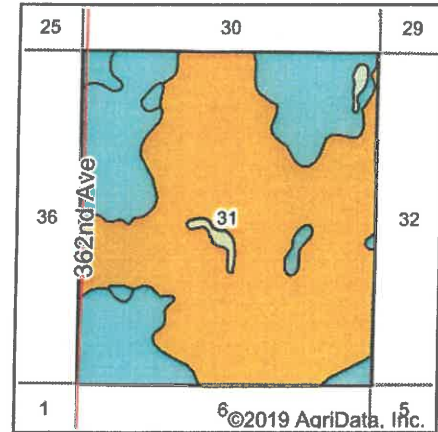
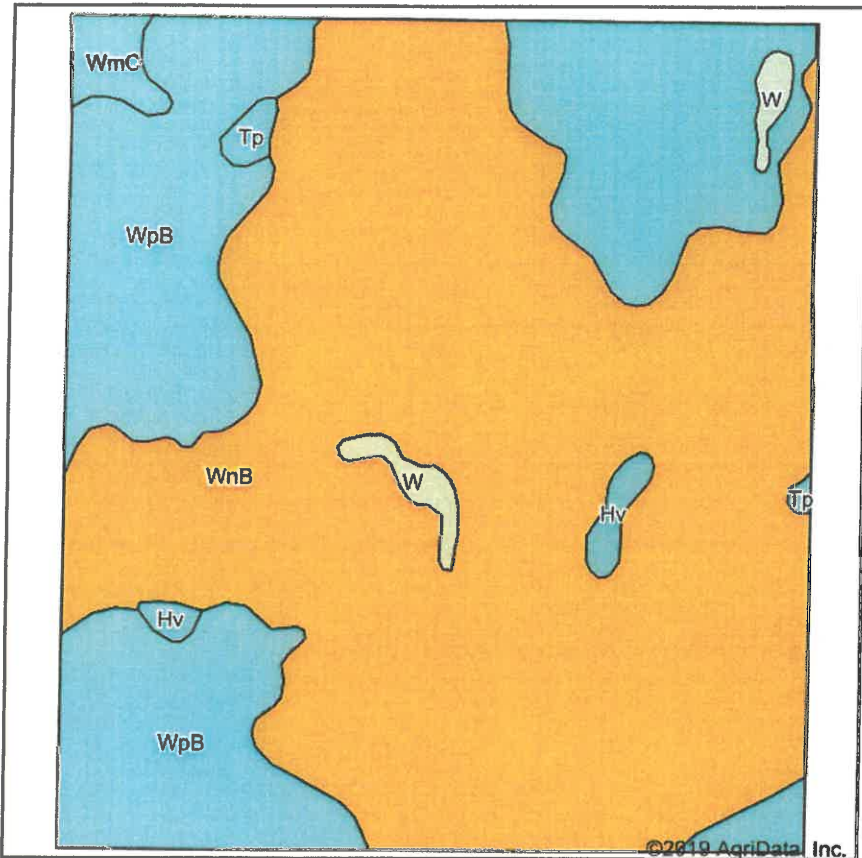
*n: The aggregation method is "Weighted Average using major components"

*c: Using Capabilities Class Dominant Condition Aggregation Method

Soils data provided by USDA and NRCS.

Soils Map

Field 4



State: **South Dakota**
 County: **Hand**
 Location: **31-111N-67W**
 Township: **Pearl**
 Acres: **583.77**
 Date: **6/3/2019**

CENTROL
 CROP CONSULTING


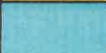


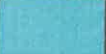


Maps Provided By:

 CUSTOMIZED ONLINE MAPPING
 © AgriData, Inc. 2019 www.AgriDataInc.com



Soils data provided by USDA and NRCS.

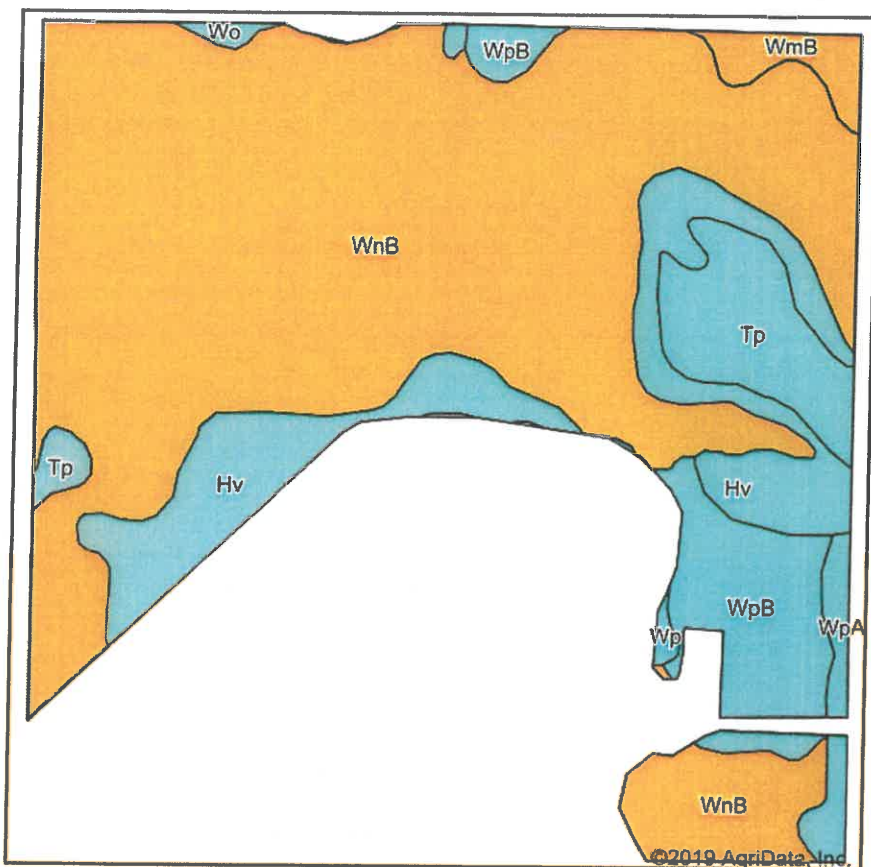
Area Symbol: SD059, Soil Area Version: 20

Code	Soil Description	Acres	Percent of field	PI Legend	Non-Irr Class *c	Productivity Index	*n NCCPI Soybeans
WnB	Glenham-Propser loams, 1 to 6 percent slopes	384.29	65.8%		Ile	82	54
WpB	Glenham-Cavo loams, undulating	173.37	29.7%		Ile	58	49
W	Water	6.64	1.1%		VIII	0	0
WmC	Glenham loam, rolling	6.63	1.1%		IIle	64	56
Hv	Hoven silt loam, 0 to 1 percent slopes	5.01	0.9%		Vis	15	4
Wp	Worthing silty clay loam, ponded, 0 to 1 percent slopes	4.87	0.8%		VIIIw	10	2
Tp	Tetonka silt loam, 0 to 1 percent slopes	2.96	0.5%		IVw	56	13
Weighted Average						72.4	*n 50.9

*n: The aggregation method is "Weighted Average using major components"

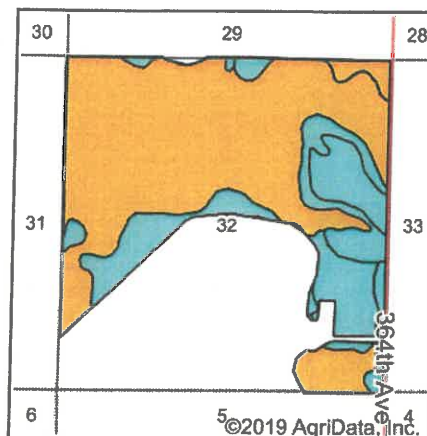
*c: Using Capabilities Class Dominant Condition Aggregation Method

Soils Map



Soils data provided by USDA and NRCS.

Field 5



State: **South Dakota**
 County: **Hand**
 Location: **32-111N-67W**
 Township: **Pearl**
 Acres: **417.75**
 Date: **6/3/2019**

CENTROL
 CROP CONSULTING

Maps Provided By: **surety**
 CUSTOMIZED ONLINE MAPPING
 © AgriData, Inc. 2019 www.AgriDataInc.com



Area Symbol: SD059, Soil Area Version: 20

Code	Soil Description	Acres	Percent of field	PI Legend	Non-Irr Class *c	Productivity Index	*n NCCPI Soybeans
WnB	Glenham-Propser loams, 1 to 6 percent slopes	286.92	68.7%		Ile	82	54
Hv	Hoven silt loam, 0 to 1 percent slopes	55.47	13.3%		Vls	15	4
WpB	Glenham-Cavo loams, undulating	31.61	7.6%		Ile	58	49
Tp	Tetonka silt loam, 0 to 1 percent slopes	25.92	6.2%		IVw	56	13
WpA	Glenham-Cavo loams, nearly level	7.29	1.7%		IIc	63	50
WmB	Glenham loam, undulating	7.19	1.7%		Ile	82	56
Wo	Worthing silty clay loam, 0 to 1 percent slopes	2.03	0.5%		Vw	30	2
Wp	Worthing silty clay loam, ponded, 0 to 1 percent slopes	1.32	0.3%		VIIIw	10	2
Weighted Average						68.9	*n 44

*n: The aggregation method is "Weighted Average using major components"

*c: Using Capabilities Class Dominant Condition Aggregation Method

Soils data provided by USDA and NRCS.

RUSLE2 Profile Erosion Calculation Record

Info: Field 1

File: profiles/default

Inputs:

Location: USA\South Dakota\Hand County
Soil: Hand County, South Dakota\WnB Glenham-Prosper loams, undulating\Glenham Loam 64%
Slope length (horiz): 300 ft
Avg. slope steepness: 1.5 %

Management		Vegetation	Yield units	# yield units, #/ac
managements\CMZ 04\c.Other Local Mgt Records\Manure C-Soy		vegetations\Corn, grain	bushels	180.00
managements\CMZ 04\c.Other Local Mgt Records\Manure C-Soy		vegetations\Soybean, mw 7in rows	bu	40.000

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:

T value: 5.0 t/ac/yr
Soil loss erod. portion: 0.26 t/ac/yr
Detachment on slope: 0.26 t/ac/yr
Soil loss for cons. plan: 0.26 t/ac/yr
Sediment delivery: 0.26 t/ac/yr

Crit. slope length: 300 ft
Surf. cover after planting: -- %
Avg. ann. total biomass removal: 0 lb/ac

Date	Operation	Vegetation	Surf. res. cov. after op, %
11/1/0	Manure injector, low disturb. 30 inch		80
5/5/1	Cultivator, field 6-12 in sweeps		52
5/5/1	Sprayer, pre-emergence		52
5/5/1	planter, double disk opnr	Corn, grain	52
6/7/1	Sprayer, post emergence and fert. tank mix		47
10/20/1	Harvest, killing crop 50pct standing stubble		87
11/1/1	Chisel, st. pt.		63

5/1/2				
5/10/2	Disk, tandem light finishing			53
5/10/2	Cultivator, field 6-12 in sweeps			51
5/10/2	Sprayer, pre-emergence			51
5/10/2	Drill or airseeder, double disk			51
6/7/2	Sprayer, post emergence		Soybean, mw 7in rows	51
8/1/2	Sprayer, insecticide post emergence			53
10/5/2	Harvest, killing crop 20pct standing stubble			41
				86

RUSLE2 Profile Erosion Calculation Record

Info: Field 2

File: profiles/default

Inputs:

Location: USA\South Dakota\Hand County

Soil: Hand County, South Dakota\WnB Glenham-Prosper loams, undulating\Glenham Loam 64%

Slope length (horiz): 300 ft

Avg. slope steepness: 1.5 %

Management		Vegetation	Yield units	# yield units, #/ac
managements\CMZ 04\c.Other Local Mgt Records\Manure C-Soy		vegetations\Corn, grain	bushels	180.00
managements\CMZ 04\c.Other Local Mgt Records\Manure C-Soy		vegetations\Soybean, mw 7in rows	bu	40.000

Contouring: a. rows up-and-down hill

Strips/barriers: (none)

Diversion/terrace, sediment basin: (none)

Subsurface drainage: (none)

Adjust res. burial level: Normal res. burial

Outputs:

T value: 5.0 t/ac/yr

Soil loss erod. portion: 0.26 t/ac/yr

Detachment on slope: 0.26 t/ac/yr

Soil loss for cons. plan: 0.26 t/ac/yr

Sediment delivery: 0.26 t/ac/yr

Crit. slope length: 300 ft

Surf. cover after planting: -- %

Avg. ann. total biomass removal: 0 lb/ac

Date	Operation	Vegetation	Surf. res. cov. after op, %
11/1/0	Manure injector, low disturb.30 inch		
5/5/1	Cultivator, field 6-12 in sweeps		80
5/5/1	Sprayer, pre-emergence		52
5/5/1	planter, double disk opnr	Corn, grain	52
6/7/1	Sprayer, post emergence and fert. tank mix		52
10/20/1	Harvest, killing crop 50pct standing stubble		47
11/1/1	Chisel, st. pt.		87
			63

5/1/2				
5/10/2	Disk, tandem light finishing			53
5/10/2	Cultivator, field 6-12 in sweeps			51
5/10/2	Sprayer, pre-emergence			51
5/10/2	Drill or airseeder, double disk			51
6/7/2	Sprayer, post emergence		Soybean, mw 7in rows	51
8/1/2	Sprayer, insecticide post emergence			53
10/5/2	Harvest, killing crop 20pct standing stubble			41
				86

RUSLE2 Profile Erosion Calculation Record

Info: Field 3

File: profiles/default

Inputs:

Location: USA\South Dakota\Hand County
 Soil: Hand County, South Dakota\WnB Glenham-Prosper loams, undulating\Glenham Loam 64%
 Slope length (horiz): 300 ft
 Avg. slope steepness: 1.5 %

Management		Vegetation	Yield units	# yield units, #/ac
managements\CMZ 04\c.Other Local Mgt Records\Manure C-Soy		vegetations\Corn, grain	bushels	180.00
managements\CMZ 04\c.Other Local Mgt Records\Manure C-Soy		vegetations\Soybean, mw 7in rows	bu	40.000

Contouring: a. rows up-and-down hill
 Strips/barriers: (none)
 Diversion/terrace, sediment basin: (none)
 Subsurface drainage: (none)
 Adjust res. burial level: Normal res. burial

Outputs:

T value: 5.0 t/ac/yr
 Soil loss erod. portion: 0.26 t/ac/yr
 Detachment on slope: 0.26 t/ac/yr
 Soil loss for cons. plan: 0.26 t/ac/yr
 Sediment delivery: 0.26 t/ac/yr

Crit. slope length: 300 ft
 Surf. cover after planting: -- %
 Avg. ann. total biomass removal: 0 lb/ac

Date	Operation	Vegetation	Surf. res. cov. after op, %
11/1/0	Manure injector, low disturb.30 inch		
5/5/1	Cultivator, field 6-12 in sweeps		80
5/5/1	Sprayer, pre-emergence		52
5/5/1	planter, double disk opnr	Corn, grain	52
6/7/1	Sprayer, post emergence and fert. tank mix		52
10/20/1	Harvest, killing crop 50pct standing stubble		47
11/1/1	Chisel, st. pt.		87
			63

5/1/2					53
5/10/2	Disk, tandem light finishing				51
5/10/2	Cultivator, field 6-12 in sweeps				51
5/10/2	Sprayer, pre-emergence				51
5/10/2	Drill or airseeder, double disk				51
6/7/2	Sprayer, post emergence			Soybean, mw 7in rows	53
8/1/2	Sprayer, insecticide post emergence				41
10/5/2	Harvest, killing crop 20pct standing stubble				86

RUSLE2 Profile Erosion Calculation Record

Info: Field 4

File: profiles/default

Inputs:

Location: USA\South Dakota\Hand County
 Soil: Hand County, South Dakota\WnB Glenham-Prosper loams, undulating\Glenham Loam 64%
 Slope length (horiz): 300 ft
 Avg. slope steepness: 1.5 %

Management		Vegetation	Yield units	# yield units, #/ac
managements\CMZ 04lc.Other Local Mgt Records\Manure C-Soy		vegetations\Corn, grain	bushels	180.00
managements\CMZ 04lc.Other Local Mgt Records\Manure C-Soy		vegetations\Soybean, mw 7in rows	bu	40.000

Contouring: a. rows up-and-down hill
 Strips/barriers: (none)
 Diversion/terrace, sediment basin: (none)
 Subsurface drainage: (none)
 Adjust res. burial level: Normal res. burial

Outputs:

T value: 5.0 t/ac/yr
 Soil loss erod. portion: 0.26 t/ac/yr
 Detachment on slope: 0.26 t/ac/yr
 Soil loss for cons. plan: 0.26 t/ac/yr
 Sediment delivery: 0.26 t/ac/yr

Crit. slope length: 300 ft
 Surf. cover after planting: -- %
 Avg. ann. total biomass removal: 0 lb/ac

Date	Operation	Vegetation	Surf. res. cov. after op, %
11/1/0	Manure injector, low disturb.30 inch		80
5/5/1	Cultivator, field 6-12 in sweeps		52
5/5/1	Sprayer, pre-emergence		52
5/5/1	planter, double disk opnr	Corn, grain	52
6/7/1	Sprayer, post emergence and fert. tank mix		47
10/20/1	Harvest, killing crop 50pct standing stubble		87
11/1/1	Chisel, st. pt.		63

5/1/2					
5/10/2	Disk, tandem light finishing				53
5/10/2	Cultivator, field 6-12 in sweeps				51
5/10/2	Sprayer, pre-emergence				51
5/10/2	Drill or airseeder, double disk				51
6/7/2	Sprayer, post emergence			Soybean, mw 7in rows	51
8/1/2	Sprayer, insecticide post emergence				53
10/5/2	Harvest, killing crop 20pct standing stubble				41
					86

RUSLE2 Profile Erosion Calculation Record

Info: Field 5

File: profiles/default

Inputs:

Location: USA\South Dakota\Hand County
 Soil: Hand County, South Dakota\WnB Glenham-Prosper loams, undulating\Glenham Loam 64%
 Slope length (horiz): 300 ft
 Avg. slope steepness: 1.5 %

Management		Vegetation	Yield units	# yield units, #/ac
managements\CMZ 04\c.Other Local Mgt Records\Manure C-Soy		vegetations\Corn, grain	bushels	180.00
managements\CMZ 04\c.Other Local Mgt Records\Manure C-Soy		vegetations\Soybean, mw 7in rows	bu	40.000

Contouring: a. rows up-and-down hill
 Strips/barriers: (none)
 Diversion/terrace, sediment basin: (none)
 Subsurface drainage: (none)
 Adjust res. burial level: Normal res. burial

Outputs:

T value: 5.0 t/ac/yr
 Soil loss erod. portion: 0.26 t/ac/yr
 Detachment on slope: 0.26 t/ac/yr
 Soil loss for cons. plan: 0.26 t/ac/yr
 Sediment delivery: 0.26 t/ac/yr

Crit. slope length: 300 ft
 Surf. cover after planting: -- %
 Avg. ann. total biomass removal: 0 lb/ac

Date	Operation	Vegetation	Surf. res. cov. after op, %
11/1/0	Manure injector, low disturb.30 inch		
5/5/1	Cultivator, field 6-12 in sweeps		80
5/5/1	Sprayer, pre-emergence		52
5/5/1	planter, double disk opnr	Corn, grain	52
6/7/1	Sprayer, post emergence and fert. tank mix		52
10/20/1	Harvest, killing crop 50pct standing stubble		47
11/1/1	Chisel, st. pt.		87
			63

5/1/2				
5/10/2	Disk, tandem light finishing			53
5/10/2	Cultivator, field 6-12 in sweeps			51
5/10/2	Sprayer, pre-emergence			51
5/10/2	Drill or airseeder, double disk			51
6/7/2	Sprayer, post emergence		Soybean, mw 7in rows	51
8/1/2	Sprayer, insecticide post emergence			53
10/5/2	Harvest, killing crop 20pct standing stubble			41
				86

Section 3

Nutrient Management Plan (590)

3.1 Nitrogen and Phosphorus Risk Analysis Results

3.2 Manure Application Setback Distance

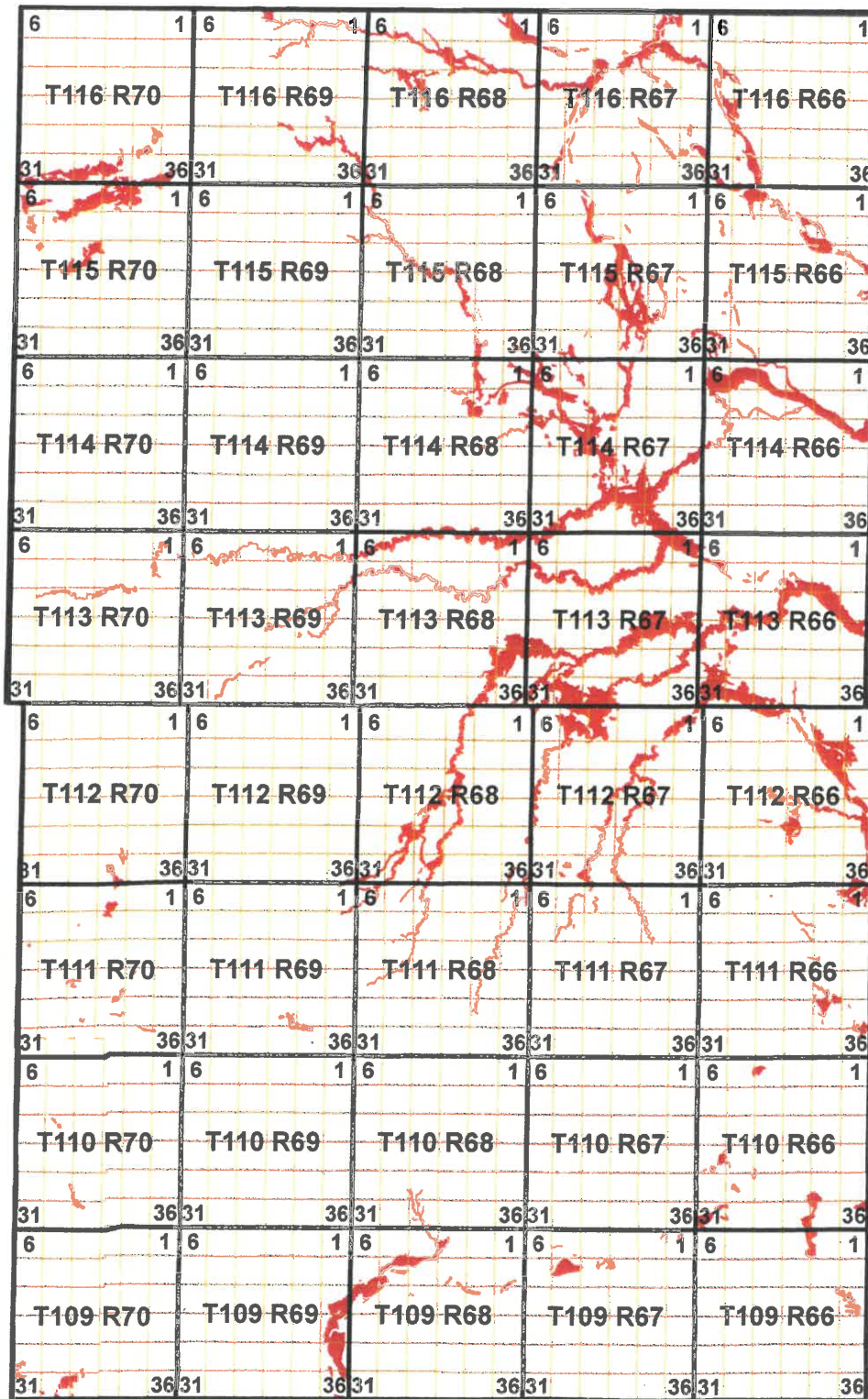
3.3 Soil Test Result Data

3.4 Manure Nutrient Analysis

3.5 - 3.10 Planned Crops, Fertilizer Recommendations,
Nutrient Applications, Field Nutrient Balance, Manure
Inventory, Fertilizer Summary, and Plan Nutrient Balance
(SD-CPA-63)

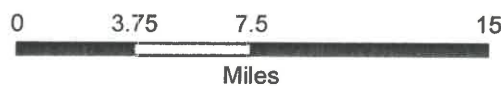
SD LEACHING TOOL HAND COUNTY

N



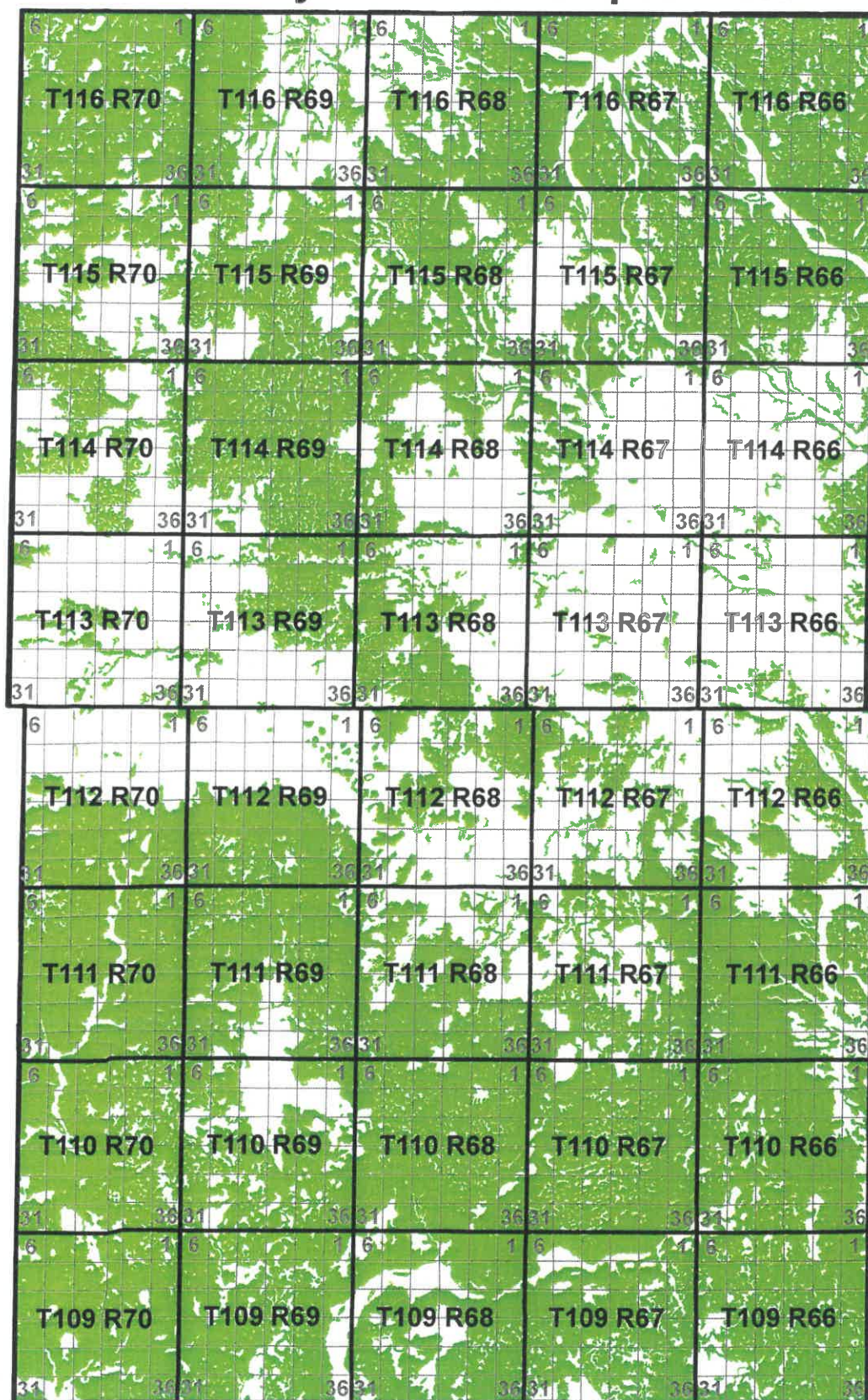
Legend

Leach_Risk ■ High
 Townships






Map Produced by USDA/NRCS
 South Dakota State Office
 Geographic Information System, July 2015

Hand County Soils with Slopes > 4%



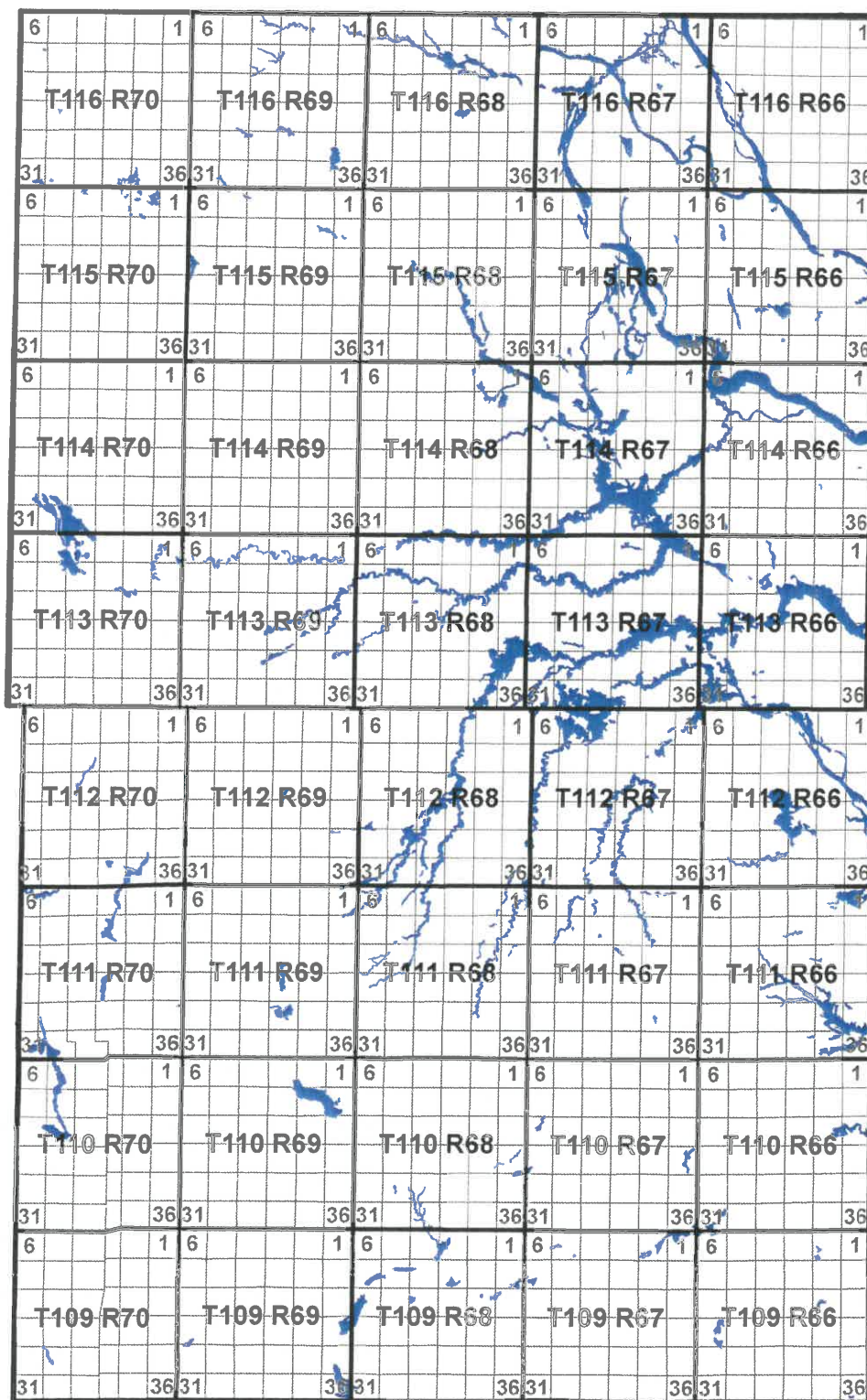
Legend

-  Slopes > 4%
-  Township boundaries
-  Sections

0 2.5 5 10
Miles

Map Produced by USDA/NRCS
South Dakota State Office
Geographic Information System, Aug 2015

Hand County Floodplain Soils



Legend

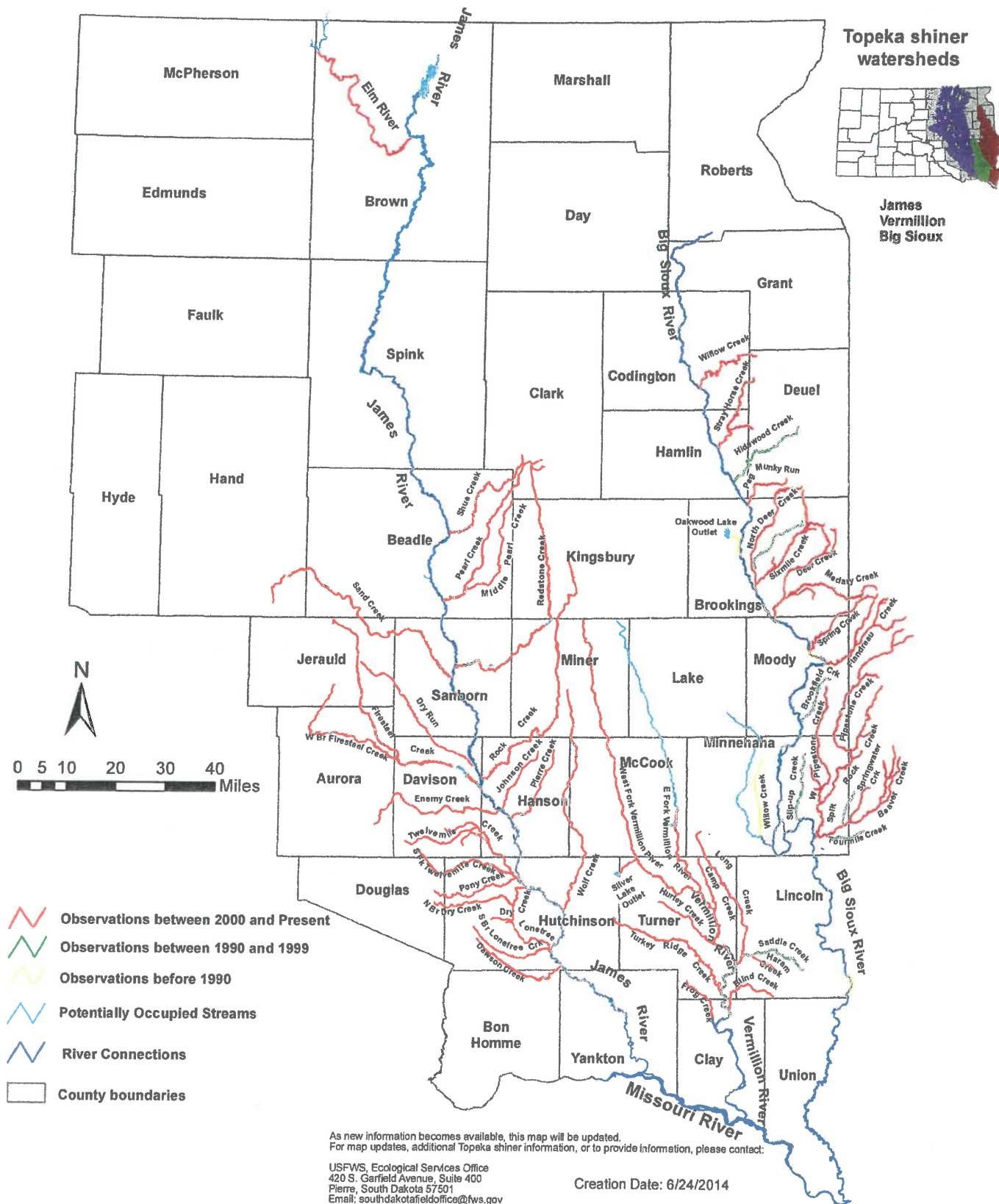
- Floodplain Soils
- Township boundaries
- Sections



Map Produced by USDA/NRCS
South Dakota State Office
Geographic Information System, Aug 2015

U.S. Fish and Wildlife Service

South Dakota Topeka shiner Range Map



South Dakota Phosphorus Loss Risk Assessment						
Soil Test Phosphorus (ppm)		Predicted annual erosion = sum of wind and water				
		<6 tons per acre per year		6 - 8 tons per acre per year		>8 tons per acre per year
				100' vegetative buffer		
Olson	Bray-1	yes	no	yes	no	
0-25	0-35	Low	Low	Low	Low	Moderate
26-50	36-75	Low	Low	Low	Moderate	High
51-75	76-110	Low	Moderate	Moderate	Moderate	High
76-100	111-150	High	High	High	High	No application
>100	>150	No application	No application	No application	No application	No application

Low Risk - Phosphorus can be applied at rates greater than crop phosphorus removal not to exceed the nitrogen requirement for the succeeding crop.

Moderate Risk - Phosphorus can be applied not to exceed crop phosphorus removal for up to a 5 year crop sequence. Application cannot exceed the nitrogen requirement for the succeeding crop.

High Risk - Phosphorus can be applied not to exceed one year crop phosphorus removal. Application cannot exceed the nitrogen requirement for the succeeding crop. The following requirements must also be met: 1. A soil phosphorus drawdown strategy has been implemented. 2. A site assessment for nutrients & soil loss has been conducted to determine if mitigation practices are required to protect water quality. 3. Any deviation from these high risk requirements must have the approval of the Chief of the NRCS.

Planning Considerations:

Wind erosion (WEPS) should be completed for all fields with predominate soils of 1=>134 or if a wind erosion resource concern exists.

Crop removal is the amount of phosphorus used in one crop year according to SDSU-Extra 8009, "Quantities of Nutrients Contained in Crops."

All fertilizer phosphorus sources should be placed below the soil surface. However, surface application is permitted on no-till cropland, pastureland, or hayland. In all other cropland tillage systems, phosphorus sources will be placed below the soil surface.

Winter manure applications are allowed only when all of the following conditions are met: 1. When incidental amounts of manure is collected during feedlot snow removal or cleaning of feed bunks or enclosed pens to facilitate livestock feeding and handling. 2. Winter manure applications will not exceed the rate per acre calculated in the nutrient budget for the application field based on fall soil test results. 3. Set back distances from surface waters or water conveyances will be 300 ft and 1,000 ft from named lakes, rivers, and perennial streams. 4. Winter manure applications are prohibited on floodplains with soils classified as frequently or occasionally flooded as listed in National Cooperative Soil Survey. 5. Applications will only be allowed on fields with slopes less than 4 % slope and be prioritized based on the water erosion prediction technology as listed in the SD tech guide. 6. Fields with lowest predicted soil loss (water erosion) will generally have the highest priority for winter applications. 7. Manure will be uniformly spread.

December 2012

Section 3.1 Inventory of Water Wells

Field ID	Location (Legal)	Well Depth (Ft.)	Use of Well	Required Setback Distance From Well For Manure Application (Ft.)	
				County Rule	State Rule
NONE	No wells Currently				

County Rule

Refer to the following website:

<http://sdda.sd.gov/farming-ranching-agribusiness/county-ordinances/>

State Rule

DENR General Permit 1.4.3.3v of the Surface Water Protection Section (pg 22 and 23)

Wastewater and manure containment structures or the manure and wastewater application sites cannot be located closer than **1,000 feet from an existing public water well** or drinking water

source nor **250 feet from an existing private water well** or drinking water source. Wastewater and

manure containment structures and the manure and wastewater application sites shall not be located closer than **150 feet from a water well or drinking water source that is owned by the producer.**

These setback requirements do not apply to wastewater and manure containment structures constructed prior to August 14, 1996.

Section 3.2 Buffer and Setback Requirements

Specific buffer zone and/or setback distances applicable to land application of manure are as follows:

Alternative
Chosen by
Producer

Option 1



- Do not apply manure (broadcast or incorporated) within **100-feet** of surface water or on either side of a conveyance.

-Or-

Option 2



- Establish and maintain a minimum **35-foot wide (quality) perennial grass filter strip** next to surface water or on either side of a conveyance; an area within which manure will not be applied.

Option 3



- The livestock operator may choose to maintain or establish a minimum **100-foot wide perennial grass filter strip** in select cases where the soil test phosphorus and potential soil erosion in the field are such as to allow application of manure based on multiple years of phosphorus crop removal (not to exceed N needs of crop). See Table I in the Manure Application Planning section of this plan.

Review and comply with other specific setback requirements in the current South Dakota **General Livestock Permit** regulations or your **local county zoning ordinance** when dealing with state and locally permitted facilities.

Manure Application On Frozen Ground

Liquid manure handling systems. Liquid manure is not to be applied to saturated, snow covered or frozen soil except in emergency situations, resulting from natural disaster, extraordinary weather events, or catastrophic equipment or structural failure.

Solid manure handling systems. Solid manure is not to be applied to saturated, snow covered or frozen soils, except in the following situations:

1. When incidental amounts of manure is collected during feedlot snow removal or cleaning of feed bunks or enclosed pens to facilitate livestock feeding and handling.
2. When a natural disaster or extraordinary weather (ie. excessive precipitation) prevent manure application during planned application periods.

General requirements for manure application on saturated, snow covered or frozen soil.

- a. If a permitted facility, the producer is responsible to contact SD DENR prior to applying on saturated, snow-covered, or frozen soil.
- b. The producer is required to provide documentation and updates to the existing nutrient management plan with dates, location(s), and volume of any emergency liquid manure or solid manure winter applications.
- c. Application rates cannot exceed recommended rates based on fall soil test results.
- d. Winter applications of nutrients must be set back a minimum of 300 feet from surface waters or water conveyances and a minimum of 1,000 feet from named lakes, rivers, and perennial streams.
- e. No winter nutrient applications on floodplain soils classified as frequently or occasionally flooded on National Cooperative Soil Survey.
- f. Winter applications only allowed on fields with slopes less than four percent.
- g. Fields with lowest predicted soil loss (water erosion) will generally have the highest priority for winter applications.
- h. Manure will be uniformly spread.
- i. A manure nutrient test is recommended (if not available), to determine nutrient content.

Management Considerations for Nitrogen

Groundwater Concerns

The groundwater concern comes primarily from nitrogen. If not captured by plant roots, it can move down below the root zone and may enter the groundwater. The speed at which nitrate moves depends on the amount of precipitation and soil texture. Water moves through sandy soil much more rapidly than a clay soil.

Because nitrate moves through soil with water, it is extremely important that the rate applied, either as manure or fertilizer, does not exceed that which can be used by crops. Any nitrate remaining in the soil profile at the end of the season is subject to leaching.

Water Quality Risk Assessment Maps will be labeled with the symbol "L" on fields that are Vulnerable to N leaching.

If a field is determined highly vulnerable for nitrate leaching to an aquifer, all of the following management activities will be implemented:

1. Prior to the application of nitrogen above starter application rates, a nitrate nitrogen test **(zero to two foot and two to four foot sample)** will be taken and analyzed. Or an acceptable alternative to the zero to four feet sampling method would be to take a **zero to two foot sample every year within four weeks after crop harvest** prior to nitrogen applications above starter rates as recommended by SDSU.
2. Soil samples (zero to six inches) should also be included and analyzed for P and K. Soil samples will be taken as per land grant university recommendations found on the back of the SDSU Soil Testing Laboratory Soil Sample Information Sheet, or SDSU-FS935, "Recommended Soil Sampling Methods for South Dakota."

Nitrogen Best Management Practices

- Match manure nutrient applications to crop needs.
- Apply manure as close to the time of crop utilization as possible. If fields are located on soils that have a high leaching potential then no commercial fertilizer application is allowed more than 45 days prior to planting.
- Whenever possible try to split apply nitrogen.
- Use nitrification inhibitors if applicable.
- Delay fall manure applications until soil temperatures drop below 50°F to minimize nitrate leaching and ammonia volatilization.
- Avoid applying manure on wet soils to minimize soil compaction, runoff, nitrate leaching and denitrification.
- Inject or incorporate the manure into the soil preferably within 24 hours for maximum nutrient-use efficiency and to reduce odor and runoff problems. Significant volatilization losses will occur when manure is left on the surface for several days.

Nitrogen Recommendations Using Manure

Crops can contain large amounts of nitrogen (Table 4-1). In most cases only the grain is removed and the straw is returned to the soil, supplying nitrogen through mineralization in subsequent years. Because of this and the other sources of N such as nitrate N already in soil, soil organic matter, precipitation and legumes, crop removal alone is not a good estimate of the amount of N to apply.

Table 4-1 Nitrogen Contained in Crops

Crop	Plant Part		
	Grain	Straw	Total
	-----pounds N-----		
Corn (bu)	0.9	0.5	1.4
Soybeans (bu)	3.7	0.8	4.5
Wheat (bu)	1.6	0.8	2.6
Oats (bu)	0.9	0.4	1.3
Barley (bu)	1.1	0.4	1.5
Sunflowers (cwt)	2.8	2.4	5.2
Alfalfa (ton)	----	----	55
Grass (ton)	----	----	30

Table 4.2 Nitrogen Requirements of Crops

Crop	Unit	Nitrogen Required ^{1/}
Wheat	bu	2.5 x yield ^{2/}
Oats	bu	1.3 x yield
Barley		
malting	bu	1.5 x yield
feed	bu	1.7 x yield
Rye	bu	2.5 x yield
Flax	bu	3.0 x yield
Corn (grain)	bu	1.2 x yield
Corn (silage)	ton	10.4 x yield
Sorghum (grain)	bu	1.1 x yield
Sorghum, sudan (hay)	ton	25 x yield
Grass hay	ton	25 x yield
Sunflowers	lb	0.05 x yield
Edible beans	lb	0.05 x yield
Millet	lb	0.035 x yield
Rape	cwt	6.5 x yield
Mustard	cwt	6.5 x yield
Safflower	lb	0.05 x yield
Buckwheat	bu	2.2 x yield
Potatoes	cwt	0.4 x yield

^{1/} Available manure nitrogen or fertilizer nitrogen to apply is equal to the nitrogen requirement minus soil NO₃-N to a 2-ft depth minus any legume credits.

^{2/} Yield goal

Management Considerations for Phosphorus

Surface Water Concerns

Surface water concerns focus primarily on Phosphorus. Phosphorus acts very differently in soils than nitrogen. It attaches tightly to soils and does not generally move down through the soil profile. This lack of movement through soils results in accumulations of phosphorus in soil if phosphorus rates, either from manure or fertilizer, are greater than crop removal.

Increases in phosphorus concentrations in soil can result in more phosphorus moving off the field either attached to soil particles lost by erosion or dissolved in the runoff water. In some situations phosphorus could move into surface waters with manure itself if the manure is applied in such a manner that it moves directly into waterways.

Water Quality Risk Assessment Maps will be labeled with the symbol “R” on fields that are vulnerable to Phosphorus runoff.

1. In no case shall manure or organic byproduct applications (broadcast or incorporated/injected) be made within 100 feet of a surface water or conveyance; 35 feet if a perennial grass filter strip is established and maintained.
2. A minimum of a 35-foot wide perennial grass filter strip is required in all cases on the edges of fields that border a lake, river, or intermittent/perennial stream.
3. In selected cases based on **SD Phosphorus Loss Risk Assessment**, depending on soil test phosphorus and estimated soil loss in a field; a perennial grass filter strip may be required within 100 feet of surface water or conveyance if manure is applied based on nitrogen needs of a crop and not crop removal of phosphorus.

Phosphorus Based Manure Application

If the manure application is required to be based on phosphorus crop removal, the application rate shall be based on phosphorus removed in the harvested portion of the crop.

Application can be based on multi-year phosphorus crop removal, but cannot exceed the one year nitrogen crop need, and no manure may be applied to that field again until the applied phosphorus has been removed from the field via harvest and crop removal.

(See *SD Phosphorus Loss Risk Assessment* for additional information)

Usually fields with High soil test P and/or high runoff potential.

Phosphorus Best Management Practices

- Establish and maintain grass filter strips at the point where water leaves the field to trap sediment and nutrients.
- Control sheet and rill erosion by installing conservation practices including conservation tillage, contour farming, strip cropping, terraces and cover crops.
- Control ephemeral erosion by installing grassed waterways, diversions and sediment retention structures.
- Incorporate or inject manure and commercial fertilizer where possible while maintaining sufficient crop residue levels for erosion control.
- Grow high yielding, high phosphorus removing crops on fields with already high soil test phosphorus to reduce test levels.

How Phosphorus affects Soils Tests

Phosphorus rate recommendations are based on the phosphorus soil test. This test is an index of availability of phosphorus to plants. It is not a measure of total available phosphorus or total phosphorus in soil. However, as total phosphorus levels increase in soils, the soil test index usually increases also. These categories represent a decreasing probability of a yield response to broadcast fertilizer or manure. The probability of response is from about 80 percent at the very low soil test level to less than a 20 percent chance when soil tests are in the very high range.

Table 4.3 Soil Test Calibration Levels Used for Phosphorus and Potassium in SD

Nutrient	Name of Soil Test	Categories				
		Very Low	Low	Medium	High	Very High
		-----ppm extractable (0-6 inch sample)-----				
Phosphorus	Bray P-1	0 - 5	6 - 10	11 - 15	16 - 20	21+
Phosphorus	Olsen	0 - 3	4 - 7	8 - 11	12 - 15	16+
Potassium	NH ₄ Ac	0 - 40	41 - 80	81 - 120	121 - 160	161+

If phosphorus is applied at rates greater than crop removal (Table 4-4), phosphorus soil test levels will increase. As a very general rule of thumb, **for every 20 pounds of phosphorus (P₂O₅) applied and not removed by crops, the soil test index will increase by 1 part per million (ppm).**

Following a good nitrogen application plan with manure in South Dakota can often result in a one to three ppm increase per year in the phosphorus soil test.

As the phosphorus soil test index increases, the possibility of moving significant amounts of phosphorus off the field to surface water usually increases. The movement is both phosphorus attached to soil particles lost with erosion and phosphorus dissolved in the runoff water.

From 60 to 80 percent of the phosphorus in most manure is available to plants within the first year of application. After several years of application, the amount of phosphorus available to plants from manure is equal to that applied with the manure each year.

1/ Source: Jim Gerwing, Extension Soil Specialist Ron Gelderman, Director, Soil Testing Lab, South Dakota State University

Table 4-4 Phosphorus Content of the Harvest Portion of Crops

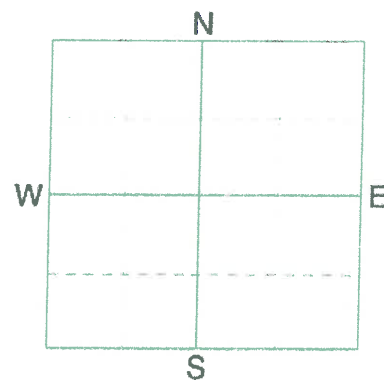
Crop	P2O ₅ (lbs)
Alfalfa (per ton)	12
Buckwheat (per bu)	0.53
Canola (per cwt)	1.5
Corn Grain (per bu)	0.35
Corn Silage (per ton)	4.3
Edible Beans (per cwt)	1.25
Feed Barley (per bu)	0.41
Flax (per bu)	0.7
Forage Sorghum (per ton)	5.8
Grass (per ton)	10
Malting Barley (per bu)	0.41
Millet (per cwt)	0.83
Mustard (per cwt)	1.5
Oats (per bu)	0.25
Potatoes (per cwt)	0.09
Rapeseed (per cwt)	1.5
Rye (per bu)	0.48
Safflower (per cwt)	1.14
Sorghum (per bu)	0.27
Soybean (per bu)	0.77
Sudan Grass (per ton)	5.8
Sunflowers (per cwt)	1.14
Wheat (per bu)	0.56



Soil Analysis by Agvise Laboratories
(<http://www.agvise.com>)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **1**
SAMPLE ID **1E**
FIELD NAME **1E**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh Site

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591654** BOX # **193**
LAB # **BN7915**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

Nutrient In The Soil		Interpretation	1st Crop Choice		2nd Crop Choice		3rd Crop Choice	
		Low Low Med High	YIELD GOAL		YIELD GOAL		YIELD GOAL	
			SUGGESTED GUIDELINES		SUGGESTED GUIDELINES		SUGGESTED GUIDELINES	
			LB/ACRE	APPLICATION	LB/ACRE	APPLICATION	LB/ACRE	APPLICATION
Nitrate			N		N		N	
Olsen Phosphorus	8 ppm	*****	P ₂ O ₅		P ₂ O ₅		P ₂ O ₅	
Potassium	451 ppm	*****	K ₂ O		K ₂ O		K ₂ O	
Chloride			Cl		Cl		Cl	
Sulfur			S		S		S	
Boron			B		B		B	
Zinc	1.48 ppm	*****	Zn		Zn		Zn	
Iron			Fe		Fe		Fe	
Manganese			Mn		Mn		Mn	
Copper			Cu		Cu		Cu	
Magnesium			Mg		Mg		Mg	
Calcium			Lime		Lime		Lime	
Sodium								
Org.Matter	6.8 %	*****						
Carbonate(CCE)								
0-6" 0.18 mmho/cm		****						
Sol. Salts								

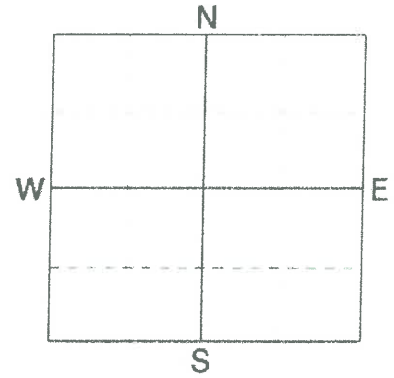
Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
0-6" 6.2							



Soil Analysis by Agvise Laboratories
(<http://www.agvise.com>)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **1**
SAMPLE ID **1W**
FIELD NAME **1W**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh Site

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591655** BOX # **194**
LAB # **BN7920**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

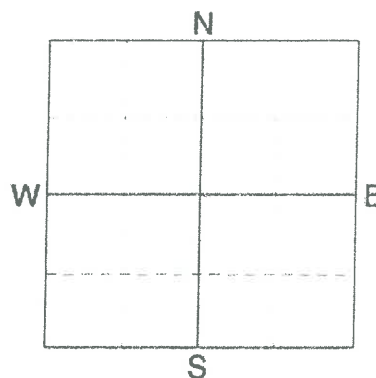
Nutrient In The Soil		Interpretation	1st Crop Choice			2nd Crop Choice			3rd Crop Choice					
Nitrate		V	Low	Med	High	YIELD GOAL			YIELD GOAL			YIELD GOAL		
						SUGGESTED GUIDELINES			SUGGESTED GUIDELINES			SUGGESTED GUIDELINES		
						LB/ACRE		APPLICATION	LB/ACRE		APPLICATION	LB/ACRE		APPLICATION
						N			N			N		
						P ₂ O ₅			P ₂ O ₅			P ₂ O ₅		
Olsen	6 ppm	*****												
Phosphorus														
Potassium	394 ppm	*****												
Chloride						K ₂ O			K ₂ O			K ₂ O		
						Cl			Cl			Cl		
						S			S			S		
						B			B			B		
						Zn			Zn			Zn		
Sulfur														
Boron														
Zinc	1.12 ppm	*****												
Iron														
Manganese														
Copper														
Magnesium														
Calcium														
Sodium														
Org.Matter	5.8 %	*****												
Carbonate(CCE)														
0-6"	0.17 mmho/cm	****												
Sol. Salts														
			Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)								
						% Ca	% Mg	% K	% Na	% H				
			0-6"	6.1										



Soil Analysis by Agvise Laboratories
(http://www.agvise.com)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **2**
SAMPLE ID **2E**
FIELD NAME **2E**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh Site

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591656** BOX # **193**
LAB # **BN7911**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

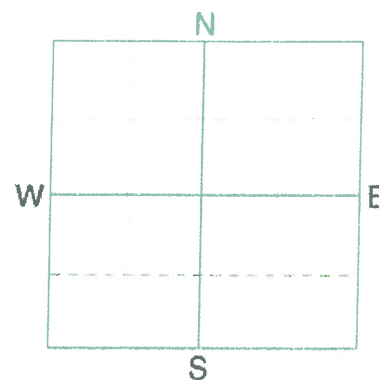
Nutrient In The Soil		Interpretation	1st Crop Choice		2nd Crop Choice		3rd Crop Choice	
		V.Low Low Med High	YIELD GOAL		YIELD GOAL		YIELD GOAL	
			SUGGESTED GUIDELINES		SUGGESTED GUIDELINES		SUGGESTED GUIDELINES	
			LB/ACRE	APPLICATION	LB/ACRE	APPLICATION	LB/ACRE	APPLICATION
Nitrate			N		N		N	
Olsen Phosphorus	13 ppm	*****	P ₂ O ₅		P ₂ O ₅		P ₂ O ₅	
Potassium	256 ppm	*****	K ₂ O		K ₂ O		K ₂ O	
Chloride			Cl		Cl		Cl	
Sulfur			S		S		S	
Boron			B		B		B	
Zinc	0.63 ppm	*****	Zn		Zn		Zn	
Iron			Fe		Fe		Fe	
Manganese			Mn		Mn		Mn	
Copper			Cu		Cu		Cu	
Magnesium			Mg		Mg		Mg	
Calcium			Lime		Lime		Lime	
Sodium								
Org.Matter	4.8 %	*****						
Carbonate(CCE)			Soil pH	Buffer pH	Cation Exchange Capacity		% Base Saturation (Typical Range)	
0-6"	0.18 mmho/cm	****			% Ca	% Mg	% K	% Na
Sol. Salts			0-6" 6.7					% H



Soil Analysis by Agvise Laboratories
(<http://www.agvise.com>)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **2**
SAMPLE ID **2W**
FIELD NAME **2W**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh Site

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591657** BOX # **193**
LAB # **BN7917**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

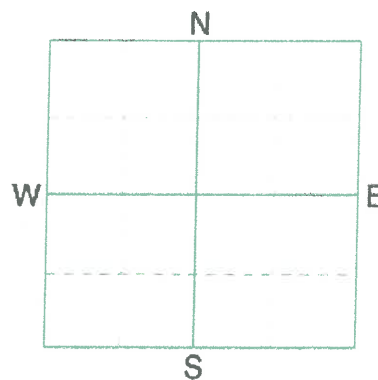
Nutrient In The Soil		Interpretation				1st Crop Choice			2nd Crop Choice			3rd Crop Choice		
Nitrate		Very Low	Low	Med	High	YIELD GOAL			YIELD GOAL			YIELD GOAL		
						SUGGESTED GUIDELINES			SUGGESTED GUIDELINES			SUGGESTED GUIDELINES		
						LB/ACRE	APPLICATION		LB/ACRE	APPLICATION		LB/ACRE	APPLICATION	
						N			N			N		
						P ₂ O ₅			P ₂ O ₅			P ₂ O ₅		
Olsen Phosphorus	10 ppm	*****				K ₂ O			K ₂ O			K ₂ O		
Potassium	296 ppm	*****				Cl			Cl			Cl		
Chloride						S			S			S		
Sulfur						B			B			B		
Boron						Zn			Zn			Zn		
Zinc	0.72 ppm	*****				Fe			Fe			Fe		
Iron						Mn			Mn			Mn		
Manganese						Cu			Cu			Cu		
Copper						Mg			Mg			Mg		
Magnesium						Lime			Lime			Lime		
Calcium														
Sodium														
Org.Matter	5.0 %	*****				Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)					
Carbonate(CCE)									% Ca	% Mg	% K	% Na	% H	
0-6" Sol. Salts	0-6" 0.22 mmho/cm	*****				0-6" 6.7								



Soil Analysis by Agvise Laboratories
(<http://www.agvise.com>)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **3**
SAMPLE ID **3W**
FIELD NAME **3W**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh Site

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591658** BOX # **194**
LAB # **BN7919**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

Nutrient In The Soil		Interpretation	1st Crop Choice		2nd Crop Choice		3rd Crop Choice				
Nitrate		V	Low	Med	High	YIELD GOAL		YIELD GOAL		YIELD GOAL	
						SUGGESTED GUIDELINES		SUGGESTED GUIDELINES		SUGGESTED GUIDELINES	
		LB/ACRE	APPLICATION		LB/ACRE	APPLICATION	LB/ACRE	APPLICATION			
		N			N			N			
		P ₂ O ₅			P ₂ O ₅			P ₂ O ₅			
Olsen Phosphorus	11 ppm	*****									
Potassium	419 ppm	*****									
Chloride											
Sulfur											
Boron											
Zinc	2.11 ppm	*****									
Iron											
Manganese											
Copper											
Magnesium											
Calcium											
Sodium											
Org.Matter	5.0 %	*****									
Carbonate(CCE)											
0-6"	0.11 mmho/cm	**									
Sol. Salts											
			Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)					
						% Ca	% Mg	% K	% Na	% H	
			0-6" 5.5	6.2							

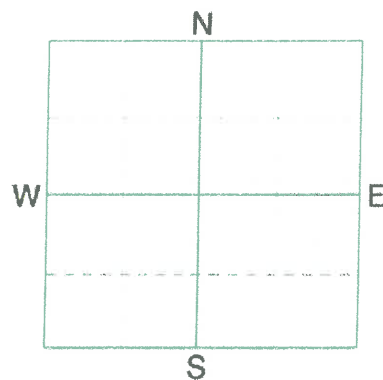
General Comments: (Reduce Lime by 1/2 for W.MN, W.IOWA and the DAKOTAS).



Soil Analysis by Agvise Laboratories
(<http://www.agvise.com>)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **3**
SAMPLE ID **3E**
FIELD NAME **3E**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh Site

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591659** BOX # **194**
LAB # **BN7918**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

Nutrient In The Soil		Interpretation	1st Crop Choice		2nd Crop Choice		3rd Crop Choice			
		Low Low Med High	YIELD GOAL		YIELD GOAL		YIELD GOAL			
		SUGGESTED GUIDELINES		SUGGESTED GUIDELINES		SUGGESTED GUIDELINES				
		LB/ACRE	APPLICATION	LB/ACRE	APPLICATION	LB/ACRE	APPLICATION			
Nitrate			N			N				
Olsen Phosphorus	10 ppm	*****	P ₂ O ₅			P ₂ O ₅				
Potassium	503 ppm	*****	K ₂ O			K ₂ O				
			Cl			Cl				
Chloride			S			S				
			B			B				
Sulfur			Zn			Zn				
Boron			Fe			Fe				
Zinc	1.70 ppm	*****	Mn			Mn				
Iron			Cu			Cu				
Manganese			Mg			Mg				
Copper			Lime			Lime				
Magnesium										
Calcium										
Sodium										
Org.Matter	5.4 %	*****								
Carbonate(CCE)										
0-6"	0.14 mmho/cm	***								
Sol. Salts										
			Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
						% Ca	% Mg	% K	% Na	% H
			0-6" 5.7	6.3						

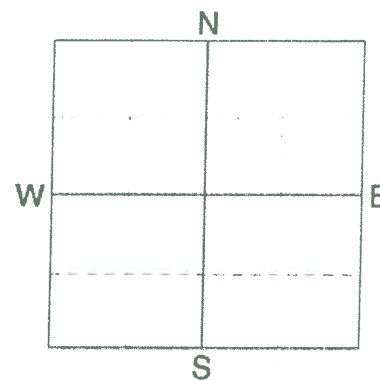
General Comments: (Reduce Lime by 1/2 for W.MN, W.IOWA and the DAKOTAS).



Soil Analysis by Agvise Laboratories
(<http://www.agvise.com>)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **4**
SAMPLE ID **4E**
FIELD NAME **4E**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591661** BOX # **193**
LAB # **BN7916**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

Nutrient In The Soil		Interpretation	1st Crop Choice		2nd Crop Choice		3rd Crop Choice	
		VLow Low Med High	YIELD GOAL		YIELD GOAL		YIELD GOAL	
			SUGGESTED GUIDELINES		SUGGESTED GUIDELINES		SUGGESTED GUIDELINES	
			LB/ACRE	APPLICATION	LB/ACRE	APPLICATION	LB/ACRE	APPLICATION
Nitrate			N		N		N	
Phosphorus	Olsen 12 ppm	*****	P ₂ O ₅		P ₂ O ₅		P ₂ O ₅	
Potassium	511 ppm	*****	K ₂ O		K ₂ O		K ₂ O	
Chloride			Cl		Cl		Cl	
Sulfur			S		S		S	
Boron			B		B		B	
Zinc	1.36 ppm	*****	Zn		Zn		Zn	
Iron			Fe		Fe		Fe	
Manganese			Mn		Mn		Mn	
Copper			Cu		Cu		Cu	
Magnesium			Mg		Mg		Mg	
Calcium			Lime		Lime		Lime	
Sodium								
Org.Matter	5.6 %	*****						
Carbonate(CCE)								
0-6"	0.2 mmho/cm	*****						
Sol. Salts								

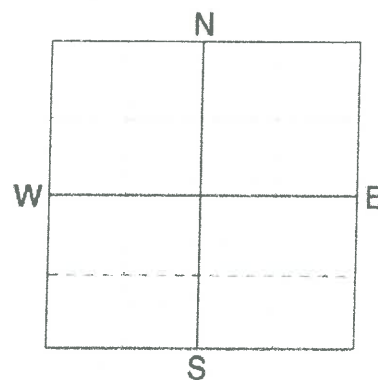
Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
0-6" 6.1							



Soil Analysis by Agvise Laboratories
(<http://www.agvise.com>)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **4**
SAMPLE ID **4W**
FIELD NAME **4W**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591662** BOX # **193**
LAB # **BN7914**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

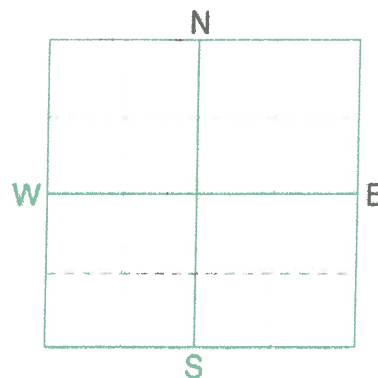
Nutrient In The Soil		Interpretation	1st Crop Choice		2nd Crop Choice		3rd Crop Choice	
		V Low Low Med High	YIELD GOAL		YIELD GOAL		YIELD GOAL	
			SUGGESTED GUIDELINES		SUGGESTED GUIDELINES		SUGGESTED GUIDELINES	
			LB/ACRE	APPLICATION	LB/ACRE	APPLICATION	LB/ACRE	APPLICATION
Nitrate			N		N		N	
Olsen Phosphorus	23 ppm	*****	P ₂ O ₅		P ₂ O ₅		P ₂ O ₅	
Potassium	439 ppm	*****	K ₂ O		K ₂ O		K ₂ O	
Chloride			Cl		Cl		Cl	
Sulfur			S		S		S	
Boron			B		B		B	
Zinc	1.31 ppm	*****	Zn		Zn		Zn	
Iron			Fe		Fe		Fe	
Manganese			Mn		Mn		Mn	
Copper			Cu		Cu		Cu	
Magnesium			Mg		Mg		Mg	
Calcium			Lime		Lime		Lime	
Sodium								
Org.Matter	5.9 %	*****						
Carbonate(CCE)								
0-6" Sol. Salts	0.19 mmho/cm	****	Soil pH	Buffer pH	Cation Exchange Capacity		% Base Saturation (Typical Range)	
					% Ca	% Mg	% K	% Na
					% H			
			0-6" 6.3					



Soil Analysis by Agvise Laboratories
(<http://www.agvise.com>)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **5**
SAMPLE ID **5E**
FIELD NAME **5E**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591663** BOX # **193**
LAB # **BN7912**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

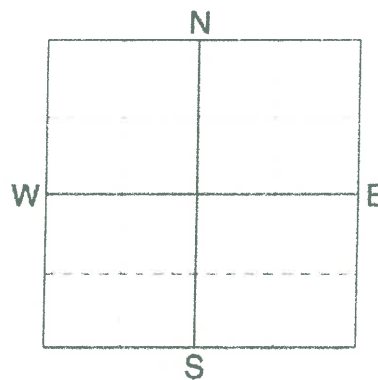
Nutrient In The Soil		Interpretation	1st Crop Choice		2nd Crop Choice		3rd Crop Choice	
		V Low Low Med High	YIELD GOAL		YIELD GOAL		YIELD GOAL	
			SUGGESTED GUIDELINES		SUGGESTED GUIDELINES		SUGGESTED GUIDELINES	
			LB/ACRE	APPLICATION	LB/ACRE	APPLICATION	LB/ACRE	APPLICATION
Nitrate			N		N		N	
Phosphorus	Olsen 15 ppm	*****	P ₂ O ₅		P ₂ O ₅		P ₂ O ₅	
Potassium	431 ppm	*****	K ₂ O		K ₂ O		K ₂ O	
Chloride			Cl		Cl		Cl	
Sulfur			S		S		S	
Boron			B		B		B	
Zinc	1.84 ppm	*****	Zn		Zn		Zn	
Iron			Fe		Fe		Fe	
Manganese			Mn		Mn		Mn	
Copper			Cu		Cu		Cu	
Magnesium			Mg		Mg		Mg	
Calcium			Lime		Lime		Lime	
Sodium								
Org.Matter	6.1 %	*****						
Carbonate(CCE)			Soil pH	Buffer pH	Cation Exchange Capacity		% Base Saturation (Typical Range)	
	0-6" 0.15 mmho/cm	***			% Ca	% Mg	% K	% Na
Sol. Salts			0-6" 6.6					% H



Soil Analysis by Agvise Laboratories
(<http://www.agvise.com>)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **5**
SAMPLE ID **5W**
FIELD NAME **5W**
COUNTY
TWP RANGE
SECTION QTR ACRES **0**
PREV. CROP



SUBMITTED FOR:
Aughenbaugh

SUBMITTED BY: **OL2837**
CENTROL CROP CONSULTING
351 BURLINGTON CIRCL
PO BOX 236
MARSHALL, MN 56258

REF # **2591664** BOX # **193**
LAB # **BN7913**

Date Sampled

Date Received **04/25/2019**

Date Reported **6/6/2019**

Nutrient In The Soil		Interpretation	1st Crop Choice		2nd Crop Choice		3rd Crop Choice	
		Low Med High	YIELD GOAL		YIELD GOAL		YIELD GOAL	
			SUGGESTED GUIDELINES		SUGGESTED GUIDELINES		SUGGESTED GUIDELINES	
			LB/ACRE	APPLICATION	LB/ACRE	APPLICATION	LB/ACRE	APPLICATION
Nitrate			N		N		N	
Phosphorus	Olsen 15 ppm	*****	P ₂ O ₅		P ₂ O ₅		P ₂ O ₅	
Potassium	449 ppm	*****	K ₂ O		K ₂ O		K ₂ O	
Chloride			Cl		Cl		Cl	
Sulfur			S		S		S	
Boron			B		B		B	
Zinc	1.86 ppm	*****	Zn		Zn		Zn	
Iron			Fe		Fe		Fe	
Manganese			Mn		Mn		Mn	
Copper			Cu		Cu		Cu	
Magnesium			Mg		Mg		Mg	
Calcium			Lime		Lime		Lime	
Sodium								
Org.Matter	6.5 %	*****						
Carbonate(CCE)								
0-6"	0.2 mmho/cm	*****						
Sol. Salts								

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
0-6" 6.6							

NUTRIENT MANAGEMENT PLAN FOR SOUTH DAKOTA ANIMAL FEEDING OPERATIONS

Field Information																							
Operator: Ratio LLC																							
17.		18.		19.		20.		21.		22.		23.		24.		25.		26.		27.		28.	
Field ID (include maps to illustrate location)		Date added to Plan		Beginning acres in field		County		Soil map unit symbol		Field Location: (1/4 Section, Township, Range)		Predicted soil loss - Wind/Water (T/ac/yr)		Control of Land		100' Vegetated Buffer		Excluded acres		Irrigated		No-Till	
#	Line	Name or Tract	Field #																				
1		Field 1		6/6/19	326.8	Hand	WnB	N 1/2	Sec. 8	T 110	R 67	0.3	Leased		47.3								
2		Field 2		6/6/19	304.5	Hand	WnB		Sec. 5	T 110	R 67	0.3	Leased		51.2								
3		Field 3		6/6/19	526.6	Hand	WnB		Sec. 6	T 110	R 67	0.3	Leased		53.9								
4		Field 4		6/6/19	575.3	Hand	WnB		Sec. 31	T 111	R 67	0.3	Leased		76.8								
5		Field 5		6/6/19	391.2	Hand	WnB		Sec. 32	T 111	R 67	0.3	Leased		66.1								
6									Sec.	T	R												
7									Sec.	T	R												
8									Sec.	T	R												
9									Sec.	T	R												
10									Sec.	T	R												
11									Sec.	T	R												
12									Sec.	T	R												
13									Sec.	T	R												
14									Sec.	T	R												
15									Sec.	T	R												
16									Sec.	T	R												
17									Sec.	T	R												
18									Sec.	T	R												
19									Sec.	T	R												
20									Sec.	T	R												
21									Sec.	T	R												
22									Sec.	T	R												
23									Sec.	T	R												
24									Sec.	T	R												
25									Sec.	T	R												
26									Sec.	T	R												
27									Sec.	T	R												
				Total:	2,124.3																		
				Comments:																			

NUTRIENT MANAGEMENT PLAN

FOR

SOUTH DAKOTA ANIMAL FEEDING OPERATIONS

Date: 06/06/19													
17.													
# Line	Field ID (Include maps to illustrate location)	Name or Tract	Field #	Current Soil Test Levels								Soil Sample Date	
				N lb/ac		Phosphorus (ppm)		K (ppm)	Organic Matter	Soil PH	Electric Conductivity (EC)		
				0-2'	2-4'	0-6"	P Test					Surface	Sub-surface
1	Field 1					7	Olsen	422.5	6.3%	6.2			04/25/19
2	Field 2					12	Olsen	276	4.9%	6.7			04/25/19
3	Field 3					11	Olsen	461	5.2%	5.6			04/25/19
4	Field 4					17.5	Olsen	475	5.8%	6.2			04/25/19
5	Field 5					15	Olsen	440	6.3%	6.6			04/25/19
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													

NUTRIENT MANAGEMENT PLAN

FOR

SOUTH DAKOTA ANIMAL FEEDING OPERATIONS

Estimated Nutrient Requirement

17.

30.

☐ Actual or Yield Goal

☒ Yields indexed by soil productivity (Productivity Index)

☐ County Average Yields (SD Agricultural Statistics Service)

Field ID (Include maps to
illustrate location)

Previous Year

Crop

PI

Yield

Actual

Yield

Year 1

Crop

PI

Yield

Goal

Year 2

Crop

PI

Yield

Goal

Year 3

Crop

PI

Yield

Goal

Year 4

Crop

PI

Yield

Goal

Year 5

Crop

PI

Yield

Goal

Field 1

Field 2

Field 3

Field 4

Field 5

Corn (bu)

Corn (bu)

Corn (bu)

Soybean (bu)

Soybean (bu)

Soybean (bu)

Soybean (bu)

Soybean (bu)

Corn (bu)

Corn (bu)

Corn (bu)

Corn (bu)

Corn (bu)

Soybean (bu)

Soybean (bu)

Soybean (bu)

Soybean (bu)

Soybean (bu)

Corn (bu)

Corn (bu)

Corn (bu)

Corn (bu)

Corn (bu)

Soybean (bu)

Soybean (bu)

Corn (bu)

Soybean (bu)

Soybean (bu)

Soybean (hu)

Corn (bu)

Corn (bu)

Yield

Goal

PI

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

Yield

Goal

NUTRIENT MANAGEMENT PLAN

FOR

SOUTH DAKOTA ANIMAL FEEDING OPERATIONS

Part 3: Planned Nutrient Application																			
17.		Date: 06/06/19		County: Hand		Date: 06/06/19													
#	Field ID (Include maps to illustrate location)	Name or Tract	Field #	Initial Nutrient Mgt. Plan - N based fields (acres)	31. Nutrient Recommendation - SDSU Extension Service EC-750		32. N	32. P ₂ O ₅	32. K ₂ O	33. Manure application based on:	34. Phosphorus Risk Assessment	35. Nitrogen Risk Assessment	36. Nutrients Applied				37. Estimated years to reapplication based on P ₂ O ₅ rate		
					N	P ₂ O ₅							Commercial lbs/acre	Manure lbs/acre	N	P ₂ O ₅		K ₂ O	Total lbs/acre
1	Field 1			279.4		25	0			Nitrogen need	Low	Low	0	0	0	0	0	0	N/A
2	Field 2			253.3		0	0			Nitrogen need	Low	Low	0	0	0	0	0	0	N/A
3	Field 3			472.6		0	0			Nitrogen need	Low	Low	0	0	0	0	0	0	N/A
4	Field 4			498.5		0	0			Nitrogen need	Low	Low	0	0	0	0	0	0	N/A
5	Field 5			325.1		6	0			Nitrogen need	Low	Low	0	0	0	0	0	0	N/A
6													0	0	0	0	0	0	
7													0	0	0	0	0	0	
8													0	0	0	0	0	0	
9													0	0	0	0	0	0	
10													0	0	0	0	0	0	
11													0	0	0	0	0	0	
12													0	0	0	0	0	0	
13													0	0	0	0	0	0	
14													0	0	0	0	0	0	
15													0	0	0	0	0	0	
16													0	0	0	0	0	0	
17													0	0	0	0	0	0	
18													0	0	0	0	0	0	
19													0	0	0	0	0	0	
20													0	0	0	0	0	0	
21													0	0	0	0	0	0	
22													0	0	0	0	0	0	
23													0	0	0	0	0	0	
24													0	0	0	0	0	0	
25													0	0	0	0	0	0	
26													0	0	0	0	0	0	
27													0	0	0	0	0	0	

1,828.9

N	P ₂ O ₅
158,815	194,420
275,663	77,399

Total lbs of N and P2O5 available for crops:
Total lbs of N and P2O5 required by fields:
Adequate acres are available based on Nitrogen analysis

However, P2O5 is in excess of removal At this rate, it will take approximately 11 year(s) to build all listed fields up to 50 ppm P (Olsen)

Producer/Operation: Ratio LLC

Producer/Operation: Ratio LLC

Check if applicable	Crop	Yield
X	Alfalfa (T)	6
X	Barley (bu)	70
X	Barley, Malting (bu)	70
	Buckwheat (bu)	
X	Canola (cwt)	20
	Chickpea	
X	Corn (bu)	220
X	Corn Silage (ton)	30
X	Cover Crops (T)	5
	Edible Beans (lbs)	
	Fallow	
	Field Pea	
	Flax (bu)	
X	Grass (Ton)	
X	Grass, Sudan (ton)	7
	Lentil	
	Melons	
X	Millet (lbs)	2200
	Mustard (cwt)	
X	Oats (bu)	100
	Potatoes (cwt)	
	Rapeseed (cwt)	
X	Rye (bu)	60
X	Rye Forage (T)	15
	Safflower (lbs)	
X	Sorghum (bu)	100
X	Sorghum, Forage (T)	10
X	Soybean (bu)	50
X	Sunflowers (lbs)	2600
	Triticale (T)	
X	Wheat, Sp. (bu)	60
X	Wheat, W. (bu)	60

[illegible]

Possible Alternative Manure Application Methods

Producer/Operation: Ratio LLC

Animal Type: Dairy Cattle, Beef Cattle, Cow, **Nurse Pig, Growing Pig, Gestating Sow, Sow and litter, Boar**, Sheep, Poultry Layer, Poultry Broiler, Turkey, Duck, Horse
(circle those that apply)

Manure Type: **Solid:** daily scrape and haul, manure pack, open lot, manure stacking, deep pit poultry, liter (birds), separator system
(circle those that apply) **Liquid:** **Anaerobic pit**, above-ground (covered), above-ground (uncovered), earth storage holding pond, lagoon, separator system

Check if applicable	Method	Solid (S) Liquid (L)
X	Injection	L
	Flood Irrigation	L
X	Sprinkling	L
X	Sprinkling (partial incorp.)	L
X	Sprinkling (incorp. within 24 hrs.)	L
	Broadcast (no incorp.)	S
	Broadcast (incorp. within 24 hrs.)	S
	Broadcast (incorp. 1 - 5 days)	S
	Broadcast (incorp. after 5 days)	S
	Broadcast w/ partial incorporation	S

Possible Alternative Manure Application Methods

Producer/Operation: Ratio LLC

Animal Type: Dairy Cattle, Beef Cattle, Cow, **Nursey Pig, Growing Pig, Gestating Sow, Sow and litter, Boar,** Sheep, Poultry Layer, Poultry Broiler, Turkey, Duck, Horse
(circle those that apply)

Manure Type: **Solid:** daily scrape and haul, manure pack, open lot, manure stacking, deep pit poultry, liter (birds), separator system
(circle those that apply) **Liquid:** **Anaerobic pit,** above-ground (covered), above-ground (uncovered), earth storage holding pond, lagoon, separator system

Check if applicable	Method	Percent Nitrogen Retained
X	Injection	98
	Flood Irrigation	70
X	Sprinkling	70
X	Sprinkling (partial incorp.)	80
X	Sprinkling (incorp. within 24 hrs.)	90
	Broadcast (no incorp.)	80
	Broadcast (incorp. within 24 hrs.)	90
	Broadcast (incorp. 1 - 5 days)	85
	Broadcast (incorp. after 5 days)	80
	Broadcast w/ partial incorporation	80

Field 4

MANURE APPLICATION AGREEMENT

This Agreement, made and entered into this 1st day of MAY, 2019, between KIRK A AUGENBAUGH hereinafter described as Landowner, and _____ hereinafter described as Tenant (Sow Farm), agree as follows:

1. Landowner allows the Tenant the right to spread solid and/or liquid animal manure on the following described real property situated in HAND County, South Dakota.

Field Location (1/4 Section, Township, Range)	Acres Available	Land Use
NE 1/4 31-111-67	160.00	CORN - BEANS
NW 1/4 31-111-67 (LOTS 1-2 & E 1/2)	129.94	CORN - BEANS
SW 1/4 31-111-67 (LOTS 3-4 & E 1/2)	129.68	CORN - BEANS
SE 1/4 31-111-67 A/K/A PARCEL #1		
EXCEPT 6.92 ACRES DESCRIBED AS PARCEL #2 HAND COUNTY	153.08	CORN - BEANS
Total Acres (more or less) AKA 572.60		

- Tenant shall be allowed to spread manure on the property owned by the Landowner described above at such regular intervals as are mutually agreeable by both parties. The spreading of manure, however, shall not interfere with the productivity, planting, growing and harvesting of crops on the above described premises.
- Tenant and Landowner jointly agree to apply manure and/or commercial fertilizer at rates not to exceed crop nutrient needs using current soil and manure test results.
- Tenant further agrees to comply with all local ordinances and state and federal environmental laws in the hauling and spreading of said animal manure.
- This agreement shall commence May 1, 2019 and terminate in 10 YEARS years on May 1, 2034. Upon expiration, this lease shall automatically renew from year-to-year, with the same terms and conditions. Either party can give written notice to the other, on or before January 1 of any given year of an election not to renew this agreement.
- It is agreed that the Tenant listed above has sole authorization of spreading manure on the above described premises.
- This agreement is transferrable by tenant to another entity if tenant sells or changes company name
- Other Conditions (Describe): PENDING APPROVALS AND OPERATING AGREEMENTS

LANDOWNER Kirk A. Augenbaugh
(Land Owner)
Printed KIRK A AUGENBAUGH
Address: 21024 421st AVENUE
City State Zip: TEBORG SD 57353
Phone: 605-546-3485

TENANT RATIO LLC BY Kirk A. Augenbaugh
(Sow Farm)
Printed RATIO LLC
Address: 1300 S HWY 75
City State Zip: Pipestone, MN 56164
Phone: 507-825-4211

Part of field 5

MANURE APPLICATION AGREEMENT

This Agreement, made and entered into this 1 day of MAY, 2019, between KIRK A AUGERBAUGH hereinafter described as Landowner, and _____ hereinafter described as Tenant (Sow Farm), agree as follows:

1. Landowner allows the Tenant the right to spread solid and/or liquid animal manure on the following described real property situated in HAND County, South Dakota.

Field Location (1/4 Section, Township, Range)	Acres Available	Land Use
SW 1/4 32-111-67 AKA PARCEL #7		
(EXCEPT 112.47 ACRES DESCRIBED AS PARCEL # 8 HAND COUNTY MAP 1	41.51	CORN - BEANS
SE 1/4 32-111-67 AKA PARCEL #10		
(EXCEPT 66.92 ACRES DESCRIBED AS PARCEL # 9 HAND COUNTY MAP 1	32.07	CORN - BEANS
Total Acres (more or less)	132.58	

- Tenant shall be allowed to spread manure on the property owned by the Landowner described above at such regular intervals as are mutually agreeable by both parties. The spreading of manure, however, shall not interfere with the productivity, planting, growing and harvesting of crops on the above described premises.
- Tenant and Landowner jointly agree to apply manure and/or commercial fertilizer at rates not to exceed crop nutrient needs using current soil and manure test results.
- Tenant further agrees to comply with all local ordinances and state and federal environmental laws in the hauling and spreading of said animal manure.
- This agreement shall commence May 1, 2019 and terminate in 10 YEARS 10 years on May 1, 2034. Upon expiration, this lease shall automatically renew from year-to-year, with the same terms and conditions. Either party can give written notice to the other, on or before January 1 of any given year of an election not to renew this agreement.
- It is agreed that the Tenant listed above has sole authorization of spreading manure on the above described premises.
- This agreement is transferrable by tenant to another entity if tenant sells or changes company name
- Other Conditions (Describe): PENDING APPROVALS AND OPERATING AGREEMENTS FA

LANDOWNER Tim A. Augerbaugh
(Land Owner)
Printed KIRK A AUGERBAUGH
Address: 21024 4212 AVENUE
City State Zip: TRAPOUILS SD 57253
Phone: 605-546-2485

TENANT RATIO LLC BY Tim A. Augerbaugh
(Sow Farm)
Printed RATIO LLC
Address: 1300 S HWY 75
City State Zip: Pipestone, MN 56164
Phone: 507-825-4211

Part of Field 5

MANURE APPLICATION AGREEMENT

This Agreement, made and entered into this 1ST day of MAY, 2019, between KIRK A AUGHEENRAUGH hereinafter described as Landowner, and _____ hereinafter described as Tenant (Sow Farm), agree as follows:

1. Landowner allows the Tenant the right to spread solid and/or liquid animal manure on the following described real property situated in HAND County, South Dakota.

Field Location (1/4 Section, Township, Range)	Acres Available	Land Use
NE 1/4 32-111-67 AKA PARCEL # 3		
EXCEPT 1.55 ACRES DESCRIBED AS		
PARCEL # 4 HAND COUNTY WA # 1	157.41	CORN - SOYBEANS
NW 1/4 32-111-67 AKA PARCEL # 5		
EXCEPT 1.21 ACRES DESCRIBED AS		
PARCEL # 6 HAND COUNTY WA # 1	158.79	CORN - SOYBEANS
Total Acres (more or less)		316.20

- Tenant shall be allowed to spread manure on the property owned by the Landowner described above at such regular intervals as are mutually agreeable by both parties. The spreading of manure, however, shall not interfere with the productivity, planting, growing and harvesting of crops on the above described premises.
- Tenant and Landowner jointly agree to apply manure and/or commercial fertilizer at rates not to exceed crop nutrient needs using current soil and manure test results.
- Tenant further agrees to comply with all local ordinances and state and federal environmental laws in the hauling and spreading of said animal manure.
- This agreement shall commence May 1, 2019 and terminate in 10 YEARS ¹⁰ years on May 1, 2034. Upon expiration, this lease shall automatically renew from year-to-year, with the same terms and conditions. Either party can give written notice to the other, on or before January 1 of any given year of an election not to renew this agreement.
- It is agreed that the Tenant listed above has sole authorization of spreading manure on the above described premises.
- This agreement is transferrable by tenant to another entity if tenant sells or changes company name
- Other Conditions (Describe): PENDING APPROVALS AND OPERATING AGREEMENTS.

LANDOWNER Th. A. Augheenaugh
(Land Owner)
Printed KIRK A AUGHEENRAUGH
Address: 21024 421ST AVENUE
City State Zip: IRABOON SD 57753
Phone: 605-644-2485

TENANT RATIO LLC BY Th. A. Augheenaugh
(Sow Farm)
Printed RATIO LLC
Address: 1300 S HWY 75
City State Zip: PIPESTONE, MN 56164
Phone: 507-825-4211

MANURE APPLICATION AGREEMENT

This Agreement, made and entered into this 1ST day of MAY, 2019, between KIRK AUGHEUBAUGH hereinafter described as Landowner, and _____ hereinafter described as Tenant (Sow Farm), agree as follows:

1. Landowner allows the Tenant the right to spread solid and/or liquid animal manure on the following described real property situated in HAND County, South Dakota.

Field Location (1/4 Section, Township, Range)	Acres Available	Land Use
Field 1 - NE 1/4 8-110-67	158.96	CORN - BEANS
NW 1/4 8-110-67	160.00	CORN - BEANS
Field 2 - NE 1/4 5-110-67 (LOTS 1-2, 5 1/2)	158.96	CORN - BEANS

Total Acres (more or less) 477.92

- Tenant shall be allowed to spread manure on the property owned by the Landowner described above at such regular intervals as are mutually agreeable by both parties. The spreading of manure, however, shall not interfere with the productivity, planting, growing and harvesting of crops on the above described premises.
- Tenant and Landowner jointly agree to apply manure and/or commercial fertilizer at rates not to exceed crop nutrient needs using current soil and manure test results.
- Tenant further agrees to comply with all local ordinances and state and federal environmental laws in the hauling and spreading of said animal manure.
- This agreement shall commence May 1, 2019, and terminate in 10 YEARS ~~15~~ years on May 1, 2034. Upon expiration, this lease shall automatically renew from year-to-year, with the same terms and conditions. Either party can give written notice to the other, on or before January 1 of any given year of an election not to renew this agreement.
- It is agreed that the Tenant listed above has sole authorization of spreading manure on the above described premises.
- This agreement is transferrable by tenant to another entity if tenant sells or changes company name
- Other Conditions (Describe): PENDING APPROVALS AND OPERATING AGREEMENTS

LANDOWNER Kirk Augheubaugh
(Land Owner)
Printed KIRK AUGHEUBAUGH
Address: 21024 421ST AUGAWE
City State Zip: FAIRBANKS SD 57525
Phone: 605-546-2485

TENANT RATIO LLC BY TIA O. AUGHEUBAUGH
(Sow Farm)
Printed RATIO LLC
Address: 1300 S HWY 75
City State Zip: PIPESTONE, MN 56164
Phone: 507-825-4211

MANURE APPLICATION AGREEMENT

This Agreement, made and entered into this 1st day of MAY, 2019, between KIRK AUGHEBAUGH hereinafter described as Landowner, and _____ hereinafter described as Tenant (Sow Farm), agree as follows:

1. Landowner allows the Tenant the right to spread solid and/or liquid animal manure on the following described real property situated in HAND County, South Dakota.

	Field Location (1/4 Section, Township, Range)	Acres Available	Land Use
Part of Field 2	SW 1/4 5-110-67	160.00	CORN - BEANS
	SE 1/4 5-110-67	158.96	CORN - BEANS
Field 3	NE 1/4 6-110-67 LOTS 1 & 2 S 1/2	160.00	CORN - BEANS
	NW 1/4 6-110-67 LOTS 3-4 S ESE 1/4	130.20	CORN - BEANS
	SW 1/4 6-110-67 LOTS 6-7 E 1/2	131.40	CORN - BEANS
	SE 1/4 6-110-67	160.00	CORN - BEANS
	Total Acres (more or less)	900.56	

- Tenant shall be allowed to spread manure on the property owned by the Landowner described above at such regular intervals as are mutually agreeable by both parties. The spreading of manure, however, shall not interfere with the productivity, planting, growing and harvesting of crops on the above described premises.
- Tenant and Landowner jointly agree to apply manure and/or commercial fertilizer at rates not to exceed crop nutrient needs using current soil and manure test results.
- Tenant further agrees to comply with all local ordinances and state and federal environmental laws in the hauling and spreading of said animal manure.
- This agreement shall commence May 1, 2019 and terminate in 10 YEARS years, on May 1, 2034. Upon expiration, this lease shall automatically renew from year-to-year, with the same terms and conditions. Either party can give written notice to the other, on or before January 1 of any given year of an election not to renew this agreement.
- It is agreed that the Tenant listed above has sole authorization of spreading manure on the above described premises.
- This agreement is transferrable by tenant to another entity if tenant sells or changes company name
- Other Conditions (Describe): PENDING APPROVALS AND OPERATING AGREEMENTS

LANDOWNER Tim Aughebaugh
(Land Owner)
Printed KIRK AUGHEBAUGH
Address: 21024 421ST AVENUE
City State Zip: TRABULS SD 57555
Phone: 605-546-2425

TENANT RATIO LLC BY Tim O Aughebaugh
(Sow Farm)
Printed RATIO LLC
Address: 1300 S HWY 75
City State Zip: Pipestone, MN 56164
Phone: 507-825-4211