

**State of North Carolina  
Department of Environment and Natural Resources  
Division of Water Resources**

**Animal Waste Management Systems**

Request for Certificate of Coverage

Facility Currently Covered by an Expiring State Non-Discharge General Permit

On September 30, 2014, the North Carolina State Non-Discharge General Permits for Animal Waste Management Systems will expire. As required by these permits, facilities that have been issued Certificates of Coverage to operate under these State Non-Discharge General Permits must apply for renewal at least 180 days prior to their expiration date. Therefore, all applications must be received by the Division of Water Resources by no later than **April 1, 2014**.

*Please do not leave any question unanswered. Please verify all information and make any necessary corrections below.*

*Application must be signed and dated by the Permittee.*

1. Facility Number: 310191 and Certificate of Coverage Number: AWS310191
2. Facility Name: Smith Farms
3. Landowner's name (same as on the Waste Management Plan): Thomas Smith
4. Landowner's mailing address: 214 Tapp Farm Rd  
City/State: Pink Hill NC Zip: 285727930  
Telephone Number (include area code): (252)568-4798 E-mail: \_\_\_\_\_
5. Facility's physical address: 214 Tapp Farm Rd  
City: Pink Hill State: NC Zip: 28572
6. County where facility is located: Duplin
7. Farm Manager's name (If different than the Landowner): \_\_\_\_\_
8. Farm Manager's telephone number (include area code): \_\_\_\_\_
9. Integrator's name (if there is not an integrator write "None"): Murphy-Brown LLC
10. Operator in Charge (OIC) name: Donna Smith Telephone Number 1-252-568-4798 OIC # 18149
11. Lessee's name (if there is not a lessee write "None"): \_\_\_\_\_
12. Indicate animal operation type and number:

**Swine**

Wean to Finish  
Wean to Feeder  
Farrow to Finish  
Feeder to Finish 6660  
Farrow to Wean  
Farrow to Feeder  
Boar/Stud  
Gilts  
Other

Horses - Horses  
Horses - Other

**Cattle**

Dairy Calf  
Dairy Heifer  
Milk Cow  
Dry Cow  
Beef Stocker Calf  
Beef Feeder  
Beef Brood Cow  
Other

Sheep - Sheep  
Sheep - Other

**Dry Poultry**

Non Laying Chickens  
Laying Chickens  
Turkeys  
Other  
Pullets  
Turkey Poults

**Wet Poultry**

Non Laying Pullets  
Layers

RECEIVED/DENR/DWR

APR 28 2014

Water Quality Regional  
Operations Section

Mail one (1) copy of the most recent Waste Utilization Plan (WUP) along with the field maps for this facility with this completed and signed application as required by NC General Statutes 143-215.10C(d) to the address below. The WUP must be signed by the owner and a certified technical specialist.

As a second option to mailing paper copies of the application package, you can scan and email one signed copy of the application and the WUP to: [animalpermits@ncdenr.gov](mailto:animalpermits@ncdenr.gov)

I attest that this application has been reviewed by me and is accurate and complete to the best of my knowledge. I understand that, if all required parts of this application are not completed and that if all required supporting information and attachments are not included, this application package will be returned to me as incomplete. **Note:** In accordance with NC General Statutes 143-215.6A and 143-215.6B, any person who knowingly makes any false statement, representation, or certification in any application may be subject to civil penalties up to \$25,000 per violation. (18 U.S.C. Section 1001 provides a punishment by a fine of not more than \$10,000 or imprisonment of not more than 5 years, or both for a similar offense.)

Printed Name of Signing Official (Landowner, or if multiple Landowners all landowners should sign. If Landowner is a corporation, signature should be by a principal executive officer of the corporation):

Name: Thomas Smith Title: Owner

Signature: Thomas Smith Date: 3-26-14

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

THE COMPLETED APPLICATION SHOULD BE SENT TO THE FOLLOWING ADDRESS:

**NCDENR-DWR  
Animal Feeding Operations Branch  
1636 Mail Service Center  
Raleigh, North Carolina 27699-1636**

**Telephone number: (919) 807-6464  
E-mail: [animalpermits@ncdenr.gov](mailto:animalpermits@ncdenr.gov)**



North Carolina Department of Environment and Natural Resources

Division of Water Resources  
Water Quality Programs  
Thomas A. Reeder  
Director

Pat McCrory  
Governor

John E. Skvarla, III  
Secretary

March 3, 2014

Thomas Smith  
Smith Farms  
214 Tapp Farm Rd  
Pink Hill, NC 285727930

Subject: Application for Renewal of Coverage for Expiring State General Permit

Dear Permittee:

Your facility is currently approved for operation under one of the Animal Waste Operation State Non-Discharge General Permits, which expire on September 30, 2014. Copies of the new animal waste operation State Non-Discharge General Permits are available at <http://www.ncwaterquality.org/web/wq/aps/afo/apps> or by writing or calling:

NCDENR-DWR  
Animal Feeding Operations Branch  
1636 Mail Service Center  
Raleigh, North Carolina 27699-1636

Telephone number: (919) 807-6464

In order to assure your continued coverage under the State Non-Discharge General Permits, you must submit an application for permit coverage to the Division. Enclosed you will find a 'Request for Certificate of Coverage Facility Currently Covered by an Expiring State Non-Discharge General Permit.' The application form must be completed, signed and returned by April 1, 2014. Please note that you must include one (1) copy of your most recent Waste Utilization Plan with the signed application form.

Failure to request renewal of your coverage under a general permit within the time period specified may result in a civil penalty. Operation of your facility without coverage under a valid general permit would constitute a violation of NCGS 143-215.1 and could result in assessments of civil penalties of up to \$25,000 per day.

If you have any questions about the State Non-Discharge General Permits, the enclosed application, or any related matter please feel free to contact the Animal Feeding Operations Branch staff at 919-807-6464.

Sincerely,

S. Jay Zimmerman, P.G., Chief  
Water Quality Regional Operations Section

Enclosures

cc (w/o enclosures): Wilmington Regional Office, Water Quality Regional Operations Section  
Duplin County Soil and Water Conservation District  
WQROS Unit Central Files - AWS310191  
Murphy-Brown LLC

1636 Mail Service Center, Raleigh, North Carolina 27699-1636  
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604  
Phone: 919-807-6464 \ FAX: 919-807-6492  
Internet: [www.ncwaterquality.org](http://www.ncwaterquality.org)

An Equal Opportunity \ Affirmative Action Employer



## NUTRIENT UTILIZATION PLAN

Grower(s): Thomas & Donna Smith  
Farm Name: Thomas & Donna Smith Farm  
County: Duplin

**Farm Capacity:**

Farrow to Wean	
Farrow to Feeder	
Farrow to Finish	
Wean to Feeder	
Wean to Finish	
Feeder to Finish	6,660

Storage Structure: Anaerobic Lagoon  
Storage Period: >180 days  
Application Method: Irrigation

RECEIVED/DENR/DWR

APR 28 2014

Water Quality Regional  
Operations Section

The waste from your animal facility must be land applied at a specified rate to prevent pollution of surface water and/or groundwater. The plant nutrients in the animal waste should be used to reduce the amount of commercial fertilizer required for the crops in the fields where the waste is to be applied.

This waste utilization plan uses nitrogen as the limiting nutrient. Waste should be analyzed before each application cycle. Annual soil tests are strongly encouraged so that all plant nutrients can be balanced for realistic yields of the crop to be grown.

Several factors are important in implementing your waste utilization plan in order to maximize the fertilizer value of the waste and to ensure that it is applied in an environmentally safe manner:

1. Always apply waste based on the needs of the crop to be grown and the nutrient content of the waste. Do not apply more nitrogen than the crop can utilize.
2. Soil types are important as they have different infiltration rates, leaching potentials, cation exchange capacities, and available water holding capacities.
3. Normally waste shall be applied to land eroding at less than 5 tons per acre per year. Waste may be applied to land eroding at 5 or more tons per acre annually, but less than 10 tons per acre per year providing that adequate filter strips are established.
4. Do not apply waste on saturated soils, when it is raining, or when the surface is frozen. Either of these conditions may result in runoff to surface waters which is not allowed under DWQ regulations.
5. Wind conditions should also be considered to avoid drift and downwind odor problems.
6. To maximize the value of the nutrients for crop production and to reduce the potential for pollution, the waste should be applied to a growing crop or applied not more than 30 days prior to planting a crop or forages breaking dormancy. Injecting the waste or disking will conserve nutrients and reduce odor problems.

This plan is based on the waste application method shown above. If you choose to change methods in the future, you need to revise this plan. Nutrient levels for different application methods are not the same.

The estimated acres needed to apply the animal waste is based on typical nutrient content for this type of facility. In some cases you may want to have plant analysis made, which could allow additional waste to be applied. Provisions shall be made for the area receiving waste to be flexible so as to accommodate changing waste analysis content and crop type. Lime must be applied to maintain pH in the optimum range for specific crop production.

This waste utilization plan, if carried out, meets the requirements for compliance with 15A NCAC 2H .0217 adopted by the Environmental Management Commission.

**AMOUNT OF WASTE PRODUCED PER YEAR ( gallons, ft<sup>3</sup>, tons, etc.):**

Capacity	Type	Waste Produced per Animal	Total
6660	Farrow to Wean	3212 gal/yr	gal/yr
	Farrow to Feeder	4015 gal/yr	gal/yr
	Farrow to Finish	10585 gal/yr	gal/yr
	Wean to Feeder	223 gal/yr	gal/yr
	Wean to Finish	838 gal/yr	gal/yr
	Feeder to Finish	986 gal/yr	gal/yr
		<b>Total</b>	<b>6,566,760 gal/yr</b>

**AMOUNT OF PLANT AVAILABLE NITROGEN PRODUCED PER YEAR (lbs):**

Capacity	Type	Nitrogen Produced per Animal	Total
6660	Farrow to Wean	3.85 lbs/yr	lbs/yr
	Farrow to Feeder	7.23 lbs/yr	lbs/yr
	Farrow to Finish	19.05 lbs/yr	lbs/yr
	Wean to Feeder	0.4 lbs/yr	lbs/yr
	Wean to Finish	1.5 lbs/yr	lbs/yr
	Feeder to Finish	1.77 lbs/yr	lbs/yr
		<b>Total</b>	<b>11,788 lbs/yr</b>

Applying the above amount of waste is a big job. You should plan time and have appropriate equipment to apply the waste in a timely manner.

**LAND UTILIZATION SUMMARY**

The following table describes the nutrient balance and land utilization rate for this facility. Note that the Nitrogen Balance for Crops indicates the ratio of the amount of nitrogen produced on this facility to the amount of nitrogen that the crops under irrigation may uptake and utilize in the normal growing season.

**Total Irrigated Acreage: 83.02**  
**Total N Required 1st Year: 24773.797**  
**Total N Required 2nd Year: 0**

**Average Annual Nitrogen Requirement of Crops: 24,773.80**  
**Total Nitrogen Produced by Farm: 11,788.20**  
**Nitrogen Balance for Crops: (12,985.60)**

The following table describes the specifications of the hydrants and fields that contain the crops designated for utilization of the nitrogen produced on this facility. This chart describes the size, soil characteristics, and uptake rate for each crop in the specified crop rotation schedule for this facility.



### Reception Area Specifications

Tract	Field	Irrigated Acreage	Soil Type	1st Crop Code	Time to Apply	1st Crop Yield	1st Crop lbs N/Unit	Lbs N/Ac Residual	Lbs N /Ac	Total lbs N Utilized	2nd Crop Code	Time to Apply	2nd Crop Yield	2nd Crop lbs N/Unit	Lbs N/Ac Residual	Lbs N /Ac	Total lbs N Utilized	Total Lbs N/Ac	Total lbs N Utilized
T5685	P1	3.63	GoA	G	Aug-July	4.0	37.5		150	544.5	*					0	0	150	544.5
T5685	P2	4.42	GoA	B	Mar-Sept	6.5	37.5		244	1077.375	K	Sept-April	1	50		50	221	293.75	1298.375
T5685	P3	4.98	GoA	B	Mar-Sept	6.5	37.5		244	1213.875	K	Sept-April	1	50		50	249	293.75	1462.875
T5685	P4	3.38	FoA	Millet Combo	May-Aug	5.0	43.75		219	739.375	I (Grain)	Sept 1-April 15	94	1.3		122.2	413	340.95	1152.411
T5685	P5	4.64	FoA	Millet Combo	May-Aug	5.0	43.75		219	1015	I (Grain)	Sept 1-April 15	94	1.3		122.2	567.008	340.95	1582.008
T5685	P6	8.04	FoA	Millet Combo	May-Aug	5.0	43.75		219	1758.75	I (Grain)	Sept 1-April 15	94	1.3		122.2	982.488	340.95	2741.238
T5684	P7	6.21	NoA	B	Mar-Sept	6.5	37.5		244	1513.688	K	Sept-April	1	50		50	310.5	293.75	1824.188
T5684	P8	5.64	NoA	B	Mar-Sept	6.5	37.5		244	1374.75	K	Sept-April	1	50		50	282	293.75	1656.75
T5684	P9	2.84	NoA	B	Mar-Sept	6.5	37.5		244	692.25	K	Sept-April	1	50		50	142	293.75	834.25
T72182	P10	2.5	FoA	B	Mar-Sept	6.0	37.5		225	562.5	K	Sept-April	1	50		50	125	275	687.5
T72182	P11	4.78	FoA	B	Mar-Sept	6.0	37.5		225	1075.5	K	Sept-April	1	50		50	239	275	1314.5
T72182	P12	7.45	FoA	Millet Combo	May-Aug	5.0	43.75		219	1629.688	I (Grain)	Sept 1-April 15	94	1.3		122.2	910	340.95	2540.078
T72182	P13	6.26	GoA	B	Mar-Sept	6.5	37.5		244	1525.875	K	Sept-April	1	50		50	313	293.75	1838.875
T72182	P14	6.26	GoA	B	Mar-Sept	6.5	37.5		244	1525.875	K	Sept-April	1	50		50	313	293.75	1838.875
T72182	P15	4.43	GoA	B	Mar-Sept	6.5	37.5		244	1079.813	K	Sept-April	1	50		50	222	293.75	1301.313
T72182	P16	3.45	FoA	B	Mar-Sept	6.0	37.5		225	776.25	K	Sept-April	1	50		50	172.5	275	948.75
T72182	P17	4.11	GoA	B	Mar-Sept	6.5	37.5		244	1001.813	K	Sept-April	1	50		50	206	293.75	1207.313
***Optional crops***																			
T5685	P4	3.38	FoA	K	Sept-April	1.0	75		75	253.5	*					0	0	75	253.5
T5685	P5	4.64	FoA	K	Sept-April	1.0	75		75	348	*					0	0	75	348
T5685	P6	8.04	FoA	K	Sept-April	1.0	75		75	603	*					0	0	75	603
T72182	P12	7.45	FoA	K	Sept-April	1.0	75		75	558.75	*					0	0	75	558.75
T5685	P4	3.38	FoA	J (Grain)	Sept-April	55.0	2.4		132	446.16	*					0	0	132	446.16
T5685	P5	4.64	FoA	J (Grain)	Sept-April	55.0	2.4		132	612.48	*					0	0	132	612.48
T5685	P6	8.04	FoA	J (Grain)	Sept-April	55.0	2.4		132	1061.28	*					0	0	132	1061.28
T72182	P12	7.45	FoA	J (Grain)	Sept-April	55.0	2.4		132	983.4	*					0	0	132	983.4

Reception Area Specifications	
-------------------------------	--

[illegible]



This plan does not include commercial fertilizer. The farm should produce adequate plant available nitrogen to satisfy the requirements of the crops listed above.

The applicator is cautioned that P and K may be over applied while meeting the N requirements. In the future, regulations may require farmers in some parts of North Carolina to have a nutrient management plan that addresses all nutrients. This plan only addresses nitrogen.

In interplanted fields ( i.e. small grain, etc, interseeded in bermuda), forage must be removed through grazing, hay, and/or silage. Where grazing, plants should be grazed when they reach a height of six to nine inches. Cattle should be removed when plants are grazed to a height of four inches. In fields where small grain, etc, is to be removed for hay or silage, care should be exercised not to let small grain reach maturity, especially late in the season (i.e. April or May). Shading may result if small grain gets too high and this will definately interfere with stand of bermudagrass. This loss of stand will result in reduced yields and less nitrogen being utilized. Rather than cutting small grain for hay or silage just before heading as is the normal situation, you are encouraged to cut the small grain earlier. You may want to consider harvesting hay or silage two to three times during the season, depending on the time small grain is planted in the fall.

The ideal time to interplant small grain, etc, is late September or early October. Drilling is recommended over broadcasting. Bermudagrass should be grazed or cut to a height of about two inches before drilling for best results.

#### CROP CODE LEGEND

Crop Code	Crop	Lbs N utilized / unit yield
A	Barley	1.6 lbs N / bushel
B	Hybrid Bermudagrass - Grazed	50 lbs N / ton
C	Hybrid Bermudagrass - Hay	50 lbs N / ton
D	Corn - Grain	1.25 lbs N / bushel
E	Corn - Silage	12 lbs N / ton
F	Cotton	0.12 lbs N / lbs lint
G	Fescue - Grazed	50 lbs N / ton
H	Fescue - Hay	50 lbs N / ton
I	Oats	1.3 lbs N / bushel
J	Rye	2.4 lbs N / bushel
K	Small Grain - Grazed	50 lbs N / acre
L	Small Grain - Hay	50 lbs N / acre
M	Grain Sorghum	2.5 lbs N / cwt
N	Wheat	2.4 lbs N / bushel
O	Soybean	4.0 lbs N / bushel
P	Pine Trees	40 lbs N / acre / yr

Acres shown in the preceding table are considered to be the usable acres excluding required buffers, filter strips along ditches, odd areas unable to be irrigated, and perimeter areas not receiving full application rates due to equipment limitations. Actual total acres in the fields listed may, and most likely will be, more than the acres shown in the tables.

See attached map showing the fields to be used for the utilization of animal waste.



## SLUDGE APPLICATION:

The following table describes the annual nitrogen accumulation rate per animal in the lagoon sludge

Farm Specifications	PAN/yr/animal	Farm Total/yr
Farrow to Wean	0.84	
Farrow to Feeder	1	
Farrow to Finish	4.1	
Wean to Feeder	0.072	
Wean to Finish	0.306	
6660 Feeder to Finish	0.36	2397.6

The waste utilization plan must contain provisions for periodic land application of sludge at agronomic rates. The sludge will be nutrient rich and will require precautionary measures to prevent over application of nutrients or other elements. Your production facility will produce approximately 2397.6 pounds of plant available nitrogen per year will accumulate in the lagoon sludge based on the rates of accumulation listed above.

If you remove the sludge every 5 years, you will have approximately 11988 pounds of plant available nitrogen to utilize. Assuming you apply this PAN to hybrid bermuda grass hayland at the rate of 300 pounds of nitrogen per acre, you will need 39 acres of land. If you apply the sludge to corn at a rate of 125 pounds per acre, you will need 95.904 acres of land. Please note that these are only estimates of the PAN produced and the land required to utilize that PAN. Actual values may only be determined by sampling the sludge for plant available nitrogen content prior to application. Actual utilization rates will vary with soil type, crop, and realistic yield expectations for the specific application fields designated for sludge application at time of removal.

## APPLICATION OF WASTE BY IRRIGATION:

The irrigation application rate should not exceed the intake rate of the soil at the time of irrigation such that runoff or ponding occurs. This rate is limited by initial soil moisture content, soil structure, soil texture, water droplet size, and organic solids. The application amount should not exceed the available water holding capacity of the soil at the time of irrigation nor should the plant available nitrogen applied exceed the nitrogen needs of the crop.

If surface irrigation is the method of land application for this plan, it is the responsibility of the producer and irrigation designer to ensure that an irrigation system is installed to properly irrigate the acres shown in the preceding table. Failure to apply the recommended rates and amounts of nitrogen shown in the tables may make this plan invalid.

\*This is the maximum application amount allowed for the soil assuming the amount of nitrogen allowed for the crop is not over applied. In many situations, the application amount shown cannot be applied because of the nitrogen limitation. The maximum application amount shown can be applied under optimum soil conditions.

Your facility is designed for >180 days of temporary storage and the temporary storage must be removed on the average of once every 6 months. In no instance should the volume of the waste stored in your structure be within the 25 year 24 hour storm storage or one foot of freeboard except in the event of the 25 year 24 hour storm.

It is the responsibility of the producer and waste applicator to ensure that the spreader equipment is operated properly to apply the correct rates to the acres shown in the tables. Failure to apply the recommended rates and amounts of nitrogen shown in the tables may make this plan invalid.

Call your technical specialist after you receive the waste analysis report for assistance in determining the amount of waste per acre and the proper application prior to applying the waste.

## Application Rate Guide

The following is provided as a guide for establishing application rates and amounts.

Tract	Hydrant	Soil Type	Crop	Application Rate in/hr	Application Amount * inches
T5685	P1	GoA	G	0.4	1
T5685	P2	GoA	B	0.4	1
T5685	P3	GoA	B	0.4	1
T5685	P4	FoA	Millet Combo	0.5	1
T5685	P5	FoA	Millet Combo	0.5	1
T5684	P6	FoA	Millet Combo	0.5	1
T5684	P7	NoA	B	0.5	1
T5684	P8	NoA	B	0.5	1
T72182	P9	NoA	B	0.5	1
T72182	P10	FoA	B	0.5	1
T72182	P11	FoA	B	0.5	1
T72182	P12	FoA	Millet Combo	0.5	1
T72182	P13	GoA	B	0.4	1
T72182	P14	GoA	B	0.4	1
T72182	P15	GoA	B	0.4	1
T72182	P16	FoA	B	0.5	1
	P17	GoA	B	0.4	1

optional crop

T5685	P4	FoA	K	0.5	1
T5685	P5	FoA	K	0.5	1
T5685	P6	FoA	K	0.5	1
T72182	P12	FoA	K	0.5	1
T5685	P4	FoA	J (Grain)	0.5	1
T5685	P5	FoA	J (Grain)	0.5	1
T5685	P6	FoA	J (Grain)	0.5	1
T72182	P12	FoA	J (Grain)	0.5	1

## NUTRIENT UTILIZATION PLAN CERTIFICATION

Name of Farm: Thomas & Donna Smith Farm  
Owner: Thomas & Donna Smith  
Manager:

### Owner/Manager Agreement:

I/we understand and will follow and implement the specifications and the operation and maintenance procedures established in the approved animal waste nutrient management plan for the farm named above. I/we know that any expansion to the existing design capacity of the waste treatment and/or storage system, or construction of new facilities, will require a new nutrient management plan and a new certification to be submitted to DWQ before the new animals are stocked.

I/we understand that I must own or have access to equipment, primarily irrigation equipment, to land apply the animal waste described in this nutrient management plan. This equipment must be available at the appropriate pumping time such that no discharge occurs from the lagoon in the event of a 25 year 24 hour storm. I also certify that the waste will be applied on the land according to this plan at the appropriate times and at rates which produce no runoff.

This plan will be filed on site at the farm office and at the office of the local Soil and Water Conservation District and will be available for review by NCDWQ upon request.

Name of Facility Owner:

Thomas & Donna Smith

Signature:

Donna Smith

8/1/12  
Date

Name of Manager (if different from owner):

Signature:

Date

Name of Technical Specialist:

Toni W. King

Affiliation:

Murphy-Brown, LLC.

Address:

2822 Hwy 24 West, PO Drawer 856

Warsaw, NC 28398

Telephone:

(910) 293-3434

Signature:

Toni W. King

7-25-2012  
Date



**Additional Comments:**

This plan is written for P1 Fescue which will be grazed, Pulls 4,5,6&12 will be in Millet which will be follow by Oats (Grain), however the grower has the option of plant and harvesting Rye Grain or a Small Grain, all other pulls will be in bermuda Grazed followed by a small grain overseed. Any changes to this crop plan need to take place by updating this Waste Management Plan first. The Millet crop mentioned above is written at the "combination" rate which means that the producer must remove atleast 1/2 of the yield produced by haying methods.



# FOOTPRINT

des in green

P9 355 FT. 2.84 AC  
BP / SG

WETTED AREA IS 193 FT.

BP / SG 456 FT. X 195 FT. = 2.5 AC. P10

T-72182  
F-1

2R1P2

P11 642 FT. 4.78 AC.  
TS7

P12 1100 FT. 7.45 AC.

BP / SG

T-72112  
F-2

P13 908 FT. 6.26 AC.

TS8

2F2P4

p14 6.26 ac.

TS10

p15 4.43 ac.

p16 3.45 ac.

p17 4.11 ac.

TS11

Don't  
know

TS3

WHEAT

BP / SG



