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Mae Cyswllt Ffermio yn gynllun o fewn Cymunedau Gwledig Llywodraeth Cymru - Rhaglen Datblygu Gwledig 2014-2020, sy'n canolbwyntio buddsoddiad sylweddol gan Lywodraeth Cymru a'r UE i adfywio cymunedau gwledig a darparu cefnogaeth ar gyfer amaethyddiaeth a choedwigaeth yng Nghymru.

Darperir Rhaglen Trosglwyddo Gwybodaeth Cyswllt Ffermio a'r Gwasanaeth Cynghori gan Menter a Busnes. Mae Lantra Cymru yn arwain ar ddarparu Rhaglen Ddysgu a Datblygu Cydol Oes Cyswllt Ffermio.

Farming Connect is a scheme within the Welsh Government Rural Communities - Rural Development Programme 2014-2020, which is focusing significant investment from Welsh Government and the EU to revitalise rural communities and provide support for agriculture and forestry in Wales.

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## 1 INTRODUCTION

The purpose of this report is to offer guidance on manure management for a proposed expansion in broiler production, increasing capacity from 140,000 to 280,000 birds at Dolidre, Llanddewi.

This report calculates total nitrogen and phosphate produced from the proposed expansion to the poultry unit and all other sources of nutrient imported or produced on the holding. Details of the area of land available to spread lightly fouled water and litter is outlined and a calculation of nutrient loading (nitrogen and phosphate) per hectare of land available for spreading given.

The report will show how nutrients will be used by the holding for agricultural benefit and a risk map of the proposed spreading area provided, indicating sensitive receptors and 'no spread zones' in accordance with the Code of Good Agricultural Practice (CoGAP). Contingency planning for when litter cannot be exported or spread to land is also outlined.

This report has been produced from figures obtained from Mr E Morgan and observations made during the visit. It confirms the advice given during the visit and supplements this with general advice on pollution risks.

### Disclaimer

**Advice and recommendations are based on information provided by the client. All reasonable efforts have been taken on the part of ADAS to verify the information is correct. Any actions that affect the tenure of the business or anyone with an interest in the business should be discussed with the appropriate professional adviser before taking material steps in their implementation.**

## 2 FARM DETAILS

Dolidre comprises some 120 ha (300 acres) of land. A further 52 ha (130 acres) are rented at nearby Pant farm. The proposed development (for which an IPPC permit from NRW is in place) will be undertaken on owned land at Dolidre.

There is currently capacity for 140,000 broilers in 3 buildings and investment is planned for another 3 buildings with capacity for 140,000 broilers, taking total capacity to 280,000.

The farm also supports a suckler herd of 50 cows and progeny. Stores from the split spring and autumn calving herd are sold as yearlings and around 120 head of cattle are housed through the winter. The farm also supports 600 breeding ewes, which are housed (in two batches) for 1 month in the lead up to lambing.

The farm is predominantly grass with baled silage produced for winter feeding. Around 10 ha of whole crop silage and roots crops are grown as part of a reseeding rotation. Solid manures are produced from the poultry, cattle and sheep and can be stored in two covered buildings (old clamps with effluent tanks) prior to spreading on fields on the farm when conditions permit, or exported to an AD plant. The farm also has a slurry store which serves the cubicle shed.

The farm is not subject to any agri-environment schemes. The Ithon, a tributary of the Wye SAC and SSSI runs through the farm.

### 3 TOTAL NITROGEN AND PHOSPHATE PRODUCTION

Under the Good Code of Agricultural and Environmental practice you should not spread more than 250Kg/ha of total nitrogen per annum from livestock manures. The area of spreadable ground is calculated to be 137.24ha. Details are shown in Appendix 1.

The amount of manure produced from the proposed level of stock and the nitrogen content of this manure over the housed period is summarised below:-

#### 3.1 Total N Produced From Manure

Stock	Number	Total N produced per day (kg)	Days Housed	Total N Produced	Area Required (Ha)
Sheep	600	0.033	30	594	2.38
Suckler Cow	50	0.227	150	1705	6.82
Bulls for Breeding	2	0.132	150	40	0.16
Cattle 2-<12 months	50	0.090	150	678	2.71
Cattle 12-<24 months	18	0.137	150	370	1.48
1,000 Broilers	280	1.06000	310	92008	368.03
<b>TOTAL</b>				<b>95395</b>	<b>381.58</b>

Source Schedule 1 NVZ Wales Regs. Notes – Sheep category includes lamb livestock unit equivalent, broilers (330 kg of N produced per 1,000 birds, based on 85% occupancy in the year).

It is important that you are aware of which fields are available for spreading manure on the farm. Spreading should not take place on ground subject to management prescriptions, with soil phosphorus indices of 4 or above, or within buffer zones adjacent to the river and other sensitive receptors. I have excluded the land which falls into these categories in the spreadable area calculation, based on information provided on the day.

**This table shows that 381.58 ha of ground would be required to spread manure under the current legislation. Appendix 1 shows an available spreading area of 137.24 ha. Therefore the total spreadable area is not sufficient to meet the 250kg/ha farm limit.**

### 3.2 Projected annual N Loading over a 12 month period

Stock	Number	Total N produced per year (kg)	Total N Produced (kg)
Sheep (>60kg)	600	11.900	7140
Suckler Cow (>500kg)	50	83.000	4150
Bulls for Breeding (>25 months)	2	48.000	96
Calves (<2 months)	50	1.400	70
Cattle 2-<12 months	50	28.000	1400
Cattle 12-<24 months	18	50.000	900
1,000 Broilers	280	330.00000	92400
			<b>106156</b>

Notes – Sheep category includes lamb livestock unit equivalent, Calves and cattle (<12 months) figure is for the period that the animal is in the category (6 months assumed), broilers (330 kg of N produced per 1,000 birds, based on 85% occupancy in the year).

### 3.3 Broiler Litter use on Farm (based on 250 kg/N/ha Field limit)

Spreadable Area (ha)	N Field Limit (Based on 250kg/N/ha)	N produced from ruminants (Kg)	Balance from Poultry (Kg)	Tonnage poultry litter to meet N field limit (@28kg/N/t)
137.24	34,310	3,387	30,923	1,104 tonnes

Utilising 1,104 tonnes of litter and FYM from ruminants on farm, and exporting the surplus would allow the farm to be compliant with the 250 kg/N/ha Field limit.

### 3.4 Exported Manure

Export of broiler litter will be required to enable the farm to be compliant with the N field limit outlined above. Records of exports will need to be maintained as evidence of compliance with this requirement, and should as a minimum include the type of organic manure exported, quantity, date of movement and name/address of recipient.

Type of manure	Kg/N/T	Minimum Tonnage exported	Minimum kg/N Exported
Broiler litter (60% DM)	28	2,200	61,600

Based on the above standard figures, exporting a minimum of 2,200 tonnes of broiler litter will reduce the land requirement for spreading by some 246.40 ha (61,600 divided by 250kg/N/ha field limit) to enable compliance.

Minimum kg/N Exported	Reduction in land needed for spreading (ha), based on 250 Kg/N/ha Field Limit	Land required for spreading (ha)	Land available for spreading (ha)
61,600	(246.4)	381.58-246.4=135.18	137.24

*Note: Above figures are based on standard published figures. However Mr Morgan can demonstrate through weigh bridge data from the existing operation that each broiler building will generate 45 tonnes of litter per batch cleanout. This would equate to just over 2,025t for 6 sheds & 7.5 cycles /year. Book figures would suggest a figure closer to 3,200 tonnes.*

*Assuming forward weigh bridge data backs this information up, Mr Morgan should still look to export the majority of the broiler litter. The actual tonnage to be exported would be based on compliance with the 250 kg/N/ha field limit, or longer term a 170 Kg/N/ha loading figure to tie in with a potential move to a system similar to NVZ in Wales.*

### 3.5 N Broiler Litter use on Farm (based on 170 kg/N/ha farm loading)

Note that if the draft Agricultural Pollution Regulations are implemented, farm loading would need to fall from 250 kg/ha to 170 kg/N/ha (assuming a derogation is not obtained). Note that farm loading is based on numbers of stock on the farm throughout the year, and not based on manure generated through housing.

Spreadable Area (ha)	N Field Limit (Based on 170kg/N/ha)	N produced from ruminants (Kg)	Balance from Poultry (Kg)	Tonnage poultry litter to meet 170 kg/N/ha (@28kg/N/t)
137.24	23,330	13,756	9,574	342

The table above indicates that 342t of broiler litter could be utilised on the farm and be compliant with a potential reduction in the farm N loading to 170 kg/N/ha. All other broiler litter produced on the holding would need to be exported.

### 3.6 Total Phosphate Produced on the Holding

The figures below are taken from Planet V3 and RB209.

Livestock Type	Annual Production Kg/P <sub>2</sub> O <sub>5</sub>	Proposed Number	Occupancy	Kg/ P <sub>2</sub> O <sub>5</sub> Produced
1,000 Broiler Places	259	280	85%	61,642
Sheep (>60kg)	3.7	600	8%	185

Livestock Type	Annual Production Kg/P <sub>2</sub> O <sub>5</sub>	Proposed Number	Occupancy	Kg/ P <sub>2</sub> O <sub>5</sub> Produced
Suckler Cow (>500Kg)	31	50	42%	651
Beef cow, 2-12 months	12	50	42%	252
Beef cow, 12-24 months	15.7	18	42%	118
Bull for breeding	22	2	42%	18
<b>Total Phosphate from manure</b>				<b>62,866</b>

### 3.7 Phosphate Loading for the Farm

Tonnage Litter utilised on farm	Kg/P <sub>2</sub> O <sub>5</sub> /T*	Kg P <sub>2</sub> O <sub>5</sub> (from poultry)	Kg P <sub>2</sub> O <sub>5</sub> (from ruminants)	Total P <sub>2</sub> O <sub>5</sub> Loading (Kg)	P <sub>2</sub> O <sub>5</sub> Loading/ha (Kg)
1,104 (250 kg/N/ha figure)	17	18,768	1,224	19,992	<b>146</b>
342 (170 kg/N/ha figure)	17	5,814	1,224	7,038	<b>51</b>

\*RB209 figures

### 3.8 Spreading Manure & Nutrient Management (Agricultural Need)

Manure applications will be timed to enable the farm to optimise the use of the available nutrients. Manures should not be spread at a rate exceeding 250 kg/N/ha. This equates to 42 tonnes/ha cattle FYM (17 t/acre), 36 tonnes/ha Sheep FYM (14 t/acre) or **8.9 t/ha 60% DM Broiler Litter (3.6 t/acre)**, based on standard figures from RB209 Nutrient Management Guide (updated May 2017).

5t/ha (2 t/ac) 60%DM broiler litter applied in the spring will supply 42kg/ha (34 units/ac) N (based on 30% availability), 85 kg/ha (68 units/ac) phosphate (based on 100% availability) and 105 kg/ha (84 units/ac) potash (based on 100% availability). This would be more than sufficient to maintain P and K indices on silage or barley fields at target indices.

20t/ha (8 t/ac) cattle FYM applied in the autumn will supply 12kg/ha (10 units/ac) N (based on 10% availability), 64 kg/ha (51 units/ac) phosphate (based on 100% availability) and 188 kg/ha (150 units/ac) potash (based on 100% availability). The above inputs would also supply sufficient P and K for swedes, or a cut of silage at target soil indices of 2 for P and 2- for K.

20t/ha (8 t/ac) sheep FYM applied in the autumn will supply 14kg/ha (11 units/ac) N (based on 10% availability), 64 kg/ha (51 units/ac) phosphate (based on 100% availability) and 160 kg/ha (128 units/ac) potash (based on 100% availability). The above inputs would also supply sufficient P and K for swedes, or a cut of silage at target soil indices of 2 for P and 2- for K.

### Specific Field Examples (based on soil test results)

#### Grazing – 5 t/ha Broiler Litter (60% DM) applied March

Up Around Pub

Soil Nutrient	Soil Index	Crop Requirement Kg/ha (units/acre)	Contribution from Manure*	Balance to be Supplied
Nitrogen	Low	50 (40)	42 (34)	8 (6)
Phosphate	1	50 (40)	51 (41)	0
Potash	2+	0	95 (76)	0

\*RB209 Figures

Recommended fertiliser type and quantity:

- Note that an appropriate gap (~1 month) should be left between application and grazing.
- No other inputs are required.

#### Grazing – with one silage cut taken 5 t/ha Broiler Litter (60% DM) applied September

Hill Field

Soil Nutrient	Soil Index	Crop Requirement Kg/ha (units/acre)	Contribution from Manure	Balance to be Supplied
Nitrogen	Low	30 (24)	0	30 (24)
Phosphate	2	20 (16)	0	20 (16)
Potash	1	30 (24)	0	30 (24)
<b>For the silage</b>				
Nitrogen	Low	80 (64)	42 (34)	80 (64)*
Phosphate	2	40 (32)	85 (68)	0
Potash	1	110 (88)	95 (76)	0

\*Litter applied to aftermath so nutrients not available to crop

Recommended fertiliser type and quantity:

- Apply 250 kg/ha of 25:0:16 when shutting up for silage.

**Recommendations for Grazing and 2 cuts of silage 5 t/ha Broiler Litter (60% DM) applied September**

Fields – Bridge Field, Field above Bridge

Soil Nutrient	Soil Index	Crop Requirement Kg/ha (units/acre)	Contribution from Manure	Balance to be Supplied
<b>1<sup>st</sup> cut</b>				
Nitrogen	Low	80 (64)	0	80 (64)*
Phosphate	2	40 (32)	0	40 (32)
Potash	1	110 (88)	0	110 (88)
<b>2<sup>nd</sup> cut</b>				
Nitrogen	Low	50 (40)	42 (34)	50 (40)*
Phosphate	2	25 (20)	85 (68)	0
Potash	1	100 (80)	95 (76)	0

\*Litter applied to aftermath so nutrients not available to crop

Recommended fertiliser type and quantity:

- With an autumn 2020 application of litter, there would be a requirement for 250 kg of 25:0:16 when shutting up for 1<sup>st</sup> cut and a further 250kg of 25:0:16 for 2<sup>nd</sup> cut. Apply 125 kg/ha MOP (60%) in the autumn to help increase K soil reserves.

## 4 STORAGE/MANURE CONTINGENCY PLAN

Litter from the poultry sheds will be stored under cover in two roofed silage clamps. The clamps are 75ft by 50 ft and 75 ft by 30ft with 20ft high walls. They both have effluent tanks to collect any liquor. With a combined footprint of 550m<sup>2</sup> and an ability to stack to over 3.5m, the stores will potentially provide some 2,000m<sup>3</sup> of storage for broiler litter prior to spreading to land or export. With an average weight of 550kg/m<sup>3</sup> for broiler litter, this equates to some 1,100 tonnes of litter. This represents several months' storage and a strong contingency if the AD plant cannot accept exports for a period of time.

In this way the litter will be kept dry to be utilised to derive maximum benefits as a fertiliser during the growing season or feedstock for the AD plant.

It is also important to adhere to the following recommendations in the Codes of Good Agricultural Practice when spreading manure:

- Do not spread within 10m of a surface water or land drain
- Do not spread within 50m of a spring or borehole
- Do not spread on land that is waterlogged
- Do not spread on land that is frozen hard
- Do not spread on land that is snow covered
- Do not spread on soil that is cracked down to the field drains or backfill
- Do not spread on a field that has been pipe or mole drained or subsoiled over drains in the last 12 months
- Do not spread on land likely to flood, or where heavy rain is forecast in the next 48 hours

The risk map at appendix 2 shows the areas where organic manures can be spread together with the areas which are not spreadable, with Appendix 1 showing the total spreadable area on the farm.

An underground tank has been installed to collect wash water from the existing buildings during clean out, and a further tank will be installed with the new buildings in line with the farm's permit (Ref: EPR/MP3130TW).

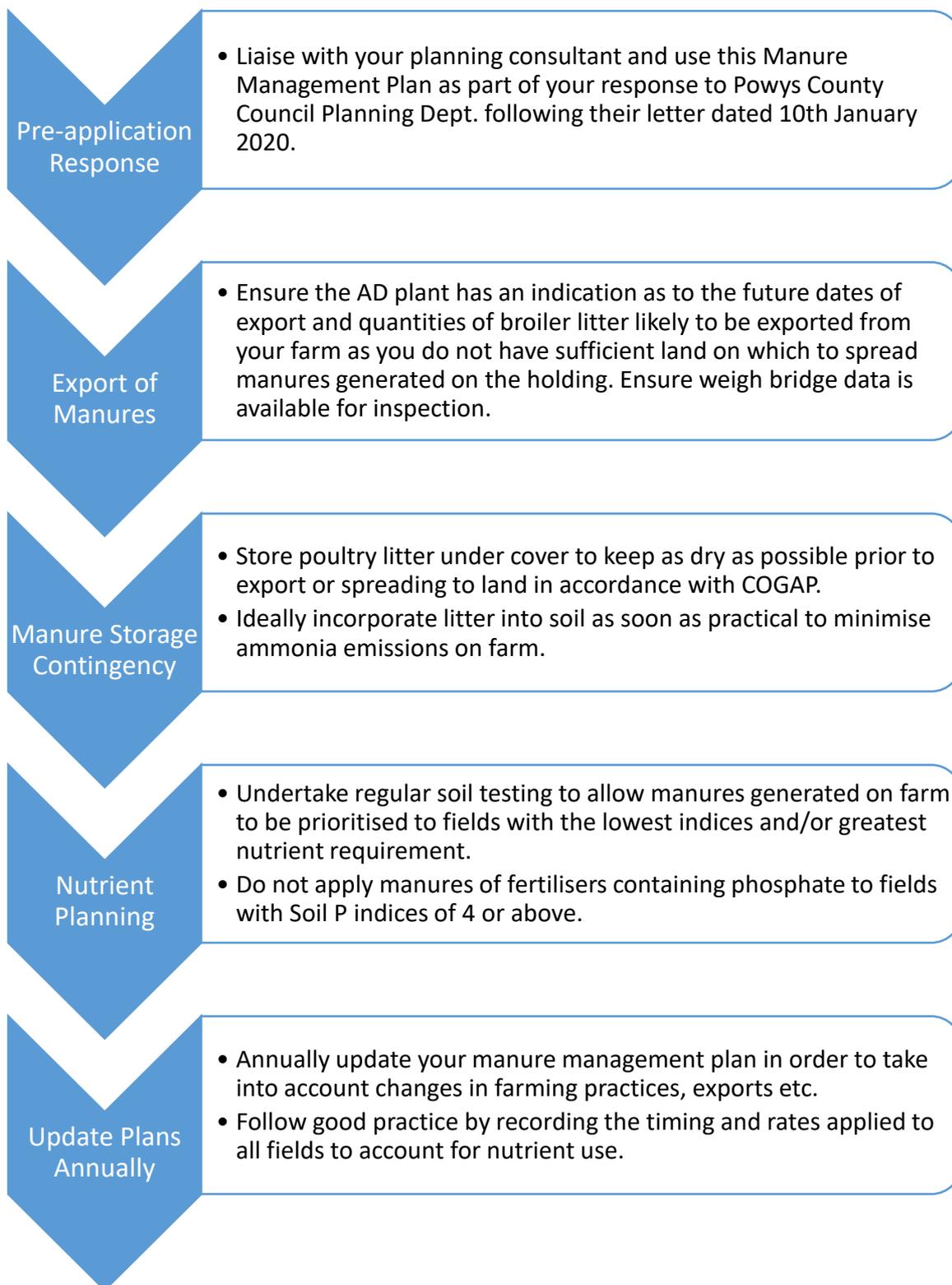
In the event of a disease outbreak, contaminated wash water will be directed to the wash water tank, followed by removal from the site in a sealed tanker by an approved contractor for appropriate disposal.

## 5 MINIMISING AMMONIA EMISSIONS

It is worth noting that the farm has an environmental permit (Ref: EPR/MP3130TW) from NRW in place.

- **Poultry housing** should be kept as dry as possible as poultry manure and litter emit more ammonia when wet.
- **Ventilate colony deep pit or channelled systems.** This reduces the moisture content of the manure and litter.
- **Regularly check building structure and water drinkers to reduce any leaks and keep litter dry.** More ammonia will be emitted if the litter becomes wet and then dried.
- **Broiler litter should be incorporated** into bare soil (turnips, triticale or reseed) as soon as possible and within 12 hours of application. Ploughing is generally more effective than disc or tine cultivations at reducing ammonia emissions from solid manures, despite the longer timeframe involved.

## 6 RECOMMENDATIONS & NEXT STEPS



## 7 SOURCES OF ADDITIONAL INFORMATION

The Water Resources (Control of Pollution) Silage, Slurry and Agricultural Fuel Oil (Wales) Regulations 2010 (SSAFO).

Cross Compliance 2019 <https://beta.gov.wales/cross-compliance-2019>

DEFRA Code of Good Practise (COGAP) for reducing Ammonia Emissions

Farming Rules for Water England <https://www.gov.uk/government/publications/farming-rules-for-water-from-april-2018/farming-rules-for-water-overview>

AHDB Nutrient Management Guide (RB209, Updated May 2017) available electronically from the Defra web site. (<http://archive.defra.gov.uk/foodfarm/landmanage/land-soil/nutrient/documents/rb209-rev-100609.pdf>)

PLANET – fertiliser planning software (available free from ADAS 0845 6023864).

Making Better Use of Livestock Manures. Booklets available from ADAS.

**APPENDIX 1 - LAND AVAILABLE FOR SPREADING MANURES**

Sheet No	Field No	Field Area (Ha)	No Spread Area (Ha)	Spreadable Area
SO0967	9886	3.35	0	3.35
SO0968	1736	4.51	0.42	4.09
SO0968	2265	4.51	0.4	4.11
SO0968	2947	1.83	0.25	1.58
SO0968	3328	1.55	0.15	1.4
SO0968	3336	1.02	0.1	0.92
SO0968	3421	4.94	0	4.94
SO0968	3748	1.42	0	1.42
SO0968	4160	2.4	0	2.4
SO0968	4761	1.89	1.09	0.8
SO0968	4924	1.31	0	1.31
SO0968	6058	3.3	0.15	3.15
SO0968	6541	3.68	1.18	2.5
SO0968	7105	6.06	0.1	5.96
SO0968	7230	4.79	0.04	4.75
SO0968	7814	1.9	0.21	1.69
SO0968	8501	1.99	0	1.99
SO0968	9208	0.67	0.09	0.58
SO1067	0397	2.22	0.04	2.18
SO1067	2672	7.2	0.1	7.1
SO1067	2491	4.12	1.02	3.1
SO1067	5373	2.58	0.2	2.38
SO1067	6192	0.74	0.14	0.6
SO1067	6565	2.25	0.05	2.2
SO1067	6983	0.89	0	0.89
SO1068	0513	5.83	0.22	5.61
SO1068	1329	3.31	0	3.31
SO1068	2416	1.87	0	1.87
SO1068	3333	3.02	0	3.02
SO1068	4201	10.12	1.62	8.5
SO1068	6901	3.23	0.16	3.07
SO1068	8042	2.34	0.3	2.04
SO1068	9531	7.05	0.4	6.65
SO1167	994	2.77	0.67	2.1
SO1168	154	1.14	0.25	0.89
SO1168	307	3.71	1.61	2.1
SO1168	1116	2.7	0	2.7
SO1168				
	<b>TOTAL</b>	<b>104.54</b>	<b>10.96</b>	<b>103.9</b>



## APPENDIX 2 - RISK MAPS FOR MANURE AND SLURRY APPLICATION

### MAP KEY

A Manure Management Plan has been produced. In addition to identifying no-spread areas, high risk areas and those areas of the farm that are suitable for applications of manures for most of the year, the plan also assesses the amount of land available to take the manures produced. The map is colour coded:

Red = *No-spread areas*, e.g. yards; within 10 metres of a watercourse or 50 metres of a borehole, spring or well used for drinking or parlour washings. Steeply sloping fields of gradients 1 in 5 or steeper and habitat ground.

Orange = *Very High Risk*. Steeply sloping fields of gradients 1 in 7; fields at risk of flooding; sandy or shallow soil over fissured rock; fields where drains have been installed during the past 12 months; poorly drained or waterlogged land; severely compacted soils, etc.

Yellow = *Moderate Risk*. Slopes between 1 in 14 to 1 in 8; land sloping towards watercourses; imperfectly drained land.

Green = *Lower Risk*. Remainder of land upon which manures are applied and which has not been subsoiled or mole ploughed within the past 12 months.

White = Areas not used for operational reasons.







