ANNEX 1: Biofertiliser Utilisation and Environmental Management Report

Biofertiliser

for use as a Crop Nutrient Supplement

in Agriculture

at

Ty-Hen Farm
Llanddarog Road
Nantycaws, Carmarthen

by D J Baldwin BSc (Hons.) CEnv. MCIWM (FACTS)

Relates to Permit Number
EPR/CB3590HU

On Behalf of Cwm Environmental Ltd.
NantyCaws Recycling Centre
Llanddarog Road
Nant y Caws
Carmarthen
SA32 8BG

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Revision Date: None

Revisions

SUMMARY

This report addresses the renewal of the registration for a deployment for the application of biofertiliser to agricultural land as a fertiliser for agricultural benefit.

It entails a systematic analysis of the biofertiliser liquid (rainwater effluent from an external composting facility), the soil type and nutrient indices and the proposed cropping of the receiving land in order to provide recommendations for nutrient application with due regard to guidance provided in the DEFRA Fertiliser Recommendations Booklet **RB209.**

The dilute rainwater effluent from the composting pad has been sampled and analysed. It has been shown to have very useful fertiliser properties notably potash, nitrogen and phosphate together with trace elements. It has been shown to be uniform in quality and without undue pte's.

The soils of the farmed land have been sampled and analysed for macro nutrient indices. These values have been found to be low and on this basis have been used to determine rates of application that will provide good agricultural benefit based on the utilisation of nutrients and taking into account relevant limits and recommendations for fertiliser application in accordance with reference booklet RB209. Soil pte levels have been assessed as low and will be unaffected by the very low pte content in the biofertiliser liquid.

Risk assessments have been undertaken to determine the presence of water courses and any other sensitive receptors. Attention has been given to sloping ground. Due consideration has been given to areas of conservation interest adjacent to the application areas. The risks have been assessed as very low, provided the operators observe these buffer strips and areas that have been identified and use appropriate equipment for application of the biofertiliser liquid.

It is concluded that the biofertiliser liquid will be beneficial to the agriculture within the cropped fields at the proposed site and the Certificate (identification card) of David Baldwin, a FACTS registered consultant is provided to confirm this.

The deployment shall be undertaken in accordance with a Mobile Plant Permit operated by Cwm Environmental Ltd. (The Permit Reference number is: **EPR/CB3590HU**).

CONTENTS

SECTION 1: LOCATION MAP AND SITE SENSITIVITY ISSUES

1.1 Land Area - Location

Land Owner/farmer:

Cwm Environmental Ltd.
Ty Hen Farm
Llanddarog Road
Nant y Caws
Carmarthen
SA32 8BG

Land at OS Grid Ref: Grid ref: SN 46971 17815 X: 246971m **Y:** 217815 m

The site is located as shown on Figure 1. Location Map.

Figure 1: Location Map: Ty Hen Farm, Nant y Caws, Carmarthen

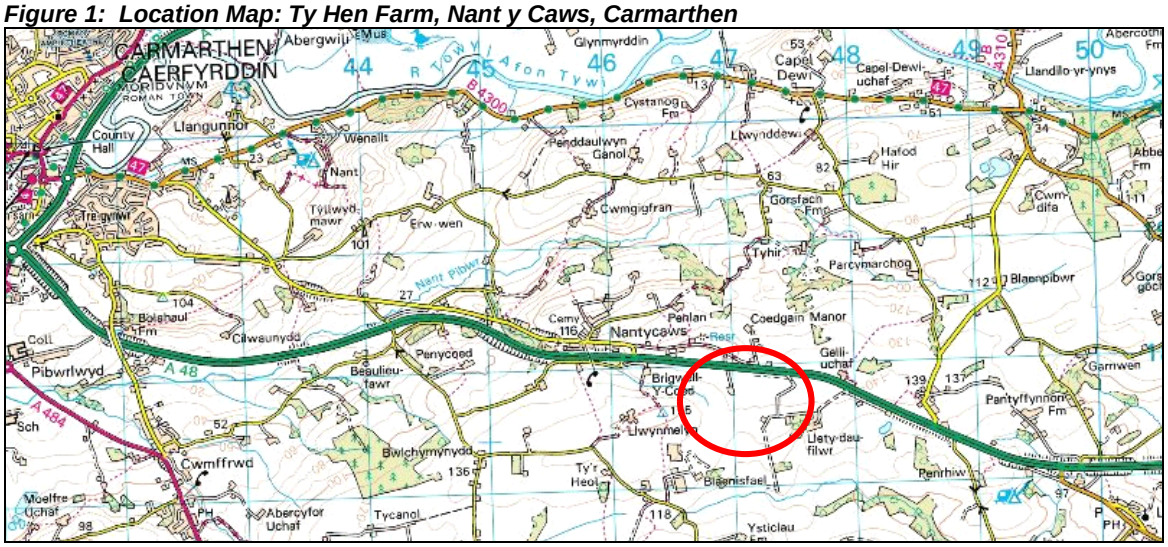
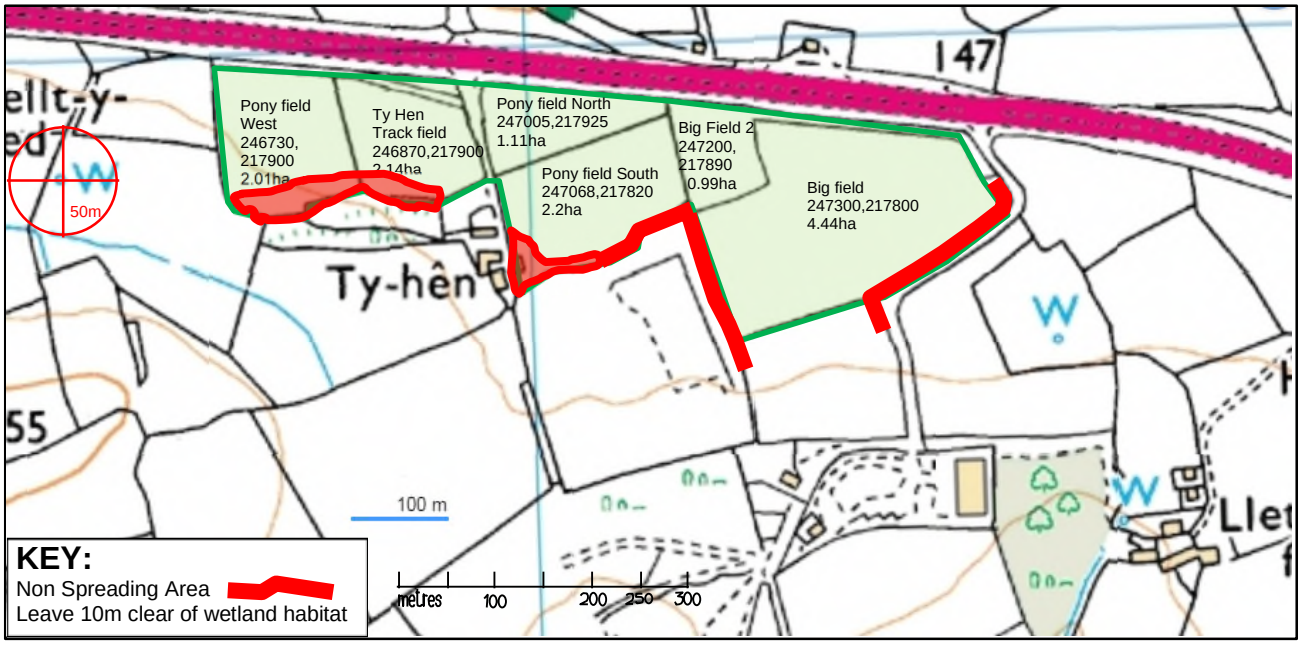


Figure 2: Field Plan: Ty Hen Farm, Nant y Caws, Carmarthen



1.2 Land Parcel Sensitivities

The land area or parcel of land, its location and proximity to nearby environmentally sensitive areas has been researched and considered. Reference has been made to the Multi-Agency Mapping 'MAGIC' on the internet at http://www.magic.gov.uk/MagicMap.aspx.... And Environment Agency 'What's in my Backyard'.

The Land parcel has been checked for the following and marked where there is an issue:

		Yes	No	Comment
i	AONB		x	None in this area
ii	National Nature reserve		x	Nearest is at the Botanical Gardens – Wernbongham Stream Section and Quarry - >5km distant
iii	National Park		x	None in this area
iv	Ramsar Site Wales		x	None in this area
v	SSSI		x	Nearest is South west at Gweunydd a Choed Pen Ty. There are others, further afield including the River Tywi
vi	Special Area Conservation		x	None in this area
vii	Special Protection Area		x	None in this area
viii	NVZ		x	None in this area
ix	Groundwater Abstraction		x	None in this area
x	Groundwater Source Protection Zone 3		x	None in this area
xi	Wells and springs		x	None that are in use were identified locally, from OS maps.

SECTION 2: AGRICULTURAL LAND USE

The land is in continuous agricultural use either as permanent grassland or as arable (cultivated) rotations.

The land includes fields that are mainly level or in part are gently sloping but without steeply sloping surfaces. A small area of the permanent pasture is prone to water logging during the wet winter months. For these reasons, the land is risk assessed (Section 7) and marked in accordance with a scale of 'orange' colours to denote where there may be sensitivities and therefore the timing and application rates shall need to be carefully managed.

There are no continuous watercourse sensitivities, though there are ditches and slow drainage. The land has been marked 'red' to denote non-spreading areas to avoid overspreading any ditches.

Attention is given to the land use in Section 4 and the Risk Assessment in Section 7. This considers a wide range of risks and potentially negative impacts but concludes that the risks can all be managed to a a very low level.

SECTION 3: BIOFERTILISER ANALYSES

3.1 There is only ONE type of waste under consideration:

Waste-water (liquid) comprising rainwater-run-off from the external composting pad area.
EWC Code and description is given as follows:

19 05 99	liquor and digestate from aerobic treatment of source segregated biodegradable waste only

3.2 Waste-water Description and Quality

The waste-water is the product of rainwater drainage from the external hard paved concreted area and may comprise soluble material and fine solids from the compost material in process on that area. The material is highly diluted. Laboratory testing has identified that it will be useful as a 'biofertiliser' when applied to the grassland, to improve and promote better growth and the production of hay or silage followed by grazing.

The waste-water/ biofertiliser contains useful amounts of Nitrogen, Phosphorous, Potash Sulphur trace elements and organic matter.

The biofertiliser as described shall be taken from the composting site water storage lagoon that is in close proximity to the fields for utilisation in agriculture, either on the grassland or cereal crops.

The following analyses have been undertaken in order to determine the agricultural merits of this Biofertiliser material, to identify the macro and trace elements, and determine if there are any potentially toxic elements.

Sample Results:

A 'NRM' Lab Report for the biofertiliser waste-water material is shown as a separate Document annexed. Reported 3/07/2020; Sample No. 97041; Report number NRM 12865

Table 1 reveals the nutrient content of the Biofertiliser as tested and reported

Table 1: The nutrient, trace element and pte content of the Biofertiliser
P=Phosphorous and K = Potassium elements are shown as the oxides in the right-hand column.

Biofertiliser	**Biofertiliser**			**per cu.m applied**	
Oven Dry Solids	0.32	%		0.32	kg/cu.m
pH	8.01				pH
Conductivity	566	uS/cm			
Total Nitrogen	0.01	percent		0.1	kg/cu.m
Nitrate Nitrogen	9.99	mg/kg			kg/cu.m
Ammonium Nitrogen	89	mg/kg		0.09	kg/cu.m
Total Phosphorus (P)	7.32	mg/kg	P_2O_5	0.02	kg/cu.m
Total Potassium (K)	660	mg/kg	K_2O	0.80	kg/cu.m
Total Magnesium (Mg)	27.1	mg/kg	MgO	0.03	kg/cu.m
Total Copper (Cu)	0.19	mg/kg			
Total Zinc (Zn)	0.499	mg/kg			
Total Sulphur (S)	23	mg/kg			
Total Calcium (Ca)	99.4	mg/kg			
Total Lead (Pb)	0.5	mg/kg			
Total Cadmium (Cd)	0.01	mg/kg			
Total Mercury (Hg)	0.05	mg/kg			
Total Nickel (Ni)	0.2	mg/kg			
Total Chromium (Cr)	0.2	mg/kg			

3.3 Biofertiliser Utilisation – Benefits and Toxicity Checks

The biofertiliser liquid is the product of a waste water run-off from an external composting pad and accordingly the material has a very low dry matter (has a low-solids content). However the quality testing shows that it has useful agricultural 'biofertiliser' properties, specifically potassium, nitrogen, phosphate and trace elements.

For the predominantly pasture and hay/silage grassland, and the arable land which is down to grass for silage, the combination of the water and nutrients is ideal, both before and after hay/silage production.

Agronomic considerations have indicated where the biofertiliser can be best utilised by spreading the application of potash throughout the grass growing season. For this reason, it is determined that a relatively low rate application relating to each successive crop offtake (i.e. beginning of the growing season and immediately after each cut of grass for silage, or grazing) will be most beneficial. This may equate as 3 or 4 applications per season. For practical reasons, it has been determined that applications of 30 m^3/ha would be ideal and that no single application should exceed 50 m^3/ha.

Tables 2 and 3 describe the nutrient and other quality aspects that these applications shall entail.

Table 2 The Nutrient Supply provided by various Rates of Application of the Biofertiliser

NRM Sample Report 2019	Check Rates		**N (total)**	**N (avail.)**	**P2O5**	**K2O**
Cwm			kg/m^3	kg/m^3	kg/m^3	kg/m^3
	Yard water	Nutrients	0.01	0.09	0.02	0.80
Rate m^3/ha	**30**	kg/ha	0.3	2.7	0.5	24.0
Rate m^3/ha	**60**	kg/ha	0.6	5.4	0.9	48.0
Rate m^3/ha	**90**	kg/ha	0.9	8.1	1.4	72.0

Calculation includes factor for interpretation of element as oxide

The applications retain the nutrient supply within the 'total' maximum nutrient threshold relating to Nitrogen good practice (250kg/ha) and also the available N and total P_2O_5 maxima in relation to the specific field soil indices.

Table 3 considers the risk of any adverse toxicity issues in relation to a theoretical maximum application rate of **120 m^3/ha** in the season and clearly shows that the associated application of potentially toxic elements (pte's) is negligible. It shows that the loading of pte's per hectare is extremely low when compared with the DEFRA soil code annual maximum.

Table 3: Consideration of the potentially toxic elements added as part of the biofertiliser

	Big 1	Big 2	Pony S	Pony N	Ty Hen	Pony W	
Apply t/ha	120	120	80	60	35	35	
Applies g Cu/ha	22.8	22.8	15.2	11.4	6.65	6.65	
Applies g Zn/ha	59.88	59.88	39.92	29.94	17.465	17.465	
Applies g Pb/ha	60	60	40	30	17.5	17.5	
Applies g Cd/ha	1.2	1.2	0.8	0.6	0.35	0.35	
Applies g Hg/ha	6	6	4	3	1.75	1.75	
Applies g Ni/ha	24	24	16	12	7	7	
Applies g Cr/ha	24	24	16	12	7	7	**DEFRA Max/yr**
Adds mg Cu/kg soil	0.01	0.01	0.00	0.00	0.00	0.00	**0.75**
Adds mg Zn/kg soil	0.02	0.02	0.01	0.01	0.01	0.01	**1.50**
Adds mg Pb/kg soil	0.02	0.02	0.01	0.01	0.01	0.01	**1.50**
Adds mg Cd/kg soil	0.00	0.00	0.00	0.00	0.00	0.00	**0.02**
Adds mg Hg/kg soil	0.00	0.00	0.00	0.00	0.00	0.00	**0.01**
Adds mg Ni/kg soil	0.01	0.01	0.01	0.00	0.00	0.00	**0.30**
Adds mg Cr/kg soil	0.01	0.01	0.01	0.00	0.00	0.00	**1.50**

 # Rates are taken from later calculations for application rates intended.

Table 4: Soil pte levels after the Application of biofertiliser (lab soil test report)

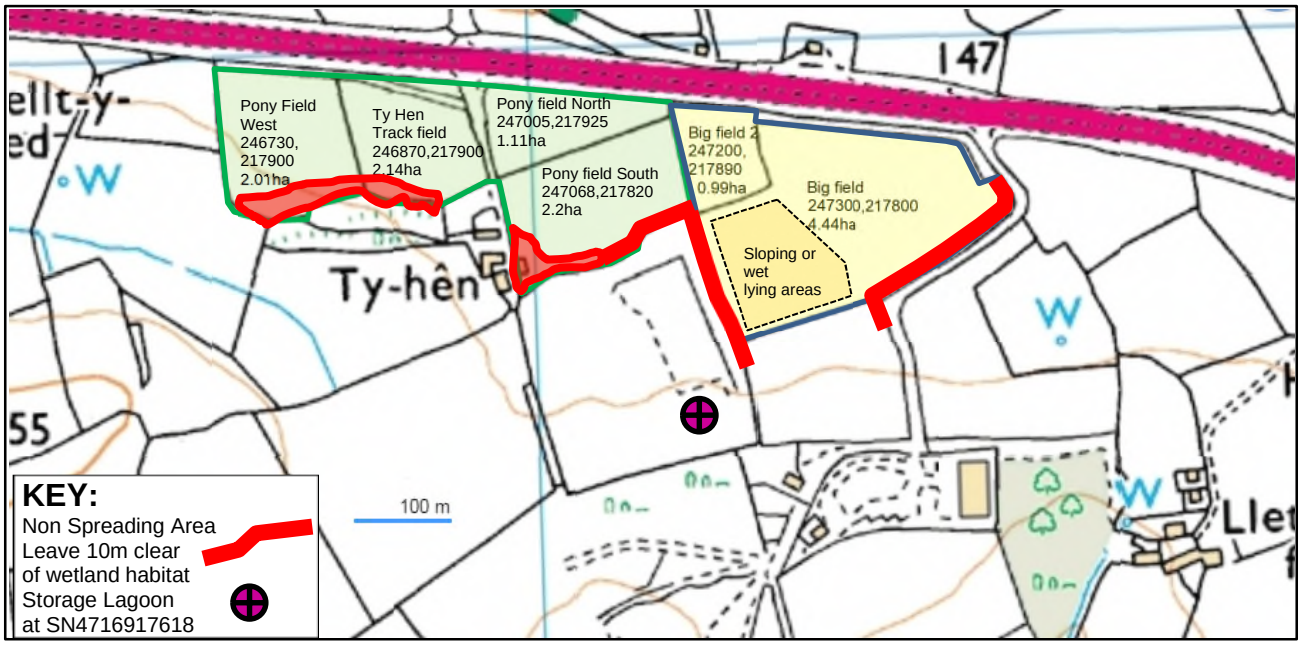
	Big 1	Big 2	Pony S	Pony N	Ty HenTr	Pony W	**Max at lowest pH #**
Resultant mg Cu/kg soil	24.71	24.41	20.60	22.80	20.30	19.60	80
Resultant mg Zn/kg soil	95.02	93.83	98.21	97.51	94.21	90.51	200
Resultant mg Pb/kg soil	31.32	30.72	32.51	34.21	30.21	29.31	300
Resultant mg Cd/kg soil	0.25	0.25	0.31	0.31	0.21	0.22	3
Resultant mg Hg/kg soil	0.20	0.20	0.20	0.20	0.20	0.20	1
Resultant mg Ni/kg soil	18.21	17.51	16.21	15.80	18.00	17.30	50
Resultant mg Cr/kg soil	43.51	43.11	35.01	34.60	39.90	37.50	400

The maximum permissible level of pte per kg of soil varies depending upon the pH, where at lower pH, the maximum pte concentration is required to be lower. Data in red show the worst-case scenario

It is concluded that because the biofertiliser liquid has negligible pte content then even within the maximum proposed seasonal 120 m^3/ha application to the land, the soil pte's are raised negligibly and easily remain within the DEFRA guideline annual average values and extremely low compared to the DEFRA soil maximum values.

SECTION 4: LAND AREAS FOR BIOFERTILISER APPLICATIONS

Figure 3: Location Map and identity of Fields for Receipt of Compost at Ty Hen Farm



SN4716917618

Areas marked with red shading, or red lines are NON-SPREADING Areas, either being areas where this risk to a watercourse (ditch, pond, stream etc.) or else it is to avoid over-spreading to pathways or roadways. In many instances these areas have been enlarged to provide an added factor of safety and also for ease alignment and equipment operation.

Fields shaded with **orange colour** are on slopes (or else are **wet-lying** for parts of the year) and therefore extra attention to land-spreading conditions needs to be applied. The green shading is for pasture, and the beige is for the arable (rotation) cropped fields; and in these instances, the application rates are different. See RISK ASSESSMENT at Section 7. The arable rotation fields may include grass for silage (big bales).

Fields not shaded are not included within this application scheme.

SECTION 5: LAND AREA - CROPPING and SOIL NUTRIENT INDICES

5.1 Soil Status

Representative samples of topsoil have been taken for each field and analysed for pH, available macro nutrients, trace elements and potentially toxic elements (pte's). The results are shown in tables 1 to 5. The soil indices are listed below in table 6 together with details of the overall field area, the field available land area, the previous cropping and current cropping details.

Table 5: Land Area Soil Indices

	Name	INDICES		
		P	**K**	**Mg**
1	BIG FIELD 1	**0**	**1**	**2**
2	BIG FIELD 2	**1**	**1**	**1**
3	PONY FIELD S	**2**	**1**	**2**
4	PONY FIELD N	**2**	**2-**	**3**
5	TY HEN TRACK	**2**	**2+**	**3**
6	PONY FIELD W	**2**	**2+**	**3**

Table 6: Land Area Soil Trace Elements (mg/kg of soil)

	Big Fld. 1	Big Fld. 2	Pony S	Pony N	Ty HenTr	Pony W
Cu	24.7	24.4	20.6	22.8	20.3	19.6
Zn	95	93.8	98.2	97.5	94.2	90.5
Ni	18.2	17.5	16.2	15.8	18	17.3
Cd	0.25	0.25	0.31	0.31	0.21	0.22
Pb	31.3	30.7	32.5	34.2	30.2	29.3
Cr	43.5	43.1	35	34.6	39.9	37.5
Hg	0.2	0.2	0.2	0.2	0.2	0.2
pH	7.2	7.4	5.8	5.6	5.4	5.3

Table 7: Land Areas Proposed Cropping and Soil Nitrogen Supply

	Name		Area	Area Utilised			
			ha	ha		Yield rate	SNS
1	BIG FIELD 1	247300, 217800	4.44	4.0	Big Bale Silage X 2	12t/ha	Low
2	BIG FIELD 2	247200, 217890	0.99	0.9	Big Bale Silage X 2	12 t/ha	Low
3	PONY FIELD S	247068, 217820	2.2	2.0	Big Bale Silage & graze	5 t/ha	Low
4	PONY FIELD N	247005, 217925	1.11	1.0	Big Bale Silage & graze	5 t/ha	Low
5	TY HEN TRACK	246870, 217900	2.14	1.9	Big Bale Silage & graze	5 t/ha	Low
6	PONY FIELD W	246730, 217900	2.01	1.8	Big Bale Silage & graze	5 t/ha	Low
				11.6			

SNS = Soil Nitrogen Supply. This has been selected as Low due to the balance between low stocking/extensive grazing having been undertaken on grassland or otherwise low N inputs in previous years overall.

Soil assessment

Results show that the top-soils are low to moderate in Phosphorous and low in Potassium.

The soil Nitrogen supply has been selected as Low due to the low stocking on the grassland. For the (arable/ Silage) fields, the soil has been estimated as a SNS of Moderate due to the Nitrogen organic fertiliser input in the rotation but poor agronomic performance in recent years.

Previous year's application of waste.

The application of waste-water in the previous year through to April 2020 has been acknowledged. Due to a change in composting systems there has been less composting yard water available to use. (Runoff from the pad as Green Waste Compost can be safely recycled back onto the green waste during windrow preparation).

Crop Requirements.

NOTE[#:] The Biofertiliser is unable to provide all nutrient requirements and shall need to be supplemented

	Field Name	Area Utilised	INDICES			CROP REQUIREMENT 1st Cut			CROP REQUIREMENT 2nd Take		
							kg/ha	kg/ha	kg/ha	kg/ha	
		ha	P	K	Mg		P	K	P	K	
1	BIG FIELD 1	4.0	0	1	2	Baled Silage	80	115	80	115	2nd B Silage
2	BIG FIELD 2	0.9	1	1	1	Baled Silage	55	115	55	115	2nd B Silage
3	PONY FIELD S	2.0	2	1	2	Baled Silage	30	115	20	30	graze
4	PONY FIELD N	1.0	2	2-	3	Baled Silage	30	90	20	15	graze
5	TY HEN TRACK	1.9	2	2+	3	Baled Silage	30	65	20	0	graze
6	PONY FIELD W	1.8	2	2+	3	Baled Silage	30	65	20	0	graze

As the yard water was in short supply, of low nutrient status, and applications ended in March 2020 as the effluent was used on the compost production, then in the year 2019-20, the crop offtakes exceeded the nutrients provided within the applications as shown below.

	Name	Area Treated	CROP REQUIREMENT			Application made	0.40 kg/m^3 N	0.06 kg/m^3 P_2O_5	1.79 kg/m^3 K_2O		
			Nitrogen	P_2O_5	K_2O	m^3/ha	Tot N	P_2O_5	K_2O	AREA	Biofertiliser Applied
		ha	kg/ha	kg/ha	kg/ha		kg/ha	kg/ha	kg/ha	ha	cu.m (t)
1	**BIG FIELD 1**	4.0	140	160	230	**30**	3	1	24	**4.0**	**120**
2	**BIG FIELD 2**	0.9	140	110	230	**30**	3	1	24	**0.9**	**27**
3	**PONY FIELD S**	2.0	105	50	145	**30**	3	1	24	**2.0**	**59**
4	**PONY FIELD N**	1.0	70	50	105	**30**	3	1	24	**1.0**	**30**
5	**TY HEN TRACK**	1.9	70	50	65	**30**	3	1	24	**1.9**	**58**
6	**PONY FIELD W**	1.8	70	50	65	**30**	3	1	24	**1.8**	**54**
								TOTALS		**11.6**	**348**

SECTION 6: APPLICATIONS PROPOSED

Table 7: Proposed Cropping and Biofertiliser Applications to address nutrient requirements[#]

	Name	Area Treated	CROP REQUIREMENT			Planned Application	0.40 kg/m³ N	0.06 kg/m³ P_2O_5	1.79 kg/m³ K_2O		
			Nitrogen	P_2O_5	K_2O	m³/ha	Tot N	P_2O_5	K_2O	AREA	Biofertiliser Applied
		ha	kg/ha	kg/ha	kg/ha		kg/ha	kg/ha	kg/ha	ha	cu.m (t)
1	**BIG FIELD 1**	4.0	**140**	**160**	**230**	**90**	9	2	72	**4.0**	**360**
2	**BIG FIELD 2**	0.9	**140**	**110**	**230**	**90**	9	2	72	**0.9**	**80**
3	**PONY FIELD S**	2.0	**105**	**50**	**145**	**60**	6	1	48	**2.0**	**119**
4	**PONY FIELD N**	1.0	**70**	**50**	**105**	**60**	6	1	48	**1.0**	**60**
5	**TY HEN TRACK**	1.9	**70**	**50**	**65**	**60**	6	1	48	**1.9**	**116**
6	**PONY FIELD W**	1.8	**70**	**50**	**65**	**60**	6	1	48	**1.8**	**109**
									TOTALS	**11.6**	**843**

It is clear that the Biofertiliser liquid will provide useful quantities of Potash but insufficient Phosphate and therefore the Nitrogen and Phosphate shall need to be addressed by use of mineral or similar fertiliser.

Application Timing: Grassland (3 split applications): For grassland the first application timing shall be in late Spring-time (Late March) to supply the growing grass with nutrients and then in May after crop offtake, and again in July.

Application Technique: By the use of a mobile liquid 'slurry' tanker with low trajectory nozzle, or else by a mobile piped system with tractor-drawn trailing hose type low trajectory distribution device.

Liquid Storage

Storage of liquid biofertiliser prior to the deployment land application is undertaken under an Environmental Permit Ref No: EPR/EP3698FL/V004.

The storage compound is located as marked on Figures 3 and 4 at SN4716917618.

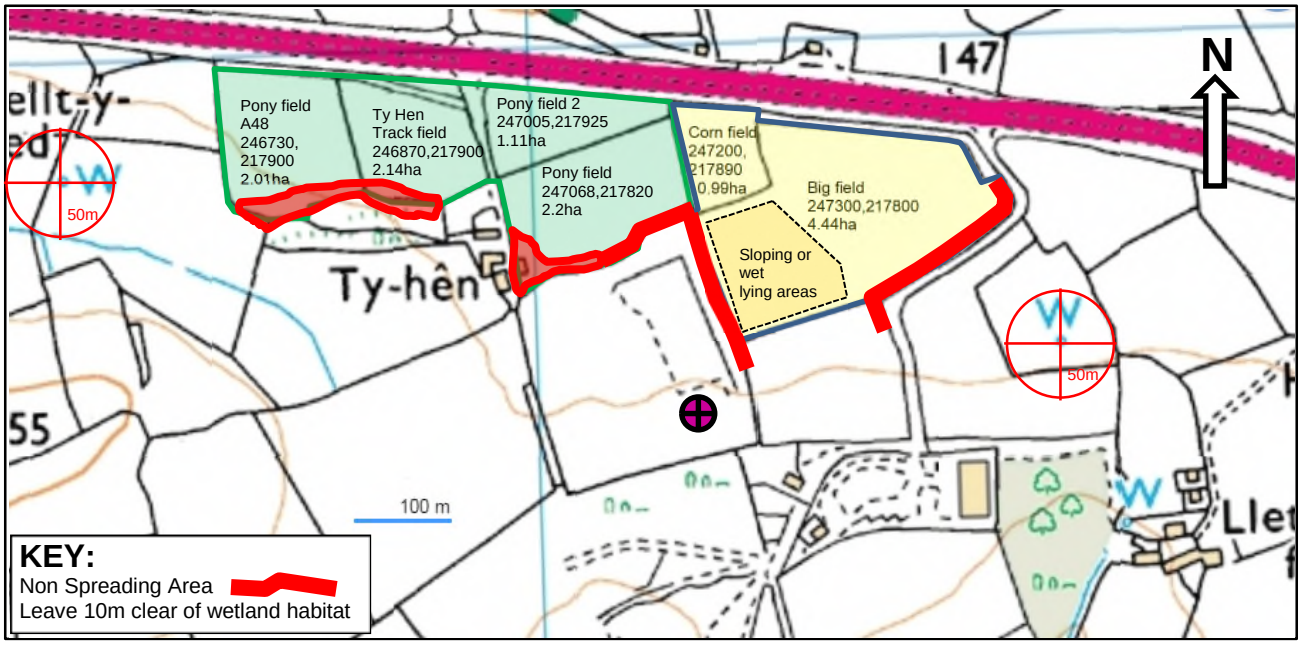
SECTION 7: RISK and IMPACTS ASSESSMENT OF THE APPLICATION

7.1 Consideration of Risks and Potentially Negative Impacts

The primary risk which involves surface water or drainage run-off is considered in 7.2 and 7.3 table 9.
Risks entailing potentially toxic elements are considered in Section 3 table 3.
Other Risks and potentially Negative Impacts (including risks to humans as aerosols or odour etc.), and risks to flora and fauna (particulates and disease) are considered within the Table 10

7.2 Field Plan

Figure 4: Management Plan Site showing Watercourse Sensitive Receptors and Controls at Ty Hen Farm



LEGEND			TITLE
NON SPREADING AREAS **Leave 10m clear area**	**SEASONAL SPREADING** for sloping and **WATERLOGGED AREAS** Avoid when rainfall due **Do Not Spread** **When Wet or Frozen**	**SUITABLE FOR SPREADING AT ANY TIME** **Subject to animals grazing and rainfall** **Check Application Rate**	**Liquid Biofertiliser Spreading Areas** **Land at: Ty Hen Farm, Nantycaws, Carmarthen**
Watercourse Buffers **no spreading within 10m**	**STORAGE Lagoon.** **Located at SN4716917618** on **Permit No. R/EP3698FL/V004)**	**SOME FIELDS ARE NOT HAVING BIOFERTILISER APPLIED UNDER THIS PLAN**	Drawn by: **D J Baldwin** **Recogen Ltd. 1 Shackleton Way, Shrewsbury, SY3 8SW** **Tel: 01743 340630 DATE: 6/10/2020**

Areas marked with red shading, or red lines are NON-SPREADING Areas, either being areas where this risk to a watercourse (ditch, pond, stream etc.) or else it is to avoid over-spreading to pathways or roadways. In many instances these areas have been enlarged to provide an added factor of safety and also for ease alignment and equipment operation.

Fields shaded with orange colour are seasonally water-logged and therefore extra attention to land-spreading conditions needs to be applied. The green shading is for the grass/grazed fields where there is a much wider season of application due to the permanent crop cover and ease of access. However, the possibility of the land being waterlogged is indicated and should be taken into account when determining spreading areas. See written RISK ASSESSMENT at Section 7.2.

The fields that are shown in a beige colour will be restricted in the availability for access due to standing crops and periods when cropping is in the advanced stages for higher yield of silage.

Fields not shaded are not included within this application scheme.

The liquid storage lagoon is the subject of a separate Permit.

7.3 Written Risk Assessment and Plan

RISK ASSESSMENT: For the proposed land-spreading at Ty Hen Farm, Nantycaws, Carmarthen
Assessment by: D J Baldwin CEnv. MCIWM, Technical Director, Recogen Ltd.

Table 9: Environmental Risk Assessment – Watercourses

Information				Determination of Risk				Risk Mitigation Actions	
Receptor	Source	Harm	Pathway	Probability	Severity	Magnitude of risk	Basis	Risk Management	Residual Risk
Surface Water, ditches and streams etc.				There are some surface water areas on or by the site					
Pony Field West and Ty-Hen Track Field & Pony Field S	Biofertiliser	Diffuse Water Pollution	Surface Runoff due to seasonal land waterlogging	Low, subject to 30m^3/ha application rate, at 1 time	Low. Diffuse, with protection zones near watercourses.	LOW	Ensure at least 10m Buffer strip	Buffer strip. Care in management, low rate Avoid frosts	LOW
Seasonally Dry ditch south of Pony Field S.	Biofertiliser	Water Pollution	Over spreading	LOW	LOW	LOW	Ensure at least 10m Buffer strip	Inform Operator, maintain buffer strip	LOW
Ditches to E. & S of Big Field 1	Biofertiliser	Water Pollution	Over spreading	LOW	LOW	LOW	Ensure > 10m Buffer strip	Operator maintain buffer strip	LOW

Table 10. Environmental Risk Assessment - Human and Other Receptors

Information				Determination of Risk				Risk Mitigation Actions	
Receptor	Source	Harm	Pathway	Probability	Severity	Magnitude of risk	Basis	Risk Management	Residual Risk
Risk to people's amenity etc.				There are some dwellings, footpaths and tracks within the farmed area and proposed spreading areas					
Dwellings	Aerosols	People breathing	Airborne	V LOW	LOW	LOW	Experience	Low trajectory application	V LOW
People	Odour	People, annoyance	Airborne	V LOW	LOW	LOW	High water content	Low rate application	V LOW
People on tracks or footpaths	Odour	People, annoyance	Airborne	V LOW	LOW	LOW	High water content	Operator to leave buffer strips.	V LOW
Animals, flora and fauna	Particulate Residues	Ingested litter/ debris	Physical	V LOW	VERY LOW	VERY LOW	Low solids content liquid	Use of filter mesh at suction pump	V LOW
Animals	Disease	Ingested	Microbial	V LOW	VERY LOW	VERY LOW	Liquid pathogen levels V. low	Liquid results only from treated waste	V LOW

There are only low or very low risks of environmental pollution or harm associated with biofertiliser liquid due to its dilution by rainwater. The site offers a large land area, that does not entail sensitive surface water or nearby drinking water. The soil-type is variable, and generally in need of improvement of nutrient status. The use of dilute nutrients in the grassland rotation will be very useful each occasion after hay harvesting.

SECTION 8: CERTIFICATE OF BENEFICIAL USE

Basis of Certificate for Liquid Biofertiliser application to Land at Ty Hen Farm, Nantycaws, Carmarthen

Liquid Biofertiliser (Yard water) has been sampled and analysed. It has been shown to have very useful fertiliser properties notably potash, nitrogen and phosphate together with trace elements. These have been shown to be typical in quality and without undue pte's. The liquid will be beneficial to the grass as the nitrogen is in a readily available form.

The soils of the farm have been sampled and analysed for macro nutrient indices. These values have been used to determine rates of application that will provide good agricultural benefit based on the utilisation of nutrients and taking into account any limits and recommendations for fertiliser application in accordance with reference booklet RB209, the DEFRA Fertiliser Recommendations Booklet. It is noted that the soil analyses have revealed LOW Phosphorous and Potassium levels; and therefore there shall be a net benefit of applying Liquid Biofertiliser rich in much needed Potassium. Where Liquid Biofertiliser is applied, there should be adjustments to applications of Nitrogen, and Phosphate.

Nitrogen pollution prevention
The application rates for nitrogen are well below the Good Practice; 250 kg/ha reference value. Furthermore, the availability of the nitrogen is very LOW and the risks of nitrogen leaching are therefore very LOW.

Phosphate pollution prevention
In keeping with the Environment Agency methodology, the application rates have been calculated based on the 'total' nutrients' (Nitrogen, Phosphate and Potash) in the biofertiliser compared to 'artificial' fertilisers. On this basis, there is confidence that Phosphorous pollution is adequately accounted for and there is minimal risk.

Risk assessments have been undertaken to determine the presence of water courses and any other sensitive receptors. The risks have been assessed as low, provided the operators observe the buffer strips and areas that have been identified.

Care should be taken to plan and observe non-grazing periods to avoid animal ingestion of biofertiliser. Applications to Grassland shall be undertaken as split applications, to avoid undue potassium uptake issues in the fodder or grazing.

Liquid Storage is undertaken within a Separate Permit. This provides a below ground level lagoon that is lined with a heavy duty liner on a clay subsoil and is to the required standards.

Certificate

Based on the foregoing, Recogen Ltd. have concluded and hereby certify that the use of this material of the quality as sampled and analysed, on the land identified, will be agriculturally beneficial for the soil and the grass crops utilised on this farm, and with care in the future will allow reduced dependency on artificial fertilisers and therefore will enable a move to a more organic and environmentally friendly style of farming.

D. J. Baldwin
D J Baldwin, BSc CEnv. MCIWM,
Technical Director; Recogen Ltd.
FACTS Registered Certificate number **FE 3674.**
6/10/2020

SECTION 9: STATEMENT OF TECHNICAL COMPETENCE.

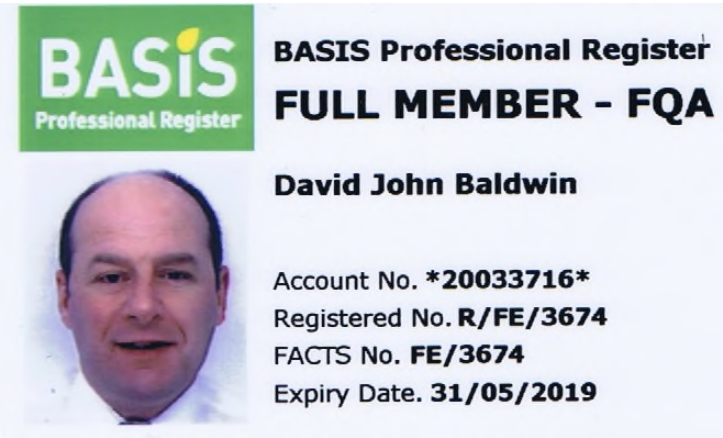
The Technical report for Good Agricultural Practice, fertiliser use and risk assessment has been undertaken by David Baldwin of Recogen Ltd. David has worked with ADAS the UK leading consultancy in Agriculture for 25 years, is identified as an ADAS National Expert in Waste Management, and was formerly based at the ADAS Farm Waste Unit at Silsoe for 4 years as National Specialist providing technical expertise and training on agricultural and municipal waste management to large corporations and Government Departments.

David has completed training and passed examinations for the FACTS Certification at Harper Adams University College. David has certificates for EPOC, IOSH, HACCP and WAMITAB.

His FACTS Registered Certificate number is **FE 3674.** Scan of Certificate (Card) is shown below.

He has provided BASIS and NRoSO registered training for courses, workshops and seminars to farmers, consultants and agrochemical suppliers.

Recogen Ltd. is registered with Business Link and is a framework supplier of technical expertise and consultancy for organic waste treatment and recycling to WRAP. Recogen Ltd. Are members of the CIWM, REA Ltd and the ADBA.



ANNEXES. Laboratory test Results

A1.1 Soil Analyses (Nutrient Status) April 2019
(see separate document)

A1.2 Waste Analyses Wastewater April 2019
(see separate document)