Agricultural Benefit Statement

For the application of beneficial wastes to fields at;

Lodge Farm (#1), Borras Road, Rossett, Wrexham, LL13 9TE

14th March 2022

1 Person with appropriate technical expertise and permit details

This benefit statement has been compiled by Dr Chris Ash (Consultant at 4R Group) who has the following qualifications and experience;

- Ph.D. Fate and Behaviour of Potentially Toxic Elements in Soils
- MSc. Natural Resources and Environment
- BSc. (Hons) Environmental Science
- FACTS Qualified Advisor (No. FE/6324) and Full Member of BASIS Professional Register
- 5 years' landspreading experience

Permit number under which this deployment application is being made: **EPR/QB3893HG**

2 Where the waste is to be spread

Table 1. Where the waste is to be spread

Farm address:	Lodge Farm, Borras Road, Rossett, Wrexham, LL13 9TE	
Stockpile grid reference:	Refer to Table 4	
Area of the receiving land:	37.3 ha	
Quantity to be stored at any one time:	Stackable: 447	Non-Stackable: Spread on delivery
Total maximum quantity to be spread:	1,613 t	
Location map document reference:	LF-01	

3 What is the waste to be spread

Table 2. Description of waste(s) to be applied

Waste	***EWC Code***	***Description***	***Waste Producer***	***Additional Information***
1	19 06 06	Whole digestate (liquid sludge) from anaerobic treatment of food wastes	Lodge Farm Biogas	-
2	19 12 12	Gypsum from recycled plasterboard	Heatrick N.I	-

4 Operational details

4.1 Cropping details

Table 3. Cropping details

Current crop including projected yield if known:	Refer to Table 6-7
Is straw removed?	Y ☒ N ☐ N/A ☐
Following crop and any sensitive crops within rotation which you are amending the soil for in good time:	Refer to Table 6-7
When do you intend to apply this waste; e.g. post harvest – pre-ploughing, during seed bed cultivations, on the stubble over winter:	Spreading will only take place subject to ground conditions and following the Code of Good Agricultural Practice (Defra, 2011). Targeted periods of spreading on grass fields include early Spring, and after cutting of silage through Summer and Autumn. Gypsum is low in nitrogen and can be applied year-round to grass if weather conditions are appropriate. On cereals gypsum is best applied post-harvest onto stubble. Liquid sludges will be spread on delivery. No more than 50t/ha of liquid sludge will be spread on a field in any 3-week period in accordance with CoGAP, and no more than 250t/ha will be spread within any 12-month period.

4.2 Waste storage

Table 4. Waste storage

How is the waste to be stored?	**Stackable wastes**: stacked heap for gypsum

e.g. mobile tank, field heap, spread on delivery	**Non-stackable wastes**: Spread on delivery
Where is the waste to be stored prior to spreading?	No storage requirement for digestate. Gypsum stored in field heap at 338300 355220
Why were these storage locations chosen?	Storage locations are easily accessible by delivering vehicles. Also, they are not within 10m of any ditch, watercourse, or footpath, and are at least 50m from any well spring or borehole. They are also a safe distance from overhead powerlines.

4.3 Waste application

Table 5. Waste application

How is the waste to be spread and why is it to be spread that way?	Liquid digestate will be spread using either a trailing shoe/dribble bar or injected – whatever is optimal according to ground conditions and availability. Gypsum will be spread using a conventional rear discharge spreader.
How do you plan to incorporate the waste following application?	There is no requirement for further incorporation of wastes on grass fields. Gypsum sprad onto stubble will get ploughed into the soil as part of field cultivations.
With liquid wastes is there any mole draining or sub-soiling planned? *Are there land drains in the field?*	No There are drainage pipes buried in some fields to the depth of approximately 800 mm. The depth of the drainage pipes and the relatively low application rates of waste mean that risks of wastes percolating to the depth of the pipe and entering a watercourse is negligible. Water that reaches the drainage system would have to have passed through a significant depth of soil and a gravel pre-filter. As part of CoGAP and the conditions of the permit, no spreading will take place when soil is waterlogged, frozen, or in periods of prolonged or heavy rainfall.
Other relevant operational information:	The digestate is produced near to the land under deployment but will be stored at the site of production. The waste storage is permitted under the production site's permit and so it is not subject to assessment under the land spreading permit deployment. Digestate is in a liquid sludge form and will be spread upon delivery to the fields.

Table 6. Lodge Farm Biogas digestate

						N			P_2O_5				K_2O				Mg				
Field Reference	**Total Area**	**Sprd Area**	**Previous Crop**	**Next Crop**	**pH**	**SNS**	**Req kg/ha**	**In Wst kg/ha**	**P Ind**	**Req kg/ha**	**Crop Use kg/ha**	**In Wst kg/ha**	**K Ind**	**Req kg/ha**	**Crop Use kg/ha**	**In Wst kg/ha**	**Mg Ind**	**Req kg/ha**	**In Wst kg/ha**	**Rate t/ha**	**Totals tonnes**
1	4.9	4.7	oats	oats	6.5	1	110	110	1	85	54	46	1	130	99	78	4	0	2	50	**235**
2	3.8	3.5	oats	oats	6.9	1	110	110	1	85	54	46	1	130	99	78	4	0	2	50	**175**
3	3.6	3.5	oats	oats	6.4	1	110	64	3	0	54	53*	0	160	99	45	2	0	1	29	**102**
4	2.7	2.4	oats	oats	6.2	1	110	64	2	55	54	53*	1	130	99	45	4	0	1	29	**70**
5	5.5	5.2	oats	oats	6.6	1	110	110	0	115	54	46	1	130	99	78	4	0	2	50	**258**
6	8.5	8.4	oats	grass	6.6	M	250	95	2	80	80	79*	1	290	282	67	3	0	2	43	**361**
7	9.8	9.6	oats	grass	7.1	M	250	95	3	20	80	79*	1	290	282	67	3	0	2	43	**413**
Ha	**38.8**	**37.3**																			**1613**

Nutrient requirement based on values for grass with 3 cuts of silage (target DM yield 9-12t/ha) and oats, described in RB209 (2020)

Grass crop use based on yield totalling 47t/ha where 1.7kg/t P_2O_5 and 6.0kg/t K_2O removed in offtake (RB209, 2020)

Oats crop use based on yield totalling 6t/ha where 9.0kg/t P_2O_5 and 16.5kg/t K_2O removed in offtake (RB209, 2020)

N, P_2O_5, K_2O and Mg stated are **available** concentrations in units of kg/ha

***Total** P_2O_5 and K_2O stated where soil indices ≥2

Total N supplied at an application rate of 50t/ha is 163kg/ha

Table 7. Heatrick gypsum

						N			P_2O_5				K_2O				Mg				
Field Reference	**Total Area**	**Sprd Area**	**Previous Crop**	**Next Crop**	**pH**	**SNS**	**Req kg/ha**	**In Wst kg/ha**	**P Ind**	**Req kg/ha**	**Crop Use kg/ha**	**In Wst kg/ha**	**K Ind**	**Req kg/ha**	**Crop Use kg/ha**	**In Wst kg/ha**	**Mg Ind**	**Req kg/ha**	**In Wst kg/ha**	**Rate t/ha**	**Totals tonnes**
1	4.9	4.7	oats	oats	6.5	1	110	0.1	1	85	54	1	1	130	99	8.3	4	0	23	12	**56**
2	3.8	3.5	oats	oats	6.9	1	110	0.1	1	85	54	1	1	130	99	8.3	4	0	23	12	**42**
3	3.6	3.5	oats	oats	6.4	1	110	0.1	3	0	54	2*	0	160	99	8.3	2	0	23	12	**42**
4	2.7	2.4	oats	oats	6.2	1	110	0.1	2	55	54	2*	1	130	99	8.3	4	0	23	12	**29**
5	5.5	5.2	oats	oats	6.6	1	110	0.1	0	115	54	1	1	130	99	8.3	4	0	23	12	**62**
6	8.5	8.4	oats	grass	6.6	M	250	0.1	2	80	80	2*	1	290	282	8.3	3	0	23	12	**101**
7	9.8	9.6	oats	grass	7.1	M	250	0.1	3	20	80	2*	1	290	282	8.3	3	0	23	12	**115**
Ha	**38.8**	**37.3**																			**447**

Nutrient requirement based on values for grass with 3 cuts of silage (target DM yield 9-12t/ha) and oats, described in RB209 (2020)

Grass crop use based on yield totalling 47t/ha where 1.7kg/t P_2O_5 and 6.0kg/t K_2O removed in offtake (RB209, 2020)

Oats crop use based on yield totalling 6t/ha where 9.0kg/t P_2O_5 and 16.5kg/t K_2O removed in offtake (RB209, 2020)

N, P_2O_5, K_2O and Mg stated are **available** concentrations in units of kg/ha

***Total** P_2O_5 and K_2O stated where soil indices ≥2

Total N supplied at an application rate of 12t/ha is 5.1kg/ha

5 Compliance with NVZ regulations

Table 8. Compliance with NVZ regulations

<table>
<tr><td>Does the site fall within a designated NVZ?</td><td>Y ☒ N ☐ (Please skip to section 6)</td></tr>
<tr><td>Do closed periods apply for the wastes to be applied?</td><td>Y ☒ N ☐

Applicable to: Whole digestate (>30% RAN)

If yes, please indicate the appropriate period:

<table>
<tr><th>Start Date</th><th>End Date</th><th>Land Use</th><th>Soil Type</th><th></th></tr>
<tr><td>1st Aug</td><td>31st Dec</td><td>Tillage Land</td><td>Shallow/Sandy</td><td>☐</td></tr>
<tr><td>1st Sept</td><td>31st Dec</td><td>Grassland</td><td>Shallow/Sandy</td><td>☐</td></tr>
<tr><td>16th Sept</td><td>31st Dec</td><td>Tillage Land*</td><td>Shallow/Sandy</td><td>☐</td></tr>
<tr><td>1st Oct</td><td>31st Jan</td><td>Tillage Land</td><td>All Other Soils</td><td>☒</td></tr>
<tr><td>15th Oct</td><td>31st Jan</td><td>Grassland</td><td>All Other Soils</td><td>☒</td></tr>
</table>

*For Tillage Land with crops sown on or before 15th September

If no, applications will be carried out as per CoGAP i.e. when ground conditions are suitable and when no heavy rain is forecast.</td></tr>
<tr><td>Will application rates comply with crop requirement and field/whole farm limit?</td><td>Yes, see Table 6 - 7</td></tr>
<tr><td>Previous applications:</td><td>No previous applications</td></tr>
</table>

6 Benefits and nutrients supplied to the soil or crop from this application

6.1 Receiving soils

The nutrient status of individual fields to be registered are provided in Table 6 above. General soil type(s) for the fields to be registered are;

Soil Scape 18: Slowly permeable seasonally wet slightly acid but base rich loamy and clayey soils.

Table 9. Soil type

Light sand soils	Soils which are sand, loamy sand or sandy loam to 40cm depth and are sand or loamy sand between 40 and 80 cm, or over sandstone rock.	☐
Shallow soils	Soils over impermeable subsoils and those where the parent rock (chalk, limestone or other rock) is within 40cm of the soil surface. Sandy soils developed over sandstone rock should be regarded as light sand soils.	☐
Medium soils	Mostly medium-textured mineral soils that do not fall into any other soil category. This includes sandy loams over clay, deep loams, and silty or clayey topsoils that have sandy or loamy subsoils.	☐
Deep clayey soils	Soils with predominantly sandy clay loam, silty clay loam, clay loam, sandy clay, silty clay or clay topsoil overlying clay subsoil to more than 40cm depth. Deep clayey soils normally need artificial field drainage.	☒
Deep silty soils	Soils of sandy silt loam, silt loam or silty clay loam textures to 100 cm depth or more. Silt soils formed on marine alluvium, warp soils (river alluvium) and brickearth soils are in this category. Silty clays of low fertility should be regarded as other mineral soils.	☐
Organic soils	Soils that are predominantly mineral but with between 10 and 20% organic matter to depth. These can be distinguished by darker colouring that stains the fingers black or grey.	☐
Peat soils	Soils that contain more than 20% organic matter derived from sedge or similar peat material.	☐

The soil analyses (**Soil Analysis**) shows the soils to have sufficient background concentrations of Mg (*i.e.* ADAS Index 4-5). It is therefore unlikely that the crop will require any additional input of Mg over the course of the cropping cycle. A high magnesium content is typical for soils that are heavy clay type and less permeable.

6.2 Waste characterisation

Full characterisations of individual wastes with total and available nutrients at the recommended rates for each waste stream are supplied in **Waste Analysis**. This information is further summarised against the nutrient requirements for proposed crops in Table 6-7 above.

The digestate is produced at the Lodge Farm Biogas facility which is in close vicinity to the fields that are under deployment. The facility has its own storage that is subject to regulation by the site permit, the digestate is effectively to be spread upon delivery to the fields. The digestate has been previously applied as a PAS110 certified digestate.

The limiting factors for the different wastes are as follows;

- Lodge Farm Biogas digestate – application js limited to the P_2O_5 crop offtake value on fields with P Index 2 or above, the additions of RAN do not exceed the N requirement of the crop.

6.3 Summary of benefits

The digestate is an excellent source of nutrient that are required by the crops. It is a source of readily available nitrogen that can replace up to 100% of the bagged fertiliser requirement. It is also a very good source of P_2O_5 and K_2O, which will also contribute significantly toward the crops annual requirement, lessening the need to import and spread chemical fertiliser to maintain productivity on these fields.

The over-application of P_2O_5 on fields that are below target level will help raise the soil P index in future, as per RB209 recommendations.

Gypsum is top dressed to soils as a treatment to manage heavy and impermeable or compact soils, usually those associated with heavy clay type. The analysis of the gypsum waste shows that it contains significant amounts of calcium and sulphur, providing good additions of both these nutrients to the soil.

6.4 Additional requirements

Fields may require additional future P and K applications to raise field Indices to the target level. pH levels in the soil are sufficiently high and will not require liming at the present time.

7 Potential negative impacts to the soil or crop from this application

7.1 Potentially Toxic Elements (PTEs)

All the wastes contain traces of PTEs, however concentrations applied to the receiving soils are below maximum upper limits for heavy metal applications described in the Sludge (Use in Agriculture) Regulations 1989 (SI, 1989). Refer to interpretations in **Waste Analysis**.

7.2 Other waste characteristics

The pH level of the digestate and gypsum was measured at pH 7.6 and 7.9 respectively

It is unlikely that soil pH will decrease following the application detailed here due to the extensive buffering capacity of the receiving soils. The pH levels of the receiving soils are ≥ 6.2 therefore it is unlikely that availability of any naturally occurring heavy metals present in these soils will become more available after application of these wastes.

7.3 Operational factors

1. Liquid wastes will be surface spread, applied using trailing she/hose, minimal spray equipment.
2. Potential compaction of receiving soil will be mitigated by suitable adjustment of tyres/tyre pressure to match soil conditions, direction of spreading and load to be spread.
3. Wastes will be applied when ground and weather conditions are suitable, following CoGAP to avoid soil damage including wheel ruts, compaction, structural damage, erosion and run-off.

8 Sensitive human and environmental receptors

Locations of sensitive receptors are shown in **LF1 Maps**. Prevailing winds are south-westerly.

9 Practices to reduce the impacts of the operation on identified sensitive receptors

Mitigation measures to safeguard site-specific high and moderate likelihood of emission detection by sensitive receptors are shown above. Generic measures (in addition to permit requirements and following the EMS) to reduce potential negative impacts of the proposed spreading operation will be as follows;

1. Spreading will only be undertaken when weather conditions are suitable within restrictions outlined in CoGAP and any relevant closed periods.
2. Spreading will not be carried out in any areas of a field that will be sub-soiled.
3. Machinery operations will take account of soil conditions, slopes *etc.*
4. Liquid spreading machinery will be turned off and lifted away from soil prior to turning at the end of each run.
5. Machinery will be checked daily when in use, regularly serviced and spreading equipment calibrated. Umbilical hoses will be regularly checked for damage to prevent leaks.
6. Machinery turns will not be executed in the buffer strips.
7. Waste deliveries to field/stores will be supervised.
8. All spillages will be reported immediately to NRW.

10 Contingency planning

Replacement spreading machinery will be available to prevent waste being retained in faulty machinery. Hire vehicles will be used if required. All machinery will be fully serviced.
There will be a sufficient number of trained staff available to ensure that the operation continues throughout operational hours (*i.e.* there will be sufficient cover for illness, holiday *etc.*).
In adverse weather, storage is available until ground/weather conditions become favourable for land application.
In circumstances where the wastes cannot be stored or spread beyond normal capacities, wastes will be diverted to a local alternative deployment.