

# Agricultural Benefit Statement

## For the application of beneficial wastes to fields at: The Dderw Farm, Llyswen, Brecon, LD3 0UT

4<sup>th</sup> December 2025

### 1 Person with appropriate technical expertise and permit details

This benefit statement has been compiled by Dawn Loos (Lead Consultant at 4R Group) who has the following qualifications and experience:

- B.Agric – Plant production
- PGDip – Agronomy
- MSc - Sustainable Agriculture
- 3 years of agronomic experience
- 4R Group Deployment Training Course
- Facts Qualified Advisor (FE/7676)

Verified by Jonathan Lloyd; FACTS Qualified Advisor (No. FE/ 4524)

Permit number under which this deployment application is being made: EPR/GP3792SK

### 2 Where the waste is to be spread

Table 1. Where the waste is to be spread

<i>Farm address:</i>	Dderw Farm, Llyswen, Brecon, LD3 0UT	
<i>Stockpile grid reference:</i>	Refer to Table 4.	
<i>Area of the receiving land:</i>	44.40ha	
<i>Quantity to be stored at any one time:</i>	Stackable: N/A	Non-Stackable: N/A
<i>Total maximum quantity to be spread:</i>	8,387t	
<i>Location map document reference:</i>	DD_M01	

### 3 What is the waste to be spread

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

<b>Waste</b>	<b>EWC Code</b>	<b>Description</b>	<b>Waste Producer</b>	<b>Additional Information</b>
1.	19 09 02	Sludges from water clarification. Potable water treatment effluent.	DCWW Elan Valley	Non-stackable ferric liquid sludge
2.	19 09 02	Sludges from water clarification. Potable water treatment effluent.	DCWW Talybont	Non-stackable alum based liquid sludge
3.	19 09 02	Sludges from water clarification. Potable water treatment effluent.	DCWW Llyswen	Non-stackable alum based liquid sludge
4.	19 06 06	Liquid digestate from anaerobic treatment of source segregated biodegradable waste.	Biogen Digestate	
5.	19 06 06	Liquid digestate from anaerobic treatment of source segregated biodegradable waste.	Welsh Water Organic Energy Digestate	

### 4 Operational details

#### 4.1 Cropping details

Table 3. Cropping details

<i>Current crop including projected yield if known:</i>	Refer to tables 6-10
<i>Is straw removed?</i>	Y <input type="checkbox"/> N <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
<i>Following crop and any sensitive crops within rotation which you are amending the soil for in good time:</i>	Refer to tables 6-10
<i>When do you intend to apply this waste, e.g. post-harvest – pre-ploughing, during seed bed cultivations, on the stubble over winter:</i>	<p>Spreading will only take place subject to ground conditions and following the Code of Good Agricultural Practice (Defra, 2011), NVZ regulations and the permit holder's Environmental Management System (EMS). Spreading activities will also comply with The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021.</p> <p>Targeted periods of spreading on grass fields will occur between February-May, and after silage cuts, June through</p>

	<p>October. This is to allow for grassland fields to have use of late autumn grazing.</p> <p>No spreading will occur outside of the target periods unless agreed upon by the local area officer and only taking place if weather and ground conditions permit the farmer to do so.</p> <p>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.</p>
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#### 4.2 Waste storage.

Table 4. Waste storage.

<p><i>How is the waste to be stored?</i></p> <p><i>e.g. mobile tank, field heap, spread on delivery</i></p>	Spread on delivery.
<p><i>Where is the waste to be stored prior to spreading?</i></p>	N/A
<p><i>Why were these storage locations chosen?</i></p>	N/A

#### 4.3 Waste application

Table 5. Waste application

<p><i>How is the waste to be spread and why is it to be spread that way?</i></p>	Spread with a Vacuum tanker with low trajectory spread pattern, as this is readily available to the farmer.
<p><i>How do you plan to incorporate the waste following application?</i></p>	<p>The waste will be applied prior to ploughing or sowing or spread onto the surface and incorporated after ploughing and incorporated using secondary cultivations.</p> <p>Routine grassland management such as harrowing or rolling, in preparation for silage or grazing, will help to reduce particle size and waste to soil contact for the sludge cakes proposed for application.</p>
<p><i>With liquid wastes is there any mole draining or sub-soiling planned?</i></p>	No

<p><i>Are there land drains in the field?</i></p>	<p>Yes</p>
<p><i>Other relevant operational information:</i></p>	<p>The waste may be applied separately or in combination. If the wastes are applied in combination the total combined amount applied will not exceed 250 t/ha, the total nitrogen loading will be less than 250 kg/ha, and the amount of available nitrogen and total or available phosphate and potash (whichever is appropriate) will not exceed the fertiliser recommendation or the amount removed in crop offtake, whichever is the greater.</p> <p>Alum flocculated sludges will not be spread on fields where pH &lt;6.0.</p>

Table 6. DCWW Talybont

**Nutrient Requirements for Land at The Derw**

Field Ref	Total Area	Spread Area	Previous Crop	Next Crop	Soil pH	N			P <sub>2</sub> O <sub>5</sub>			K <sub>2</sub> O			Mg			Rate t/ha	Totals tonnes		
						SNS	Req	*In Wst	P Ind	Req	Crop Use	*In Wst	K Ind	Req	Crop Use	*In Wst	Mg Ind			Req	*In Wst
1	9.20	8.80	Grass	Grass	5.9	M	200	0	1	95	65	0	1	180	228	0	2	0	0	0	0
2	5.70	5.50	Grass	Grass	6.1	M	200	3.5	1	95	65	33.3	0	200	228	5.6	2	0	4.4	250	1375
3	11.30	8.00	Grass	Grass	6.6	M	200	3.5	1	95	65	33.3	2-	170	228	6.2*	2	0	4.4	250	2000
4	6.60	6.40	Grass	Grass	6.3	M	200	3.4	2	65	65	64.8*	1	180	228	5.4	1	0	4.2	243	1555.2
5	4.60	4.20	Grass	Grass	6.6	M	200	3.4	2	65	65	64.8*	3	70	228	6*	1	0	4.2	243	1020.6
6	4.60	4.20	Grass	Grass	6.5	M	200	1.7	3	20	65	32.5*	3	70	228	3*	2	0	2.1	122	512.4
7	5.30	5.00	Grass	Grass	5.9	M	200	0	4	0	65	0	2+	120	228	0	2	0	0	0	0
8	9.11	2.30	Grass	Grass	5.8	M	200	0	2	65	65	0	2-	170	228	0	3	0	0	0	0
<b>Ha</b>	<b>56.41</b>	<b>44.40</b>																			<b>6463</b>

Grass = 2 cut silage with aftermath grazing

Nutrient requirement based on values for grass with 2 cuts of silage with aftermath grazing (target DM yield 9-12t/ha) described in RB209 (2023).

Expected Grazing yield of 9-12t/ha.

Crop use based on Grass totalling 38t/ha yield (25%DM) where 1.7kg/t P<sub>2</sub>O<sub>5</sub> and 6.0kg/t K<sub>2</sub>O removed in offtake (RB209, 2023).

N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O and Mg stated are **available** concentrations in units of kg/ha

\*Total P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O stated where soil indices ≥2

Total N supplied at an application rate of 250 t/ha is 144.8 kg/ha

Table 7. DCWW Elan Valley

**Nutrient Requirements for Land at The Derw**

Field Ref	Total Area	Spread Area	Previous Crop	Next Crop	Soil pH	N			P <sub>2</sub> O <sub>5</sub>			K <sub>2</sub> O			Mg			Rate t/ha	Totals tonnes		
						SNS	Req	*In Wst	Ind	Req	Crop Use	*In Wst	Ind	Req	Crop Use	*In Wst	Ind			Req	*In Wst
						kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	
1	9.20	8.80	Grass	Grass	5.9	M	200	5	1	95	65	46.7	1	180	228	4.7	2	0	3.2	250	2200
2	5.70	5.50	Grass	Grass	6.1	M	200	5	1	95	65	46.7	0	200	228	4.7	2	0	3.2	250	1375
3	11.30	8.00	Grass	Grass	6.6	M	200	5	1	95	65	46.7	2-	170	228	5.3*	2	0	3.2	250	2000
4	6.60	6.40	Grass	Grass	6.3	M	200	3.4	2	65	65	64.6*	1	180	228	3.3	1	0	2.2	173	1107.2
5	4.60	4.20	Grass	Grass	6.6	M	200	3.4	2	65	65	64.6*	3	70	228	3.6*	1	0	2.2	173	726.6
6	4.60	4.20	Grass	Grass	6.5	M	200	1.7	3	20	65	32.5*	3	70	228	1.8*	2	0	1.1	87	365.4
7	5.30	5.00	Grass	Grass	5.9	M	200	0.9	4	0	65	16.1*	2+	120	228	0.9*	2	0	0.6	43	215
8	9.11	2.30	Grass	Grass	5.8	M	200	3.4	2	65	65	64.6*	2-	170	228	3.6*	3	0	2.2	173	398
<b>Ha</b>	<b>56.41</b>	<b>44.40</b>																			<b>8387</b>

Grass = 2 cut silage with aftermath grazing

Nutrient requirement based on values for grass with 2 cuts of silage with aftermath grazing (target DM yield 9-12t/ha) described in RB209 (2023).

Expected Grazing yield of 9-12t/ha.

Crop use based on Grass totalling 38t/ha yield (25%DM) where 1.7kg/t P<sub>2</sub>O<sub>5</sub> and 6.0kg/t K<sub>2</sub>O removed in offtake (RB209, 2023).

N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O and Mg stated are **available** concentrations in units of kg/ha

\*Total P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O stated where soil indices ≥2

Total N supplied at an application rate of 250 t/ha is 98.6 kg/ha

Table 8. DCWW Llyswen

**Nutrient Requirements for Land at The Derw**

Field Ref	Total Area	Spread Area	Previous Crop	Next Crop	Soil pH	N			P <sub>2</sub> O <sub>5</sub>			K <sub>2</sub> O			Mg			Rate t/ha	Totals tonnes		
						SNS	Req	*In Wst	P Ind	Req	Crop Use	*In Wst	K Ind	Req	Crop Use	*In Wst	Mg Ind			Req	*In Wst
1	9.20	8.80	Grass	Grass	5.9	M	200	0	1	95	65	0	1	180	228	0	2	0	0	0	0
2	5.70	5.50	Grass	Grass	6.1	M	200	0.1	1	95	65	11.4	0	200	228	10.3	2	0	12.3	250	1375
3	11.30	8.00	Grass	Grass	6.6	M	200	0.1	1	95	65	11.4	2-	170	228	11.4*	2	0	12.3	250	2000
4	6.60	6.40	Grass	Grass	6.3	M	200	0.1	2	65	65	22.8*	1	180	228	10.3	1	0	12.3	250	1600
5	4.60	4.20	Grass	Grass	6.6	M	200	0.1	2	65	65	22.8*	3	70	228	11.4*	1	0	12.3	250	1050
6	4.60	4.20	Grass	Grass	6.5	M	200	0.1	3	20	65	22.8*	3	70	228	11.4*	2	0	12.3	250	1050
7	5.30	5.00	Grass	Grass	5.9	M	200	0	4	0	65	0	2+	120	228	0	2	0	0	0	0
8	9.11	2.30	Grass	Grass	5.8	M	200	0	2	65	65	0	2-	170	228	0	3	0	0	0	0
<b>Ha</b>	<b>56.41</b>	<b>44.40</b>																			<b>7075</b>

Grass = 2 cut silage with aftermath grazing

Nutrient requirement based on values for grass with 2 cuts of silage with aftermath grazing (target DM yield 9-12t/ha) described in RB209 (2023).

Expected Grazing yield of 9-12t/ha.

Crop use based on Grass totalling 38t/ha yield (25%DM) where 1.7kg/t P<sub>2</sub>O<sub>5</sub> and 6.0kg/t K<sub>2</sub>O removed in offtake (RB209, 2023).

N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O and Mg stated are **available** concentrations in units of kg/ha

\***Total** P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O stated where soil indices ≥2

Total N supplied at an application rate of 250 t/ha is 92.8 kg/ha

Table 9. Biogen Digestate

**Nutrient Requirements for Land at The Derw**

Field Ref	Total Area	Spread Area	Previous Crop	Next Crop	Soil pH	N			P <sub>2</sub> O <sub>5</sub>			K <sub>2</sub> O			Mg			Rate t/ha	Totals tonnes		
						SNS	Req	*In	Ind	Req	Crop Use	*In	Ind	Req	Crop Use	*In	Ind			Req	*In
						kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha			kg/ha	kg/ha
1	9.20	8.80	Grass	Grass	5.9	M	200	185.8	1	95	65	19	1	180	228	97.1	2	0	0.3	23	202.4
2	5.70	5.50	Grass	Grass	6.1	M	200	185.8	1	95	65	19	0	200	228	97.1	2	0	0.3	23	126.5
3	11.30	8.00	Grass	Grass	6.6	M	200	185.8	1	95	65	19	2-	170	228	107.9*	2	0	0.3	23	184
4	6.60	6.40	Grass	Grass	6.3	M	200	185.8	2	65	65	38*	1	180	228	97.1	1	0	0.3	23	147.2
5	4.60	4.20	Grass	Grass	6.6	M	200	185.8	2	65	65	38*	3	70	228	107.9*	1	0	0.3	23	96.6
6	4.60	4.20	Grass	Grass	6.5	M	200	153.5	3	20	65	31.4*	3	70	228	89.2*	2	0	0.2	19	79.8
7	5.30	5.00	Grass	Grass	5.9	M	200	80.8	4	0	65	16.5*	2+	120	228	46.9*	2	0	0.1	10	50
8	9.11	2.30	Grass	Grass	5.8	M	200	185.8	2	65	65	38*	2-	170	228	107.9*	3	0	0.3	23	53
<b>Ha</b>	<b>56.41</b>	<b>44.40</b>																			<b>939</b>

Grass = 2 cut silage with aftermath grazing

Nutrient requirement based on values for grass with 2 cuts of silage with aftermath grazing (target DM yield 9-12t/ha) described in RB209 (2023).

Expected Grazing yield of 9-12t/ha.

Crop use based on Grass totalling 38t/ha yield (25%DM) where 1.7kg/t P<sub>2</sub>O<sub>5</sub> and 6.0kg/t K<sub>2</sub>O removed in offtake (RB209, 2023).

N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O and Mg stated are **available** concentrations in units of kg/ha

\*Total P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O stated where soil indices ≥2

Total N supplied at an application rate of 23 t/ha is 246.1 kg/ha

Table 10. Welsh Water Organic Energy Digestate

**Nutrient Requirements for Land at The Derw**

Field Ref	Total Area	Spread Area	Previous Crop	Next Crop	Soil pH	N			P <sub>2</sub> O <sub>5</sub>			K <sub>2</sub> O			Mg			Rate	Totals		
						SNS	Req	*In	Ind	Req	Crop Use	*In	Ind	Req	Crop Use	*In	Ind			Req	*In
						kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha			kg/ha	kg/ha
1	9.20	8.80	Grass	Grass	5.9	M	200	163.2	1	95	65	30.2	1	180	228	95.7	2	0	0.8	29	255.2
2	5.70	5.50	Grass	Grass	6.1	M	200	163.2	1	95	65	30.2	0	200	228	95.7	2	0	0.8	29	159.5
3	11.30	8.00	Grass	Grass	6.6	M	200	163.2	1	95	65	30.2	2-	170	228	106.3*	2	0	0.8	29	232
4	6.60	6.40	Grass	Grass	6.3	M	200	163.2	2	65	65	60.5*	1	180	228	95.7	1	0	0.8	29	185.6
5	4.60	4.20	Grass	Grass	6.6	M	200	163.2	2	65	65	60.5*	3	70	228	106.3*	1	0	0.8	29	121.8
6	4.60	4.20	Grass	Grass	6.5	M	200	84.4	3	20	65	31.3*	3	70	228	55*	2	0	0.8	15	63
7	5.30	5.00	Grass	Grass	5.9	M	200	45	4	0	65	16.7*	2+	120	228	29.3*	2	0	0.2	8	40
8	9.11	2.30	Grass	Grass	5.8	M	200	163.2	2	65	65	60.5*	2-	170	228	106.3*	3	0	0.8	29	67
<b>Ha</b>	<b>56.41</b>	<b>44.40</b>																			<b>1124</b>

Grass = 2 cut silage with aftermath grazing

Nutrient requirement based on values for grass with 2 cuts of silage with aftermath grazing (target DM yield 9-12t/ha) described in RB209 (2023).

Expected Grazing yield of 9-12t/ha.

Crop use based on Grass totalling 38t/ha yield (25%DM) where 1.7kg/t P<sub>2</sub>O<sub>5</sub> and 6.0kg/t K<sub>2</sub>O removed in offtake (RB209, 2023).

N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O and Mg stated are **available** concentrations in units of kg/ha

\*Total P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O stated where soil indices ≥2

Total N supplied at an application rate of 29 t/ha is 246.5 kg/ha

## 5 Compliance with NVZ regulations

Table 8. Compliance with NVZ regulations

<p><i>Does the site fall within a designated NVZ?</i></p>	<p>Y <input checked="" type="checkbox"/>    N <input type="checkbox"/> (Please skip to section 6)</p>																														
<p><i>Do closed periods apply for the wastes to be applied?</i></p>	<p>Y <input checked="" type="checkbox"/>    N <input type="checkbox"/></p> <p>Applicable to: Biogen and Welsh Water Organic Energies</p> <p>If yes, please indicate the appropriate period:</p> <table border="1" data-bbox="706 632 1344 856"> <thead> <tr> <th>Start Date</th> <th>End Date</th> <th>Land Use</th> <th>Soil Type</th> <th></th> </tr> </thead> <tbody> <tr> <td>1st Aug</td> <td>31st Dec</td> <td>Tillage Land</td> <td>Shallow/Sandy</td> <td><input type="checkbox"/></td> </tr> <tr> <td>1st Sept</td> <td>31st Dec</td> <td>Grassland</td> <td>Shallow/Sandy</td> <td><input type="checkbox"/></td> </tr> <tr> <td>16th Sept</td> <td>31st Dec</td> <td>Tillage Land*</td> <td>Shallow/Sandy</td> <td><input type="checkbox"/></td> </tr> <tr> <td>1st Oct</td> <td>31st Jan</td> <td>Tillage Land</td> <td>All Other Soils</td> <td><input type="checkbox"/></td> </tr> <tr> <td>15th Oct</td> <td>31st Jan</td> <td>Grassland</td> <td>All Other Soils</td> <td><input checked="" type="checkbox"/></td> </tr> </tbody> </table> <p>*For Tillage Land with crops sown on or before 15th September</p> <p>If no, applications will be carried out as per CoGAP <i>i.e.</i> when ground conditions are suitable and when no heavy rain is forecast.</p>	Start Date	End Date	Land Use	Soil Type		1st Aug	31st Dec	Tillage Land	Shallow/Sandy	<input type="checkbox"/>	1st Sept	31st Dec	Grassland	Shallow/Sandy	<input type="checkbox"/>	16th Sept	31st Dec	Tillage Land*	Shallow/Sandy	<input type="checkbox"/>	1st Oct	31st Jan	Tillage Land	All Other Soils	<input type="checkbox"/>	15th Oct	31st Jan	Grassland	All Other Soils	<input checked="" type="checkbox"/>
Start Date	End Date	Land Use	Soil Type																												
1st Aug	31st Dec	Tillage Land	Shallow/Sandy	<input type="checkbox"/>																											
1st Sept	31st Dec	Grassland	Shallow/Sandy	<input type="checkbox"/>																											
16th Sept	31st Dec	Tillage Land*	Shallow/Sandy	<input type="checkbox"/>																											
1st Oct	31st Jan	Tillage Land	All Other Soils	<input type="checkbox"/>																											
15th Oct	31st Jan	Grassland	All Other Soils	<input checked="" type="checkbox"/>																											
<p><i>Will application rates comply with crop requirement and field/whole farm limit?</i></p>	<p>Please refer to tables 6-10.</p>																														
<p><i>Previous applications:</i></p>	<p>Refer to LPD1</p>																														

## 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 tables 6-10 above. General soil type(s) for the fields to be registered are:

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.	<input type="checkbox"/>
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.	<input type="checkbox"/>
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.	<input checked="" type="checkbox"/>
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.	<input type="checkbox"/>
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.	<input type="checkbox"/>
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.	<input type="checkbox"/>
Peat soils	Soils that contain more than 20% organic matter derived from sedge or similar peat material.	<input type="checkbox"/>

The soil analyses (**Soil Analysis**) show the soils to have ample background concentrations of Mg (*i.e.* ADAS Index 1-3). Mg are minimal with the proposed waste applications but will aid in maintaining soil Mg indices over the course of the cropping cycle. Md index maintenance is crucial in grass systems to reduce the risk of hypomagnesemia in livestock.

### 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 Tables 6-10 above.

The application of all wastes is limited by the total phosphate on fields where the P index is 2 and above. The application therefore has been amended so that the amount of phosphate added from the waste does not exceed the crop offtake. 50% of crop offtake has been used where fields present a P index of 3 to ensure run down and where the field Index for P is at a 4, it is limited to 25% of crop offtake use to ensure run down. In the case of the digestates, Total N is also a limiting factor.

### **Important information**

- DCWW report all their analysis on a dry matter basis, including the liquid treatment sludges, unless otherwise stated.

- The moisture content at time of analysis is indicative of whether the sludge is a cake or a liquid. Typically, the sludge cake samples contain a significantly higher dry matter content than the liquid sludges. In this case, all wastes are liquids. Please refer to table 2 (page 2) which includes details of the physical state of each waste.

### 6.3 Summary of benefits

These wastes are a source of essential elements N, P, K, macronutrients Mg, Ca, S and provide trace amounts of micronutrients. Wastes are beneficially used to replace a proportion of the bagged mineral fertiliser used by farmers. The recommended application rates shown in tables 6-10 are based on the crop requirement and soil analysis.

Clean water treatment sludges and digestate contain significant amounts of organic matter. Additions of organic matter to soil will improve soil structural stability, biological activity, water, and nutrient holding capacity, i.e., resistance to drought, and reduction of localised flooding, reduced leaching of nutrients, and improved workability in soil. Organic matter is a particularly good source of N and S, and organic acids that aid nutrient solubility and uptake, as well as enhancing microbial activity for enhanced nutrient cycling in soils.

## 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**.

The potable water treatment sludges contain varying amounts of Al and Fe due to the flocculation process in the water treatment. At low pH (<6.0), aluminium can potentially transform into the toxic  $Al^{3+}$  species, it is therefore necessary to avoid spreading Al flocculated wastes on fields with pH <6.0. Additionally, care will be taken to prevent the waste entering a watercourse because aluminium can harm aquatic life. This will be achieved through observing buffer zones as per the location plan. Also, watercourses will be checked before, during and following spreading.

Iron flocculated wastes also have potential disbenefits if applied to inappropriate soils. Spreading high Fe wastes onto soils with pH <5.0 is not recommended. Spreading onto fields with pH 6.0 – 5.5 requires consideration and possible mitigation. Due to potential for Fe-oxide formation which can reduce  $P_2O_5$  mobility, spreading of Fe-flocculated wastes onto fields that are pH 5.0-5.5 and with P Index below target level has been avoided (please refer to table 7 above).

### 7.2 Other waste characteristics

The pH levels in the wastes range from 6.6- 8.8.

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 between 6.5 and 9, 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.

The digestate listed in this deployment is PAS110 and analysed to ensure it meets the specification.

### 7.3 Operational factors

1. 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.
2. 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.
3. Sampling methods will be consistent with those set out in the RB209, and the analysis for PTE's are consistent with the code of agricultural practice.
4. With regards to odour management for any potentially odorous material – the materials will only be disturbed when the material is being spread, and application to land will be done under permit conditions, following procedures in our permit EMS to minimise risk of odour emissions.

## 8 Sensitive human and environmental receptors

Please refer to site specific risk assessment. Locations of sensitive receptors are shown in the spreading maps **DD\_M01**. Prevailing winds are south-westerly.

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

Mitigation 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.
9. Buffer zones as depicted in the spreading maps have been implemented and will be abided by to protect adjacent sites (SINC/Restored ancient Woodland).

## 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 or DCWW sewage treatment works.