





# Non-Technical Summary

Permit Variation at High Hedley Biogas



Report produced for W J Drennan Limited

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## 1.0 INTRODUCTION

### 1.1 Site Address

High Hedley Biogas Plant,  
High Hedley Hope Farm,  
East Hedleyhope,  
Durham,  
DL13 4PR

### 1.2 Operational Location

Site Grid Reference: Easting 415008, Northing 541013.

### 1.3 Site Description

The anaerobic digestion facility is located in County Durham, approximately 0.79km northwest of the village of East Hedleyhope, approximately 0.77km south of the village of Hedley Hill and approximately 11.79km west of the city of Durham. The facility is located in a rural setting surrounding by agricultural land. The site's main access point is located off Commercial Street via the B6301.

The site, wholly owned by W.J. Drennan Limited, is situated next to High Hedley Hope Farm (also owned by Mr W.J. Drennan) and contains a weighbridge, site office, reception hall, two primary digesters, one pasteurisation tank, negative aeration system, biogas cleaning system, one combined heat and power (CHP) unit and a gas to grid entry system.

### 1.4 Plans

A plan showing the site's layout is presented in *HHB01- Site Layout Plan*.

### 1.5 Permits and Licenses

The site currently holds the following environmental permit:

- Standard Rules SR2012 No12 under reference EPR/LB3536AZ.

This permit allows for an Anaerobic Digestion facility with a treatment capacity up to 100 tonnes per day including use of the resultant biogas. The permit was granted on 28/07/2014.

### 1.6 Planning

The site has full planning permission for the operations from The Planning Inspectorate under reference APP/X1355/A/12/2188741. Planning secured 31/05/2013.

### 1.7 Reason for Application

W J Drennan Limited (hereon referred to as 'HHB') is seeking permission to vary their existing environmental permit to incorporate the following:

- To increase the site's throughput capacity to 55,000 tonnes per annum which results in a treatment capacity of more than 100 tonnes per day

It should be noted that as a result of this increase in throughput capacity an installation permit will be required. The proximity of buildings which have the potential to be used as dwellings in the future means that a bespoke installation permit will be required.

A site capacity assessment submitted in support of the original permit application demonstrated that the site is capable of processing 55,000 tonnes per annum of material through the existing tank arrangement. This will enable the site to realise its full processing potential following the installation of a gas to grid unit.

It is important to note that changes to the existing process will be minimal as the current process will not be affected and additional infrastructure is not required to achieve the throughput capacity.

## 2.0 OVERVIEW OF PROPOSED OPERATION

### 2.1 Operational Layout

The operational layout of the facility is shown on the Site Layout. The current layout of the site incorporates a weighbridge, site office, reception hall, depack unit, two primary digesters, pasteurisation tank, negative aeration system and biofilter, biogas cleaning system, one combined heat and power (CHPs) unit, gas to grid entry unit, an emergency flare and one digestate storage lagoon.

There will be no changes to the operational layout as part of this variation application.

### 2.2 Materials to be Processed

No new waste codes are to be added to the permit as this variation purely covers the throughput capacity increase of the site.

### 2.3 Capacity Increase

For this proposal, HHB is seeking to increase the permitted capacity of the plant from 36,500 tonnes per annum to 55,000 tonnes per annum. This is to enable the full potential of the current infrastructure at the site to be realised.

In order to justify the proposed increase in annual throughput and establish whether or not the site will fall below the industrial emissions directive (IED) threshold of 100 tonnes per day, a site capacity assessment has been undertaken (see HHB-A02 – Site Capacity Assessment). The assessment indicates the plant can handle the increase in throughput and the tonnes per day value is calculated to be above the IED threshold.

## 3.0 OPERATING PROCEDURES

### 3.1 Overview

Management of the site adheres to procedures documented and adhered to by all staff. These documents include risk assessments and method statements for all tasks undertaken on site, and consider environmental, quality, health and safety risks. All documents have a named author who is responsible for their content and regular updates. These documents form part of site inductions and are available for all staff if required. Some of these documents also form part of externally audited schemes such as the Biofertiliser Certification Scheme and are inspected every year as part of this certification process. For ease of reference, an overview of the operating procedures and process used at the site is included below.

#### 3.1.1 Pre-Acceptance

The Site shall only accept input material permitted within the Anaerobic Digestion Quality Protocol and the Sites Environmental Permit (EPR/LB3536AZ). The full list of waste codes can be seen in Annex B below. HHB have written agreements with their waste suppliers. These supply agreements define the type of waste to be expected and details unacceptable material. Records of supply agreements shall be retained for a 5-year period. New waste streams are sampled prior to delivery to confirm they are suitable and desirable for the process. Input materials are then sampled quarterly to ensure they continue to meet waste acceptance criteria. Appropriate records are retained electronically. Should any concerns be raised at 'pre-acceptance', the load can be rejected, or further analysis can be undertaken to confirm that the material is acceptable.

#### 3.1.2 Acceptance and Rejection

When delivered, the paperwork is checked to confirm that the material is as described and expected. Each load of packaged material will pass over the weighbridge and be recorded within the electronic Waste Movements Log. Pasteurised soup received from other anaerobic digestion facilities doesn't always pass over the weighbridge as the operator receives the carrier's waste ticket from loading at the other facility and does not re-weigh as their site is also permitted by the EA, and as such there is no requirement to.

The load will then be directed to the appropriate discharge point, depending on the waste stream. Packaged waste is tipped across the reception hall, where it is visually inspected. Materials will not be passed into the system unless their content is known. Only wastes specified in the permit will be accepted.

Any load may be rejected prior to acceptance for the following reasons (non-exhaustive list):

- i) Non-permitted, or non-conforming in relation to the permit.
- ii) Non-allowable under the Anaerobic Digestion Quality Protocol (PAS110).
- iii) Insufficient capacity (physical or permitted) within the facility to receive the load.
- iv) Content is undesirable for the AD process.

The non-conforming wastes will be quarantined in a suitable area of the site reflecting its nature and the reason for it being unsuitable. They will be removed from site as soon as is practical and taken to a suitably permitted facility. An investigation will be undertaken, and the

customer contacted, as appropriate. Any resulting actions will be documented e.g. changes to procedures, additional training etc.

### 3.1.3 *Input Materials Pre-Treatment*

Liquid wastes are directed to the liquid reception area where they are emptied directly into waste storage tanks (4x 60m<sup>3</sup> + 2x 90m<sup>3</sup>). Packaged food waste sent to the food waste reception hall is loaded into an atritor de-packaging unit, Turbo Separator, which separates the organic waste material from its packaging, at a maximum throughput of 10,000kg/hr.

The material is introduced into the Turbo Separator via a Hopper where the material is cycled through the separation chamber by the agitator. The variable speed drive along with the design features of the beater blades and breaker bars separate the material from its packaging. The material is routed through a centre discharge, where a screen filters the recovered material; various screens are available depending on the recovered material size and consistency. The packaging continues through the separation chamber to an end discharge chute. Packaging residues are sent to a compactor container and are then sent to an off-site incinerator for energy recovery.

Recovered organic material is stored, with liquid feedstock, in the waste storage tanks. A trap/U-bend is located inside one of the tanks. All material passes through the tank containing the U-bend before reaching other tanks. It is a one metre plastic 90° bend which is fastened to the tank outlet, this provides one metres worth of space in the bottom of the tank to capture any sediment.

Subsequently, a pump conveys liquid and recovered packaged waste through a 24mm Rota Cut Pump and then a 12mm Rota Cut Pump to former pasteuriser tanks (2x 1.5m<sup>3</sup>), which are no longer operational. In accordance with BREF treatment standards for biogas digestion, waste is cut to a particle size of 12mm. The material is then intermediately stored in the GRP buffer tank (5m<sup>3</sup>), equipped with:

- Filler neck and inspection opening;
- Overfill sensor with alarm;
- Agitator.

From here, the material is fed to the Kreis Dissolvers (2 x 1.5m<sup>3</sup>, 37KW) by a pump. The Kreis dissolvers mix different feedstocks which are either pumped or conveyed into the dissolver, depending on the waste stream. The dissolvers are equipped with a toothed disc which shreds the materials and results in a homogenous mass which is then pumped into the digester. The Kreis Dissolvers are equipped with:

- Weight measurement with alarm;
- Load cells which capture input and emptying of material (this is shown on the display and in the visualisation system);
- Overfill sensor system with alarm;
- Inspection opening;
- H<sub>2</sub>S sensor;
- CH<sub>4</sub> sensor with display indication - If the value is exceeded, the alarm and safety system are triggered.

The homogenised substrate is pumped from the Kreis-Dissolver into the digesters by the substrate pump.



### 3.1.4 Digestion Phase

Active digestion of all waste takes place within the two sealed digestion tanks. A range of micro-organisms will digest the waste, whereby a methane-rich gas (biogas) will be released and a nutrient rich material (digestate) will be produced. The maximum organic loading rate for the digesters will be approximately 2.28kgVS/m<sup>3</sup>/day. Feeding progresses at approximately 150 tonnes per day.

The substrate is transported from the Kreis dissolvers into Digesters I and II through two heavy duty plastic pipes which run underground, in parallel. The substrate is fed into the microbiology in the digesters, so that the digestion process can commence immediately after the pumping process is complete. The digester is designed as a fully mixed straight-through reactor operating in the mesophilic temperature of 39°C. The substrate is added on a time-controlled basis via a substrate line, which ends above the level of the liquid in the digester.

Process Control Monitoring on site is primarily provided by a SCADA system which monitors gas composition, gas pressure, digester temperature etc. The SCADA system provides various alerts and alarms as certain parameters are approached or reached. Such alerts are being actioned and responded to appropriately.

Material is retained in the digesters for approximately 30 days and the temperature is to be maintained at 39°C. Once the material in Digesters I and II has achieved the stipulated residence time, it is fed into the pasteurisation building housing the pasteurisation stainless steel tank (20m<sup>3</sup>).

### 3.1.5 Batch Pasteurisation

All digestate material will be batch pasteurised prior to discharge from the site for landspreading. Batch pasteurisation takes place within a 20m<sup>3</sup> pasteurisation tank. Using hot water from the CHP, the substrate is heated in a 65-minute cycle at a minimum temperature of 70.2°C, in accordance with the time and temperature requirements stipulated by the ABP Directive. The digestate is then passed through a second 12mm chopper pump before entering the lagoon.

The pasteurisers do not release the material into the storage lagoon until the temperature and time parameters have been met. If at any point in the 65-minute process the temperature drops below 70.2°C, the process will stop, take the digestate back up to a minimum of 70.2°C and start the 65-minute process again. This will be recorded in the PAS110 Pasteurisation files along with all successful pasteurisation batches.

Once pasteurisation has finished the material will be sampled in accordance with Rule 4 of the PAS110 scheme to ensure it has complied with PAS110 parameters. Whole digestate samples are taken from the sample tap on the outlet pipe of the pasteurisation tank. The material is also passed through a 4mm and 2mm sieve to ensure that physical contaminants have been removed to an acceptable level. This is carried out weekly and is recorded in the weekly checklist.

### 3.1.6 Digestate Storage

The whole digestate is now ready for use or can be stored in the 12,000 – 15,000m<sup>3</sup> engineered, covered lagoon. The lagoon is lined and covered with welded plastic and vents are

installed within the lagoon cover. Digestate is removed on a campaign basis and is used in the AD operator's own farm operations.

A digestate pump, situated in a suitably contained area, is used to offtake product from the lagoon. The lagoon is fitted with four mixers which are used to homogenise the digestate and prevent silting in the lagoon. Approximately 1 hour before digestate offtake, the mixers are activated via control panel located near the offtake point.

### 3.1.7 Biogas Production and Combustion

The digesters are equipped with a Flexo-roof with an integrated gas membrane. All biogas formed within the digesters is collected in the airspace at the top of the tank. To remove the sulphur from the biogas, ferric sulphate is fed into the Kreis dissolver.

Biogas produced in the digesters is fed from the gas storage to the combined heat and power plant (CHP) (499kW 2g engine). Prior to entering the CHP, the biogas is dehydrated. The condensate produced here runs off into the condensate shaft. The CHP has an upstream frequency-regulated gas compressor. Excess gas in the digester gas membrane is flared off via a stationary gas flare.

A proportion of the electricity generated by the CHP is used to power the site with the remaining electricity exported to the National Grid.

Please note, a gas flare is installed at the site which can process the dual fuel in an emergency situation (i.e. biomethane or biogas).

### 3.1.8 Gas to Grid Connection

In conjunction with the CHP activity above, biogas produced in the digesters is also fed from the gas storage to the Bright (manufacturer) biomethane membrane upgrading system. The gas to grid entry process is as follows:

Please note, when outlining the process; the term *biogas* is used to describe the raw gas from the digester, and *biomethane* refers to gas that has been processed and upgraded to a gas grid specification.

- Biogas passes through an activated carbon filter to pre-cleanse.
- The biogas is compressed to approximately 10-12 bar.
- It is then injected into the membrane unit to scrub the gas to specification agreed with the grid operator. This includes removal of gases such as CO<sub>2</sub>, H<sub>2</sub>S and water vapour.
- It is then chilled to specification to allow grid injection.
- Propane may be injected to attain the required CV for grid entry.
- Odourant is applied to the biomethane.
- The biomethane then enters the network entry unit containing metering equipment and the remotely operated valve that is controlled by Northern Gas Networks.

Up to 300m<sup>3</sup>/hour of biomethane will be injected into the grid following treatment.

The upgrading system is monitored and controlled via the SCADA system.

### 3.2 Operational Hours

Whilst the AD facility operates 24 hours a day, 365 days a year, the operational hours for the facility for staffing and receipt of waste will typically be as identified below:

Monday to Friday	08:00-18:00
Saturday	08:00-12:00
Sunday and Bank Holidays	Closed

### 3.3 Technical Standards and Control Measures

A documented list of technical standards that the site will be operating to is provided in Annex A. The critical control points governing these technical standards are to be applied to this site.

## 4.0 ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

All facilities have a potential impact on the environment around them. An Environmental Risk Assessment (HHB-A03) has been undertaken for the bespoke installation permit which covers all permitted operations on site.

### 4.1 Odour Management

Odour is considered a potential issue for the proposed variation due to the proximity of sensitive receptors and the nature of the developments. Odour control measures have been addressed within a comprehensive Odour Management Strategy (OMS) (HHB-B02).

### 4.2 Flood Risk and Drainage

The site is located within Flood Zone 1 (<1 in 1,000 annual probability of river or sea flooding) and lies outside any Groundwater Source Protection Zones. Due to this and the nature of the proposed variation, changes in flood risk or drainage are not considered a potential issue.

### 4.3 Sensitive Receptors

There are two sensitive receptors within 250m of the site boundary. The nearest ecological receptor is an unnamed area of Ancient Woodland and Woodpasture & Parkland BAP priority habitat, which is located approximately 135m south of the site. The nearest known residential receptor is the farmhouse on High Hedley Hope Farm, located approximately 160m south-southwest of the site. These properties are currently unoccupied.

## ANNEX A – LIST OF TECHNICAL STANDARDS

The table below presents a list of technical documents, with reference, for the process of anaerobic digestion. These documents will continue to be in use as a point of reference during the operational lifetime of the permitted site. Documents have been sourced from both regulatory agencies and industry-led organisations.

<b>Anaerobic Digestion – Technical Standards</b>	
<b>Technical Guidance Note</b>	<b>Document Reference</b>
Develop a management system: environmental permits	DEFRA and EA Guidance
Controlling and monitor emissions for your environmental permit	DEFRA and EA Guidance
Risk assessments for your environmental permit	DEFRA and EA Guidance
PAS 110 Standard Operating Procedure	BSi
H4 Odour Management Guidance	EA Pollution Prevention Guidance
Guidance for the Recovery and Disposal of Hazardous and Non-Hazardous Waste	EA SGN IPPC S5.06
How to comply with your environmental permit. Additional guidance for: Anaerobic Digestion	LIT 8737

## ANNEX B – LIST OF EWC CODES

Waste codes	Description
<b>02</b>	<b>WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING</b>
02 01	wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing
02 01 01	sludges from washing and cleaning – vegetables, fruit and other crops
02 01 02	animal tissue waste
02 01 03	plant tissue waste
02 01 06	animal faeces, urine, manure (including spoiled straw) only
02 01 07	wastes from forestry
02 01 99	residues from commercial mushroom cultivation
02 02	wastes from the preparation and processing of meat, fish and other foods of animal origin
02 02 01	sludges from washing and cleaning
02 02 02	animal tissue waste
02 02 03	materials unsuitable for consumption or processing
02 02 04	sludges from on-site effluent treatment
02 02 99	sludges from gelatine production, animal gut contents
02 03	wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation
02 03 01	sludges from washing, cleaning peeling, centrifuging and separation
02 03 04	materials unsuitable for consumption or processing
02 03 05	sludges from on-site effluent treatment
02 03 99	sludge from production of edible fats and oils to include seasoning residues, molasses residues, residues from production of potato, corn or rice starch
02 04	wastes from sugar processing
02 04 01	soils from washing and cleaning beet
02 04 03	sludges from on-site effluent treatment
02 04 99	other biodegradable wastes
02 05	wastes from the dairy products industry
02 05 01	materials unsuitable for consumption or processing
02 05 02	sludges from on-site effluent treatment
02 06	wastes from the baking and confectionery industry
02 06 01	materials unsuitable for consumption or processing
02 06 03	sludges from on-site effluent treatment
02 07	wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)
02 07 01	wastes from washing, cleaning and mechanical reduction of raw materials
02 07 02	wastes from spirits distillation
02 07 04	materials unsuitable for consumption or processing
02 07 05	sludges from on-site effluent treatment
02 07 99	spent grains, hops and whisky filter sheets/ cloths, yeast and yeast like residues, sludge from production process
<b>03</b>	<b>WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD</b>
03 03	wastes from pulp, paper and cardboard production and processing
03 03 02	green liquor sludge
03 03 08	paper and cardboard - not allowed if any non biodegradable coating or preserving substance present
03 03 10	fibre rejects fibre -, filler - and coating from mechanical separation
<b>04</b>	<b>WASTES FROM THE LEATHER, FUR AND TEXTILE INDUSTRIES</b>
04 01	Wastes from the leather and fur industry
04 01 01	fleshings and lime split wastes
04 01 05	tanning liquor free of chromium
04 01 07	sludges not containing chromium
04 02	waste from the textile industry



04 02 10	organic matter from natural products, e.g. grease, wax
<b>07</b>	<b>WASTES FROM ORGANIC CHEMICAL PROCESSES</b>
07 01	wastes from the manufacture, formulation, supply and use of basic organic chemicals
07 01 08	glycerol waste from bio-diesel manufacture from non-waste vegetable oils only
<b>15</b>	<b>WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED</b>
15 01	waste packaging, absorbents, filter materials, wiping cloths and protective clothing
15 01 01	paper and cardboard packaging – not allowed if any non biodegradable coating or preserving substance present.
15 01 02	biodegradable plastic packaging – must be independently certified to BS EN 13432
15 01 03	untreated wooden packaging – not allowed if any non biodegradable coating or preserving substance present.
15 01 05	composite packaging - must conform to BS EN 13432 and not allowed if any non biodegradable coating or preserving substance present
15 02	Absorbents, filter materials, wiping cloths and protective clothing
15 02 03	Absorbents, filter materials and cloths from the production of alcoholic and non-alcoholic beverages other than those mentioned in 15 02 02 made from compostable material only
<b>16</b>	<b>WASTES NOT OTHERWISE SPECIFIED IN THE LIST</b>
16 10	aqueous liquid wastes destined for off-site treatment
16 10 02	liquor/leachate from a composting process that accepts waste input types listed in these standard rules only
16 10 02	Untreated wash waters from cleaning fruit and vegetables on farm only
16 10 02	Milk and dairy waste milk from agricultural premises only
<b>19</b>	<b>WASTE FROM WASTE MANAGEMENT FACILITIES, OFF SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE</b>
19 02	wastes from physicochemical treatments of waste
19 02 03	waste types listed within this table that have been mixed together only
19 02 06	sludge types from waste listed within this table that have been heat treated only
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05 (sewage sludge which has been previously pasteurised and stabilised only)
19 02 10	glycerol not designated as hazardous i.e excludes EWC code 19 02 08
19 05	wastes from the aerobic treatment of solid wastes
19 05 01	non composted fraction of municipal and similar waste
19 05 02	non composted fraction of animal and vegetable waste
19 05 03	off-specification compost from source segregated biodegradable waste
19 05 99	composting liquors
19 06	waste from anaerobic treatment of waste
19 06 03	liquor from anaerobic treatment of municipal waste
19 06 04	digestate from anaerobic treatment of source segregated biodegradable waste
19 06 05	liquor from anaerobic treatment of animal and vegetable waste
19 06 06	digestate from anaerobic treatment of animal and vegetable waste
19 08	wastes from wastewater treatment works
19 08 09	grease and oil mixture from oil/water separation containing only edible oils and fats
19 08 12	sludges from biological treatment of industrial waste water
19 12	wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified
19 12 12	waste types listed within this table, Table 2.3, that have been subjected to mechanical treatment only
<b>20</b>	<b>MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS</b>
20 01	municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions

20 01 01	paper and cardboard – not allowed if any non biodegradable coating or preserving substance present.
20 01 08	biodegradable kitchen and canteen waste
20 01 25	edible oil and fat
20 01 38	untreated wood where no non-biodegradable coating or preserving substance present
20 02	garden and park wastes (including cemetery waste)
20 02 01	biodegradable waste
20 03	other municipal wastes
20 03 01	mixed municipal waste – only separately collected wastes of types listed within this table
20 03 02	wastes from markets, allowed only if source segregated biodegradable fractions e.g. plant material, fruit and vegetables



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