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F11 – Non-Technical Summary

Prepared for:

BREWDOG

BrewDog plc

Balmacassie Industrial Estate
Ellon, Aberdeenshire, U.K.
AB41 8BX

Contents Amendment Record

This report has been issued and amended as follows:

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Acknowledgement

This report has been prepared for the sole and exclusive use of BrewDog plc (BrewDog) in accordance with the scope of work presented in Mabbett & Associates Ltd (Mabbett) Letter Agreement (M306975.001/LA/JF&DDC), dated 15 April 2021. This report is based on information and data collected by Mabbett. Should any of the information be incorrect, incomplete or subject to change, Mabbett may wish to revise the report accordingly.

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Section 1.0: Non-Technical Summary

1.1 Introduction

BrewDog plc, which was established in Scotland in 2006, is one of the UK's leading independent brewers. BrewDog has undergone significant expansion in recent years and now operates 4 large-scale breweries globally, along with a range of associated hospitality businesses including bars and hotels. BrewDog's flagship Ellon brewery, which has been in operation since 2012, is Europe's largest craft brewery.

The brewery is located in a semi-rural location at the north-eastern edge of the Balmacassie Industrial Estate in Ellon, Aberdeenshire. The site has already undergone significant expansion and diversification since its inception, but BrewDog has recently initiated a multi-phase capital expenditure programme to increase the production capacity of the brewery, to reduce its environmental footprint, increase its sustainability and to minimise its impact on the wider community.

The first phase of the development programme will involve the addition of an effluent treatment plant to the brewery (the Ellon Brewery Effluent Treatment Plant, EBETP) to reduce its environmental impact. The EBETP development, which will be located on a greenfield site located immediately opposite the brewery to the northeast of the A948 road, was granted planning consent in January 2021.

The EBETP has been designed specifically to treat the sludge waste ('trub') and washing effluent (OPL) produced by the brewery. The co-product streams, which feature high levels of biodegradable organic materials, are currently pumped to two existing holding tanks located in the southeast of what will become the EBETP installation. The material is currently collected from the tanks by a third-party waste contractor (using up to 20 truck movements a day) and subsequently disposed of by off-site land-spreading.

Given the need to dispose of the trub and washing effluent, these wastes currently represent a significant environmental and cost burden for the Ellon Brewery. The EBETP has been designed both to minimise the site's environmental impact and to generate commercial benefit for BrewDog by the production of a revenue-generating asset from the wastes (biogas, which can be sold to the local gas transmission network).

Residual solid materials from the process (a digestate material) will still be disposed of by land spreading, but the volume of this material will be a fraction of the wastes that are currently disposed of by this route. The aqueous fraction of the brewery effluent will be cleaned to a sufficient degree to allow its direct discharge to the Broomies Burn (a tributary of the River Ythan) to the southwest of the brewery site. Future developments at the site will see a portion of this cleansed water being subject to further treatment prior to re-use as grey water on the brewery site.

This report provides a brief explanation of operation of the proposed EBETP installation, the methods to be used to minimise the emissions from the plant and how BrewDog will operate the plant to ensure that it does not have an adverse environmental impact.

1.2 Pollution Prevention and Control (PPC) Regulations

The waste treatment processes operated in the EBETP installation will be of a sufficient scale to fall under the remit of the Pollution Prevention and Control (PPC) Regulations, specifically Part A of Section 5.4 (b) of Schedule 1 to the Regulations, "Disposal, recovery or a mix of disposal and recovery of non-hazardous waste".

The current production capacity of the Ellon Brewery is below the level which would bring the brewery itself within the scope of the Regulations. Subsequent phases of the brewery development programme will involve the expansion of the production capacity of the brewery, increases in the waste treatment capacity of the EBETP and a range of measures aimed at improving the resource efficiency of the brewery (e.g. the potential installation of a carbon dioxide recovery plant). The later phases of development will be addressed through additional PPC applications; the current application addresses only the operation of the EBETP development.

1.3 Process Description

In order to achieve the aim of reducing the environmental impact of the brewery, while increasing its financial and social sustainability, the EBETP development will feature a range of waste treatment technologies:

- An Anaerobic Digestion (AD) plant, which feature a fully-enclosed digester tank to generate biogas (principally methane) from the brewery waste streams. AD is a process by which organic wastes are broken down sequentially by a range of bacteria in the absence of oxygen and at carefully controlled temperatures in the range of 35 - 40°C. The ultimate products of the process are biogas, a solid residue material (digestate) consisting principally of residual, non-volatile organic materials and a liquid effluent stream which requires further treatment prior to disposal;
- A physical separation system, which will use a screw press to separate the residual solid matter (digestate) from the digester effluent. The digestate will be collected in an enclosed skip pending collection and off-site land application for disposal;
- An effluent treatment system which will treat the spent digester tank effluent through sequential processes of Coarse Air Flotation (CAF) and multi-stage, recirculatory aerobic treatment (nitrification in an aerobic treatment tank, denitrification in an anoxic treatment tank and biological treatment in a membrane bioreactor (MBR)) to produce a clean effluent stream;
- An Environmental Treatment System (ETS), which will utilise a series of planted wetland cells to provide natural attenuation of the effluent such that it will be of sufficiently high quality to permit its direct discharge to a local surface water course (Broomies Burn);
- A Gas Conditioning Unit, which will be used to purify the biogas to form two discrete gas streams – methane and carbon dioxide. Once purified and compressed, the product gas is termed biomethane. A carbon dioxide recovery plant will be added in a later phase of development to avoid waste of the carbon dioxide but is not included in the scope of this current application; and
- A Biomethane Network Entry Facility (BNEF, or gas-to-grid plant), which will adjust the composition of the biomethane to match the requirements of the local gas network and then inject the gas into the network.

It should be noted that the EBETP will utilise significant recirculation of materials between the process stages to maximise the conversion of organic materials into biogas and to minimise the residual concentrations of pollutants in the final effluent. The EBETP plant, which will be operated by BrewDog, will operate continuously once it has been commissioned.

1.3.1 Point source emissions to air

The principal point source emissions to air from the installation will be:

- A single stack serving the natural gas-fired hot water boiler used to provide supplementary heating to the AD process;
- A biogas flare, which dispose of surplus biogas by combustion and which will be used only when the gas cannot be exported to the local distribution network (e.g. due to plant breakdown);
- The Gas Conditioning Unit vent, through which the carbon dioxide fraction of the biogas produced by the AD process will be vented. A carbon dioxide recovery plant (for use in the brewery) will be added in a later phase of development; and
- A biogas pressure relief valve, which will provide venting of the biogas from the AD plant in the event of emergencies only.

The key substances released from the installation will be combustion gases from the hot water boiler and biogas flare, namely carbon dioxide (CO_2), carbon monoxide (CO), oxides of nitrogen (NOx) and sulphur dioxide (SO_2).

1.3.2 Point source emissions to surface water

The aqueous effluent from the AD process will be treated in the CAF and aerobic treatment processes to produce a clean effluent stream, prior to discharge to the Ecological Treatment System for final attenuation. The discharge from the ETS will be routed to a SUDS retention basin located at the southwest of the EBETP installation prior to the final discharge to the Broomies Burn. The SUDS basin, which will also accept the clean surface water run-off from the installation, has been included in the EBETP design to minimise the potential for flooding in the Broomies Burn.

There will be no discharge of effluent from the EBETP installation to sewer.

1.3.3 Point source emissions to groundwater

There will be no direct or indirect releases of process effluent from the EBETP installation to ground or groundwater. Domestic effluent from the EBETP control building will be discharged to ground via a soakaway following treatment in a septic tank.

1.3.4 Fugitive emissions to air

Management and plant controls will be put in place for the minimisation of fugitive emissions to air. These controls will include:

- Planned preventive and reactive maintenance programmes to minimise risk of leaks from the process;
- The operation of all processing stages with the potential to give rise to fugitive losses of pollutants (particularly the AD and CAF processes) within fully enclosed systems, venting through appropriate abatement and emissions control systems; and
- Effective waste management to ensure that no residual waste is retained on site for protracted periods.

1.3.5 Fugitive emissions to surface water, sewer and groundwater

Fugitive emissions to water could potentially arise through spillages and leaks or significant plant failure. However, the control mechanisms that will be used at the site (i.e. bunding of all tanks used for the storage and treatment of wastes and the use of high quality hardstanding throughout the site) will minimise the potential impact of these emissions should they arise.

1.3.6 Odour

Some of the waste materials received at the AD plant will have the potential to cause odorous releases as they pass through the process. However, the enclosed nature of the system and the controls that will be put in place at the installation will minimise the potential for odour to cause an off-site impact. All waste treatment activities with the potential to result in odorous emissions will be undertaken within fully enclosed systems venting through appropriate odour control systems (i.e. the biogas flare and the Gas Conditioning Unit carbon filter).

1.4 Management

BrewDog is currently developing an environmental management system (EMS) for the EBETP development which will be used to control the operations of the plant and to minimise its environmental impact. The system, which is being developed to meet the requirements of the ISO 14001 standard, will be fully implemented in advance of the installation being made operational.

1.5 Raw Materials

The principal material inputs to the EBETP installation will be washing effluent and trub waste from the Brewery. There will be no facility in the installation to accept waste materials from any other source.

Other chemical additives will be used to optimise the operation of the installation (e.g. sodium hydroxide for pH control) but their use will be minor in comparison to the throughput of the brewery waste materials. The selection of the auxiliary raw materials will be carefully controlled by senior site management in line with process requirements and relevant legislation. Consumption of these materials will be regularly reviewed as part of ongoing environmental and cost-control and they will only be purchased from a list of approved suppliers.

The site will maintain an up-to-date inventory of raw materials consumed on site and, as part of the EMS, BrewDog will review the inventory regularly to identify if material substitutions are possible, taking into consideration best practice environmental options, the effectiveness of the materials in their intended function, cost and the COSHH (Control of Substances Hazardous to Health) Regulations.

1.5.1 Water use

Overall water usage at the installation will be relatively low, as process effluent will be recycled into the waste treatment activities wherever possible.

1.6 Waste Recovery or Disposal

Operation of the EBETP installation will facilitate the diversion of a considerable quantity of waste (approximately 190,000 tonnes per annum) away from its current disposal by landspreading towards the production of a renewable energy source (biomethane).

The waste produced by the installation will largely comprise the solid residue produced by the AD process (digestate). Approximately 4,500 tonnes per annum of this material will be produced, which will be disposed of by landspreading on local agricultural land, where it will act as a soil conditioner and help to reduce fertiliser consumption.

1.7 Energy

The AD process in the EBETP installation will produce approximately 490kg of biogas per hour from the input waste materials, with an equivalent thermal output in excess of 2MW. On an annual basis, the EBETP installation will provide a surplus of approximately 5,200MWh of energy in the form of biomethane once the expected energy consumption of the plant is accounted for. Given that the biomethane produced by the EBETP installation is derived from food products, this export is a renewable form of energy and can be used to substitute fossil-fuel-derived energy products in the brewery and third-party facilities.

Energy-saving measures (e.g. insulation, energy efficient pumps and motors, etc) will be used throughout the installation to maximise the efficiency of the plant and thus to maximise the potential export of gas to the local distribution network.

1.8 Accident Risk

BrewDog has completed an assessment of the risks posed to the environment in the event of abnormal operating conditions and accidents in the EBETP installation. This assessment has allowed BrewDog to determine the appropriate measures to be implemented to minimise the environmental impact of the plant, such as the design and development of operating procedures and control systems.

1.9 Noise and Vibration

A noise model (SoundPLAN) has been used to calculate the likely impact of the EBETP installation on noise levels at nearby sensitive receptor locations. Key noise sources will be located within suitable acoustic enclosures and additional noise attenuation measures have been specified where required to minimise breakout from internal to external areas. Despite the relatively small distance to the nearest receptors to the north of the EBETP site, it is calculated that the installation will have a low impact on noise levels at these sites and a negligible impact on receptors further from the site.

1.10 Monitoring

Air: A proposed position with regard to monitoring of emissions to air from the installation has been developed. Annual monitoring will be undertaken for the two key emission points at the site, the LTHW boiler and the biogas flare. No other air emissions monitoring is deemed to be necessary.

Water: An extensive monitoring programme for the sole emission point to surface water in the installation, the discharge to the Broomies Burn, has been proposed. Daily monitoring and analysis will be undertaken and made available to SEPA for assessment.

1.11 Emissions

Emission inventories are presented for releases to air, water and land. Where emission benchmarks are available, a comparison of the releases with them has been included.

1.12 Environmental Impact

1.12.1 Air quality

Detailed modelling has been undertaken for the proposed emissions to air from the installation using the modelling software ADMS. The modelling indicated that the proposed facility is unlikely to result in any

unacceptable impacts on air quality, either in terms of its impact on human health or on ecological receptors.

A qualitative risk assessment has also been undertaken concerning the potential impact of emissions of odour from the installation. Since all key processing activities with the potential to give rise to odour will be undertaken in fully enclosed facilities venting through appropriate abatement and control equipment, the proposed facility is highly unlikely to contribute to off-site concentrations of odour which could lead to potential nuisance for local residents.

1.12.2 Water quality

Discussions concerning the discharge from the EBETP installation to the Broomies Burn were held between SEPA and BrewDog as part of the planning application process for the development. Based on the maximum projected flow of the combined effluent from the SUDS basin and the ETP, and also taking the existing quality of the Broomies Burn into consideration, SEPA calculated a set of proposed discharge consent limits for the EBETP installation. Compliance with these consent limits will ensure that the EBETP installation does not cause any unacceptable diminution of the water quality in the Burn.