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Brioche Pasquier – Environmental Permit Application: Surface Water Risk Assessment

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Date of issue:	16/05/2025
Version number:	1.0

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1 Introduction

As part of the Environmental Permit application for Brioche Pasquier (hereafter 'Site'), EHS Projects (hereafter 'EHS') undertook a Surface Water Risk Assessment order to verify emissions to surface water arising from water discharged to sewer by the Site are under the threshold levels for stipulated freshwater specific pollutants.

The following sections of this report outline the methodology, data input process and results from the screening which has been conducted in accordance with the Environment Agency Guidance: Surface water pollution risk assessment for your environmental permit - GOV.UK (www.gov.uk).

2 On site effluent management

The production on site is a dry process and therefore no process effluent is generated with the exception of CIP flushes which are discharged to the foul sewer. Discharge from the CIP is consented through the sites Anglian Water consent to discharge (reference: TEDI-0136-2025). There is total separation between the foul and surface water drainage systems. All foul water is discharged to the Cotton Valley Waste Water Treatment Works before being discharged to stream.

3 Screening assessment methodology

The screening assessment is to appraise the potential effect of emissions to water from the Site.

A surface water pollution risk assessment has been undertaken by EHS in accordance with government guidance prepared by both the EA and the Department for Environment, Food & Rural Affairs (DEFRA). This surface water pollution risk assessment involves three stages:

1) Identification of pollutants released from the plant;

2) Gathering of data on pollutants released from plant; and,

3) Screening tests on data.

The following section will document the assessment methodology and the associated findings within each of these stages.

4 Screening assessment

The following assessment was conducted based on the site's data pertaining to the liquid inventory and records of the chemical characteristics of the effluent produced by the Site. The aim of the assessment is to evaluate key potential pollutants within the chemical inventory and effluent to determine whether they pose a potential risk to surface waters upon discharge.

4.1 Identification of pollutants

EHS has collated a chemical inventory of liquid products used at the site, which may have the potential to enter the effluent or may be considered chemical constituents of the effluent itself. This screening stage included the examination of Material Safety Data Sheets (MSDS) to identify; priority pollutants as determined by the EA; substances that exhibit eco-toxicological hazard statement; or substances may pose threat to aquatic environments.

The complete review of hazardous substances used on site is presented within the Materials Inventory, included in this submission (See Main Document, Appendix C for the full materials inventory and Appendix – SWRA Tool Compounds of Concern for identified hazardous substances).

4.2 H1 Screening Test

The review in Section 4.1 has identified that there are no substances that require further evaluation to determine emissions to water. All chemical constituents have been discounted for further consideration as they are not included on the EA priority substance, do not register an eco-toxic hazard code on the MSDS, or are not potentially polluting substances released to drain in significant quantities.

4.3 Screening tests of other potential pollutants

The remaining constituents of concern identified during the initial screening of the chemical inventory are screened within this section. These potential pollutants do not have EQS screening values as either freshwater priority or priority pollutants under the EA guidance. They do not feature within the H1 screening tool.

However, for completeness these compounds have been assessed in accordance with the EA methodology to determine the potential effect of these emissions to water.

The chemicals are as follows:

- Sodium Hypochlorite
- Sodium Hydroxide
- Acetic acid
- Hydrogen peroxide
- Amines, C12-14 alkyl dimethyl, N-oxides
- Sodium aryl sulphonate (SAS)
- Alcohol ethoxylate
- Dischloroisocyanuric acid salts
- Ammonia

4.3.1 Methodology

In order to appraise the emission rates, EHS evaluated the chemical inventory to determine annual product use and concentration to estimate the mass of each chemical constituent of concern that may be emitted to water.

The mass of each constituent of concern was calculated via evaluating the mass of the chemical constituent within the chemical inventory. This data was derived from the MSDS. Where a concentration range was provided, EHS have used the highest potential concentration to ensure a precautionary approach. The emission rate was then calculated using the measured average daily volume of effluent discharged from Site (20 m^3/ day).

Effluent is discharged to sewer under Trade Effluent Discharge Consent with Anglian Water. It is understood that effluent discharges to Cotton Valley Wastewater Treatment works. Following further treatment stages, treated sewage is discharged by Anglian Water Limited into controlled waters under the terms of their environmental permit. As such, 'Sewage Treatment Reduction Factors' (STRF) are considered for each constituent of concern as the additional treatment step may result in further reduction of chemicals within the discharge.

It is understood that the Cotton Valley Wastewater Treatment works comprises various stages of treatment including screening to remove large and fine items of debris within the wastewater stream. The treatment process uses filters and activated sludge treatments to treat wastewater prior to discharge to controlled waters.

On this basis, EHS have applied sewage reduction factors (STRF) to the relevant compounds being assessed to appraise reductions of concentrations as a consequence of the wastewater treatment works stage prior to discharge. The STRF applied are those published by the EA for an activated sludge plant, or

are STRF's identified through research in relevant peer reviewed literature. The STRF calculation is as follows. The total releases are presented in Table 1 below.

Table 1: Summary of emission rates and sewage reduction factors

Constituent of Concern	Emission Rate [mg/l]	Sewage Treatment Reduction Factor (STRF)	Total release concentration to freshwater [mg/l] = Emission Rate*STRF
Hydrogen peroxide	1.77	0.00	0.000
Ammonium nitrate	1.07	0.00	0.000
Nitric acid	0.75	0.00	0.000
Acetic acid	0.51	0.00	0.000
Peracetic acid	0.30	0.00	0.000
Sodium hydroxide	3.86	0.00	0.000
N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine	1.16	0.00	0.000
Amines, C12-14 (even numbered)-alkyldimethyl, N-oxides	1.16	0.00	0.000
Fattyalcohol ethoxylates =/< C15 and =/< 5EO	33.33	0.00	0.000
Benzalkonium chloride	8.33	0.00	0.000
Didecyl Dimethyl Ammonium Chloride	8.33	0.00	0.000
Isopropyl alcohol	33.33	0.00	0.000
Phosphoric acid	0.29	0.80	0.231
Alcohol (C9-C11) ethoxylate (6EO)	0.17	0.00	0.000
Alkyl (C12-16) dimethyl benzyl ammonium chloride	0.17	0.00	0.000

4.3.2 Qualitative Assessment

There are several acids and alkalis found within food grade cleaning chemicals including sodium hydroxide and, hydrogen peroxide and various acids: nitric acid, acetic acid and peracetic acid. EHS consider that these compounds have a short lifespan, and their pollution potential is likely to be mitigated through reaction during the cleaning processes, neutralisation through in line dosing, and balancing at the Site. Furthermore, due to the instability and highly reactive nature of these substances, they will disappear very rapidly during activated sludge treatment at the Cotton Valley Wastewater Treatment Works. There are no published STRF values for these chemicals however their behaviour would result in a high likelihood of complete removal. As such, EHS conclude that no significant emissions would occur beyond the wastewater treatment works. As such, these compounds are not considered to present a significant risk to the water environment and have been discounted from further assessment.

Amines and associated compounds are former derivatives of ammonia found within food grade cleaning chemicals used at the Site. They are typically reactive with acids and may therefore neutralise in contact with acidic cleaning products and / or pH correction at the effluent treatment plant. It is considered that they would be unlikely to be detectable within emissions to water. Peer reviewed studies have demonstrated removal rates within industrial wastewater of at least 96 % [1].

Sodium aryl sulphates (SAS) are water-soluble salts that can be used in detergents, dish washing liquids, shower gels, shampoos, hair conditioners and fabric softeners. They are toxic for freshwater fish, however, do not concentrate in the food chain. A peer reviewed assessment by HERA in 2005 stated 'SAS is removed readily in sewage treatment plants mostly by biodegradation (ca. 83%) and by sorption to sewage sludge (ca. 16%). Only around 1% of the mass load from sewage is discharged into surface water and readily biodegraded in river as well [2].

Alcohol ethoxylates (AE) are a common non-ionic surfactant employed in consumer and industrial detergents worldwide. Commercial AE are typically complex mixtures composed of > 100 homologous compounds with varying alkyl chain lengths and varying numbers of ethylene oxide (EO) units. A recent study of AE removal rates in several types of sewage treatment works determined that all AE homologues are effectively removed (>99%) in the most common treatment types.[3]

5 Conclusion

The Site generates effluent wastewater during the CIP process associated with its production. This effluent comprises production wastewater following cleaning and processing works and contains a predominance of cleaning water and residual food grade cleaning chemicals using during the site processes.

EHS has reviewed the liquid inventory and chemical characteristics of the effluent discharged from the site. Of the chemical inventory reviewed none of the chemicals used have published STRF and EQS values.

The remaining chemical constituents do not feature on the EA priority substance or freshwater EQS schedule. EHS has performed a qualitative risk appraisal of those compounds to appraise potential risks. This assessment has concluded that the food grade cleaning product's (i.e., acids, alkali, amines) pollution potential would be readily removed at the Cotton Valley Wastewater Treatment Works via reaction with organic substances during filtration and sludge treatments.

6 References

[1] Sanderson, H., Tibazarwa, C., Greggs, W., Versteeg, D.J., Kasai, Y., Stanton, K. and Sedlak, R.I., 2009. High production volume chemical amine oxides [C8–C20] category environmental risk assessment. *Risk Analysis: An International Journal*, *29*(6), pp.857-867.

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