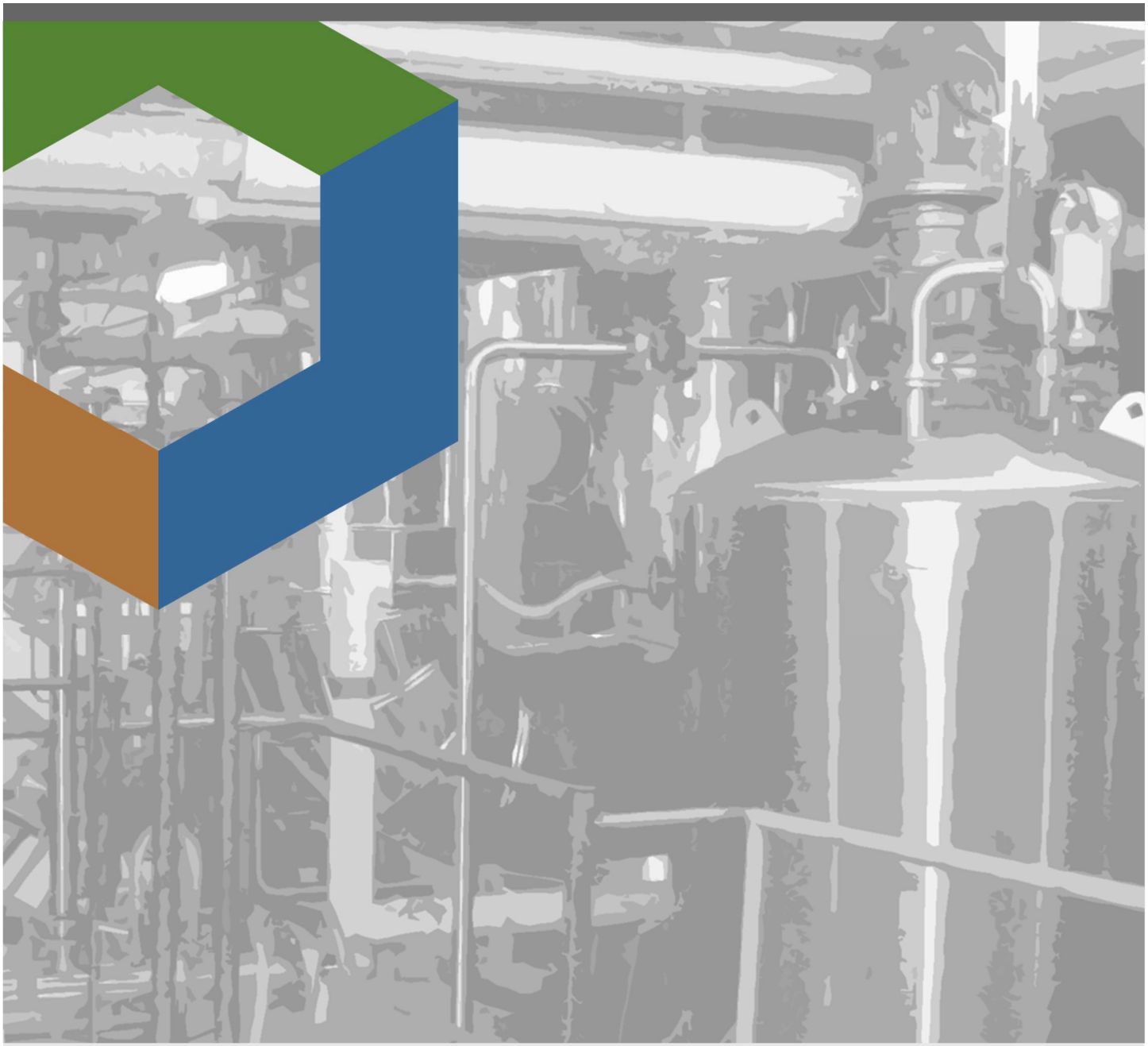


# Addendum to H1 assessment discharges to sewer

## Mondelez UK Confectionery Production Ltd

Sept 2026

Project Environmental Solutions
www.peslconsulting.com

# Quality control sheet

| Project details | |
|---|---|
| Project number | MON.24.b |
| Project name | Sheffield Permitting Support |
| Date | 29 September 2026 |

| Client details | |
|---|---|
| Client name | Mondelez UK Confectionery Production Ltd |
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| Document details | |
|---|---|
| Document title | Addendum to H1 assessment discharges to sewer |
| Document version | Issue_v1 |
| Report author | Emma Stewart |
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| Report approved by | Philip Smith |
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# Introduction

In July 2026 Mondelez UK Confectionery Production Ltd submitted application for a new environmental permit for its Sheffield site (permit application reference EPR/ZP3722SD). As part of this submission (Appendix 7) an H1 assessment of discharges to sewer was carried out.

Following application submission, the Environment Agency submitted a request for an updated H1 water screening assessment to include the following additional information:

> *"The H1 assessment that was provided with the application focuses on sanitary pollutants; however, the assessment should identify if there are any 'hazardous pollutants or elements' in the discharge(s) and quantify their impact.*
>
> *This is required to assess the installations discharge for specific and priority substances, these substances have Environmental Quality Standards (EQS), you may also need to risk assess substances which do not have EQSs. This includes substances which have ecotoxic properties and are released in concentrations high enough to risk harming the surface water environment. You should assess these substances using suitably derived 'predicted no effect concentrations' (PNECs). Further information can be found in the previously referred to guidance Surface water pollution risk assessment for your environmental permit - GOV.UK.*
>
> *I have included a list below of some additional information to help you complete this assessment:*
>
> - *Provide the location ideally as a National Grid Reference of the discharge point into the receiving water (this is the point the effluent discharges from the sewage treatment works rather than leaves the installation).*
> - *Provide an emissions inventory which includes all the pollutants released from the proposed facility to sewer, we also require MSDS for all relevant substances, however, I can see these have been provided in Appendix 11 of you application document please provide any additional MSDSs if relevant.*
> - *Provide data on pollutant concentrations (worst case average and maximum concentrations should be assumed) and maximum & average discharge flow rates using actual measurements – with sufficient 'raw data' sample numbers (at least 12 samples, ideally 36); if this data is not available, data from a proxy site or estimations from raw material usage and/or waste (pre) acceptance procedures and/or manufacturers data can be used. Please provide any 'raw data' in an excel format.*
> - *Source data on upstream background pollutant levels of the receiving waters (upstream river flows and the relevant EQS/PNECs (for substances that have ecotoxicological properties but no EQS)).*
> - *PNEC substances can be added to the H1 tool (v2.79) as shown in the images below and should be included as freshwater annual averages.*
> - *Provide a copy of the updated H1 tool (in access) this can be done by providing this as a zip folder – further information can be found regarding this in the H1 pdf note included in the zip folder I have attached which also includes a copy of the H1 tool."*

This document provides an addendum to the H1 assessment report submitted as Appendix 7 to the July 2026 permit application. The original report remains correct and up to date in respect of the determinands assessed at that time; there is no change to the findings and conclusions of that original assessment. This report is supplementary to the original application by assessing a range of additional determinands not previously considered.

## Approach to effluent treatment

Effluent generated from CLP (continuous liquorice production), jellies and soft mints plants is discharged from site for treatment by Yorkshire Water (YW) at the Blackburn Meadows wastewater treatment works (WwTW). Prior to sewer discharge, process effluent from these manufacturing areas is conveyed to an on-site effluent treatment plant (ETP) for partial treatment comprising effluent balancing and pH correction. This discharge to sewer (via emission point S1) is regulated by a Trade Effluent Consent (TEC) with YW (Consent no. 3390775, dated 17th March 2017).

Wastewater from the hard mints manufacturing plant generated during weekly cleaning is collected in a dedicated sump and is separately removed from site by tanker for off-site treatment and disposal at an appropriately licensed facility and is therefore not considered further within this assessment. Off-site treatment has been selected for this effluent stream as it was not considered economically viable to install effluent pumping and transfer facilities due to the very low volumes of effluent generated.

## Assessment methodology

### Overview

The potential effect of releases of effluent to sewer (via S1) on the River Don have been assessed using the H1 software tool (version 2.7.9, October 2024), taking account of the treatment provided on site and at YW WwTW. The data input and assumptions underpinning the assessment are described below.

The H1 methodology applies a sequence of tests to screen environmental releases and establish whether those releases are 'insignificant', or whether they require more detailed assessment. For discharges to water there are four screenings tests as follows:

- **Test 1** screens out any substances as insignificant where the release concentration is less than 10% of the Environmental Quality Standard (EQS). Release concentration does not take account of emissions reduction due to effluent treatment at the off-site municipal WwTW.
- **Test 2** screens out any substances as insignificant where the Process Contribution (PC) is less than 4% of applicable EQSs. This test takes account of the treatment at the WwTW by applying a sewage treatment reduction factor (STRF).
- **Test 3** and **Test 4** are only required where substances have not been screened out in Test 2. For releases where the screening criterion in Test 2 is exceeded, the predicted environmental concentration (PEC) is calculated (as a sum of PC plus the background pollutant concentration already present in the receiving watercourse). The PEC is assessed in relation to the Annual Average EQS (AA EQS) and the Maximum Allowable Concentration EQS (MAC EQS). Any substance that passes all three of the tests below can be screened out as insignificant.
    - **Test 3** substances pass this assessment test where PEC minus the background concentration is less than 10% of the AA EQS.
    - **Test 4a** substances pass this assessment test where PEC is less than 100% of the AA EQS.
    - **Test 4b** substances pass this assessment test where PEC is less than 100% of the MAC EQS.

In the absence of an EQS, and in line with updated Environment Agency guidance, suitable PNEC (Predicted No-Effect Concentration) values should be used for any hazardous components. PNEC is the estimated maximum level of a chemical or pollutant below which no adverse biological effects are expected to occur.

## Monitoring data

There is limited data available for site trade effluent discharges via emission point S1 as monitoring has historically covered only those determinands for which a limit is included within the TEC. To support the

permit application, some additional monitoring (comprising three samples) was undertaken by Mondelez in July 2025 for key determinands (i.e. determinands identified in BATc) for the purpose of completion of the H1 assessment that was submitted with the application.

Subsequently, as part of the permit application validation process, the Environment Agency requested that any further 'hazardous pollutants or elements' in the discharge are identified and their impact assessed using the H1 assessment methodology. As there is no monitoring data available for any other potential pollutants in the effluent an alternative approach has been identified based on evaluation of raw materials used on site. It should be noted that this approach provides only an indication of potential release concentrations in the effluent as it does not take any account of the chemical fate of the substances in use on site and in the effluent stream. The findings of this screening assessment should therefore be considered with a high level of caution. Further information and discussion is included below.

## Approach to estimation of release concentration

### Identification of potential hazardous substances

Materials safety data sheets (MSDS) for process chemicals used within the installation were reviewed. This included cleaning chemicals and other chemicals used by engineering or facilities teams on site (i.e. boiler treatment chemicals, water treatment chemicals etc). This review was undertaken to identify any hazardous components of the chemical formulations in use on site. For each hazardous component listed within the MSDS, the % concentration of the component material was recorded. In most cases a concentration range was provided, and in some cases this was a very wide range e.g. an order of magnitude or greater in the concentration range of the raw material formulation. The assessment has therefore been undertaken considering both the upper and lower ends of the concentration range.

### Calculation of release concentrations for the purpose of the assessment

The potential release concentrations (considering both the higher and lower end of the substance concentration range) have been calculated based on:

- the quantity of each hazardous material used on site per annum (data presented in the permit application has been updated slightly due to a change in CIP chemical type); and
- the average volumes of effluent released per day (as presented in the permit application).

For each hazardous component the quantity released was calculated by multiplying the total raw materials use per annum by the % concentration of the hazardous compound in the raw material (upper and lower) and dividing this by 365 days in order to determine the mass of each chemical used per day, as a range. Where raw material use is recorded in litres a 1:1 ratio of litres to kgs has been assumed for simplicity. Where the same hazardous compound is identified in more than one chemical formulation, the data was added together to determine the total site release concentration.

The quantity of each chemical compound released per day was then divided by the daily volume of effluent generated to determine an estimated average concentration of each specific chemical compound in site effluent.

Key points to note are:

- For simplicity it has been assumed that 100% of the raw materials used on site are released to sewer. This will be an over-estimation of releases as a proportion of the raw materials used will be released via other routes e.g. disposal as a waste material (including effluent arising from the hard mints department which is separately removed from site by tanker), residues on surfaces, volatilisation and release to atmosphere, release to atmosphere in steam etc. This will vary from

substance to substance; a detailed and accurate assessment of the fate of each raw material would require substantial research and analysis.

- It was assumed that raw materials are used at a steady rate every day of the year (i.e. annual quantities used were divided by 365 days). Effluent generation per day was also assumed to be steady daily average figure. For simplicity shutdowns, plant production variability and other factors have been disregarded.

- The assessment methodology assumes that each hazardous component reaches the receiving watercourse in its original form i.e. there is no breakdown during use, during effluent pre-treatment and handling on site, during transfer through the sewerage network and during treatment at the receiving sewage treatment works. This assumption is highly unrealistic; a number of the compounds considered in this assessment are highly volatile / unstable and will breakdown rapidly into constituent molecules through their normal use. Further discussion of this issue is provided below.

**Identify Environmental Quality Standards**

Environment Agency sources were reviewed in order to identify relevant Environmental Quality Standards (EQS) for use in the assessment. This was required in order to determine whether the release concentrations have the potential to cause negative environmental impacts at the receiving watercourse. An EQS was available for only one substance potentially present in the raw materials evaluated, EDTA. Ethylenediaminetetraacetic acid (EDTA) tetrasodium salt is present in one of the raw materials used on site. However, a PNEC has been identified for EDTA tetrasodium salt specifically (refer to comments below in relation to PNEC), which is considered to be more suitable.

In the absence of an EQS, and in line with updated Environment Agency guidance, publicly available information sources were reviewed to identify suitable PNEC values for each hazardous components in a freshwater environment. PNEC figures were obtained from MSDS (either MSDS provided by Mondelez's suppliers or other MSDS found via internet searches) for the majority of the hazardous components identified.

**Other H1 assessment requirements**

As effluent from the Mondelez Sheffield site is released to sewer and is treated in a YW WwTW it is necessary to identify a sewage treatment reduction factor (STRF) for each of the substances considered in the assessment. The STRF is the multiplier used to estimate how much a chemical or pollutant's concentration decreases as wastewater passes through a treatment plant. This information was not available for the vast majority of hazardous components considered and therefore a STRF of 1 has been used in the assessment. A STRF of 1 indicates that there is no removal at the WwTW; this is likely to be an over-estimate for the majority (or all) of the substances considered as they are likely to readily breakdown upon release. Some chemicals such as sodium disulfite and hydrogen peroxide for instance are, by their nature unstable and will rapidly break down to component molecules. The use of a STRF of 1 (in the absence of fully evaluated and published STRF) results in a significant over estimation of the impacts for some or potentially all of the substances considered in this assessment.

For substances not screened out at Test 1 and 2, and which are therefore taken through to Test 3 and 4, the methodology requires evaluation of the PEC, which includes consideration of the background pollutant concentration already present in the receiving watercourse (the River Don). This information was not available for any of hazardous components considered. Environment Agency guidance indicates that in these circumstances the background concentration of each substance should be assumed to be 50% of the EQS (PNEC has been assumed to be equivalent of the EQS for this purpose).

## Assessment input data

Table 1 below summarises data used to determine approximate release concentrations (RC) (in the trade effluent) for each of the identified hazardous substances.

**Table 1 Determination of potential release concentrations**

| Hazardous component | Concentration (%) | Quantity used p.a. (kgs)* | Quantity released p.a. (based on max. % conc.) (kgs) | Quantity released p.a. (based on min. % conc.) (kgs) | Estimated total RC (based on max. % conc.) (µg/l) | Estimated total RC (based on min. % conc.) (µg/l) | STRF** |
|---|---|---|---|---|---|---|---|
| Sodium bisulfite | 30 - <50 | 2,555 | 1,277.50 | 766.50 | 12,372.33 | 7,422.91 | 1 |
| | 0.25 – 0.5 | 100 | 0.50 | 0.25 | | | |
| Cobalt sulfate | 0.01 - <0.1 | 2,555 | 2.55 | 0.25 | 24.73 | 2.47 | 1 |
| Sodium (xylenes and 4-ethylbenzene) sulphonates | 1 - 5 | 100 | 5.00 | 1.00 | 2,166.13 | 433.23 | 1 |
| | 1 - 5 | 1875 | 93.75 | 18.75 | | | |
| | 1 - 5 | 2,500 | 125.00 | 25.00 | | | |
| Alcohols C12-C14, ethoxylates, sulphate, sodium salts | 1 - 5 | 100 | 5.00 | 1.00 | 229.92 | 27.83 | 1 |
| | 0.1 - 1 | 1875 | 18.75 | 1.87 | | | |
| Alcohols, C12-C16 | 0.1 - 1 | 100 | 1.00 | 0.10 | 9.68 | 0.97 | 1 |
| Iso tridecanol alcohol ethoxylate | 1 - 5 | 3700 | 185.00 | 37.00 | 1,790.99 | 358.20 | 1 |
| Beta-alanine, N-(2 carboxyethyl)-N-dodecyl mono sodium salt | 1 - 5 | 3700 | 185.00 | 37.00 | 1,790.99 | 358.20 | 1 |
| Sodium hypochlorite | 1 - 10 | 1875 | 187.75 | 18.75 | 2,202.43 | 375.14 | 0.3 |
| | 10 – 20 | 200 | 40.00 | 20.00 | | | |
| Amines, C12-14 (even numbered)-alkyldimethyl, N-oxides | 1 - 5 | 1875 | 93.75 | 18.75 | 907.59 | 181.52 | 1 |
| Hydrogen peroxide | 0.25 – 0.5 | 100 | 0.50 | 0.25 | 4.84 | 2.42 | 1 |
| Ethylenediamine tetraacetic acid (EDTA) tetrasodium salt | 1 - 5 | 2500 | 125.00 | 25.00 | 1,210.13 | 242.03 | 0.63 |
| N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine | 1 - 5 | 2500 | 125.00 | 25.00 | 1,210.13 | 242.03 | 1 |
| Betaines, C12-14 (even numbered)-alkyldimethyl | 0.1 - 0.9 | 2500 | 22.50 | 2.50 | 217.82 | 24.20 | 1 |
| Isotridecanol, ethoxylated | 0.1 - 0.9 | 2500 | 22.50 | 2.50 | 217.82 | 24.20 | 1 |
| Trisodium nitrilotriacetate | 3-10% | 13,800 | 1,380 | 414 | 13,359.79 | 4,007.94 | 1 |

Table notes:

* Annual use is recorded on either in kilograms (kgs) or litres (l). Where l is used this has been converted to kgs based on an assumed 1:1 ratio of litres to kgs

** STFR for sodium hypochlorite of 0.3 based on 70% removal of sodium hypochlorite in the sewage treatment system (Source: American Cleaning Institute, 1997)
STRF for EDTA of 0.63 taken from https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit

## Assessment results

### Test 1

Test 1 results are summarised in Table 2 below. Considering both the maximum and minimum concentration scenarios, the release concentration (RC) for all parameters other than alcohols, C12-C16 exceeds 10% of the EQS and therefore it was not possible to screen out these determinands at this stage. Alcohols, C12-C16 is not considered further in this assessment. All other substances proceed to Test 2.

**Table 2 Test 1 results**

| Determinand | PNEC (µg/l) | % RC of PNEC (max substance conc.) | RC <10% of PNEC? (max substance conc.) | % RC of PNEC (min substance conc.) | RC <10% of PNEC? (min substance conc.) |
|---|---|---|---|---|---|
| Sodium bisulfite | 1,090 | 1,135 | Fail | 681 | Fail |
| Cobalt sulfate | 0.5 | 4,947 | Fail | 495 | Fail |
| Sodium (xylenes and 4-ethylbenzene) sulphonates | 230 | 942 | Fail | 188 | Fail |
| Alcohols C12-C14, ethoxylates, sulphate, sodium salts | 240 | 96 | Fail | 11 | Fail |
| Alcohols, C12-C16 | 140 | **6.9** | **Pass** | **0.69** | **Pass** |
| Iso tridecanol alcohol ethoxylate | 74 | 2,420 | Fail | 484 | Fail |
| Beta-alanine, N-(2 carboxyethyl)-N-dodecyl mono sodium salt | 30 | 5,970 | Fail | 1,194 | Fail |
| Sodium hypochlorite | 0.21 | 1,048,776 | Fail | 178,638 | Fail |
| Amines, C12-14 (even numbered)-alkyldimethyl, N-oxides | 33.5 | 2,709 | Fail | 542 | Fail |
| Hydrogen peroxide | 12.6 | 256,758 | Fail | 19 | Fail |
| Ethylenediamine tetraacetic acid (EDTA) tetrasodium salt | 2,200 | 55 | Fail | 11 | Fail |
| N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine | 1 | 121,0122 | Fail | 24,203 | Fail |
| Betaines, C12-14 (even numbered)-alkyldimethyl | 7.6 | 2,867 | Fail | 318 | Fail |

| Determinand | PNEC (µg/l) | % RC of PNEC (max substance conc.) | RC <10% of PNEC? (max substance conc.) | % RC of PNEC (min substance conc.) | RC <10% of PNEC? (min substance conc.) |
|---|---|---|---|---|---|
| Isotridecanol, ethoxylated | 4.36 | 4,996 | Fail | 555 | Fail |
| Trisodium nitrilotriacetate | 930 | 1,436 | Fail | 431 | Fail |

**Test 2**

Test 2 results are summarised in Tables 3 and 4 below. At this stage the process concentration (PC) is calculated on the basis of release concentration, the removal achieved at the WwTW (as defined by the STRF) and dilution in the River Don. Due to data limitations the assessment was undertaken assuming the PNEC is an annual average (AA) figure. The assessment is again undertaken using both minimum and maximum concentration values.

The results indicate that, when using the maximum substance concentration (i.e. the upper end of the concentration range provided in the relevant MSDS) three further substances can be screened out. When using the lower end of the substance concentration all substances other than four can be screened out.

**Table 3 Test 2 results (assuming maximum substance concentration)**

| Determinand | PNEC (µg/l) | PC (µg/l) | % PC of PNEC | PC <4% of PNEC? |
|---|---|---|---|---|
| Sodium bisulfite | 1,090 | 76.46 | 7.01 | Fail |
| Cobalt sulfate | 0.5 | 0.15 | 30.57 | Fail |
| Sodium (xylenes and 4-ethylbenzene) sulphonates | 230 | 13.38 | 5.82 | Fail |
| Alcohols C12-C14, ethoxylates, sulphate, sodium salts | 240 | 1.42 | **0.59** | **Pass** |
| Iso tridecanol alcohol ethoxylate | 74 | 11.06 | 14.96 | Fail |
| Beta-alanine, N-(2 carboxyethyl)-N-dodecyl mono sodium salt | 30 | 11.06 | 36.89 | Fail |
| Sodium hypochlorite | 0.21 | 4.08 | 1,944.45 | Fail |
| Amines, C12-14 (even numbered)-alkyldimethyl, N-oxides | 33.5 | 5.60 | 16.74 | Fail |
| Hydrogen peroxide | 12.6 | 0.02 | **0.24** | **Pass** |
| Ethylenediamine tetraacetic acid (EDTA) tetrasodium salt | 2,200 | 4.71 | **0.21** | **Pass** |
| N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine | 1 | 7.47 | 747.87 | Fail |
| Betaines, C12-14 (even numbered)-alkyldimethyl | 7.6 | 1.34 | 17.71 | Fail |
| Isotridecanol, ethoxylated | 4.36 | 1.34 | 30.87 | Fail |

| | | | | |
|---|---|---|---|---|
| Trisodium nitrilotriacetate | 930 | 82.56 | 8.88 | Fail |

**Table 4 Test 2 results (assuming minimum substance concentration)**

| Determinand | PNEC (µg/l) | PC (µg/l) | % PC of PNEC | PC <4% of PNEC? |
|---|---|---|---|---|
| Sodium bisulfite | 1,090 | 45.87 | 4.21 | Fail |
| Cobalt sulfate | 0.5 | 0.01 | **2.97** | **Pass** |
| Sodium (xylenes and 4-ethylbenzene) sulphonates | 230 | 2.67 | **1.16** | **Pass** |
| Alcohols C12-C14, ethoxylates, sulphate, sodium salts | 240 | 0.17 | **0.07** | **Pass** |
| Iso tridecanol alcohol ethoxylate | 74 | 2.21 | **2.99** | **Pass** |
| Beta-alanine, N-(2 carboxyethyl)-N-dodecyl mono sodium salt | 30 | 2.21 | 7.37 | Fail |
| Sodium hypochlorite | 0.21 | 0.69 | 331.08 | Fail |
| Amines, C12-14 (even numbered)-alkyldimethyl, N-oxides | 33.5 | 1.12 | **3.36** | **Pass** |
| Hydrogen peroxide | 12.6 | 0.01 | **0.12** | **Pass** |
| Ethylenediamine tetraacetic acid (EDTA) tetrasodium salt | 2,200 | 0.94 | **0.04** | **Pass** |
| N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine | 1 | 1.49 | 149.56 | Fail |
| Betaines, C12-14 (even numbered)-alkyldimethyl | 7.6 | 0.14 | **1.95** | **Pass** |
| Isotridecanol, ethoxylated | 4.36 | 0.14 | **3.40** | **Pass** |
| Trisodium nitrilotriacetate | 930 | 24.76 | **2.66** | **Pass** |

### Tests 3 and 4a

Test 3 and 4a results are summarised in Tables 5 and 6 below. For these tests the PC is combined with the background concentration (BC) of the pollutant in question to produce the PEC. BCs were not available for any of hazardous components considered and therefore the BC was assumed to be 50% of the EQS/PNEC in line with Environment Agency guidance.

Test 4b in the H1 tool requires use of the MAC EQS; due to data limitations it has been assumed that the PNEC data represents the AA EQS and therefore Test 4b cannot be completed.

### Table 5 Test 3 and 4a results (assuming maximum substance concentration)

| Determinand | Test 3 | | | | | Test 4a | |
|---|---|---|---|---|---|---|---|
| | BC (µg/l) | PC (µg/l) | PEC (µg/l) | (PEC – BC) / PNEC | PEC – BC >10% of PNEC? | % PEC of PNEC? (%) | PEC >100% of PNEC? |
| Sodium bisulfite | 545 | 76.5 | 621 | **7.0%** | **Pass** | **57.0** | **Pass** |
| Cobalt sulfate | 0.25 | 0.15 | 0.40 | 30.5 | Fail | **80.6** | **Pass** |
| Sodium (xylenes and 4-ethylbenzene) sulphonates | 115 | 13.4 | 128 | **5.8** | **Pass** | **55.9** | **Pass** |
| Iso tridecanol alcohol ethoxylate | 37 | 11.1 | 48.1 | 15.0% | Fail | **65.0** | **Pass** |
| Beta-alanine, N-(2 carboxyethyl)-N-dodecyl mono sodium salt | 15 | 11.1 | 26.1 | 36.9% | Fail | **86.9** | **Pass** |
| Sodium hypochlorite | 0.105 | 4.09 | 4.19 | 1,944.1% | Fail | 1,994 | Fail |
| Amines, C12-14 (even numbered)-alkyldimethyl, N-oxides | 16.75 | 5.61 | 22.4 | 16.7% | Fail | **66.8** | **Pass** |
| N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine | 0.5 | 7.48 | 7.98 | 747.8% | Fail | 798 | Fail |
| Betaines, C12-14 (even numbered)-alkyldimethyl | 3.8 | 1.35 | 5.15 | 17.7 | Fail | **67.8** | **Pass** |
| Isotridecanol, ethoxylated | 2.18 | 1.35 | 3.53 | 30.9% | Fail | **80.9** | **Pass** |
| Trisodium nitrilotriacetate | 465 | 82.6 | 548 | **8.9** | **Pass** | **58.9** | **Pass** |

### Table 6 Test 3 and 4a results (assuming minimum substance concentration)

| Determinand | Test 3 | | | | | Test 4a | |
|---|---|---|---|---|---|---|---|
| | BC (µg/l) | PC (µg/l) | PEC (µg/l) | (PEC – BC) / PNEC | PEC – BC >10% of PNEC? | % PEC of PNEC? (%) | PEC >100% of PNEC? |
| Sodium bisulfite | 545 | 45.9 | 591 | **4.2%** | **Pass** | **54.3** | **Pass** |
| Beta-alanine, N-(2 carboxyethyl)-N-dodecyl mono sodium salt | 15 | 2.22 | 17.3 | **7.4%** | **Pass** | **57.4** | **Pass** |
| Sodium hypochlorite | 0.105 | 0.69 | 0.8 | 331.1% | Fail | 381 | Fail |
| N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine | 0.5 | 1.5 | 2 | 149.6% | Fail | 200 | Fail |

**Other hazardous substances identified in MSDS but not considered in the H1 assessment**

A small number of hazardous substances were identified from raw materials MSDS but which could not be assessed using the H1 methodology. These are summarised in Table 7 below for completeness.

### Table 7 Hazardous substances not considered in the assessment

| Determinand | Reason for exclusion from the assessment |
|---|---|
| Sodium hydroxide | A standard numerical PNEC is not established for sodium hydroxide because its environmental hazard depends on changes to pH rather than direct chemical toxicity. |
| Potassium hydroxide | There is no official PNEC established for potassium hydroxide because its environmental toxicity is driven entirely by changes in pH rather than a specific chemical toxicity. |
| Nitric acid | Nitric acid is a strong acid that dissociates completely into hydronium and nitrate ions in water, therefore its ecotoxicological impacts are entirely driven by changes in pH and a PNEC value is not available. |
| Phosphoric acid | Phosphoric acid is a strong inorganic acid, its ecotoxicity is driven primarily by its ability to alter pH levels in the aquatic environment. As a result, its environmental impact depends heavily on the specific buffering capacity and existing pH of the receiving body of water, and therefore a PNEC value is not available. |
| Sodium octanoate | No PNEC available. |
| Sulphuric acid | PNEC available however it was not possible to add this substance to the H1 tool. |
| Alanine, N,N-bis(carboxymethyl) - trisodium salt | % substance concentration in raw material not provided in MSDS. |
| Alkylamine dicarboxylate | % substance concentration in raw material not provided in MSDS. |

## Summary of assessment findings

Of the hazardous substances identified in raw materials used on site, a total of 15 hazardous substances were considered in the H1 assessment. Of these substances, only alcohols C12-C16 could be screened out at the Test 1 stage. At Test 2 between three and ten substances can be screened out, depending on whether the maximum or minimum end of the substance concentration range is used. At Tests 3 and 4a between two and nine further substances can be screened out, depending on whether the maximum or minimum end of the substance concentration range is used. In both scenarios (i.e. considering both the maximum and minimum substance concentration) the H1 assessment methodology predicts a PEC exceedance of the PNEC for only two substances, which therefore are not screened out. These are:

- Sodium hypochlorite (PEC between 381 and 1,944% of the PNEC);
- N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine (PEC between 200 and 798% of the PNEC).

In respect of these two substances:

- When added to water ($H_2O$), sodium hypochlorite (NaOCl) reacts and forms hypochlorous acid (HOCl) and sodium ions ($Na^+$), with HOCl further dissociating into hypochlorite ions ($OCl^-$) depending on the water's pH. The active chlorine is rapidly consumed through oxidation reactions with organic and inorganic substances in the wastewater, eventually reducing down to stable chloride salts ($Cl^-$).
- N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine is considered readily biodegradable and does not bioaccumulate; microorganisms in biological wastewater treatment plants can breakdown the substance over time. As a biocide it has potential to inhibit or kill bacteria if it were to be directly released in high concentrations (such as spills or concentrated flushes). This issue is considered separately in the permit application (Appendix 10 Accident Management Plan).

With regards to the other substances where the PEC is predicted to be <100% of PNEC, these will also typically breakdown or degrade during normal usage in the process and/or during the wastewater treatment process.

Given the highly conservative nature of the assessment and the limitations to the approach taken (most significantly that the assessment considers that all substances will be discharged to river in their original form rather than breaking down into component molecules) it is considered highly unlikely that any of these substances will lead to an exceedance of a PNEC standard within the River Don receiving environment or result in significant environmental effects. All the substances in question are standard industrial formulations used widely within the food and drink and other industrial sectors and do no present any unusual risks to the environment in normal use.

## Assessment limitation and constraints

A summary of the limitations and constraints of this assessment is provided below:

- It has been assumed that 100% of the raw materials used on site are released to sewer. This will be an over-estimation of releases as a proportion of the raw materials used will also be released via other routes e.g. disposal as a waste material (including effluent arising from the hard mints department which is separately removed from site by tanker), residues on surfaces, volatilisation and release to atmosphere, release to atmosphere in steam etc. This will vary from substance to substance; a detailed and accurate assessment of the fate of each raw material would require substantial research and analysis.

- It was assumed that raw materials are used at a steady rate every day of the year (i.e. annual quantities used were divided by 365 days). Effluent generation per day was also assumed to be steady daily average figure. For simplicity shutdowns, plant production variability and other factors have been disregarded.

- The assessment methodology assumes that each hazardous component reaches the receiving watercourse in its original form i.e. there is no breakdown during use, during effluent pre-treatment and handling on site, during transfer through the sewerage network and during treatment at the receiving sewage treatment works. This assumption is highly unrealistic; a number of the compounds considered in this assessment are highly volatile / unstable and will rapidly breakdown into constituent molecules through their normal use.

- Chemical suppliers do not provide a sufficient level of accuracy in MSDS on % concentrations of hazardous components, which may vary by an order of magnitude of more. This may be due to variability in formulation or for commercial confidentiality reasons. As a result, MSDS composition data is inherently unsuitable for accurate environmental assessment.

- There is no STRF available for the vast majority of hazardous components considered and therefore a STRF of 1 has been used in the assessment. A STRF of 1 indicates that there is no removal at the WwTW; this is likely to be an over-estimate for the majority (or all) of the substances considered as they are likely to readily breakdown upon release.

- Discussion of chemical fate has been derived in part from internet research. However, the findings are considered to be sufficiently accurate for this exercise.