



Landmark House  
20 Broomgrove Road  
Sheffield  
S10 2LR

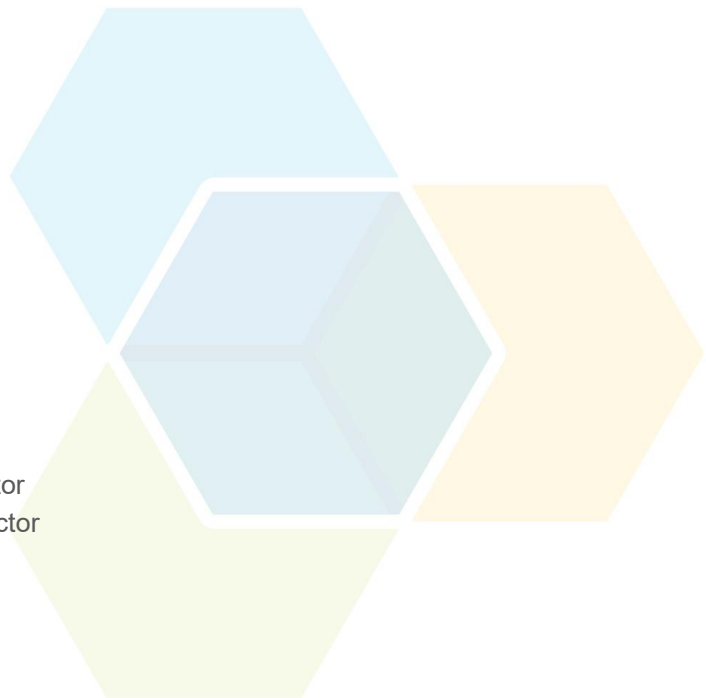
**Tel:** 0114 263 1824  
**ehsprojects.co.uk**

Registered no. 04845638

## Arla Taw Valley: Surface Water Risk Assessment

*A Surface Water Risk Assessment conducted as a technical appendix to the variation of  
EPR/NP3638NN*

Project number: 1369  
Prepared for: Arla Taw Valley  
Prepared by: Dan Evans – Director  
Reviewed by: Steve Power - Director  
Date of issue: 12/01/2026





## Contents

1	Introduction .....	1
2	Scope of the Assessment .....	1
3	Screening assessment methodology.....	1
4	Proposed Point Source Emissions Limits .....	2
4.1	Proposed Point Source Emissions.....	2
4.2	Environment Agency Detailed Modelling .....	3
5	Hazardous Substances Screening assessment.....	3
5.1	Identification of pollutants.....	3
5.2	Hazardous Substance Emissions Rates .....	3
5.3	H1 Screening Test .....	4
5.3.1	Test 1.....	4
5.3.2	Test 2.....	5
5.3.3	Test 3, 4a and 4b.....	5
5.4	Screening tests of other potential pollutants .....	6
6	Conclusion .....	6
	References:.....	7
	Appendix 10 (iii) River Sampling PRE APP. Results Spreadsheet .....	8
	Appendix 13 - Inventory of Hazardous Substances Within Effluent.....	8

### Disclaimer

*This report has been prepared by EHS Projects Ltd, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporation of our General Terms and Conditions of Business and taking account of the resources devoted to us by agreement with the client.*

*We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.*

*This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.*

## 1 Introduction

EHS Projects (EHS) have been commissioned on behalf of Arla Foods Limited (the 'Client') to undertake a H1 Screening and Surface Water Risk Assessment in order to assess the significance of impact on controlled waters from the proposed changes at the site.

The following sections of this report outline the methodology, data input process and results output from the assessments, undertaken in accordance with the EA Guidance: [Surface water pollution risk assessment for your environmental permit - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit).

EHS were advised at the time of completing the assessment that the current MS Excel Version of the H1 Tool will not work for emissions to water. A representative of the River Quality Team within the EA confirmed that the National Permitting Service will be accepting surface water risk assessments using the MS Access Tool V.2.7.9 for the interim period.

## 2 Scope of the Assessment

The wider variation to EPR/NP3638NN seeks authorisation to decommission the existing aged effluent treatment plant (ETP), and commission a new state of the art ETP. All site process effluent will be treated in a dedicated, purpose-built aerobic wastewater treatment plant which will be built alongside and will replace the existing plant. In conjunction with specialist suppliers, the operator has identified a treatment approach that includes primary screening and flow balancing of influence volumes, followed by Dissolved Air Flotation (DAF) to reduce contaminant loading, followed by further treatment within a membrane bioreactor (MBR) that is in alignment with the Waste Treatment Sector and Food, Drink and Milk Sector BREFs. The facility is designed to treat up to a maximum of 5,000 m<sup>3</sup>/day. The plant is designed with full automation and resilience, ensuring consistent performance while minimising environmental risks.

A summary process flow diagram and supporting information including anticipated equipment specification for key treatment assets is detailed in Appendix 2.

The proposed changes to the effluent plant are required to handle the increase in received influent from the combined production facility when at full capacity. Whilst an initial enhanced pre-application consultation obtained indicative limits for an uplift of discharge volumes to 3250m<sup>3</sup> this variation seeks authorisation to increase the treatment capacity of the ETP to support the maximum design production capacity of the overall integrated site. The total volumetric discharge limit from the plant to the River Taw would be required to be increased by 80% (a maximum total daily volume of discharge of 4500m<sup>3</sup> per day). The entire discharge of all effluent will be treated through one ETP, and discharged only at the existing discharge point (W1).

The submission, response and information request covered by the Pre-Application request is included at Appendix 10 of this variation application.

## 3 Screening assessment methodology

The aim of this screening assessment is to appraise the maximum potential impact that the uplifted discharge of treated effluent from the site could have on the receiving River Taw. This 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.
3. Screening tests on data.

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

## 4 Proposed Point Source Emissions Limits

### 4.1 Proposed Point Source Emissions

A pre-application request was submitted to the EA to increase the maximum flow limit at Taw Valley Creamery to 3250 m<sup>3</sup>/day. As a result of this request, the EA undertook a detailed modelling exercise that has produced a set of indicative effluent discharge limits. Since this pre application was submitted, the operator has determined that at maximum sustained capacity of operations of the combined process will generate more effluent than was anticipated at the time of the pre application submission. The total volumetric discharge limit applied for in this variation is therefore 4500m<sup>3</sup>/day.

Table 1 below provides a proposal for the limits to set for emissions point W1 in Table S3.2 of the varied permit at a flow limit of 4500m<sup>3</sup> per day. The proposed limits have been determined by applying the EA's 'no deterioration' principle to the provided indicative limits. The mass emission release (kg/day) of BOD, Suspended Solids, Ammoniacal Nitrogen, Total P, Iron and Total K was calculated. The emissions concentrations required to match this mass loading, at a maximum flow of 4500m<sup>3</sup>/day, were calculated. This calculation is the basis of the proposed limits. A summary of this calculation is provided in Table 2a and Table 2b.

The remaining parameter limits (pH, COD, Temperature and Total N) were stated by an EA Water Quality representative, through an assessment of BAT. This is reflected in the pre application advice. Therefore, it is understood that no change to these indicative limits is required.

**Table 1 – Proposed emissions limits for a 4500m<sup>3</sup>/day maximum effluent outflow flow.**

Determinant	Current Permit 2500m <sup>3</sup>	Uplift to 3250m <sup>3*</sup>	Uplift to 4500m <sup>3**</sup>
pH	6 - 9	6 - 9	<b>6 - 9</b>
Temperature	30	30	<b>30</b>
COD (mg/l)	125	125	<b>125</b>
BOD (mg/l)	9	7	<b>5</b>
Suspended Solids (mg/l)	14	11	<b>8</b>
Ammoniacal Nitrogen (mg/l)	5	3	<b>2.2</b>
Total P (mg/l)	2	0.5	<b>0.36</b>
Iron (ug/l)	No limit	2600	<b>1878</b>
Total N (mg/l)	20	20	<b>20</b>
Total K (mg/l)	No limit	145 (95%ile) 371 maximum	<b>105 (95%il 268 maximum</b>

\* Indicative limits received from EA following initial enhanced pre-application consultation (30% uplift in effluent flow).

\*\* Extrapolated limits for 80% uplift required at full production capacity based on mass loading of the determinant on a daily basis. Where no change is applied this is because the original EA modelling which screened the uplift against BAT limits rather than against parameters in the model.

**Table 2a: Emissions loading using indicative limits at 3250 m<sup>3</sup>/day**

Parameter	Indicative Limit	Mass Release to River Taw
Total daily volume of discharge	3250 m <sup>3</sup> /day	
Biological Oxygen Demand (BOD)	7 mg/l	23 kg
Suspended Solids	11 mg/l	36 kg
Ammoniacal nitrogen	3 mg/l	10 kg

Total phosphorus (TP)	0.5 mg/l	1.6 kg
Total K	145 (mg/l) (95%ile) 371 (mg/l) (maximum)	471 kg (95%ile) 1,205 kg (maximum)
Iron (Fe)	2.6 mg/l	8.5 kg

**Table 2b: Proposed missions loading at 4500 m<sup>3</sup>/day**

Parameter	Proposed Limit	Mass Release to River Taw
Total daily volume of discharge	4500 m <sup>3</sup> /day	
Biological Oxygen Demand (BOD)	5 mg/l	23 kg
Suspended Solids	8 mg/l	36 kg
Ammoniacal nitrogen	2.2 mg/l	10 kg
Total phosphorus (TP)	0.36 mg/l	1.6 kg
Total K	105 (mg/l) (95%ile) 268 (mg/l) (maximum)	471 kg (95%ile) 1,205 kg (maximum)
Iron (Fe)	1.878 mg/l	8.5 kg

## 4.2 Environment Agency Detailed Modelling

It is stated in the pre application advice letter that an Environment Agency Water Quality team will undertake a further detailed modelling exercise based on up-to-date information to verify that the proposed sanitary pollutants discharge is acceptable in terms of river quality. To support this exercise, the following additional data is provided as requested by the pre application response:

- Appendix 10 (iii) River Sampling PRE APP. Results Spreadsheet. This is the data from 36 additional river Taw sampling rounds. This was conducted to satisfy caveat 3 of the EA Pre Application report (Appendix 10).

## 5 Hazardous Substances Screening assessment

The following assessment was conducted based on the proposed worst-case loading of the hazardous materials to the effluent, based on the planned post upgrade hygiene chemical usage, effluent dosing chemical usage and the proposed discharge to river emission limit values. The aim of the assessment is to evaluate potential hazardous pollutants within the chemical inventory and effluent to determine whether they pose a potential risk to surface waters upon discharge.

### 5.1 Identification of pollutants

EHS has collated a chemical inventory of liquid products that will be used and at 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 full chemical inventory is provided as Appendix 13 - Inventory of Hazardous Substances Within Effluent.

### 5.2 Hazardous Substance Emissions Rates

Based on chemical product usage rates provided by Arla Taw Valley, the maximum chemical emissions rates have been calculated. The mass of each constituent of concern was calculated by evaluating the mass of the chemical constituent within the chemical inventory. This data was derived from the MSDS for each material. Where a concentration range was provided in the MSDS, EHS have used the highest potential concentration to ensure a precautionary approach. The emission rate was then calculated using the proposed permitted volume of effluent discharged from site.

The emission limit values outlined in Table 1 above were also screened for hazardous substances. It was noted that Iron is considered a freshwater specific pollutant by the EA, therefore, Iron is also considered in Section 5.

EHS have applied sewage reduction factors (STRF) to the relevant compounds being assessed to appraise reductions of concentrations as a consequence of the site ETP stages (physiochemical followed by biological activated sludge) 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 and qualitative interpretation (Section 5.4). A summary of the anticipated emissions rates from the remaining hazardous effluent input is provided as Table 3. The full inventory is available in Appendix 13 - Inventory of Hazardous Substances Within Effluent.

**Table 3: Inventory of Hazardous Substances Discharge Summary**

Materials Group	Hazardous Substance	Untreated Emission Rate [mg/l]	STRF	Treated Emissions Rate (mg/l)
EA Freshwater Specific Pollutants	EDTA	0.2	0.63	0.13
	Iron*	1.9	NA	1.9
Caustics	Sodium Hypochlorite	4.6	0.00	0.00
	Sodium Hydroxide	306.6	0.00	0.00
	Hydrogen Peroxide	2.2	0.00	0.00
Acids	Citric Acid	353.7	0.00	0.00
	Nitric Acid	223.1	0.00	0.00
	Phosphoric Acid	9.2	0.00	0.00
	Peracetic Acid	2.2	0.00	0.00
	Hydrochloric Acid	47.3	0.00	0.00
	Sulphuric Acid	3.2	0.00	0.00
	Acetic Acid	1.0	0.00	0.00
Surfactants	Natural / Organic Acids	0.3	0.00	0.00
	Amines	0.3	0.00	0.00
	Alcohol ethoxylates	0.0	0.00	0.00
	Other surfactants	0.0	0.00	0.00

\* Iron has been, and will again be, modelled by the EA in addition to H1 screening assessment. The proposed limit as described in Section 4 is used for the purpose of this H1 Assessment.

### 5.3 H1 Screening Test

The review above has identified a schedule of substances that require further evaluation to determine the significance of impact of their emissions from the site to the River Taw. All other 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.

Of the substances listed above, EHS has identified Dissolved Iron and EDTA as compounds that are able to be assessed using the EA's H1 Tool. The following subsections summarise the results of the H1 screening tests. The fully populated H1 can be provided upon request.

#### 5.3.1 Test 1

Test 1 determines whether the concentrations of substances within the final discharge of effluent are less than 10% of the EQS. As the Iron and EDTA release concentrations were calculated as greater

than 10% of the relevant EQS, Test 1 was 'Failed'. Emissions cannot be screened out as insignificant at this stage.

**Figure 1: Result of H1 Test 1**

**Water Impacts - Fresh Water Releases**

Apply Test 1 (See Guidance) and Calculate Process Contributions of Emissions to Water

This table applies Test 1 and also estimates the Process Contribution for Freshwater releases, this is calculated after dilution into the relevant surface water type for each emission to water listed in the inventory, according to the release point parameters input earlier. If you have more accurate data obtained through dilution modelling, this may be entered as indicated and will be used instead of the estimated PC. Any releases which 'Pass' Test 1 are screened out at this point.

Substance	Annual Avg EQS			MAC EQS		
	Release µg/l	EQS µg/l	Release conc < 10% EQS Test 1	Release µg/l	MAC µg/l	Release conc < 10% EQS Test 1
[W1] EDTA (River Taw (50007 - Taw at Taw Bridge))	130.0000	400.0000	Fail	130.0000	4000	Pass
[W1] Iron (dissolved) (River Taw (50007 - Taw at Taw Bridge))	1878.0000	1000.0000	Fail	1878.0000		N/A

### 5.3.2 Test 2

This test introduces the dilution available in the receiving water to determine whether the process contribution (PC) of Iron and EDTA to the receiving water is greater than 4% of the EQS. The dilution factor specified for use in the H1 tool is the 95% Exceedance (Q95) River Flow Rate. For this assessment, the most appropriate river monitoring location is the Taw at Taw Bridge, flow data was sources from the UK Centre for Ecology and Hydrology National River Archive (<https://nrfa.ceh.ac.uk/data/station/meanflow/50007>). The Q95 flow rate at this location is 0.179 m<sup>3</sup>/s.

Through H1 Test 2, the calculated annual average emission of Iron was calculated as 42% PC of the EQS value; the EDTA emission rate was calculated as 7% PC of the EQS value. Therefore, Iron and EDTA cannot be screened as having an insignificant impact on the receiving aquatic environment at this stage.

**Figure 2: Result of H1 Test 2**

**Water Impact Screening - Fresh Water Releases**

Apply Test 2

This page applies Test 2 and displays the Process Contribution as a proportion of the EQS. Emissions with PCs that are less than 4% of the EQS can be screened from further assessment as they are likely to have an insignificant impact.

Substance	Annual Avg EQS					MAC EQS				
	Annual Avg EQS µg/l	PC µg/l	Modelled PC	% PC of EQS %	PC < 4% of EQS? Test 2	MAC EQS µg/l	PC µg/l	Modelled PC	% PC of MAC %	PC < 4% of MAC? Test 2
EDTA (River Taw (50007 - Taw at Taw Bridge))	400	29.3077		7.33	Fail	4000	29.3077		0.733	Pass
Iron (dissolved) (River Taw (50007 - Taw at Taw Bridge))	1000	423.3830		42.34	Fail		423.3830		-	Pass

### 5.3.3 Test 3, 4a and 4b

These tests use the previously supplied data, and in the absence of measured data follow the EA's guidance on SWRA to assume the Background Concentration (BC) of contaminants in the River Taw is 50% of the EQS value. This was set at 500 µg/l for Iron, and 200 µg/l for EDTA, to calculate Predicted Environmental Concentrations (PEC) in relation to BC. As can be seen in Figure 3 below, as Tests 3, 4a and 4b were 'Pass' for EDTA. Therefore, EDTA can be screened out as having an insignificant impact on the receiving river.

For Iron, Tests 4a and 4b were passed. However, the PEC minus the BC is 311µg/l, as this is greater than 10% of the EQS (100µg/l) Test 3 was failed. Iron therefore the proposed iron emission rate of 1878µg/l cannot be screened as insignificant at the H1 stage. It is understood that further detailed modelling will be undertaken by the EA as part of the application determination process.

**Figure 3: Result of H1 Test 3, 4a & 4b**

Water Impact Screening (Predicted Environmental Concentration) - Fresh Water Releases

Apply Tests 3 and 4 and identify which releases may need more Detailed Modelling of Emissions/Discharges to Water

This page applies Tests 3, 4a and 4b and displays the Predicted Environmental Concentrations in relation to the background pollutant levels and the AA or MAC EQS. Any substances that pass all 3 of these tests can be screened out. Substances failing any of the tests must be modelled. Note that releases that have passed Tests 1 and 2 are insignificant are not shown as they are already screened out.

Number	Substance	Bkgmd Conc. µg/l	Annual Avg EQS				MAC* EQS					
			PC µg/l	PEC µg/l	(PEC-BC)/EQS	PEC-BC >10% AA EQS	% PEC of EQS	PEC >100% AA EQS	PC µg/l	PEC µg/l	% PEC of MAC	PEC >100% MAC
1	EDTA (River Tow (50007 - Tow at Tow Bridge))	200	29.4	184	-3.9%	Pass	46.1	Pass	29.4	184	4.61	Pass
2	Iron (dissolved) (River Tow (50007 - Tow at Tow B	500	423	811	31.1%	Fail	81.1	Pass	423	0	-	Pass

## 5.4 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 freshwater priority pollutants under the EA guidance. 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 remaining chemicals are as follows:

- Sodium hydroxide
- Hydrogen peroxide
- Various acids for hygiene purposes, this is dominated by Citric and Nitric acid.
- Sodium hypochlorite
- Small quantities of different surfactants

The acids and alkalis are components of the vast majority of hygiene chemicals used throughout the food and drink sector. All of these materials have short lifespans during usage and treatment. Due to the instability and highly reactive nature of these substances, they will disappear very rapidly during the neutralisation and biological treatment processes at the site. 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 site. As such, these compounds are not considered to present a significant risk to the water environment.

Surfactants, such as alcohol ethoxylates, sodium cumenesulphonate, disodium metasilicate etc, are also present in most domestic and industrial cleaning and hygiene products. By the nature of their function, they are highly reactive with the other components and will neutralise in contact with acidic cleaning products and / or pH correction at the effluent treatment plant. There have been various academic studies assessing the removal rates if these substances, biodegradation rates would likely mean removal of well over 90% of surfactants by the treatment at site. It is considered that surfactants would be unlikely to be detectable within emissions to water. Some examples of academic works identifying high removal are provided in the References section.

## 6 Conclusion

The wider variation to EPR/NP3638NN seeks authorisation to decommission the existing aged effluent treatment plant (ETP), and commission a new state of the art ETP. The site are applying to increase the daily total effluent flow limit to 4500m<sup>3</sup> per day. All site process effluent will be treated in a dedicated, purpose-built aerobic wastewater treatment plant. All processed effluent will be discharged at the existing discharge point (W1).

To support this variation, the above report provides a H1 Screening and Surface Water Risk Assessment in order to assess the significance of impact on controlled waters from changes at the site.

In terms of the point source emissions limits at the outfall, the site anticipates an update to the indicative limits that were determined by the EA's enhanced pre application process in 2024. The proposed limits have been determined through reducing the concentrations of modelled parameters proportionally to the increase in volume from 3250m<sup>3</sup>/day to 4500m<sup>3</sup>/day. In summary, the mass of pollution discharged is unchanged for the modelled parameters.

The remaining parameter limits (pH, COD, Temperature and Total N) were stated by an EA Water Quality representative, through an assessment of BAT. This is reflected in the pre application advice. Therefore, it is understood that no change to these indicative limits is required.

The below table outlines the proposed new emissions concentration limits for the treated effluent outfall to river.

Parameter	Proposed Limit
Total daily volume of discharge	4500 m <sup>3</sup> /day
Biological Oxygen Demand (BOD)	5 mg/l
Suspended Solids	8 mg/l
Ammoniacal nitrogen	2.2 mg/l
Total phosphorus (TP)	0.36 mg/l
Total K	105 (mg/l) (95%ile) 268 (mg/l) (maximum)
Iron (Fe)	1878 ug/l

Regarding the hazardous substances that may be present within the effluent discharge, a chemical inventory of liquid products was collated. A number of substances and their potential emissions were determined from a worst-case mass balance calculation. Emissions of dissolved iron and EDTA were assessed using the EA's H1 Tool. The H1 screening stages concluded that the emissions of EDTA can be screened out as an insignificant impact on the receiving water. Dissolved iron could not be fully screened out at H1 stage, it is understood that further EA modelling will be undertaken to assess the emissions of iron.

The remaining acids, alkalis and surfactants do not have EQS screening values as freshwater priority pollutants under the EA guidance. However, for completeness these compounds have been assessed in accordance with the EA methodology to determine the potential effect of these emissions to water. As described in the final subsection of this report, all substances are likely to be removed to a degree that emissions are negligible and have insignificant impact on the receiving water.

In summary, the EA's determined limits have been, and will further be, modelled to demonstrate acceptability of impact to the river. The remaining hazardous substances have been assessed through the EA's H1 methodology and determined to be insignificant.

## References:

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.

HERA., 2005. Human & Environmental Risk Assessment on ingredients of household cleaning products - Secondary Alkane Sulfonate (SAS).

Morrall, S.W., Dunphy, J.C., Cano, M.L., Evans, A., McAvoy, D.C., Price, B.P. and Eckhoff, W.S., 2006. Removal and environmental exposure of alcohol ethoxylates in US sewage treatment. *Ecotoxicology and environmental safety*, 64(1), pp.3-13.

Williams, Terry M. "Isothiazolone Biocides In Water Treatment Applications." Paper presented at the CORROSION 2004, New Orleans, Louisiana, March 2004.

**Appendix 10 (iii) River Sampling PRE APP. Results Spreadsheet**

**Appendix 13 - Inventory of Hazardous Substances Within Effluent**