Background

Knolton Farmhouse Cheese has an effluent treatment plant that treats liquid waste from the dairy processes carried out on site. In recent years the consent form Phosphate emissions has been reduce and the enable this level to be achieved the site has identified that dosing the waste with Aluminium Chloride will reduce the final Phosphate levels. The site is has been dosing over the last 6 months in a controlled manner and is now in a position to complete an H1 risk assessment to assess the impacts of the residue Aluminium on the quality of the water in the river Dee

Objectives of the Risk Assessments

The Environment Agency H1 risk assessment software has been used to do two assessments

Risk Assessment 1

- To assess whether the releases of Aluminium following treatment to control Phosphate is likely to have a significant impact on the river Dee**.** This assessment is based on the results of test on the discharge during the period 26/06/2019 to 10/10/2019.
- To assess impacts of Phosphate at the maximum consented level

Risk Assessment 2

- To assess the impact of releases of Aluminium at a level of the maximum measured release +25% to understand the impact of a higher than expected release
- To assess the impact of a release of Phosphate at 4x the consented level to understand the imact this may have on the river

Risk Assessment 1

Data used

Summary of data used to assess aluminium emissions from the effluent plant at Knolton Farmhouse Cheese

Table 1	
Substance	Aluminium
Unit	micrograms per litre (µg/l)
Maximum measured conc	751 µg/l
Minimum conc	16 µg/l
Mean conc	178µg/l
Maximum flow	Max as in consent - 9l/s (0.009m3/s or 800m3/day)
Mean flow	The average recorded effluent flow - 5l/s
Number of samples	15
Total and/or dissolved metal data	Total
Required limit of detection	<10 µg/l
EQS	Used MAC which is 1000 µg/l
River Dee flow rate	20m3/s

All samples were taken from the final effluent discharge point over a period from June 2019 to October 2019 (see table 2) The variation in the emission levels can be explained by the need to adjust the dosing of Aluminium Chloride depending on the Phosphate levels being found to the final effluent. The operator aims to dose the minimum required quantity required to achieve final discharge Phosphate levels that meet the permit conditions.

Table 2

Knolton Farmhouse Cheese Aluminium Test results	
Date	Al mg/l
26/06/2019	0.016
01/07/2019	0.02
24/07/2019	0.025
01/08/2019	0.023
22/08/2019	0.105
27/08/2019	0.13
29/08/2019	0.142
05/08/2019	0.136
09/09/2019	0.088
12/09/2019	0.089
17/09/2019	0.196
19/09/2019	0.206
24/09/2019	0.18
03/10/2019	0.559
10/10/2019	0.751
Range	0.02 - 0.75
Mean	0.178

The Phosphate level used to assess the impact of the maximum consented discharge was 2mg/l flow information is as above.

Outcome of the risk assessment 1

Extracts from the H1 Risk Assessment can be seen in Appendix 1.

The H1 data base applied test 2 to the data, this assesses the Process Contribution as a proportion of the EQS/MAC and considers values of <4% to indicate that no further assessment is required as the impact are likely to be insignificant. The releases of Aluminium gave a Process Contribution of 0.0338% of the MAC, more than 100x below the level of significance. The Phosphate release were found to be only 1% of the EQS so again well below a level that is likely to have a significant impact on the river Dee.

Risk Assessment 2

Data Used

The assess the potential impacts of exceptionally high releases the Aluminium release level was raised to 1000ug/l and for Phosphate a level of 8mg/l was used. All the other parameters were the same as in Risk Assessment 1

Outcome of Risk Assessment 2

Extracts of Risk Assessment 2 can be found in Appendix 2.

The H1 data base applied test 2 to the data, this assesses the Process Contribution as a proportion of the EQS/MAC and considers values of <4% to indicate that no further assessment is required as the impact are likely to be insignificant. The releases of Aluminium gave a Process Contribution of 0.045% of the MAC, nearly 100x below the level of significance. The Phosphate release was found to be only 4% of the EQS so again unlikely to have a significant impact on the river Dee.

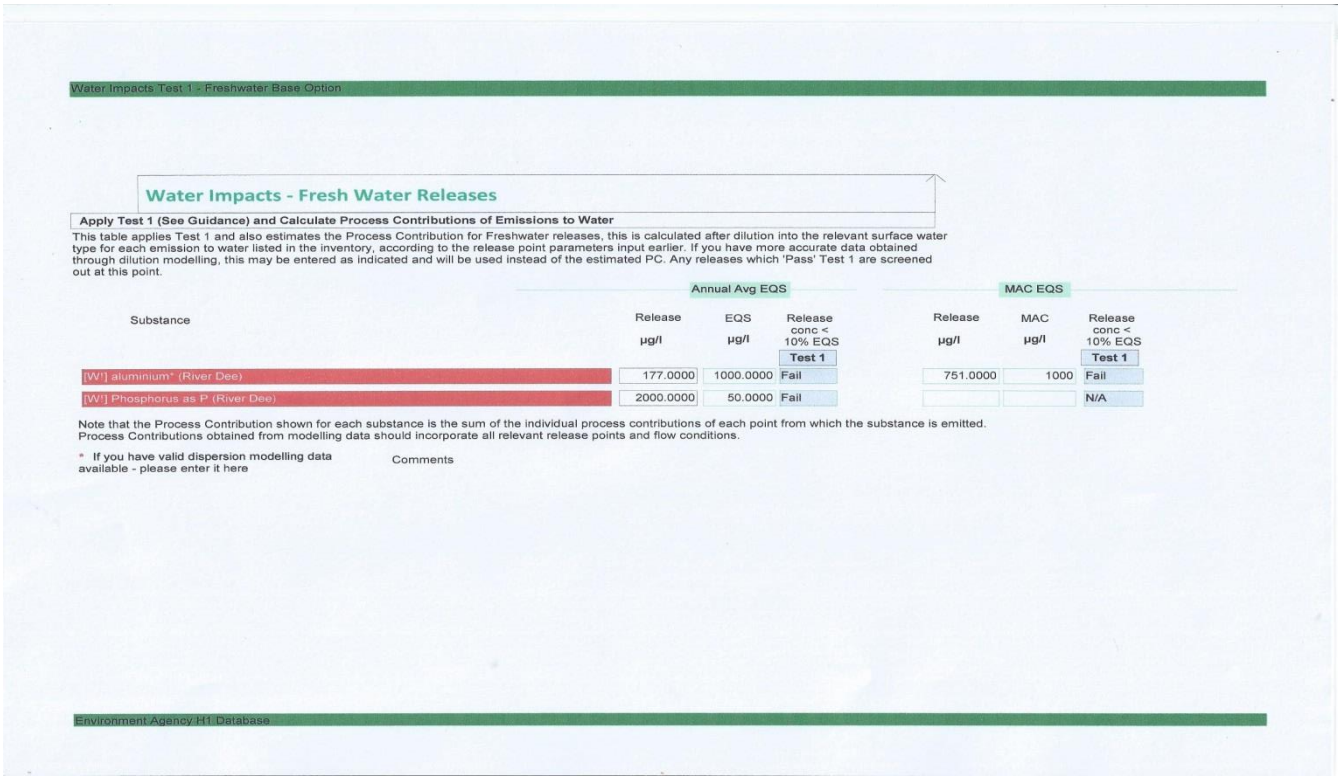
Conclusions

The use of Aluminium Chloride in the effluent plant at the levels required to control phosphate emission will not have a significant impact on the River Dee.

The permitted level of Phosphate emissions will not have a significant impact on the River Dee and even small breached of this will not have an adverse impact.

Appendix 1

Risk Assessment 1 Outcomes



Water Impacts Test 1 - Freshwater Base Option

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.

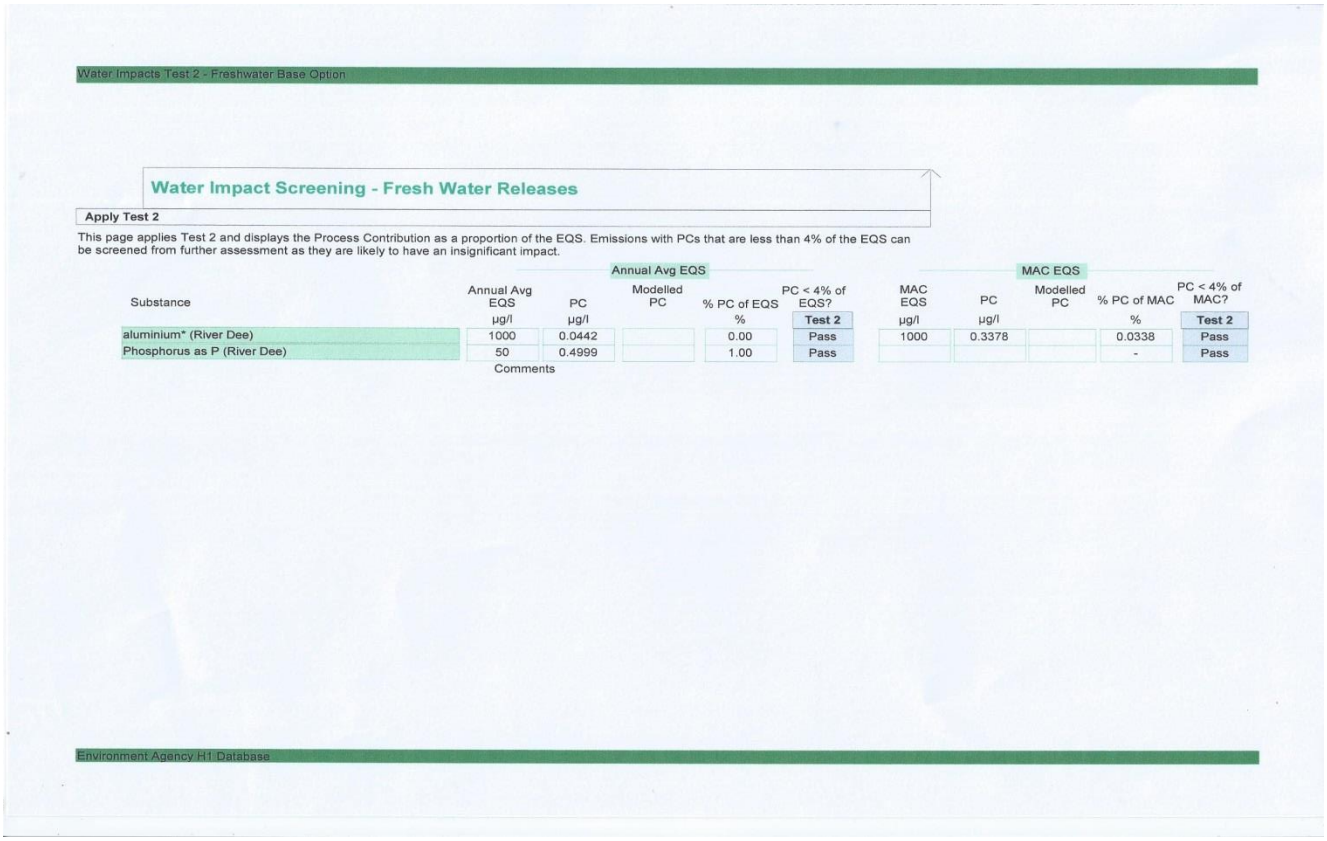
Substance	Annual Avg EQS Release µg/l	Annual Avg EQS EQS µg/l	Annual Avg EQS Release conc < 10% EQS Test 1	MAC EQS Release µg/l	MAC EQS MAC µg/l	MAC EQS Release conc < 10% EQS Test 1
[W!] aluminium* (River Dee)	177.0000	1000.0000	Fail	751.0000	1000	Fail
[W!] Phosphorus as P (River Dee)	2000.0000	50.0000	Fail			N/A

Note that the Process Contribution shown for each substance is the sum of the individual process contributions of each point from which the substance is emitted. Process Contributions obtained from modelling data should incorporate all relevant release points and flow conditions.

* If you have valid dispersion modelling data available - please enter it here

Comments

Environment Agency H1 Database



Water Impacts Test 2 - Freshwater Base Option

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.

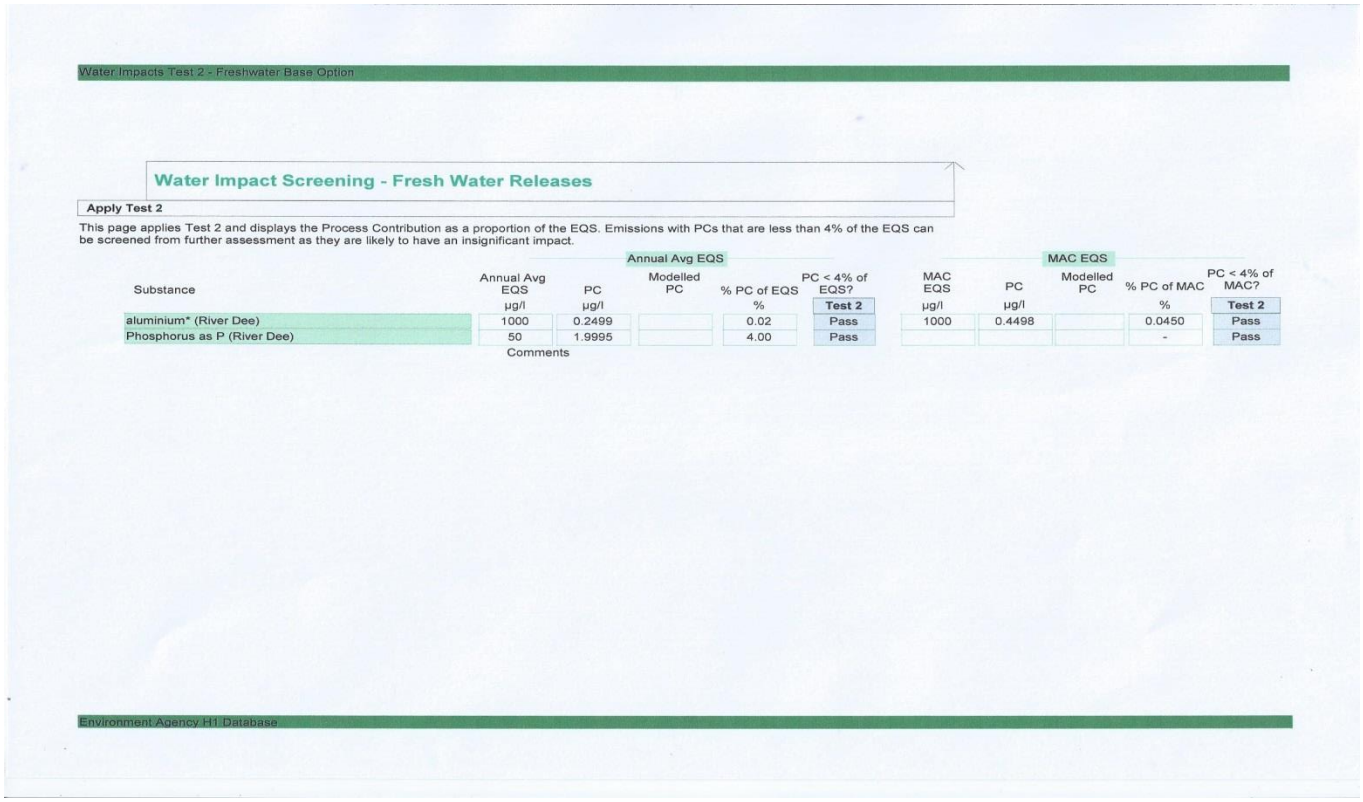
Substance	Annual Avg EQS EQS µg/l	Annual Avg EQS PC µg/l	Annual Avg EQS Modelled PC	Annual Avg EQS % PC of EQS %	Annual Avg EQS PC < 4% of EQS? Test 2	MAC EQS MAC EQS µg/l	MAC EQS PC µg/l	MAC EQS Modelled PC	MAC EQS % PC of MAC %	MAC EQS PC < 4% of MAC? Test 2
aluminium* (River Dee)	1000	0.0442		0.00	Pass	1000	0.3378		0.0338	Pass
Phosphorus as P (River Dee)	50	0.4999		1.00	Pass				-	Pass

Comments

Environment Agency H1 Database

Appendix 2

Risk Assessment 2 Outcomes



Water Impacts Test 2 - Freshwater Base Option

Water Impact Screening - Fresh Water Releases

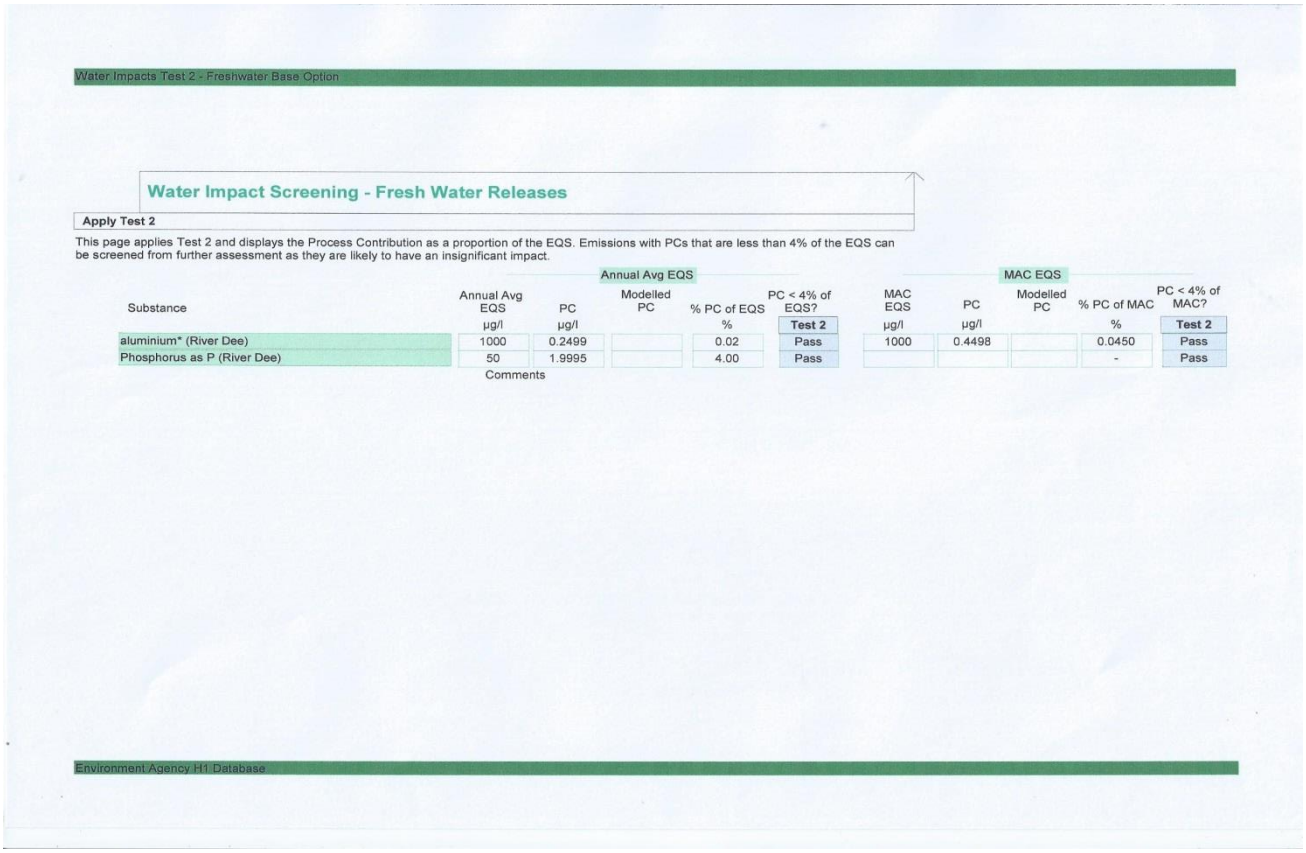
Apply Test 2

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	PC	Modelled PC	% PC of EQS	PC < 4% of EQS?	MAC EQS	PC	Modelled PC	% PC of MAC	PC < 4% of MAC?
	µg/l	µg/l		%	Test 2	µg/l	µg/l		%	Test 2
aluminium* (River Dee)	1000	0.2499		0.02	Pass	1000	0.4498		0.0450	Pass
Phosphorus as P (River Dee)	50	1.9995		4.00	Pass				-	Pass

Comments

Environment Agency H1 Database



Water Impacts Test 2 - Freshwater Base Option

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	PC	Modelled PC	% PC of EQS	PC < 4% of EQS?	MAC EQS	PC	Modelled PC	% PC of MAC	PC < 4% of MAC?
	µg/l	µg/l		%	Test 2	µg/l	µg/l		%	Test 2
aluminium* (River Dee)	1000	0.2499		0.02	Pass	1000	0.4498		0.0450	Pass
Phosphorus as P (River Dee)	50	1.9995		4.00	Pass				-	Pass

Comments

Environment Agency H1 Database