Permitting decisions

Variation

We have decided to grant the variation for Waste Water Treatment Plant operated by 2 Sisters Food Group Limited.

The variation number is EPR/CP3739FQ/V005.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- summarises the decision making process in the decision checklist to show how all relevant factors have been taken into account
- explains why we have also made an Environment Agency initiated variation
- shows how we have considered consultation responses

Unless the decision document specifies otherwise we have accepted the Operator's proposals.

Read the permitting decisions in conjunction with the environmental permit and the variation notice. The introductory note summarises what the variation covers.

Description of the changes introduced by the Variation

This is a Substantial Variation.

The site treats the effluent from the poultry processing sister site (*2 Sisters Food Group-Flixton TP3530BN).* The variation application is to increase the effluent discharge flow rate from the site's effluent treatment plant into a drainage ditch, a tributary of the River Waveney at discharge point W1. The increase is from 1200m^3/day (as a daily average) to 1900m^3/day (as a daily maximum volume). This increase has resulted in changes to the instantaneous maximum flow rate and emission limit value (ELV) for ammonia, BOD and phosphate and the inclusion of a flow rate.

Additionally all the variations have been consolidated and the permit has been updated to modern conditions as a part of the variation.

Key issues of the decision

Point Source Emissions to Water - Priority Hazardous Substances

The Operator's assessment followed our guidance "Surface Water Pollution Risk Assessment for your Environmental Permit", using theoretical concentrations based on the volume of sodium hydroxide used annually and the concentration levels (of mercury and cadmium) supplied by the manufacturer.

Theoretical values were previously used in determining impacts from the installation. Justification of this approach is supported with results of discharge and downstream surface water chemical analysis tests for cadmium and mercury (carried out by an independent certified laboratory). These were submitted with the variation application.

The Operator submitted a H1 screening tool, this is known as phase 1. As part of Phase 1, tests 1 and 2 for freshwater were completed for ammonia, cadmium, chloride and mercury. These are the parameters which are given emission limits under the existing permit. Ammonia, chloride and mercury screened out following completion of tests 1 and 2. Cadmium was taken through tests 3 and 4, which were passed.

However, we reviewed the Operators H1 assessment and found this was incorrectly completed; incorrect flow value, incorrect value for chloride, incorrect EQS limits for cadmium (the hardness of the watercourse was incorrect) and 2 sets of flows were used for the initial screening tests. They also included ammonia which cannot be run on the H1 tool. Once rerun, mercury and chloride screened out in the phase 1 screening tests while cadmium is screened out in the modelling tests, known as phase 2.

A process flow of the assessment is included in Annex 1. Our summary of the H1 screening is below.

H1 Screening (Phase 1)

Phase 1 consists of 4 tests and can only be carried out for chloride, cadmium and mercury. This looks at the impacts on Flixton Drain. Ammonia, BOD and phosphate need to be looked at in the 'Monte Carlo' tool (the Environment Agency's detailed water quality assessment tool, detailed later in this document).

Table 1 – Environmental quality standards

Substance	Annual Average (AA) EQS	Maximum Allowable Concentration (MAC) EQS
Chloride	250 mg/l	-
Cadmium*	0.25 µg/l	1.5 µg/l
Mercury	-	0.07 µg/l
*(hardness band of over 200mg/l $CaCO_3$)		

Test 1: Does the concentration of the substance in the discharge exceed 10% of the EQS?

If the concentration of the substance in the discharge is <10% of both AA and MAC EQS, the substance cannot cause more than 10% deterioration in the watercourse, even if it receives no dilution. If a substance causes less than 10% deterioration in the watercourse, it is not liable to cause pollution and is deemed insignificant with no further assessment required. Substances >10% of the EQS are potentially significant and should be carried forward to test 2.

Table 2 – Outcome of test 1

Substance	10% of EQS AA concentration	10% of EQS MAC	Release concentration	Potentially significant?
Chloride	25 mg/l	-	400 mg/l[1]	Yes
Cadmium	0.025 µg/l	0.15 µg/l	0.6 µg/l	Yes
Mercury	-	0.007 µg/l	0.1 µg/l	Yes
[1] Assessed based on existing permit limit				

Chloride, cadmium and mercury proceed to test 2.

Test 2: Does the Process Contribution (PC) exceed 4% of the EQS?

This step introduces the dilution available in the receiving watercourse. Process Contribution (PC) is the concentration of a discharged substance in the receiving water after dilution. River flow data and the daily discharge volume are therefore required for this calculation.

$$PC = \frac{(EFR \times RC)}{(EFR + RFR)}$$

If the PC exceeds 4% of either the AA or the MAC EQS, it is potentially significant and should be carried forward to tests 3 and 4. If it does not, the substance is insignificant and is screened out.

Table 3 – Calculation of process contribution

		Chloride	Cadmium	Mercury
EFR	Effluent Flow Rate (based on 1,900m^3/d)	0.0220 m^3/s	0.0220 m^3/s	0.0220 m^3/s
RC	Release Concentration in the effluent	400 mg/l	0.6 µg/l	0.1 µg/l
RFR	Q_{95} River Flow Rate (of Flixton Drain)	0.463 m^3/s	0.463 m^3/s	0.463 m^3/s
PC	Process Contribution	18.14 mg/l	0.0272 µg/l	0.00453 µg/l

Table 4 – Outcome of test 2

Substance	4% of EQS AA	4% of EQS MAC	PC	Potentially significant?
Chloride	10 mg/l	-	18.14 mg/l	Yes
Cadmium	0.01 µg/l	0.06 µg/l	0.0272 µg/l	Yes
Mercury	-	0.0028 µg/l	0.00453 µg/l	Yes

Chloride, cadmium and mercury are carried forward to tests 3 and 4.

Test 3: Does the difference between upstream quality and the Predicted Environmental Concentration (PEC) exceed 10% of the EQS?

Note: A substance must pass both tests 3 and 4 to be screened out.

This step introduces the existing concentration of the substances in the receiving watercourse, therefore requires upstream chemical quality data, or assumed upstream chemical quality data.

The PEC is the predicted concentration in the receiving water downstream of the discharge. As the dilution used in the calculation of the PC is more than 10:1 (21:1) the PEC can be calculated as a combination of the process contribution (PC) and background concentration (PEC = PC + BC).

If the difference between upstream quality and the PEC (i.e. the PC) is greater than 10% of the EQS, the substance is potentially significant and needs to be assessed in phase 2 modelling. If it is not, proceed to test 4.

Table 5 – Calculation of predicted environmental outcome

			Chloride	Cadmium	Mercury
PC	Process Contribution		18.14 mg/l	0.0272 µg/l	0.0046 µg/l
BC	Mean background (i.e. upstream) Concentration*	AA	125 mg/l	0.125 µg/l	--
		MAC	-	0.75 µg/l	0.035 µg/l
PEC	Predicted Environmental Concentration	AA	143.14 mg/l	0.153 µg/l	--
		MAC	-	0.778 µg/l	0.0395 µg/l
*(assumed 50% of AA and MAC EQS due to no background data available)					

Table 6 – Outcome of test 3

Substance	10% of EQS AA	10% of EQS MAC	PEC-BC AA	PEC-BC MAC	Pass?
Chloride	25 mg/l	-	18.14 mg/l	-	Yes
Cadmium	0.025 µg/l	0.15 µg/l	0.153 µg/l	0.778 µg/l	No
Mercury	-	0.007 µg/l	-	0.0395 µg/l	Yes

Cadmium has failed test 3, therefore phase 2 modelling is required. Chloride and mercury pass test 3 so are carried forwards to test 4.

Test 4: Does the PEC exceed the EQS in the receiving water downstream of the discharge?

This test assesses whether the discharge, when combined with the existing upstream water quality, will contribute to an EQS failure in the receiving water. It therefore takes account of in-combination effects with existing discharges. If the PEC exceeds the EQS, the substance is potentially significant and needs to be assessed in phase 2 modelling. If it is not exceeded, the substance is not liable to cause pollution and is screened out.

Table 7 – Outcome of test 4

Substance	MAC EQS	PEC	Pass?
Chloride	-	-	Yes
Mercury	0.07 µg/l	0.0395 µg/l	Yes

There is no Mac EQS for chloride. For mercury the PEC is below the MAC EQS. Chloride and mercury pass test 4 therefore no further assessment is required.

Is the significant load exceeded?

Additional screening is required for priority hazardous substances, mercury and cadmium in this case. Significant loads are annual loads which have been set for priority hazardous substances (PHS). These annual loads should not be exceeded in any individual discharge. The annual significant load limit for cadmium is 5 kg/year and for mercury is 1 kg/year.

If the significant load test is passed, and the substance was screened out in phase 1 screening, the substance can be screened out as insignificant and requires no control. If the significant load test is passed, but the substance failed phase 1 screening, it will pass to phase 2 modelling.

Based on the discharge parameters in table 3 above the significant load for cadmium is 0.416 kg/yr and 0.069 kg/yr for mercury. This is calculated assuming 100% operating mode. The application states that the discharge will occur for 5.7 days (81.4%), therefore a more reflective significant load would be 0.339 kg/yr for cadmium and 0.056 kg/yr for mercury. Both substances have passed the significant load test, however cadmium did not screen out during phase 1 therefore additional phase 2 modelling was required for cadmium.

Modelling (Phase 2)

Cadmium

Phase 2 modelling for cadmium consists of 3 tests. The River Waveney is the nearest WFD classified water body (Waveney (Starston Brook - Ellingham Mill) (GB105034045902)). Cadmium has been assessed at the point Flixton Drain meets the River Waveney.

Table 8 – input parameters for cadmium modelling in Monte Carlo

	Mean	Q95	SD	90th %ile	95th%ile
Upstream river flow[1]	252,979 m^3/d	40,003 m^3/d	-	-	-
Upstream quality[2] – Scenario 1	0.05 µg/l	-	0.04	0.0962 µg/l	0.125 µg/l
Upstream quality – Scenario 2	0.04 µg/l	-	0.04	0.0822 µg/l	0.125 µg/l
Discharge flow[3]	947 m^3/d	-	312.53	-	-
Discharge quality[4]	0.024 µg/l	-	0.019 µg/l	-	0.6 µg/l

[1] River Waveney flow at Flixton Drain

[2] Calculated using 50% of the AA EQS as a 95th%ile and a CoV of 1.0

[3] Calculated using 1,900m3/d as 99th%ile and a CoV of 0.33

[4] Mean and SD calculated using CoV of 0.8

Test 1 - Modelling test 1 - risk to EQS from load

The River Waveney upstream quality is calculated using a mean quality of 0.25 µg/l (50% of EQS) and a coefficient of variation (CoV) of 0.8 in scenario 1 and 1.0 in scenario 2.

The results of the Monte Carlo modelling are included in Annex 2. **Note -** Where figures are less than 0.1 within the inputs, all inputs (apart from flow inputs) have been multiplied by 100 for more accuracy in Monte Carlo.

The results show a release cadmium concentration of 0.6 µg/l. In scenario 1, the mean downstream quality is 0.0518 µg/l. The EQS downstream is not exceeded downstream. In scenario 2, the mean quality is 0.0419 µg/l, which again is lower than the EQS downstream. Both scenarios pass test 1.

In this case there is 100% confidence that the EQS is complied with. Tests passed for scenario 1 and scenario 2.

Additional sensitivity test (assuming downstream monitoring point concentration on Flixton Drain is regarding as upstream data)

Since downstream sample point is used as upstream data therefore looking at 700 m^3 for downstream flow as existing discharge already taken into account in sampling.

With a release cadmium concentration of 0.6 µg/l, the mean quality downstream of the discharge is 0.0318 µg/l. The EQS (0.25 µg/l) is therefore not exceeded downstream of the discharge and this modelling test is passed.

In this case there is no confidence (0.00%) that the standard was exceeded i.e. there is 100% confidence that the EQS is complied with. Test passed.

Test 2 – deterioration of receiving water quality

Determining whether the discharge causes upstream quality to deteriorate by more than 10% of the AA EQS (0.025 ug/l).

In scenario 1 the deterioration in the river is 0.0018 ug/l. In scenario 2 the deterioration is 0.0019 ug/l. Both scenarios are below 10% of the EQS and the modelling test has been passed. A numeric emission limit for cadmium is therefore not required on the permit.

Additional sensitivity test - Deterioration in the river = 0.0008 µg/l

The deterioration in the river therefore does not exceed 10% of the EQS and the modelling test has passed. A numeric emission limit is therefore not required on the permit.

Test 3 - Modelling test 3 - risk of effluent quality deteriorating significantly

Local issues may override the modelling outcomes and mean that a limit is required when the modelling has shown that one is not needed. It may be the case that only a small percentage of the permitted trade effluent into a sewage catchment have historically been used, and so using the current discharge quality there is no threat to EQS, or a significant deterioration in receiving water quality. However, if a greater proportion of the authorised trade effluent load were utilised, the load of hazardous pollutants in the sewage effluent may increase to the degree that there could be a significant deterioration, or even threat to the EQS in the receiving water.

There appears to be no external issues/influences to cause significant deterioration – test passed

Sanitary and Other Pollutants

The Operator submitted an assessment of sanitary and other pollutants and their impact on the receiving water. The H1 tool submitted used incorrect upstream data. We used Monte Carlo to model the limits for BOD and Ammonia and to look at a potential new phosphate limit.

We have used the Operator's calculated mean and standard deviation for ammonia, BOD and phosphate. The Monte Carlo screenshots are included in Annex 3.

The application was to increase the maximum discharge from 1,200m3/d to 1,900m3/d. We based the receiving river quality on a downstream sample point as this was the most appropriate sample point. Therefore, the impacts of the existing discharge were already included in that sample point data. This is explained in more detail below. For the modelling simulations we took the additional volume applied for in to account, 700 m^3/day.

Table 9 - Discharge Data

Parameter	Flow	Ammonia	BOD	Phosphate
Flow: Mean*	348.91 m^3/d	-	-	-
Flow: SD*	115.14 m^3/d	-	-	-
Quality: Mean	-	0.4888 µg/l	3.48 µg/l	0.2904 µg/l
Quality: SD	-	0.2174 µg/l	2.7857 µg/l	0.2375 µg/l
* calculated using Monte Carlo with 700m3/d at the 99^{th}%ile and a CoV of 0.33				

Selecting sample point for upstream river data

There was a choice of 2 sample points which could have been used for upstream data input. From the point where the Flixton Drain discharges into the River Waveney:

- Sample point WAV050 is 10 km upstream. There are 4 different sewage works and other permitted discharges downstream of the sampling point, therefore deemed unsuitable.
- Sample point WAV114 is 2.5 km downstream. Therefore, is considered suitable sampling point to use. Ammonia, BOD and Phosphate upstream mean and SD values have been taken from this monitoring point.

Under WFD, the River Waveney is a Type 7 for ammonia and BOD, the river falls into the Lowland & High Alkalinity typology. For phosphorus (nutrients) it falls into Type 3n. The WFD (waterbody GB 105034 045902) classifications are; ammonia is in high class, BOD is in high class and phosphate in good class. The overall class is moderate. This is based on 2013 baseline data. This is echoed by the WAV114 monitored data.

Table 10 - Upstream Data – based on WAV114

Parameter	Flow	Ammonia	BOD	Phosphate
Flow: Mean	252,979.2	-	-	-
Flow: Q95	40,003.2	-	-	-
Quality: Mean	-	0.048115	1.219048	0.078154
Quality: SD	-	0.040891	1.444984	0.036233
Quality: 90^{th} %ile	-	0.0943	2.61	0.1248

Modelling outcome

There are 5 steps in assessing the impacts of the discharge on the waterbody. The impacts should aim to meet all these criteria.

1 – No deterioration of mean quality

2 – 10% deterioration of the mean quality

3 – No deterioration of the 90th %ile

4 – 10% deterioration of the 90th %ile

5 – Deterioration to WFD class limit

The results of the tests can be seen in Annex 4. Tables 11, 13 and 15 show the outcome of the modelling. Tables 12, 14 and 16 show what the discharge quality would need to be to meet the tests which are not met.

The calculated discharge limits that are needed to prevent deterioration by more than 10% of EQS in some cases can be too tight for the operator to comply with. If an acceptable amount of EQS deterioration is not achievable in the receiving small watercourse, we will usually expect the effluent to be treated to BAT standards or, where BAT is not available, the best technically feasible option should be used. It may be acceptable to allow more than 10% deterioration of the EQS in a watercourse, providing the downstream "main river" is not adversely impacted. In this situation, a permit limit protective of the main watercourse should be applied to the permit.

All situations are site-specific, and depend upon the status of the receiving water and any susceptible/ protected biota which may be present. However, it is important to note that to be compliant with WFD requirements for surface waters, no more than 15% of the water body should be allowed to be in worse condition that the overall status of the water body.

It's not possible to look at deterioration within the Flixton Drain as it is not classified as either high, good, moderate or poor. This stream is a non WFD watercourse. We would not normally look at the effects on this non-WFD tributary and in fact can allow deterioration if it meets the class objectives on the WFD waterbody downstream.

Ammonia Conclusion

Table 11 – Modelling outcome

Parameter	Upstream	Downstream	Deterioration
Quality: Mean	0.048115	0.0498	3.5%
Quality: 90th %ile	0.0943	0.0947	0.4%
WFD Classification	High	High	No change

This shows that tests **2**, **4** and **5** are met. The table below indicates the discharge quality needed to meet tests **1** and **3**.

Table 12 – Quality required to need tests

Step 1	Step 3
Not possible	0.66 mg/l (as a 95%ile)

To meet the tests a discharge limit of between 0.66 mg/l and 81.35 mg/l would be required. However, the permit includes a limit of 15mg/l, this should not be relaxed as it is an achievable limit. A limit of 15mg/l would be sufficient to meet test 5. However, to maintain a constant load (the total mass of ammonia entering the water body) the limit will be reduced to 10mg/l. This is still an achievable limit for a treatment plant of this nature and is deemed to be reasonable.

BAT and industry standards recommends a limit between 3 mg/l and 15 mg/l. Therefore a limit of 10mg/l would be in line with BAT.

BOD Conclusion

Table 13 – Modelling outcome

Parameter	Upstream	Downstream	Deterioration
Quality: Mean	1.22	1.24	1.7%
Quality: 90^{th} %ile	2.61	2.59	-0.8% (improvement)
WFD Classification	High	High	No change

This shows that tests **2**, **3**, **4** and **5** are met. The table below indicates the discharge quality needed to meet test **1**. Meeting test 1 is not possible unless the upstream quality is improved.

However, the permit includes a limit of 20mg/l, this should not be relaxed as it is an achievable limit. A limit of 20 mg/l would be sufficient to meet 4 of the tests. However, to maintain a constant load (the total mass of BOD entering the water body) the limit will be reduced to 15 mg/l. This is still an achievable limit for a treatment plant of this nature and is deemed to be reasonable.

Phosphate Conclusion

Table 14 – Modelling outcome

Parameter	Upstream	Downstream	Deterioration
Quality: Mean	0.078154	0.0792	1.34%
Quality: 90^{th} %ile	0.1248	0.1461	-0.08% (improvement)
WFD Classification	Good	Good	No change

This shows that tests **2**, **3, 4** and **5** are met. It is not possible to meet test **1** without improving the upstream quality.

An annual average limit of 1mg/l is achievable and has been set in the varied permit.

Decision checklist

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified information provided as part of the application that we consider to be confidential.
Consultation	
Consultation	The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement. The application was publicised on the GOV.UK website. We consulted the following organisations: • Local Authority Environmental Protection Department • Director of Public Health • Public Health England The comments and our responses are summarised in the consultation section.
The site	
Biodiversity, heritage, landscape and nature conservation	The application is not within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat with respect to discharges to water. There are several international and UK designations within the relevant distance criteria with respect to air emissions but as there are no changes to air emissions these have not been assessed.
Environmental risk assessment	
Environmental risk	We have reviewed the operator's assessment of the environmental risk from the facility. The operator's risk assessment was unsatisfactory and required additional Environment Agency assessment. See key issues above.
Operating techniques	
General operating techniques	We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility. The principles of S5.06 are applied to non-hazardous waste operation facilities. The operating techniques that the Operator must use are specified in table S1.2 in the environmental permit.
Operating techniques for emissions that do not screen out as insignificant	We have decided that emission limits should be set for the parameters listed in the permit. With respect to point source emissions to water (other than sewer), the following substances have previously been identified as being emitted in

Aspect considered	Decision
	significant quantities and ELVs have previously been set for those substances. • Ammoniacal Nitrogen – 10 mg/l • Phosphate – 1 mg/l • Suspended Solids – 25 mg/l • Biological Oxygen Demand – 15 mg/l • Total mercury – 0.1 µg/l • Total cadmium – 0.6 µg/l • Flow – 1,900 m^3/d It is considered that, following the increase in discharge flow proposed in the variation, the ELVs described above will ensure that significant pollution of the environment is prevented and a high level of protection for the environment secured. The proposed techniques/emission levels for emissions are in line with the techniques and benchmark levels contained in the technical guidance and we consider them to represent appropriate techniques for the facility. The permit conditions ensure compliance with relevant BREFs and ELVs deliver compliance with BAT-AELs. We consider that the emission limits included in the installation permit reflect the BAT for the sector.
Permit conditions	
Updating permit conditions during consolidation	We have updated permit conditions to those in the current generic permit template as part of permit consolidation. The conditions will provide the same level of protection as those in the previous permit(s).
Use of conditions other than those from the template	Based on the information in the application, we consider that we do not need to impose conditions other than those in our permit template.
Raw materials	We have specified limits and controls on the use of raw materials and fuels. Sodium Hydroxide - <0.3ppm mercury and <0.1ppm cadmium.
Waste types	We have specified the permitted waste types, descriptions and quantities, which can be accepted at the regulated facility. We are satisfied that the operator can accept these wastes for the following reasons: • they are suitable for the proposed activities • the proposed infrastructure is appropriate • the environmental risk assessment is acceptable. The annual throughput has been capped at 562,000 tonnes as indicated in the application: Total weekly process water = 10,791 m^3 per week. Therefore 561,132 tonnes per year based on 52 weeks. This does not restrict the current processing capacity.
Emission limits	ELVs or equivalent parameters or technical measures based on BAT have been added and amended. It is considered that these limits described in

Aspect considered	Decision
	key issues will prevent significant deterioration of receiving waters. We have imposed these limits because either a relevant environmental quality or operational standard requires this.
Monitoring	We have decided that monitoring should be added and amended to ensure that the permit can achieve the emission limit values and meet BAT requirements.
Reporting	We have decided that reporting should be added and amended to ensure that the permit can achieve the emission limit values and meet BAT requirements.
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

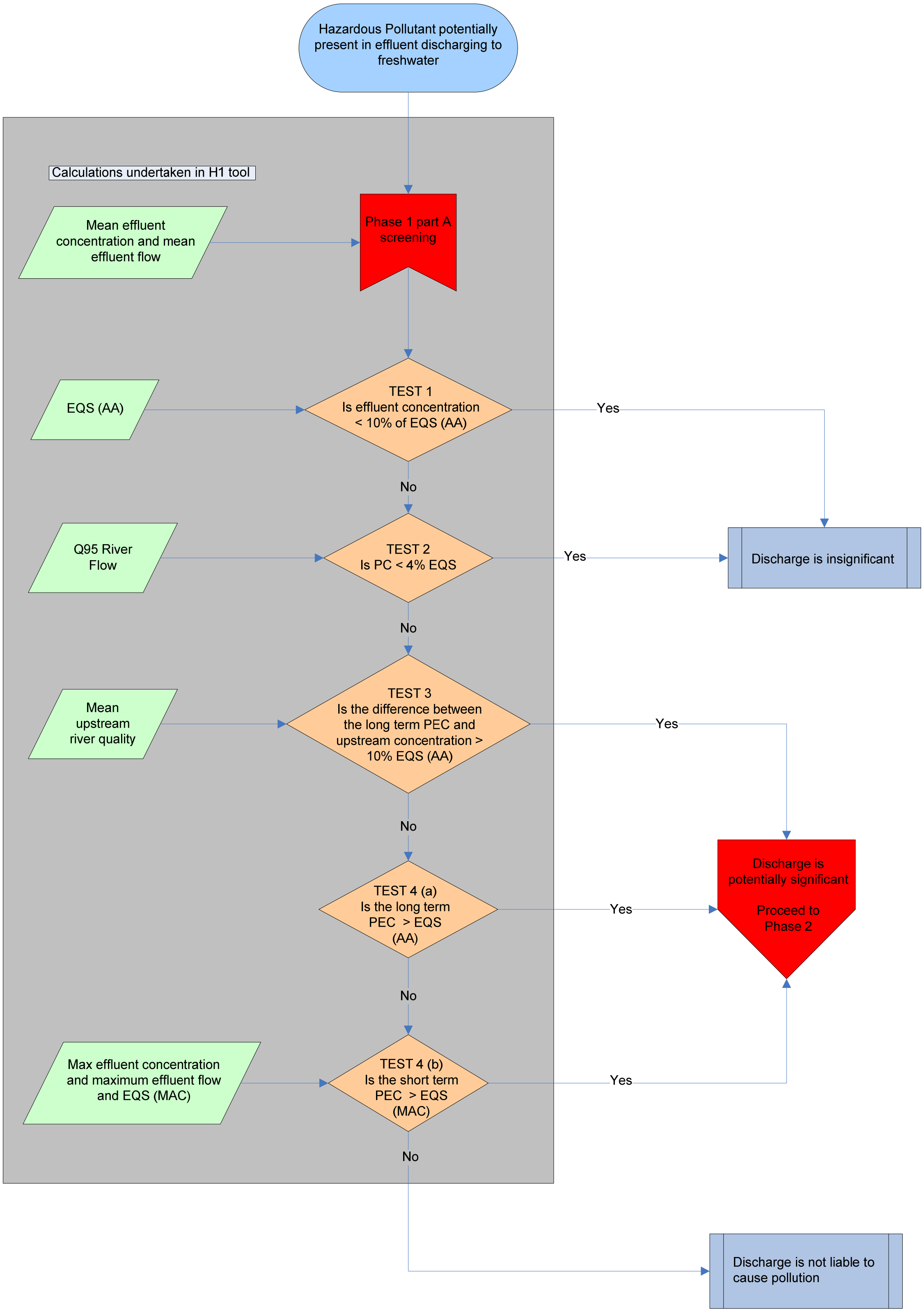
Consultation

The following summarises the responses to consultation with other organisations, our notice on GOV.UK for the public and the way in which we have considered these in the determination process.

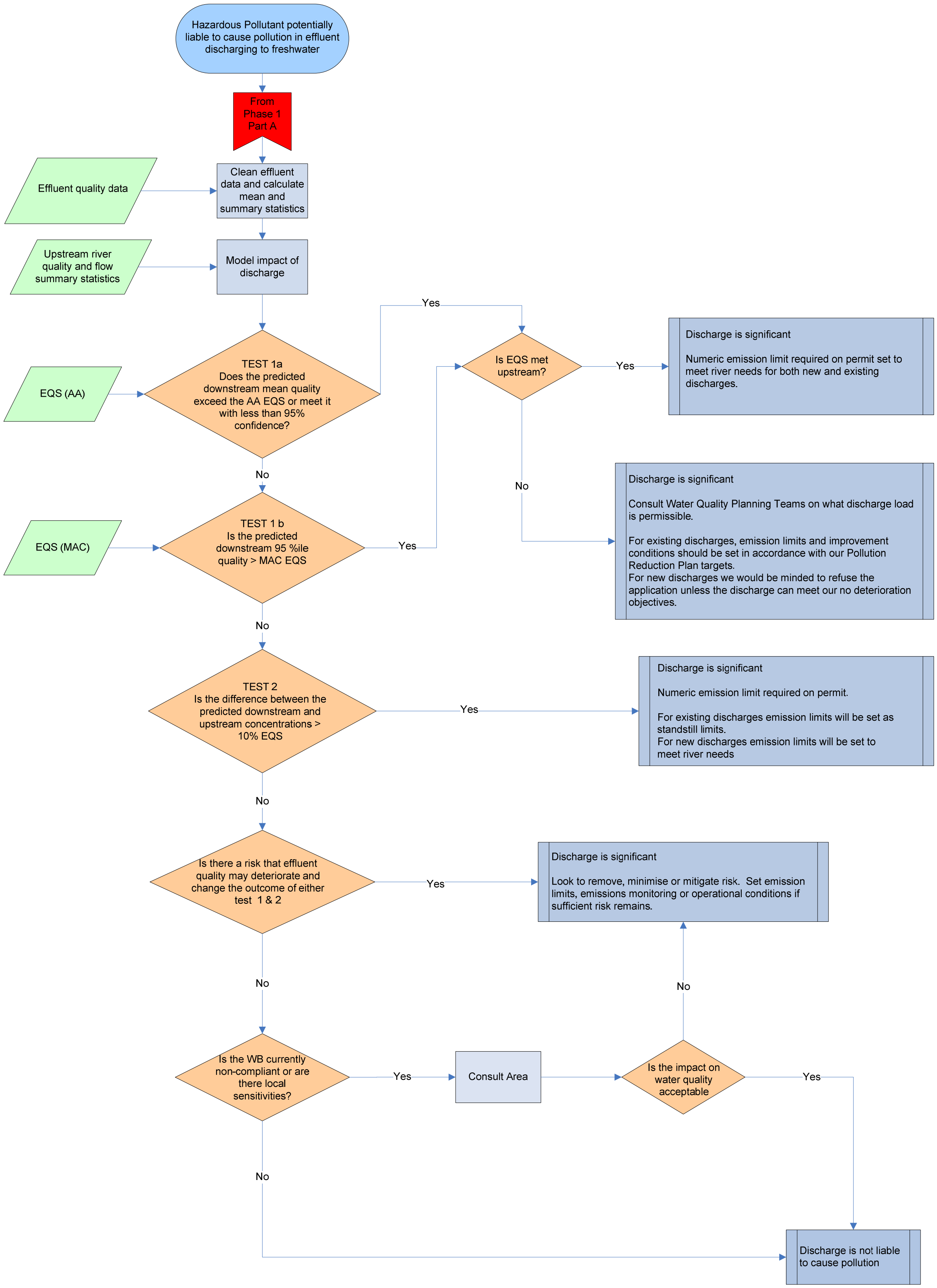
Responses from organisations listed in the consultation section

Response received from
Public Health England
Brief summary of issues raised
No significant concerns raised providing the Operator takes all appropriate measures to prevent or control pollution in accordance with relevant sector technical guidance or industry best practice. Recommend conditions to ensure emissions don’t impact public health in relation to odour and associated handling/storage of suspended solids waste.
Summary of actions taken or show how this has been covered
The increase in discharge has been assessed to ensure environmental protection in line with our guidance and best available techniques. Conditions and emission limits have been set accordingly.

Annex 1 – H1 screening



Annex 2 – modelling cadmium



Annex 3 - Cadmium modelling on the River Waveney, Monte Carlo screenshots

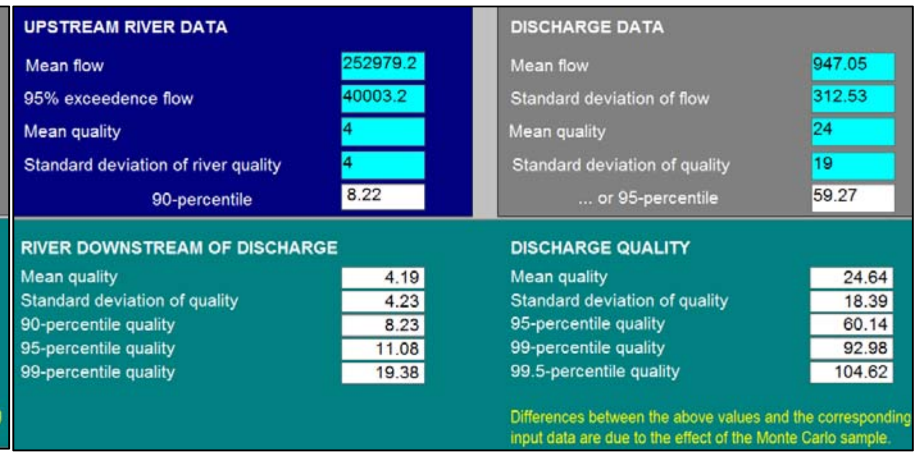
Effluent discharge flow calculation

Test 1 Scenario 1 – using CoV of 0.8

UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	947.05
95% exceedence flow	40003.2	Standard deviation of flow	312.53
Mean quality	5	Mean quality	24
Standard deviation of river quality	4	Standard deviation of quality	19
90-percentile	9.62	... or 95-percentile	59.27
RIVER DOWNSTREAM OF DISCHARGE		**DISCHARGE QUALITY**	
Mean quality	5.18	Mean quality	24.64
Standard deviation of quality	4.13	Standard deviation of quality	18.39
90-percentile quality	9.61	95-percentile quality	60.14
95-percentile quality	12.38	99-percentile quality	92.98
99-percentile quality	19.81	99.5-percentile quality	104.62

Differences between the above values and the corresponding input data are due to the effect of the Monte Carlo sample.

Test 1 Scenario 2 – Using CoV of 1.0



UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	947.05
95% exceedence flow	40003.2	Standard deviation of flow	312.53
Mean quality	4	Mean quality	24
Standard deviation of river quality	4	Standard deviation of quality	19
90-percentile	8.22	... or 95-percentile	59.27
RIVER DOWNSTREAM OF DISCHARGE		**DISCHARGE QUALITY**	
Mean quality	4.19	Mean quality	24.64
Standard deviation of quality	4.23	Standard deviation of quality	18.39
90-percentile quality	8.23	95-percentile quality	60.14
95-percentile quality	11.08	99-percentile quality	92.98
99-percentile quality	19.38	99.5-percentile quality	104.62

Differences between the above values and the corresponding input data are due to the effect of the Monte Carlo sample.

EQS confirmed using the "Compliance with mean standards" test

Assessment of compliance with Mean Standard

Name of Site	2 Sisters - Flixton
Sampling Period	
Determinand	Cadmium
Mean quality	0.0518
Standard deviation	0.0413
Number of samples	17
Mean standard	0.25
Mean	0.05
Optimistic 95% confidence limit	0.03
Pessimistic 95% confidence limit	0.07
Confidence that the standard was exceeded	0.00 %

Assessment of compliance with Mean Standard

Name of Site	2 Sisters - Flixton
Sampling Period	
Determinand	Cadmium
Mean quality	0.0419
Standard deviation	0.0423
Number of samples	17
Mean standard	0.25
Mean	0.04
Optimistic 95% confidence limit	0.02
Pessimistic 95% confidence limit	0.06
Confidence that the standard was exceeded	0.00 %

Additional sensitivity test (assuming downstream monitoring point concentration on Flixton Drain is regarding as upstream data)

UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	348.91
95% exceedence flow	40003.2	Standard deviation of flow	115.41
Mean quality	3.1	Mean quality	24
Standard deviation of river quality	2.05	Standard deviation of quality	19
90-percentile	5.59	... or 95-percentile	59.27

RIVER DOWNSTREAM OF DISCHARGE		DISCHARGE QUALITY	
Mean quality	3.18	Mean quality	24.64
Standard deviation of quality	2.10	Standard deviation of quality	18.39
90-percentile quality	5.60	95-percentile quality	60.14
95-percentile quality	6.95	99-percentile quality	92.98
99-percentile quality	10.45	99.5-percentile quality	104.62

Differences between the above values and the corresponding input data are due to the effect of the Monte Carlo sample.

EQS confirmed using the "Compliance with mean standards" test

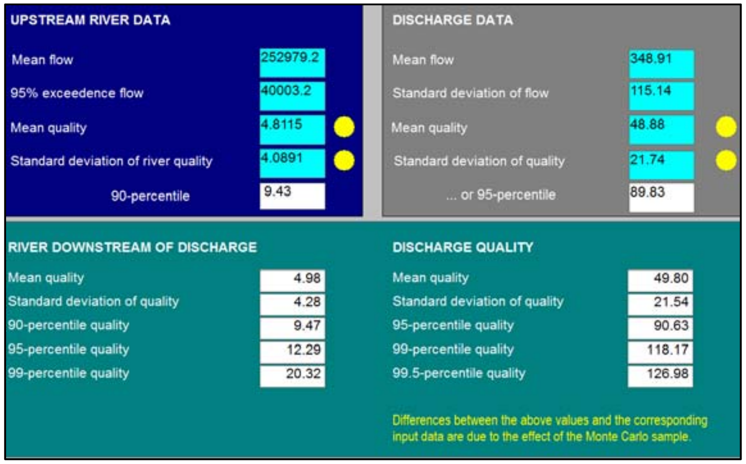
Assessment of compliance with Mean Standard

Name of Site	2 Sisters - Flixton
Sampling Period	
Determinand	Cadmium
Mean quality	0.0318
Standard deviation	0.0210
Number of samples	12
Mean standard	0.25
Mean	0.03
Optimistic 95% confidence limit	0.02
Pessimistic 95% confidence limit	0.04
Confidence that the standard was exceeded	0.00 %

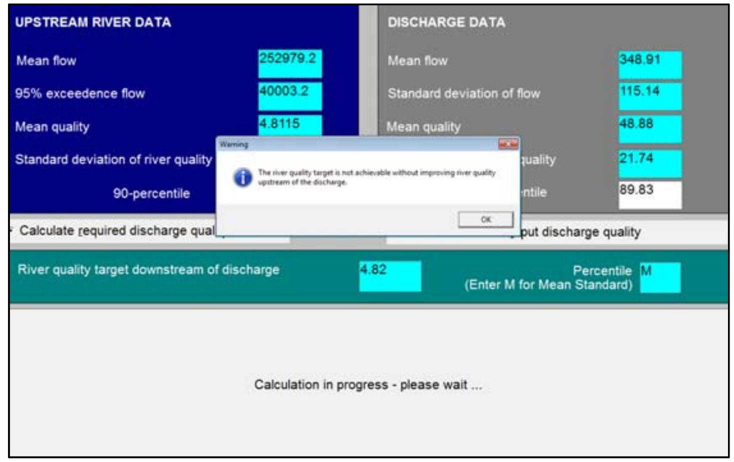
Annex 4 – Sanitary pollutants modelling on the River Waveney, Monte Carol results

<u>Ammonia</u>

As some values are lower than 0.1, values have been multiplied by 100.



Impact of discharge.



No deterioration of mean not possible unless quality improves

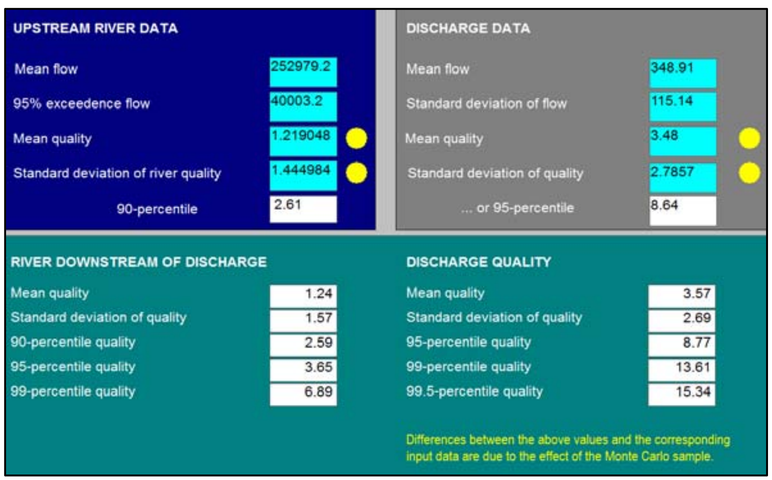
10% deterioration of the mean target

No deterioration of the 90%ile target.

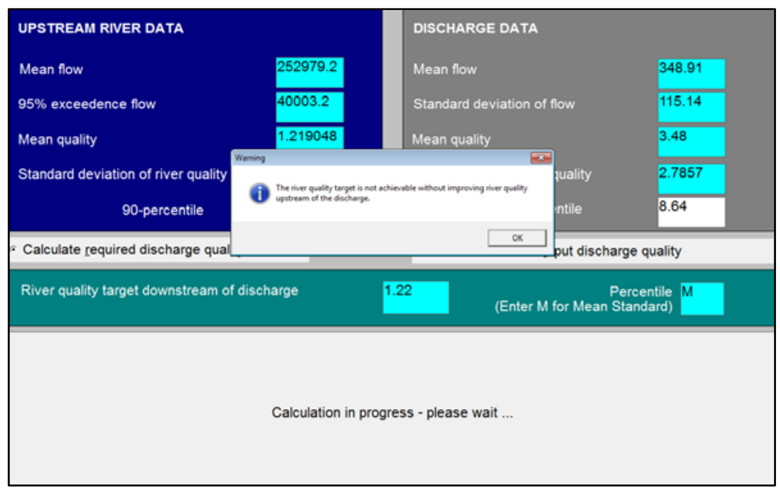
10% deterioration of the 90%ile target.

Deterioration to WFD high class status of 0.3mg/l.

BOD calculation



Impact of discharge.



No deterioration of mean not possible unless quality improves.

UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	348.91
95% exceedence flow	40003.2	Standard deviation of flow	115.14
Mean quality	1.219048	Mean quality	3.48
Standard deviation of river quality	1.444984	Standard deviation of quality	2.7857
90-percentile	2.61	... or 95-percentile	8.64

RIVER DOWNSTREAM OF DISCHARGE		DISCHARGE QUALITY NEEDED	
Mean quality	1.34	Mean quality	41.39
Standard deviation of quality	1.57	Standard deviation of quality	31.21
90-percentile quality	2.68	95-percentile quality	101.62
95-percentile quality	3.69	99-percentile quality	157.70
99-percentile quality	6.93	99.5-percentile quality	177.64
Quality target (Mean)	1.34		

10% deterioration of the mean target.

UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	348.91
95% exceedence flow	40003.2	Standard deviation of flow	115.14
Mean quality	1.219048	Mean quality	3.48
Standard deviation of river quality	1.444984	Standard deviation of quality	2.7857
90-percentile	2.61	... or 95-percentile	8.64

RIVER DOWNSTREAM OF DISCHARGE		DISCHARGE QUALITY NEEDED	
Mean quality	1.28	Mean quality	19.07
Standard deviation of quality	1.57	Standard deviation of quality	14.38
90-percentile quality	2.62	95-percentile quality	46.82
95-percentile quality	3.66	99-percentile quality	72.66
99-percentile quality	6.91	99.5-percentile quality	81.85
Quality target (90-percentile)	2.62		

No deterioration of the 90%ile target.

UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	348.91
95% exceedence flow	40003.2	Standard deviation of flow	115.14
Mean quality	1.219048	Mean quality	3.48
Standard deviation of river quality	1.444984	Standard deviation of quality	2.7857
90-percentile	2.61	... or 95-percentile	8.64

RIVER DOWNSTREAM OF DISCHARGE		DISCHARGE QUALITY NEEDED	
Mean quality	1.47	Mean quality	92.92
Standard deviation of quality	1.59	Standard deviation of quality	70.07
90-percentile quality	2.87	95-percentile quality	228.11
95-percentile quality	3.90	99-percentile quality	353.99
99-percentile quality	6.98	99.5-percentile quality	398.75
Quality target (90-percentile)	2.87		

10% deterioration of the 90%ile target.

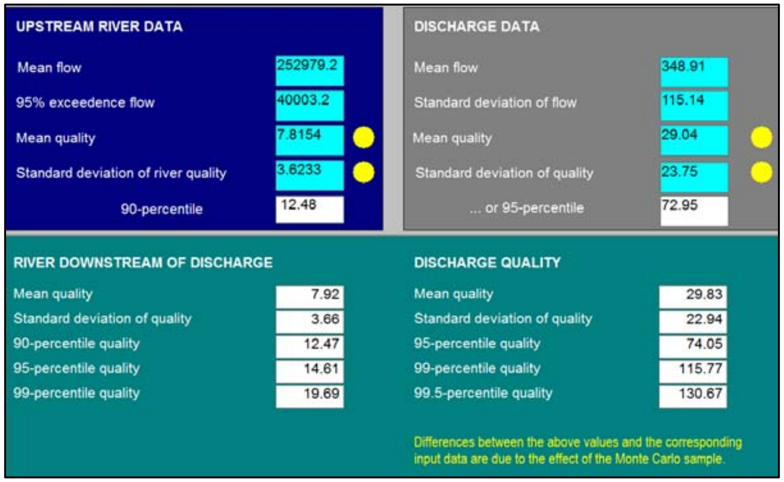
UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	348.91
95% exceedence flow	40003.2	Standard deviation of flow	115.14
Mean quality	1.219048	Mean quality	3.48
Standard deviation of river quality	1.444984	Standard deviation of quality	2.7857
90-percentile	2.61	... or 95-percentile	8.64

RIVER DOWNSTREAM OF DISCHARGE		DISCHARGE QUALITY NEEDED	
Mean quality	2.05	Mean quality	317.75
Standard deviation of quality	1.83	Standard deviation of quality	239.61
90-percentile quality	4.00	95-percentile quality	780.07
95-percentile quality	5.21	99-percentile quality	1210.5
99-percentile quality	8.76	99.5-percentile quality	1363.6
Quality target (90-percentile)	4.00		

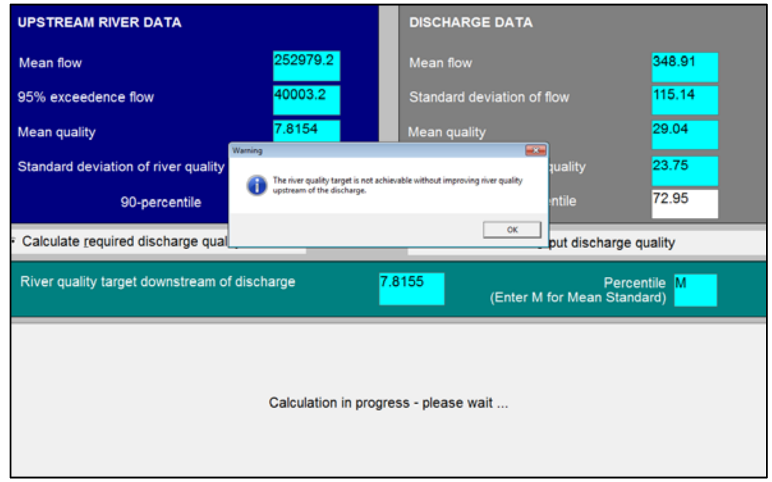
Deterioration to WFD high class status limit of 4.00mg/l.

Phosphate calculation

As some values are lower than 0.1, values have been multiplied by 100.



Impact on the mean and 90%ile.



No deterioration of the mean is not possible unless quality improves.

10% deterioration of the mean target.

Deterioration of 90%ile target.

UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	348.91
95% exceedence flow	40003.2	Standard deviation of flow	115.14
Mean quality	7.8154	Mean quality	29.04
Standard deviation of river quality	3.6233	Standard deviation of quality	23.75
90-percentile	12.48	... or 95-percentile	72.95

RIVER DOWNSTREAM OF DISCHARGE		DISCHARGE QUALITY NEEDED	
Mean quality	8.79	Mean quality	369.70
Standard deviation of quality	3.80	Standard deviation of quality	284.30
90-percentile quality	13.73	95-percentile quality	917.84
95-percentile quality	15.74	99-percentile quality	1435.0
99-percentile quality	20.68	99.5-percentile quality	1619.8
Quality target (90-percentile)	13.73		

10% deterioration of the 90%ile target.

UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	348.91
95% exceedence flow	40003.2	Standard deviation of flow	115.14
Mean quality	7.8154	Mean quality	29.04
Standard deviation of river quality	3.6233	Standard deviation of quality	23.75
90-percentile	12.48	... or 95-percentile	72.95

RIVER DOWNSTREAM OF DISCHARGE		DISCHARGE QUALITY NEEDED	
Mean quality	12.00	Mean quality	1619.3
Standard deviation of quality	6.18	Standard deviation of quality	1245.3
90-percentile quality	19.56	95-percentile quality	4020.3
95-percentile quality	23.58	99-percentile quality	6285.6
99-percentile quality	32.65	99.5-percentile quality	7094.8
Quality target (Mean)	12.00		

Deterioration to WFD good class limit of 0.12 mg/l AA.

UPSTREAM RIVER DATA		DISCHARGE DATA	
Mean flow	252979.2	Mean flow	348.91
95% exceedence flow	40003.2	Standard deviation of flow	115.14
Mean quality	7.8154	Mean quality	29.04
Standard deviation of river quality	3.6233	Standard deviation of quality	23.75
90-percentile	12.48	... or 95-percentile	72.95

RIVER DOWNSTREAM OF DISCHARGE		DISCHARGE QUALITY NEEDED	
Mean quality	25.00	Mean quality	6679.5
Standard deviation of quality	21.23	Standard deviation of quality	5136.6
90-percentile quality	48.32	95-percentile quality	16583.3
95-percentile quality	65.04	99-percentile quality	25927.4
99-percentile quality	107.48	99.5-percentile quality	29265.1
Quality target (Mean)	25.00		

Deterioration to WFD moderate class for the River Waveney as a whole.