



# Drinking Water Inspectorate

GUIDANCE ON ASSESSING RISK FROM *CRYPTOSPORIDIUM* OOCYSTS

IN TREATED WATER SUPPLIES

TO SATISFY

THE WATER SUPPLY (WATER QUALITY) (AMENDMENT) REGULATIONS 1999

SI 1524

## Contents

		Page
1	Introduction	3
2	Risk assessment	3
3	Reporting the risk assessment	4
Annex A	Factors which could contribute to the risk of <i>Cryptosporidium</i> oocysts in the final water	5
Annex B	Risk assessment report	7

## 1 Introduction

1.1 The Water Supply (Water Quality) (Amendment) Regulations 1999 require water companies to carry out a risk assessment for each of their treatment works in accordance with guidance issued by the Secretary of State to establish whether there is a significant risk from *Cryptosporidium* oocysts in water supplied from the works and to submit a report of the assessment to the Secretary of State. At each works where there is a significant risk, the Regulations require water companies to sample continuously for *Cryptosporidium* oocysts.

1.2 This document provides guidance for the initial risk assessment that water companies should undertake to identify water treatment works where there is a significant risk from *Cryptosporidium* oocysts in the final water.

1.3 A key element in providing protection for public health is the assessment of risk from *Cryptosporidium*. Risk assessment for water catchments should cover anything in the catchment area that has the potential to allow *Cryptosporidium* into the raw water. At the treatment works it should cover any factors which indicate an inadequate barrier to *Cryptosporidium*, or could contribute to *Cryptosporidium* breaking through filters, or which fail to alert treatment staff to filter breakthrough.

1.4 It is not possible to establish in detail a universal method of defining significant risk. This is because circumstances will be different at each treatment works and detailed local knowledge of the catchment and the

treatment is necessary to carry out the risk assessment and this information is available only to the water companies.

1.5 Risk assessment needs to be reviewed from time to time to take into account the possible effect of any changes in the catchment area and at the treatment works. In addition, the Regulations make provision for the Secretary of State to require by notice a formal review of the risk assessment. The time-scale and format for this review will be included in further guidance to be issued in due course. This Guidance will take into account experience gained from this initial review. The Regulations also make provision for a water company to carry out a review of its risk assessment at works where there was a significant risk. Water companies are likely to wish to use this provision at works where oocysts are not detected within a certain period. Advice on the use of this provision will also be included in further guidance.

## 2 Risk Assessment

2.1 Water companies must carry out a risk assessment for each of their water treatment works taking into account the factors listed in Annex A. However, for the purposes of the Regulations, the Secretary of State considers that the following water treatment works should in all cases (other than 2.2 below) be classified as constituting a significant risk.

- i) Direct abstraction or with average storage of seven days or less from a river or stream.
- ii) Evidence of rapid river or surface water connection to the aquifer demonstrated by the confirmed presence of faecal coliform bacteria in the raw water.
- iii) Past history of an outbreak of cryptosporidiosis associated with the water supply where the reason is unexplained and no specific steps have been taken to prevent a recurrence.

2.2 Any treatment works, in which all water passes through sufficient treatment plant capable of continuously removing or retaining particles greater than one micron diameter and where this process is subject to continuous monitoring and shutdown or turn out on failure, will not require continuous monitoring irrespective of other factors, including 2.1 (i), (ii) and (iii) above.

2.3 The Drinking Water Inspectorate on behalf of the Secretary of State will consider each risk assessment and will check that all water companies have satisfactorily carried out the risk assessment process in accordance with this Guidance and in a thorough, consistent and defensible basis, such that sources constituting a significant risk will not have been excluded from the requirements of the Regulations. The Secretary of State will notify each water company whether he is satisfied that it has carried out its risk assessment on this basis.

2.4 At works identified as at significant risk a water company may choose to comply with paragraph 2.2 above rather than install continuous sampling provided it adheres to a timetable agreed with DWI for the installation of such treatment plant.

2.5 Where a water company identifies a treatment works where there is a significant risk from *Cryptosporidium* oocysts in water supplied from the works and installs continuous sampling for *Cryptosporidium* oocysts in accordance with the Regulations but complies subsequently with paragraph 2.2 above, it shall not be required to maintain continuous sampling

### **3 Reporting the risk assessment**

3.1 For each of their water treatment works, water companies must respond to and, where necessary supply additional information on, those of the factors listed in sections 2-8 of Annex B that apply to the particular catchment and treatment works and adding any other factors that are important locally.

3.2 Water companies must then complete the assessment conclusion and an appropriate company representative must sign and date the report.

3.3 Each risk assessment will be considered by the Drinking Water Inspectorate, acting on behalf of the Secretary of State. Water companies will be notified of the result of this consideration within one month of receipt.

3.4 If a risk assessment has not been satisfactorily carried out, a reason for the rejection will be given and the water company will be expected to resubmit a revised version within one month of receipt of the Inspectorate's notification. If the Inspectorate considers that the revised risk assessment is still unsatisfactory it will require the company to install continuous monitoring at that treatment works and for this to remain in operation unless a satisfactory risk assessment by a consultant approved by the Inspectorate has demonstrated that the works is not at significant risk.

**FACTORS WHICH COULD CONTRIBUTE TO THE RISK FROM *CRYPTOSPORIDIUM* OOCYSTS IN WATER SUPPLIED FROM A TREATMENT WORKS**

**1 Water source - surface water**

- 1.1 Direct abstraction
- 1.2 Short duration storage
- 1.3 Long duration storage with short circuiting
- 1.4 Infiltration to aqueduct

**2 Catchment factors - surface water**

- 2.1 Water company lacks control over catchment activities
- 2.2 Sewage treatment works discharging upstream of intake
- 2.3 Storm water outlets upstream of intake
- 2.4 Septic tanks close to water course upstream of intake
- 2.5 Livestock farming
- 2.6 Roosting birds
- 2.7 Application of faecal matter to land
- 2.8 Slurry or dung stores
- 2.9 Abattoirs or livestock markets not on main drainage
- 2.10 High numbers of faecal conforms in raw water
- 2.11 Detection of *Cryptosporidium* oocysts in raw water

**3 Surface water intake management**

- 3.1 Flashy<sup>1</sup> river or stream
- 3.2 Reservoir or lake subject to algal growth or other factors affecting treatment
- 3.3 No automatic quality monitors on raw water
- 3.4 Intake shutdown not available or only of short duration

**4 Water source - groundwater**

- 4.1 Known or some evidence of river aquifer connection
- 4.2 Swallow holes
- 4.3 Adits or mine Galleries with upbores or ventilation shafts
- 4.4 Lowland river gravel abstraction
- 4.5 Shallow underground sources
- 4.6 Insecure springs
- 4.7 Unconfined conditions with shallow water table

**5 Groundwater source - additional and catchment factors**

- 5.1 Water company lacks control of catchment activity close to wellhead, borehole or spring collecting chamber
- 5.2 Poor casing integrity
- 5.3 Poor sanitary seals
- 5.4 Wellhead or borehole liable to flooding
- 5.5 Old, poorly documented construction
- 5.6 Sewer / septic tank / slurry pit system near well head or above adits swallow holes
- 5.7 Livestock housed or grazed near wellhead
- 5.8 Slurry spreading
- 5.9 Sewage sludge application to land
- 5.10 Dung spreading
- 5.11 Dung or slurry stores
- 5.12 Abattoirs or livestock markets with land drainage
- 5.13 Location of main sewerage system
- 5.14 Rapid changes in water quality following rain
- 5.15 High numbers of faecal conforms in raw water
- 5.16 Detection of *Cryptosporidium* oocysts in raw water

---

<sup>1</sup> A "flashy" river or stream is one in which there is a rapid and significant change in water quality, particularly turbidity, within hours of a storm.

## **6 Water treatment**

- 6.1 Ineffective barriers to *Cryptosporidium* oocysts
- 6.2 Works or individual treatment units operating above hydraulic design capacity
- 6.3 Solid-liquid separation phase bypassed at times
- 6.4 Significant fluctuations in final water turbidity
- 6.5 Coagulation directly onto filters
- 6.6 Sudden changes to water flow through plant or filters
- 6.7 Individual filters not monitored continuously for turbidity
- 6.8 Filters not run to waste or head of works on start up
- 6.9 Filter backwash water not recycled at a constant rate
- 6.10 Sludge supernatant not recycled at a constant rate
- 6.11 Novel water treatment processes
- 6.12 Training and awareness of treatment works operators
- 6.13 Detection of *Cryptosporidium* oocysts in final water

## **7 Cryptosporidium history**

- 7.1 Past history of suspected outbreak of cryptosporidiosis associated with supply

## RISK ASSESSMENT REPORT

REF	WATER TREATMENT WORKS	
1.1	Name	
1.2	National Grid Reference	
1.3	Surface water, groundwater or both	
1.4	Raw water source(s)	
1.5	Maximum design capacity	
1.6	Normal daily output range	
1.7	Pattern of use (continuous, intermittent, stand-by, emergency)	
1.8	Population supplied	
1.9	Size of catchment	

REF	FACTOR	INFORMATION REQUIRED	RESPONSE
<b>2</b>	<b>WATER SOURCE - SURFACE WATER</b>		
2.1	Upland river/stream – direct abstraction	Y/N	
2.2	Upland river/stream via reservoir	Average storage time in days	
2.3	Have tests been carried out to check for short circuiting in storage at 2.2	Y/N, if Y describe and give results	
2.4	Lowland river/stream – direct abstraction	Y/N	
2.5	Lowland river/stream via reservoir	Average storage time in days	
2.6	Have tests been carried out to check for short circuiting in storage at 2.5	Y/N, if Y describe and give results	
2.7	Lake	Describe	
2.8	Other	Describe	
<b>3</b>	<b>CATCHMENT FACTORS - SURFACE WATER</b>		
3.1	Extent of catchment control by the water company	Describe	
3.2	Sewage works discharging upstream	Population served and distance from intake	
3.3	Storm water outlets	Number and distance from intake	
3.4	Septic tanks close to watercourse	Number in catchment	
3.5	Cattle / calves	Describe intensive / sparse and location	
3.6	Sheep / lambs	Describe intensive / sparse and location	
3.7	Deer / pig farms / other farmed animals or birds	Describe extent and location	
3.8	Bird roosting on storage reservoirs	Describe extent	
3.9	Slurry spreading	Describe intensive/ sparse and location	
3.10	Sewage sludge to land	Describe intensive/ sparse and location	
3.11	Dung spreading	Describe intensive/ sparse and location	
3.12	Dung or slurry stores	Number and location	
3.13	Abattoirs or livestock markets not connected to main drainage	Number and location	
3.14	Number of samples of raw water analysed for faecal conforms in last two years	Give number	
3.15	Mean / median / maximum faecal coliforms in raw water in last two	Number per 1 00 ml	

	years		
3.16	Number of raw water samples analysed for <i>Cryptosporidium</i> in last two years	Give number and sample size	
3.17	Mean / median / maximum <i>Cryptosporidium</i> oocysts detected in raw water in last two years	Number per 10 litres	
<b>4 SURFACE WATER INTAKE MANAGEMENT</b>			
4.1	Variation in raw water quality	Describe stable / flashy	
4.2	Infiltration to aqueduct	Describe and quantify	
4.3	Water quality monitoring on the intake	Describe	
4.4	Water quality monitors alarmed to threshold levels	List parameters and alarm levels	
4.5	Intake shut down under water	Y/N quality alarm conditions	
4.6	Intake manually shut down on water quality alarm	Y/N, if Y list alarm levels	
4.7	Water quality monitors automatically trigger shutdown	Y / N, if Y list alarm levels	
4.8	How long can intake be shut down before there is a supply problem	Quote hours or days	
<b>5 WATERSOURCE-GROUNDWATER</b>			
5.1	Boreholes and deep wells	Describe geology and soil type	
5.2	Secure natural springs	Describe geology and soil type	
5.3	Upland river gravel abstraction	Describe	
5.4	Lowland river gravel abstraction	Describe	
5.5	Other shallow underground sources	Describe geology and soil type	
5.6	Raw water quality monitoring	Describe	
5.7	Length of time source can be taken out of supply without supply difficulties	Special hours or days	
<b>6 GROUNDWATER SOURCE - ADDITIONAL AND CATCHMENT FACTORS</b>			
6.1	Known or some evidence of aquifer or surface water connection nearby	Describe	
6.2	Company control over catchment activity close to wellhead, borehole or spring collecting chamber	Describe	
6.3	Adits or mine galleries with upbores or ventilation shafts	Describe	
6.4	Wellhead or borehole subject to flooding	Y/N, if Y give details	
6.5	Poor casing integrity	Y/N, if Y give details	
6.6	Masonry lining above pumping water level without additional sanitary seal	Y/N, if Y give details	
6.7	Unconfined conditions with shallow water table	Y/N, if Y give details	
6.8	Sewer / septic tank / slurry pit systems or sewage effluent to around close to wellhead or above adits / swallow holes	Y/N, if Y give details	
6.9	Livestock housed or grazed near wellhead	Y/N, if Y give details	
6.10	Slurry spreading	Describe intensive / sparse location	
6.11	Sewage sludge to land	Describe intensive / sparse location	
6.12	Dung spreading	Describe intensive / sparse location	
6.13	Dung or slurry stores	Number and Location	
6.14	Septic tanks	Number and Location	

6.15	Abattoirs or livestock markets not connected to mains drainage	Number and Location	
6.16	Rapid changes in raw water quality following rain in the catchment	Time delay, parameters affected	
6.17	Likelihood of sewerage leak or burst affecting aquifer	Comment	
6.18	Number of samples of raw water analysed for faecal conforms in last two years	Give number	
6.19	Mean / median / maximum faecal conforms in raw water in last two years	Number per 100 ml	
6.20	Number of raw water samples analysed for <i>Cryptosporidium</i> in last two years	Give number and sample volume	
6.21	Mean / median / maximum <i>Cryptosporidium</i> oocysts detected in raw water in last two years	Number per 10 litres	
<b>7</b>	<b>WATER TREATMENT</b>		
7.1	Complete treatment stream	Describe (a flow diagram is sufficient)	
7.2	Is any part of the solid-liquid separation phases of treatment bypassed at any time	Y/N, if Y give details	
7.3	Filters run to waste or head of works on start up	Y/N	
7.4	Water flow through plant changes suddenly	Y/N if Y give details	
7.5	Filter backwash water recycled to head of works	Y/N@ if Y state if this is a constant rate or give details	
7.6	Filter backwash water recycled to other part of treatment stream	Y/N if Y state location. State if this is at a constant rate or give details.	
7.7	Sludge supernatant recycled to head of works	Y/N, if Y, state if this is at a constant rate or give details	
7.8	Sludge supernatant recycled to other part of treatment stream	Y/N, if Y state location. State if this is at a constant rate or give details	
7.9	Water quality monitoring relevant to <i>Cryptosporidium</i>	Describe	
7.10	Water quality monitoring relevant to <i>Cryptosporidium</i> linked to alarms	List parameters and alarm levels	
7.11	Particle counting monitors	Y/N, if Y describe	
7.12	Works manned continuously	Y/N, if N describe manning	
7.13	Training programme for treatment works operators	Y/N, if Y describe	
7.14	Number of treated water samples analysed for <i>Cryptosporidium</i> in last two years	Give number and sample volume	
7.15	Mean / median / maximum <i>Cryptosporidium</i> oocysts detected in the final water in the last two years	Give number of samples and sample volumes	
<b>8</b>	<b>CRYPTOSPORIDIUM HISTORY</b>		
8.1	Is there a past history of suspected outbreak of cryptosporidiosis associated with the water supply	Y/N, if Y give details, including any changes made to the water treatment stream	

**9 ASSESSMENT CONCLUSION**

9.1 From the above risk assessment the water company concludes that there is a significant risk from *Cryptosporidium* oocysts in water supplied from this treatment works because

9.2 From the above risk assessment the water company concludes that there is not a significant risk from *Cryptosporidium* oocysts in water supplied from this treatment works because

9.3 Comments

9.4 Signed on behalf of the water company

Name .....

Position.....

Date .....