guardians of drinking water quality

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[redacted]
Severn Trent Water Ltd
Po Box 5309
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Dear [redacted]

Water Quality Event: Concerning sub optimal disinfection at Melbourne water treatment works occurring in September 2011.

This letter sets out the Inspectorate's conclusions and recommendations in relation to the water quality event occurring at Melbourne Water Treatment works (WTW) in September 2011 and subsequent prosecution. It is in the form of an Executive Summary followed by the detailed Event Assessment Letter in the usual format.

Executive Summary

[redacted] The Company pleaded guilty to the offence of failing to disinfect the water and to design and continuously operate an adequate treatment process relating to Regulations 26 (1)(a), 26 (3) in Chesterfield Magistrates' court on the 13th September 2012. The Court fined the Company £10,000.

Inspectorate's Conclusions:

[redacted]

[redacted]

- The company failed to disinfect the water failing to meet the requirements of Regulation 26 (1) (a) of the Water Supply (water Quality) Regulations 2000 as amended.
- The company failed to meet the requirements of Regulation 26 (3) which imposes a requirement on water companies to design and continuously operate an adequate treatment process,
- The Company did notify stakeholders in accordance with regulation.
- Repetition of any of these deficiencies will result in further enforcement action by the Inspectorate.

Inspectorate's Recommendations to prevent a reoccurrence

- [redacted] The company has also reviewed arrangements at its other works.
- The Inspectorate **recommends** that the company ensures that the use of treatment overrides are time limited and full authorisation is obtained on every occasion of use. Further to this, I would encourage the company to ensure that there is clear indication on the SCADA system for operators to show when the overrides are in place and that their use is recorded in the site log (written day log and electronic records)
- The Inspectorate **recommends** that the company ensures all equipment used in water treatment is fit for purpose at all times in particular those associated with disinfection.
- The Inspectorate **suggested** that the company consider completing a comprehensive exercise to model the flow of water through the contact tank using tracer tests and/or computational fluid dynamic models to comply with the requirement to have in place and maintain a robust disinfection policy

Introduction

1.1. The purpose of this letter is to inform you of the conclusions and recommendations arising from the Inspectorate's assessment of the Melbourne disinfection event. This was classified using a risk-based approach as a **serious** event (Category four).

1.2. When notified of an event, the Inspectorate assesses the information provided by the Company about the circumstances and any actions taken. The Company notified the Inspectorate of this event on 19th September 2011. I have set out my conclusions and recommendations below.

2. Overview of the event and Company Actions

2.1 Melbourne works abstracts raw water from [redacted]. Due to the nature and presence of the storage reservoirs, the Works does not generally suffer from rapid changes to raw water quality.

2.2 [redacted]

2.3 [redacted]

2.4 [redacted]

2.5 [redacted]

2..5 Having successfully serviced the standby ejector, the maintenance team turned its attention to the second, duty ejector. Because they could hear water running through both ejectors, they assumed, mistakenly, that chlorine was running through both ejectors. I am ***highly critical*** that during this event and a subsequent site visit in 2012 it was apparent that the company have identified issues with the chlorine ejectors on this site and visible leaks could be seen. The system cannot be operated as duty and standby and there is a label to this effect on the equipment. [redacted] I ***recommend*** that the company ensures all equipment used in water treatment is fit for purpose at all times in particular those associated with disinfection.

2.6 In order to work on this system they took the second ejector out of service. This lead to the loss of the primary chlorine dose in the pre contact tank for 23 minutes. The final chlorine residual was below the company's own target for 19 minutes, with a minimum residual of 0.4mg/l recorded. The site was therefore not in compliance with the company's own disinfection policy, which requires a minimum residual of 0.5 mg/l, during this period.

2.7 The company's subsequent investigation of the loss of chlorine residual identified that variations in the pre contact and post contact chlorine residuals occurred almost simultaneously. When a pre contact tank chlorine spike was applied, the time difference between the pre contact chlorine residual monitor and post contact tank chlorine residual monitor registering the spike was just 4 minutes. The known retention time of the contact tank was approximately 45 minutes, depending on flow. During this investigation it was apparent that whilst the theoretical retention time of the contact tank had been calculated and some limited tests to spike a known concentration of chlorine had been made, the fluid dynamics and actual path of water through this contact tank was poorly understood by the company and was reliant on theoretical calculations and basic drawings. I ***suggest*** that the company consider completing a comprehensive exercise to model the flow of water through this tank using tracer tests and/or computational fluid dynamic models to comply with the requirement to have in place and maintain a robust disinfection policy

2.8 [redacted]

2.9 [redacted]

[redacted]

2.10 The staff immediately commenced shutting down the works. [redacted] After checking the chlorine residuals, the works was re-started.

2. [redacted]. I am ***critical*** that the company failed to meet its own disinfection policy of 30 minutes and an equivalent ct of 20 mg.min/l and was in breach of Regulation 26 (1)(a). I note that the company also failed to meet the World Health Organisation guidelines (WHO) best practice for disinfection of water. The results of the company investigations show that water was passing from the inlet of the contact tank to the point of being measured in approximately four minutes instead of being retained in the contact tank for an extended duration of at least 30 minutes. I note that since the time of this event the company has corrected the deficiencies which led to this failure to disinfect the water.

2. [redacted]

2.13 [redacted]

2.14 Monthly microbial samples are taken by the company prior to the contact tank, but due to the limited sampling, it is not possible to draw reliable conclusions on the quality of the water entering the disinfection system. However, between July 2010 and September 2011, 16 samples were taken; the maximum number of coliforms recorded was 34 per 100ml, and the maximum number of *E. coli* was 7 per 100 ml.

3. Conclusions.

3.1. This is the fifth event at this works since 2005 and the Inspectorate carried out a technical audit of this works in 2006, 2009, 2011 and again in 2012 following a subsequent event of a similar nature [redacted]. The Inspectorate concluded that a number of actions and recommendations made during these audits and event assessments had been ineffective and this informed the decision to pursue a prosecution.

3.2. In order to assess the impact of this event the Inspectorate reviewed the potential impact on consumers. On this occasion the chlorine residuals in downstream assets were within expected range and there is not likely to have been any noticeable changes for consumers in terms of the water being supplied during this event.

3.3. On the 8th and 9th November 2011 The Inspectorate visited Melbourne works and took six statements from company staff to understand the circumstances of this event. The following key points arose:

[redacted]

- Operators appear to have received no training on emergency disinfection system and limited or no training on disinfection theory.
- Operators had conflicting views on the manageability of alarm levels and lacked understanding on the lone worker system
- Both Operators agreed there were some alarm banners which they did not understand and on occasion these were simply accepted.
- Two out of three alarms which should have been sent to the lone worker for low chlorine were not configured to actually be sent, this has been changed.

[redacted]

- How long the override keys remained active was at the discretion of the operator.

- Improver Maintainer instigated a chlorine spike and manually timed how long it took the post contact monitor to respond after seeing the pre contact monitor responded (4 minutes).

[redacted]

3.4 An interview under caution was conducted with [redacted] of Severn Trent Water, on 8 February 2011. [redacted]. The company discussed matters relating to consideration of offences under Regulation 33 of the Water Supply (Water Quality) Regulation 2000 (as amended), (Through breaches of Regulations 26(1) (a), and 26 (3) which could lead to the instituting of prosecution proceedings.

3.6 I am **critical** that during the investigation of this event it was found that operators and maintainers had received what they considered to be inadequate training in the use of the lone worker system and it was also found that operators reported issues with the number and identification of alarms from the treatment process equipment at this site. I do however note that since the time of this event the company has reviewed the number and type of alarms being sent to the lone worker system. The company has additionally completed the following actions:

[redacted]

iv. Procedure for use of the emergency chlorination has been written (document creation date 29.11.11).
v. Procedure for use of the override keys has been written (document creation date 18.11.11). This includes that the keys should not be used for routine maintenance tasks.
vi. Procedure for maintenance and repair of Cl2/SO2 dosing loops and ejectors revised (document creation: 14.11.03, document revision: 12.10.11).
vii. Disinfection system has been reviewed and will be upgraded, including the installation of OSEC plant.

However I believe some of this work was already ongoing, whilst other aspects have been included in response to this event.

viii. Provided training for operators on disinfection theory.
ix. Provided training for operators on the use of the lone worker alarm system.
x. Ensured the lone worker alarm system has vibrate function as well as audible.
xi. Reviewed and amended alarms which are transmitted to lone worker system.
xii. Ensured staff understand only operators may switch between duty and standby chlorination system and effective communication must be in place.
xiii. Only one 'gas' job to be undertaken at any one time (at time of event work was ongoing on the ejectors whilst the SO2 drum was changed.

4. Regulation 28 risk assessment

4.1 There are no unacceptable residuals risks identified in the Regulation 28 report for the Melbourne water treatment works.

4.2 A number of risks relating to microbial and cryptosporidium challenges in the raw water are noted, with mitigation in place (the existing treatment process [redacted]

4.3 There are no Notices or Undertakings in place for the Melbourne water treatment works.

5. Contraventions of the Water Supply (Water Quality) Regulations 2000 as amended

5.1 The Company took 136 compliance samples from the final treated water [redacted]. All sample results have been compliant with the regulations. However it should be noted that the company breached Regulation 26 (1)(a) and 26 (3) and whilst I conclude that these failures were serious in their nature I acknowledge the actions taken by the company and in progress to prevent a recurrence of these failures. The company has acknowledged that this site requires improvement in relation to its management and control and is working to implement a series of improvements in 2012, which The Inspectorate has been closely monitoring.

5.2 On the 19th September the company informed East and North Midlands Health protection units, North West Leicestershire district council, Rushcliffe borough council, South Derbyshire district council, Charnwood district council, West Midlands East Coventry and Warwickshire health protection unit, and the Consumer Council for Water (Midlands). I therefore conclude that the company met the requirements of Regulation

35 of the Water Supply (Water Quality) Regulations 2000 as amended.

5.3 The company notified the Inspectorate on 19th September 2011 and provided associated reports by the agreed dates. I therefore **conclude** that the company met the notification and reporting requirements of Section 9 of the Water Undertakers (Information) Direction 2009.

6.0 Offences

6.1 Water may be regarded as being **unfit for human** consumption if either, when drunk it would be likely to, or did in fact, cause injury to the consumer or, where by reason of its appearance or smell, it was of such quality that it would cause a reasonable consumer of firm character to refuse to drink it or use it in the preparation of food.
There is no evidence to conclude that the water supplied during this event was unfit for human consumption.

6.2 The Company received 9 complaints of illness from consumers in the area supplied from Melbourne between July 2010 and September 2011. However none of these complaints were from the area receiving solely Melbourne water, they were from the whole area supplied from Melbourne and blended with other works supply. The company investigation detailed that the 9 complaints in this timescale were within normally expected levels.

6.3 From the complaints data available to the DWI, I note there were 8 Gastroenteritis complaints in 2009 and 7 Gastroenteritis complaints in 2010, in the zones directly supplied from Melbourne.

6.4 There was no increase in cases of illness in the community recorded by the Health Authorities. (confirmed by the local HPU units)

6.2 The company failed to disinfect the water and design and continuously operate an adequate treatment process and this was a repeat event at this works.
These were grounds for my recommending instituting proceedings against the company under Section 70 of the Water Industry Act 1991.

6.3 On 13th September 2012 at Chesterfield Magistrates Court the Company pleaded **guilty** to charges relating to breaches of Regulation 26 (1) (a), and 26 (3) and was fined £10,000 and agreed to pay costs in the region of £12,355 as part of combined costs for the investigation of three cases incurred by the DWI out of court by mutual agreement.

7 Other relevant matters

7.1 I should be grateful for a response to my recommendations and my suggestions within 20 working days. Please don't hesitate to contact me if you have any queries regarding this letter.

7.2 I am copying this letter to those organisations listed in paragraph 5.2

above and [redacted]

[redacted]

[redacted]