Drinking Water Audit Report

County:	County Kerry	**Date of Audit:**	18/07/2014
Plant(s) visited:	Breanlee (1300PUB1094)	**Date of issue of Audit Report:**	12/08/2014
		File Reference:	DW2010/8
		Auditors:	Mr Niall Dunne
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014).* • *The EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7)* • The recommendations specified in the EPA Report on *The Provision and Quality of Drinking Water in Ireland.* • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. **On the 10/06/2014 *Cryptosporidium* oocysts, genotyped parvum, were detected in the Breanlee public water supply at the level of 1.7 / 10L. Irish Water as a priority need to put measures in place to ensure that the supply has an appropriate barrier against the entry of *Cryptosporidium* into the treated water and that the chemical dosing regimen can adequately respond to changes in the raw water especially during and after periods of heavy rain fall.**

ii. **The *Cryptosporidium* detection on the 10/06/2014 was not notified to the EPA officially until the 16/07/2014. During the audit it as also noted that there have been persistent aluminium exceedances on this supply, of which the EPA had not been notified. Irish Water must ensure that all exceedances are notified to the EPA as per the *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014)* and as per Section 6 of the EPA Handbook.**

iii. **Irish Water should optimise the filter backwash process and put facilities in place to ensure that a slow start or a run to waste option is implemented after the back wash cycle.**

iv. **Irish Water should install a turbidity monitor on the filter outlet and connect it to a recording device with dial out alarms.**

v. **Irish Water should ensure that the final water turbidity monitor and the SAC monitor have a dial out facility to the caretaker and that a cascade system of alarms is in place to allow the caretaker or alternative personnel to respond appropriately.**

1. INTRODUCTION

Under the *European Union (Drinking Water) Regulations 2014* the Environmental Protection Agency is the supervisory authority in relation to Irish Water and its role in the provision of public water supplies. This audit was carried out in response to the written correspondence from Irish Water dated 16/06/2014 informing of the detection of *Cryptosporidium* in the Breanlee PWSS 088A. Where the text refers to the Water Service Authority this refers to Irish Water in accordance with Section 7 of the Water Services (No. 2) Act 2013.

The plant serves a population of approximately 800. The plant is a new Actiflow plant, commissioned in 2012. The treatment system consists of coagulation and sedimentation followed by rapid gravity filtration. Disinfection consists of chlorination.

Photographs taken by Niall Dunne during the audit are attached to this report and are referred to in the text where relevant.

The opening meeting commenced at 10.00 am at the Breanlee plant. The scope and purpose of the audit were outlined at the opening meeting. The audit process consisted of interviews with staff, review of records and observations made during an inspection of the treatment plant. The audits observations and recommendations are listed in Section 2 and 4 of this report. The following were in attendance during the audit.

Representing Irish Water: (* indicates that person was also present for the closing meeting)

Conor Foley, Water Above Ground Lead (IW) *; John Ahern, Acting Senior Executive Engineer (KCC)*; Des Fitzgerald, Plant Engineer (KCC)*; Shane Moriarty, Assistant Engineer (KCC)*; P.J McAuliffe, Compliance Technician (KCC)*; Kathleen Casey, O&M Technician (KCC)*; John Fitzgerald, Caretaker (KCC)*.

Representing the Environmental Protection Agency:

Niall Dunne - Inspector

2. AUDIT OBSERVATIONS

The audit process is a random sample on a particular day of a facility's operation. Where an observation or recommendation against a particular issue has not been reported, this should not be construed to mean that this issue is fully addressed.

1.	**Source Protection** a. The raw water source is a tributary of the Cottoners River, an upland mountain stream (see photograph 1). b. Sheep mainly graze the mountainous commonage catchment (see photograph 1). c. The abstraction point was surrounded with both an inner and an outer protection fence. d. There is a turbidity meter on the raw water, the reading on the day was 1.29 NTU. This monitor is not alarmed and there was no calibration sticker observed on the monitor. e. The *Cryptosprodium* risk score for this supply was calculated in October 2013 as moderate risk. f. KCC stated that the raw water quality is variable, especially after heavy rain fall, and that this can lead to issues regarding chemical dosing.
2.	**Actiflow** a. Treatment consists of a new Actiflow plant, commissioned in March 2012, according to KCC. b. KCC stated that the coagulant dosing is controlled by a spectral absorbance coefficient (SAC) monitor and probe, (see photograph 2 & 3), which assesses chemical dosing based on a water quality calibration curve developed by Veolia, the design and build contractor. KCC stated that they queried the original dosing curve, especially for increased high SAC readings. On the 17/06/2014 KCC received a revised dosing curve but have also expressed concerns over the accuracy of the curve. c. There were no validation certificates for the SAC monitor on site.

	d. KCC stated that there is no alarm on the SAC monitor, on the day of the audit the reading on the SAC monitor was 29.2 1/m. However KCC were unable to confirm whether this reading was correct. KCC propose to use a hand held UV meter in the future to check the accuracy of the SAC monitor. The SAC monitor was calibrated in November 2013 and is due for calibration in November 2014. e. KCC stated that they check the sand levels in the Actiflow on a daily basis and that sand is topped up once a month.
3.	**Filtration** a. The backwash cycle is automated to ever12 hours, increased from 24 hours following the *Cryptosporidium* exceedance and on the advice of Veolia. The backwash cycle takes approximately 25 minutes. The filter is brought back into service straight after the backwash cycle. There is no run to waste and no slow start, due to inadequate drinking water storage capacity after the filter. b. As an interim measure, KCC is proposing to run the filter to waste for three minutes following backwash. c. There is no turbidity monitor directly after the filter; there is a turbidity monitor on the final water, after the contact tank. d. A manual final water turbidity reading taken on the day of the audit, following a back wash cycle, returned a result of 4 NTU while the reading on the monitor displayed 2.7 NTU. According to KCC the turbidity monitor on the final water is not working correctly. e. KCC stated that the filtration rate through the filter is 8 m/hr. The design backwash water rate is 180 m^3/hr but currently the plant is only achieving a backwash rate 140 m^3/hr. f. There was no sand level gauge observed within the filter. g. A copy of the investigation report carried out by Veolia, following the detection of *Cryptosporidium,* was given to the auditor.
4.	**Chlorination and Disinfection** a. There are duty standby and residual chlorine dosing pumps; the chlorine monitor has dial out alarms in place. The low level chlorine alarm level is set at 0.1 mg/l. b. KCC stated that there is a drop in chlorine levels (0.1mg/l) after backwash and that this is followed by spikes of up to 2 mg/l to compensate. c. The caretaker takes chlorine readings within the network on a weekly basis.
5.	**Treated Water Storage** a. There is a clear water tank/contact tank after the rapid gravity filter, the storage capacity according to KCC is approximately 1 hour. b. In Veolia's investigation report it stated that a bird's nest was found in one of the water storage tanks. KCC confirmed that the nest had been removed and that the opening where the birds had entered was now sealed.
6.	**Monitoring and Sampling Programme for treated water** a. KCC stated that no jar tests are carried out, but they are proposing to undertake take these in the future.
7.	**Exceedances of the Parametric Values** a. On the 16/06/2014, the EPA received a notification, not via the ODWNS, but by email direct from IW stating that on 10/06/2014 1.7/10L *Cryptosporidium* oocysts were detected in the Breanlee water supply, later genotyped as parvum. No boil water notice was issued following the exceedance. (The ODWNS notification was received on the 16/07/2014, one month after the date of the email notification). b. Follow up samples on the 19/06/2014 and the 01/07/2014 returned clear for *Cryptosporidium.* c. KCC staff stated during the audit that they were unaware that *Cryptosporidium* was now a notifiable event under the new 2014 regulations. d. During the audit KCC stated that there have also been aluminium exceedances on this supply in 2014. The most recent being on the 19/06/2014 with a result of 480 ug/l. At the time of issue of this report the EPA has not been officially notified of these aluminium exceedances.

8.	**Management and Control** a. According to KCC within a month of the date of the audit an external contractor is scheduled to undertake a full review of all monitoring and dosing equipment. b. The caretaker stated that he does not receive alarms for high turbidity. c. KCC stated that there is no documented procedure for chemical delivery. e. The caretaker is qualified to FETAC level five in water treatment.
9.	**Monitoring and Sampling Programmes for Treated Water** a. There is a turbidity monitor on the final water and KCC confirmed that the monitor is not working correctly. b. The colour monitor on the final water was reading 24.6 Hazen; KCC confirmed that this monitor was not working correctly as the monitor needs a new bulb.
10.	**Sludge Management** a. According to KCC sludge is drawn off site every two months.

3. AUDITORS COMMENTS

This is a new Actiflow plant serving the Breanlee supply, commissioned in 2012. However, on the 10/06/2014, 1.7 / 10L *Cryptosporidium parvum*, were detected in the treated water following a period of heavy rainfall. When the quality of the raw water varies significantly the plant does not adequately treat the raw water, especially during and after periods of heavy rainfall.

An investigation of the plant by Veolia following the *Cryptosporidium* detection identified areas where improvements could be made.

1. The wash water rate currently being achieved is 140 m^3/hr, while the design rate is 180m^3/hr.
2. There should be a slow start on the filters and that the filter should be run to waste for a period of time following back wash.
3. That the installation of a treated water storage tank should be progressed.

IW should as a priority progress the recommendations of the Veolia report.

As stated above, one of the main deficiencies of the plant is the lack of adequate treated water storage capacity. This results in the filter being brought straight back into service following backwash; which could lead to filter breakthrough. Irish Water should ensure that there is an adequate slow start or run to waste following the backwash of the filter.

There is no turbidity monitor directly after the filter. A monitor should be put in place without delay. This is required to ensure that the filter is operating correctly. The monitor should be fitted with a dial out alarm and connected to the SCADA. Irish Water should ensure that all the turbidity monitors in the plant have a dial out alarm facility installed to ensure that the caretaker is notified of any elevated turbidity levels and is given adequate time to respond.

There appears to be issues with the accuracy of monitoring equipment in general at the plant, especially the SAC monitor, which is used to control chemical dosing. Irish Water should put measures and checks in place to ensure that the SAC monitor and probe and all other monitoring and dosing equipment is working correctly at all times, especially during and after periods of heavy rainfall.

Cryptosporidium was detected in this supply on 10/06/2014. However, the online notification was not submitted until 16/07/2014. During the audit it was also noted that recent persistent aluminium exceedances had not been notified to the EPA. Irish Water must ensure that exceedances are notified to the EPA as per the *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014)* and as per Section 6 of the EPA Handbook (available at http://www.epa.ie/pubs/advice/drinkingwater/publicwatersupplieshandbook/). Irish Water should also

note any detections of pathogenic micro-organisms or parasites in its water supply must now be promptly notified to the EPA. Failure to notify the EPA can lead to a prosecution under the *European Union (Drinking Water) Regulations 2014 (SI No. 122 of 2014)).*

4. RECOMMENDATIONS

Source Protection

1. The Water Services Authority should continue to characterise the variability in raw water quality. Trends in raw water quality should be analysed and used to determine the optimum treatment conditions, and compared against the calibration dosing curve.

Actiflow

2. The Water Services Authority should put measures in place to ensure that the SAC monitor is operating correctly at all times and that the calibration curve is fit for purpose, ensuring that the correct chemical dose is continually being achieved, especially during and after periods of heavy rain fall. The SAC monitor should be fitted with dial out alarms to alert the caretaker to any abnormal readings. The SAC monitor should also be connected to SCADA so that readings can be recorded and reviewed.

3. The Water Services Authority should carry out jar tests regularly to determine the accuracy of the SAC monitor and to determine the optimum chemical coagulant dose and pH for the treatment of the water. The frequency of checks should be appropriate to the nature of supply and changing condition. Results should be recorded at the treatment works and used for control of the treatment plant. Jar testing of the raw and coagulated waters should be carried out as outlined in Section 3.3.1 and Appendix C of the EPA publication "*Water Treatment Manual: Coagulation, Flocculation and Clarification*"

Filtration

4. The Water Services Authority should install a continuous turbidity monitor directly after the filter. The monitor should be fitted with a dial out alarm and connected to the SCADA.

5. The Water Services Authority should put measures in place to ensure that the filter can be brought back into service with a slow start or run to waste for a period of time following backwash, to allow adequate time for the filter to mature thus ensuring that the risk of filter breakthrough is minimised.

6. The Water Services Authority should;

    i. Ensure that the filtration rate in the rapid gravity filters does not exceed 7.5 m^3/m^2/hour ;
    ii. Review the filter backwash process to ensure that the maximum backwash water flow rate is set at the design rate of 18 m^3/m^2/hour and does not exceed 20 m^3/ m^2/hour and;
    iii. Review the operation of the filter to ensure that the levels of turbidity in the filtered water are as low as possible and do not exceed 0.2 NTU.

Disinfection

7. The Water Services Authority should ensure that the fluctuations in the chlorine readings after the backwash cycle are investigated and measures put in place ensuring that chlorine levels remain consistent at all times.

Treated Water Storage

8. The Water Services Authority should ensure that all vents and hatches on reservoirs are secured against the ingress of animals or deliberate introduction of any contaminant or acts of vandalism.

Exceedences of the Parametric Values

9. The Water Services Authority must ensure that all exceedances are promptly notified to the EPA as per EPA as per the *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014)* and as per Section 6 of the EPA Handbook. The Water Services Authority should submit via the online system the aluminium exceedance for this supply without delay.

10. The Water Services Authority should ensure that all relevant Irish Water and local authority staff are instructed to promptly notify any detections of pathogenic micro-organisms or parasites, including *Cryptosporidium,* in public water supplies to the EPA via the online drinking water notification system (http://web.epa.ie/odwn/login.aspx) and that failure to do so is an offence under the *European Union (Drinking Water) Regulations 2014 (SI No. 122 of 2014)).*

11. The Water Services Authority should prepare action programmes to deal with both the *Cryptosporidium* and aluminium exceedances in this supply. Each action programme should include details of the measures proposed and outline timeframes for the completion of the works to ensure that each issue is promptly rectified.

Management and Control

12. The Water Services Authority should review the operation of all monitoring equipment and put measures in place to ensure that all the equipment, especially the SAC monitor; the raw; the filtered; and the final water turbidity monitors, are operating correctly at all times. The Water Services Authority should ensure that all monitors are linked to a recording device and, where appropriate, fitted with dial out alarms. A procedure should also be put in place defining the actions to be taken in response to the different levels of alarm.

13. The Water Services Authority should develop a documented system for the delivery of chemicals to ensure that all chemical deliveries are recorded and signed off by the appropriate personnel.

Monitoring and Sampling Programmes for Treated Water

14. The Water Services Authority should prepare a *Cryptosporidium* monitoring programme for the raw and treated water.

15. The Water Services Authority should after heavy periods of rain fall or after an event that may significantly increase the possibility of *Cryptosporidium* oocysts entering the raw water supply, or in the event of significant increases in the turbidity of the treated water, shall then continuously sample the final water for *Cryptosporidium* in accordance with the guidelines in the *EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7).*

16. If any *Cryptosporidium* oocysts are detected during the monitoring programme then the Water Services Authority should immediately contact the Health Service Executive.

17. The Water Services Authority should commence daily monitoring of the final treated water for aluminium. The results should be recorded.

FOLLOW-UP ACTIONS REQUIRED BY IRISH WATER

During the audit the Water Services Authority representatives were advised of the audit findings and that action must be taken as a priority by the Water Services Authority to address the issues raised. This report has been reviewed and approved by Ms Yvonne Doris, Drinking Water Team Leader.

The Water Services Authority should submit a report to the Agency within one month of the date of this audit report detailing how it has dealt with the issues of concern identified during this audit. The report should include details on the action taken and planned to address the various recommendations, including timeframe for commencement and completion of any planned work.

The EPA also advises that the findings and recommendations from this audit report should, where relevant, be addressed at all other treatment plants operated and managed by Irish Water.

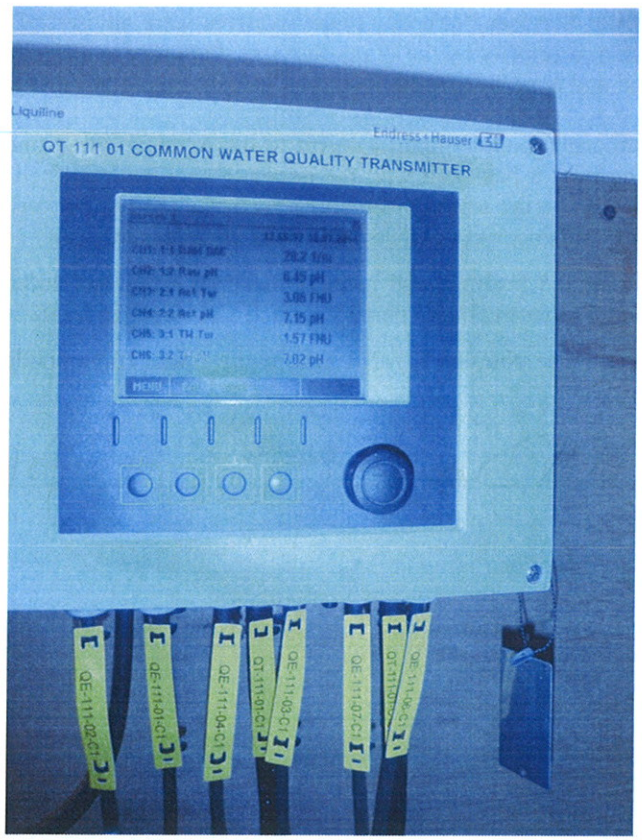
Please quote the File Reference Number DW2010/08 in any future correspondence in relation to this Report.

Report prepared by: _____ **Date:** 12/8/14

Inspector

Photograph 1: Catchment

Photograph 2: SAC monitor



Photograph 3: SAC probe