



Drinking Water Audit Report

County:	Westmeath	Date of Audit:	16 February 2018
Plant(s) visited:	Athlone Water Treatment Plant	Date of issue of Audit Report:	28 February 2018
		File Reference:	DW2018/17
		Auditors:	Ms Aoife Loughnane Ms Derval Devaney
Audit Criteria:	<ul style="list-style-type: none"> • The <i>European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) as amended.</i> • <i>The EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7).</i> • The recommendations specified in the <i>EPA Drinking Water Report.</i> • EPA Drinking Water Advice Notes No.s 1 to 15. • The recommendations in any previous audit reports. 		

MAIN FINDINGS

- i. *Cryptosporidium* was detected in the Coosan area of Athlone public water supply on 13th and 15th February 2018. The HSE has confirmed three recent cases of *Cryptosporidiosis* illness in an area which is served from the Coosan Reservoir.
- ii. The EPA carried out an audit at Athlone water treatment plant on 16th February 2018 to determine whether the *Cryptosporidium* detections were caused by a failure of the treatment plant. There was no evidence that the plant performance had been compromised. However, a new UV disinfection system was installed at the plant on the 6th February 2018 and was operating satisfactorily to inactivate *Cryptosporidium*. It was not possible to verify the performance of the old UV unit in place prior to that date, as results from its monitor were not archived and the previous UV unit was un-validated system.
- iii. Coosan reservoir has been identified as a possible source of contamination of the water supply. Since the *Cryptosporidium* detections, Coosan Reservoir was drained down and was being bypassed on the day of the audit. Its roof had vegetation overgrowth and temporary meshes were recently installed on its vents for protection.
- iv. Irish Water should continue to investigate the cause of the *Cryptosporidium* incident, and should ensure the Coosan reservoir is fully cleaned before being brought back into service.

1. INTRODUCTION

Under the *European Union (Drinking Water) Regulations 2014 as amended*, 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 notification by Irish Water on 15th February 2018 of the detection of *Cryptosporidium* in Athlone public water supply on 13th February 2018 and the reported incidents of *Cryptosporidiosis* in the area being served by the Athlone PWS.

The Athlone Water Treatment Plant abstracts approx. 12,000 m³/day from the River Shannon and serves a population of 19,352. Treatment at the plant is on a 24/7 basis and consists of coagulation with Chemifloc 103 and poly, clarification, rapid gravity filtration, chlorination, UV treatment and fluoridation. There are three reservoirs on the network, Coosan/Hillquarter Reservoir, Battery Heights and Annagh Rservoir. The latter is the only reservoir with booster chlorination and serves Athlone town and the Glasson area.

The opening meeting commenced at 1:30 pm at the Athlone Water Treatment 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 and the Coosan reservoir. Photographs taken by Aoife Loughnane during the audit are attached to this report and are referred to in the text where relevant. The audits observations and recommendations are listed in Section 2 and 4 of this report. The following were in attendance during the audit.

<p>Representing Irish Water: Andrew Boylan, Water Compliance Specialist Aoife Lambe, Compliance Analyst John McCormack, Capital Programmes John Gavin, SLA Lead</p> <p>Representing Westmeath County Council: Blathnaid Cox, Executive Engineer Eamonn Morris, Technician.</p> <p>Representing Veolia: Trevor O’Toole Brian Collier.</p> <p>Representing the Environmental Protection Agency: Aoife Loughnane, Inspector Derval Devaney, Inspector.</p> <p>Representing the HSE (who were present as observers during the audit): Paul McGuinness, Principal Environmental Health Officer Margaret Byrne, Senior Environmental Health Officer.</p>

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.

<p>1.</p>	<p>Summary of reported <i>Cryptosporidiosis</i> illness and investigations:</p> <p>a. The water supplier received a complaint on Friday 9th February 2018 of a child with confirmed <i>Cryptosporidiosis</i> and the water supplier alerted the HSE. The HSE confirmed during the audit that the onset of illness occurred on 26th January 2018 and there is up to 20 days of an incubation period. The HSE became aware of two further cases of illness shortly after. The HSE confirmed that the last onset of illness reported was 5th February 2018.</p> <p>b. Westmeath Co. Co. and the HSE had a teleconference on Saturday 10th February 2018. Irish Water became aware of the cases on Monday 12th February. A 4th case of severe gastro illness (but unconfirmed <i>Crypto.</i>) was since reported to the HSE. All cases are served from the Coosan Reservoir on the Athlone PWS.</p>
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	<ul style="list-style-type: none"> c. Irish Water, the HSE and Westmeath Co. Co. had a teleconference on Monday afternoon 12th February and a monitoring programme for the area was planned. The HSE stated it has not found any single common cause of infection between all affected customers other than their water supply. d. A grab sample was taken on Tuesday 13th February 2018 at a hydrant at the church near the Churchfield area served from the Coosan reservoir and the presence of <i>Cryptosporidium</i> was detected. Due to the small volume detected it was not possible to genotype the oocysts. Bacteriological monitoring at the inlet and outlet to the Coosan reservoir was also completed on 13th February and all results were clear. A <i>Crypto.</i> sampling rig was installed on Wednesday 14th February at the plant and on the inlet and outlet to the Coosan reservoir and the samples were collected Thursday 15th February for analysis. Bacteriological samples were also taken on 14th February 2018 at the water treatment plant, the Coosan Reservoir and points of compliance throughout the network being served from that reservoir. All bacteriological samples were clear. The chlorine residuals throughout the network were also satisfactory. e. Flushing of networks commenced on Thursday 15th February and the Coosan Reservoir (which is split into Cell 1 and Cell 2) was drained down with the water supply by-passing it. Irish Water received the <i>Crypto.</i> results on Friday morning 16th February and verbally relayed the information to the EPA and HSE during the audit. f. The <i>Crypto.</i> results were negative for the plant and inlet to the Coosan Reservoir but <i>Crypto.</i> was detected on the Reservoir's outlet for the sample lifted on Thursday morning, 15th February 2018.
<p>2.</p>	<p>Coagulation, Flocculation and Clarification</p> <ul style="list-style-type: none"> a. Two inlet pumps (duty and standby) abstract water from the River Shannon. The plant is deigned to treat 535 m³/day and throughput ranges from 515 – 525 m³/day. b. Chemifloc 103 and poly are used in the coagulation process and is dosed in proportion to flow. The poly dosing point was moved since the last EPA audit in 2012 to above the splitting chamber tank. There was an even distribution of poly across the dosing line. c. Flow is then split amongst four clarifiers. There was significant sludge settlement on the lamellae plates in the clarifiers and accumulation of material on the walls and decanter channels (see Photo 1). This was also raised by the EPA during its last audit in 2012. Some lamellae plates were broken. Westmeath County Council representatives stated that the clarifiers were due a clean but the plant is under pressure with bursts in the distribution network and access to the lamellae plates for cleaning can be difficult due to the design of the structure. Notwithstanding this, there was no evidence of floc carryover onto the filters.
<p>3.</p>	<p>Filtration</p> <ul style="list-style-type: none"> a. There are eight rapid gravity filters. The sand media was replaced in 2014. b. Backwash continues to occur every 2nd day however there are now turbidity monitors on each filter and the combined filtered water. The maximum turbidity on each filter from the 10th – 16th February 2018, (the period when <i>Cryptosporidium</i> was detected at the Church hydrant on 13th February), was inspected on the plant's SCADA system during the audit and levels were not unusual and varied from 0.16 NTU to 0.29 NTU. c. There is water and air scour during backwash and there is a slow start on each filter post backwash. d. Filters 1 – 4 and filters 5 - 8 feed into two streams which flow to the Clearwater Tank.
<p>4.</p>	<p>Disinfection</p> <ul style="list-style-type: none"> a. Prior to the clearwater tank the two streams from the filters are disinfected by a UV unit and chlorination. b. The new UV disinfection system comprises Berson UV units (IL 4500+ Model) serving each stream and each UV unit has a duty and standby arrangements with automatic switchover in the event of failure of one of the UV disinfection units. All four UV units have been validated to the USEPA method and the validation criteria was available on the site. c. The UV units were installed by Veolia and put into operation on 6th February 2018. Veolia representatives were available during the audit to explain the UV units controls and are due to hand over the operation of the treatment to Irish Water shortly. d. Prior to 6th February 2018 there was a UV unit (manufactured by ATG Willand) which had a UVI and flow monitor but its performance was not validated and the readings were not being recorded. As a result, the auditors were unable to assess its effectiveness in providing adequate disinfection

	<p>throughout January 2018 prior to onset of the 1st case of <i>Cryptosporidiosis</i> and up to the time that unit was made redundant in February 2018.</p> <ul style="list-style-type: none"> e. The validated criteria for the new UV units require a minimum UVT of 75%, a maximum flow of 296 m³/hour, a minimum flow of 12 m³/hr and a UV dose of at least 40 mJ/cm². f. During the audit the UV Unit for Stream 1 received a flow of 238 m³/hr and had a UVT of 81.1 % and the UV Unit for Stream 2 was receiving a flow of 246 m³/hr and had a UVT of 81.8 %. This demonstrates that both units were operating within their validated range of operational criteria. The UV units are alarmed to shut down the plant when the UVT falls below 75 % and there is a low alarm set at 76 %. The UVT readings are trended on SCADA. g. The UV units are also alarmed to shut down the plant when the flow is > 280 m³/hr and there is a high alarm set at 255 m³/hr and a low alarm set at 60 m³/hr and a low low alarm let at 50 m³/hr. h. The UV units also shut down if the dose falls below 40 mJ/cm². There is a low alarm at 41 mJ/cm². It was stated on site that there is a safety factor built into the system where the minimum dose rating is set at 45 mJ/cm². i. The UV units will also shut down if the turbidity exceeds 0.95 NTU. There are also additional high alarms set at > 0.9 NTU, > 0.3 NTU and > 0.2 NTU. j. If there is a power cut, the outlet valves on the UV units close. The UV units cannot be by-passed which ensures that inadequately disinfected water will not go into the distribution network. k. The lamp run time is displayed and recorded and there are spare lamps on-site. l. It was agreed during the audit while it is good practice to switch the UV units from duty to standby frequently, such as once per week, it was not something that was included as a specific requirement for their operation. m. Irish Water stated that the Athlone PWS is supplied from a lowland catchment which requires a 5-log credit for protozoal compliance. It was stated during the audit that full treatment at the plant provides for a 6-log credit.
<p>5.</p>	<p>Treated Water Storage and Distribution Network</p> <ul style="list-style-type: none"> a. Westmeath County Council representatives stated that the plant is operating at almost maximum capacity and frequent bursts in the network can put the plant under pressure. This can delay cleaning of the clarifiers. To help address this, it is planned to carry out a major water conservation programme during 2018 that will address the leaks and bursts in the network. b. The Coosan/Hillquarter Reservoir which serves 3,000 people (including those ill with <i>Cryptosporidiosis</i>) was visited during the audit. The reservoir has a 15-hour water detention time and had been drained down with the intention of flushing the networks. Water from the treatment plant is by-passing this reservoir since 15th February 2018. c. The Coosan reservoir was last cleaned in 2014 and is due a clean during 2018. d. There were four vents on the reservoir which were only recently protected by temporary meshes (see Photo 2). There was signification overgrowth on the roof the reservoir so it was difficult to visually determine its integrity. Also the overgrowth on its roof represented a health and safety risk as it was challenging to determine the edge of the reservoir when standing on its roof (see Photo 3). e. There is a chlorine analyser at the reservoir and it is alarmed and linked to SCADA. f. There is a relatively new HPDE mains pipe from the Coosan reservoir to the customers it serves.
<p>6.</p>	<p>Monitoring and Sampling Programme for treated water</p> <ul style="list-style-type: none"> a. It was stated during the audit that <i>Cryptosporidium</i> was detected in the outlet to the Coosan reservoir on Thursday 15th February 2018 and Irish Water will formally be notifying the EPA of this and seeking HSE advice. This is in addition to <i>Cryptosporidium</i> detected at the Church hydrant served from Coosan reservoir on Tuesday 13th February 2018. b. Irish Water and Westmeath Co. Co. are to conduct further investigations by taking additional bacteriological and <i>Cryptosporidium</i> sampling at compliance points on the network serving the inlet and outlet to the Coosan reservoir and around the Churchfields area. It also plans to sample from The Glen which is a private supply next to the Churchfields area which is also served by the Athlone water treatment plant.
<p>7.</p>	<p>Management and Control</p> <ul style="list-style-type: none"> a. The PLC system at the plant has a turbidity alarm on the final combined water set at 0.95 NTU. If this level is exceeded the plant is shut down. The SCADA has a setting of 1.5 NTU for the final combined water. Both systems do not currently communicate with one another and there

	are different alarm settings on each in some cases. Irish Water stated that it intends on integrating both systems.
	b. There is no generator on-site to ensure back-up power supply on-site.
8.	Sludge Management
	a. Since the last EPA audit in 2012 sludge is being tankered off-site for treatment. There is no sludge discharging to the River Shannon.

3. AUDITORS COMMENTS

The audit was carried out to determine whether the *Cryptosporidium* detections in the Coosan area were caused by a failure of the treatment processes at Athlone water treatment plant. The auditors found no evidence that the plant performance had been compromised. However, a new UV disinfection system was installed at the plant on 6th February 2018 and the auditors were unable to verify whether the previous UV system provided adequate disinfection because it was an un-validated system.

The auditors noted that Coosan reservoir was a possible source of contamination of the water supply. Works are needed to clean the reservoir and ensure it is adequately protected. Irish Water should ensure that all reservoirs serving this supply are structurally sound, free from vegetation overgrowth, adequately protected from ingress of contamination (for e.g. vents on all the reservoirs should have meshes in place) and regularly cleaned to ensure a safe and secure water supply.

Irish Water is to continue to keep the EPA updated on progress with its investigations into the safety of this water supply.

The auditors found that there have been some improvements made to the operation and control of the plants processes since the last EPA audit in 2012 such as the installation of a new UV treatment system, the cessation of sludge being discharged to the River Shannon, the installation of turbidity meters on each filter and the replacement of its media. However, the build-up of excessive sludge on the clarifiers remains an issue at this plant and a procedure for regular cleaning and maintenance of the clarifiers should be a priority in addition to water conservation measures proposed on the distribution network to ensure the Athlone Water Treatment Plant is operating optimally and not under pressure due to water demand.

4. RECOMMENDATIONS

Monitoring and Sampling Programme for Treated Water

1. Irish Water should continue its investigations, flushing and planned sampling of the water supply and notify the EPA of any further detections of *Cryptosporidium* or failures of microbiological parameters and provide an update on the outcome of its investigations. Once the Coosan Reservoir is brought back into service such sampling should be repeated. Any health advice provided by the HSE should be reported to the EPA without delay.

Coagulation, Flocculation and Clarification

2. Irish Water should ensure that the settled water outlet channels and clarifier walls are cleaned without delay to prevent build-up of algae on the weirs and on the walls of the clarifiers and to prevent build-up of excessive sludge on the lamellae plates. The broken lamellae plates should also be fixed. A regular programme of cleaning should be put in place to ensure excessive sludge and algae does not build up in the clarifiers.

Disinfection

3. Irish Water should ensure:
 - (a) Once commissioning of the new UV disinfection system is complete, there is training for staff and procedures in place for the operation and maintenance of the UV treatment process;
 - (b) the UV units are switched from duty to standby frequently, such as once per week, to ensure all UV units are operating satisfactorily.

Treated Water Storage

4. Irish Water should ensure that:
 - (a) all reservoir vents are permanently secured against ingress of animals or deliberate introduction of any contaminant or acts of vandalism;
 - (b) the Coosan reservoir is inspected and cleaned out and any maintenance and repairs completed as soon as possible;
 - (c) vegetation from the sides and cover of the Coosan reservoir is removed so that the reservoir can be visually inspected on all sides and to prevent possible damage to the integrity of the reservoir;
 - (d) an integrity assessment of the Coosan reservoir is carried out to ensure that there is no ingress into the reservoir.

Management and Control

5. Irish Water should ensure the treatment plant PLC and SCADA systems are integrated so that monitor readings and alarm settings are synchronised. It should also ensure there are adequate dial out alarms to personnel to alert them and afford them time to respond to an emerging issue.
6. Irish Water should investigate the need for a back-up power source at the plant, for example, an on-site generator or a mobile generator that can be secured without delay for the site to ensure a continuous water supply in the event of power failure.

FOLLOW-UP ACTIONS REQUIRED BY IRISH WATER

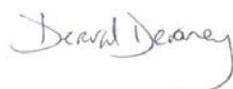
During the audit Irish Water representatives were advised of the audit findings and that action must be taken as a priority by Irish Water to address the issues raised. This report has been reviewed and approved by Aoife Loughnane, Drinking Water Team Leader.

Irish Water should submit a report to the EPA within one week of the date of this audit report detailing how it has dealt with the recommendations raised 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 in any future correspondence in relation to this Report.

Report prepared by:



Date:

28/02/2018

Derval Devaney

Inspector

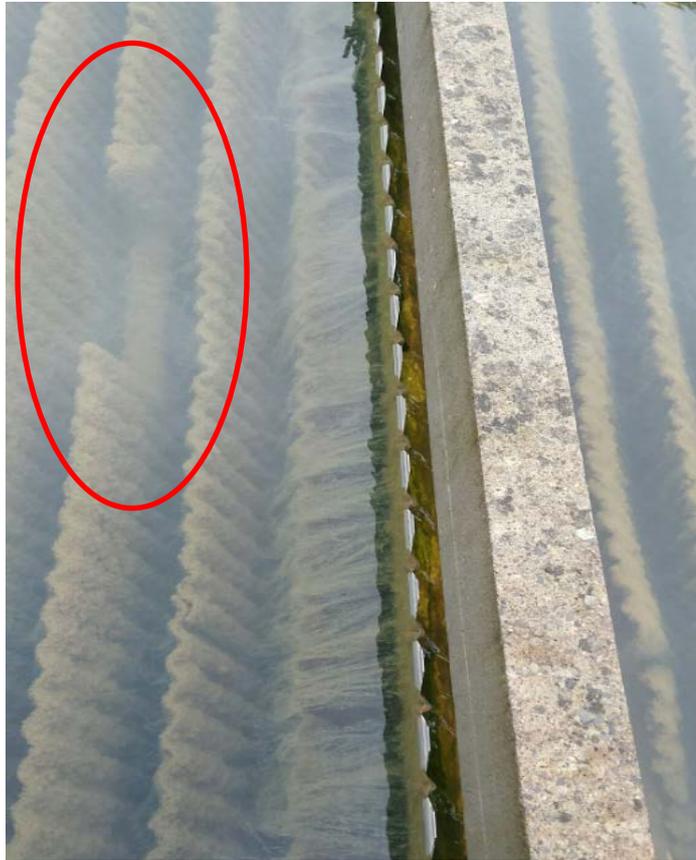


Photo 1 Sludge on clarifier and broken lamellae plate (circled)



Photo 2 Temporary mesh on Coosan Reservoir vent



Photo 3 Overgrowth of vegetation on the roof of Coosan Reservoir