Drinking Water Audit Report

County:	Galway	**Date of Audit:**	4th November 2014
Plant(s) visited:	Williamstown Water Treatment Plant	**Date of issue of Audit Report:**	21st November 2014
		File Reference:	DW2008/541
		Auditors:	Mr Darragh Page Ms Aoife Loughnane
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. **Galway County Council observed that the Williamstown water treatment plant was not adequately treating the water on 17th October 2014. Galway County Council or Irish Water did not consult with the Health Service Executive to determine if there was a potential danger to human health until 29th October even though the monitoring results from the plant indicated that the UV treatment unit was outside its validation range between the 19th October 2014 and 29th October 2014 (with the exception of 27th October). The unit was also outside its validation range from 29th October to the day of the audit (4th November).**

ii. **Following consultation with the HSE a boil water notice was placed on the supply on the 30th November 2014. This means that consumers were exposed to inadequately disinfected water for 12 days before the supply was put on a boil water notice. *Cryptosporidium* was also detected in the supply on 30th October 2014 (0.19 oocysts/10L).**

iii. **Leaflets for the boil water notice were only being distributed to consumers during the audit i.e. 4th November.**

iv. **Irish Water had not adequately investigated the cause of the failure prior to the EPA audit.**

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 notification by Irish Water dated 30/10/2014 of the imposition of a boil water notice in the Williamstown Public Water Supply.

Williamstown water treatment plant supplies approx. 500 m^3/d water to 511 properties. Treatment consists of ozonation, granular activated carbon filtration, UV and chlorination followed by storage in a 560 m^3 contact tank. The plant was previously run on a 12 hour basis but is now run 24 hours with a lower hourly flow rate.

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

The opening meeting commenced at 11:15 am at Williamstown 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. The audit observations and recommendations are listed in Section 2 and 4 of this report. The following were in attendance during the audit.

Representing Irish Water:

Ms Anne Bonner – Drinking Water Compliance Specialist, Irish Water
Mr Eunan Canavan – Engineer, O&M, Irish Water
Mr John McMyler – Executive Engineer, Galway County Council
Mr Brendan McDonagh – Graduate Engineer, Galway County Council
Mr Sean Quinn – Water Services Technician, Galway County Council
Mr Eugene Quigley – Caretaker, Galway County Council

Representing the Environmental Protection Agency:

Mr Darragh Page – Inspector, EPA
Ms Aoife Loughnane – Inspector, EPA

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 Williamstown supply is from a spring source in an area of karstic limestone bedrock. The spring is covered by a concrete chamber and roof (with lockable access panels) which is in good condition. There are no signs of ingress into the chamber. The raw water sump was cleaned as part of the plant upgrade works approximately 18 months ago.
2.	**Ozonation** a. The raw water is ozonated prior to Granular Activated Carbon (GAC) filtration for organics removal. There are two ozone generators used alternately under normal circumstances. The ozonated water goes through an ozone contactor with a target residual of 0.2 ppm. b. At the time of the audit both ozone generators were operating at maximum capacity (on a reduced flow through the plant) and there was no residual (0.00 ppm – see Photo 1) at the end of the contactor. Galway County Council staff stated that this was because the ozone generators were unable to cope with the level of organics in the raw water on the day.
3.	**Filtration** a. The ozonated water is filtered using granular activated carbon (GAC) media. b. Galway County Council stated that the media is exhausted and is not operating as an

	adsorptive media but is operating as a biological filter. This means that organics removal is compromised.
4.	**Chlorination and Disinfection** a. The filtered water is disinfected using UV and sodium hypochlorite. b. The UV treatment unit is a duty/standby unit validated to treat to ≥ 83% UVT. c. Information submitted previously to the EPA (SCADA screenshots) indicated that the UVT was operating at a flat line of 87.42% UVT for the majority of the time. The EPA had raised concerns about this on 29th August 2014 and again on 20th October 2014. Following the EPA's email of 20th October 2014, Irish Water confirmed that this issue was investigated and it was found that the HMI and SCADA cannot record results below 87.42%. This means that if the UVT dropped below 87.42% it was recorded on the SCADA as a flat line at 87.42%. Daily records of portable testing of the UVT indicate that the UVT dropped below 87.42% (i.e. was below what the SCADA was capable of recording) and was out of validation (<84%) on occasion. The UVT monitor did appear to be reading correctly on the day of the audit (65.7% UVT). Therefore it is of concern that the discrepancy between the UVT monitor and what was recorded on the SCADA was not noticed before. When the EPA raised this issue with Irish Water on 29th August 2014, Irish Water stated on 17th October 2014 that "*Investigations show that the water is very stable, investigations undertaken involved checking calibration records, and SCADA. All showed that they were operating correctly*". Evidence on the day of the audit indicates that this explanation was misleading and incorrect. d. The results recorded on the daily log sheet show that the UVT has been below the validated range for the duration of the period 19th October to 4th November 2014 (with the exception of 27th October), with UVT values as low as 58% recorded. e. UV disinfected water is then chlorinated. Galway County Council stated that the chlorine dose rate was significantly increased since the incident commenced and that dose rates were maximised at the time of the audit (i.e. two chlorine dosing pumps working at maximum capacity, dosing approximately 15 to 20 litres of sodium hypochlorite per day). In spite of this, low chlorine residuals were recorded leaving the plant and in the network. Elevated levels of turbidity and low chlorine residuals were reported at the extremities of the network (<0.1 mg/l).
5.	**Monitoring and Sampling Programme for treated water** a. Correspondence from Irish Water prior to the audit indicated that microbiological sampling had been carried out in the network. These results were not available during the audit and the Water Services Section staff present during the audit said they had not seen these results. b. Galway County Council stated that monitoring for *Cryptosporidium* in the treated water had been carried out since the incident commenced, and that the parasite was detected. However, the *Cryptosporidium* monitoring results were not available during the audit and the Council staff could not say what concentrations or numbers of oocysts were present at the time of the audit. The results were subsequently sent to the EPA on 10 November 2014 and indicated that 15 oocysts were detected in 774 L on 30th October 2014 (0.19 oocysts/10L). The UV treatment unit was outside its validated range on this day,
6.	**Chronology of Events** a. The chronology of events was outlined to the EPA during the audit. Subsequent to the audit Irish Water provided confirmation by email of the chronology of events (Appendix 1). b. Galway County Council stated that there was heavy rain during the night of Friday 17th October 2014 that resulted in a deterioration in raw water quality at the source in the spring. This impacted the water treatment plant. This impact was evident in the results of monitoring carried out at the plant on Saturday 18th October 2014. The raw water turbidity was 49.2 NTU and the colour was > 100 Hz (the maximum colour result that can be recorded). During Saturday 18th and Sunday 19th October 2014, the water services

	technician called but could not contact water services engineers in Galway County Council to alert them to the situation. Water Services Section engineers become aware of the situation on Monday 20th October 2014. During the audit, Galway County Council staff stated that they have no call-out system and are not taking out of hours calls. c. The chain of events from 20th October 2014 is included in Appendix 1. d. On 20th October 2014 the EPA advised Irish Water that "*the SCADA is not recording what the monitor says correctly*". The EPA was unaware of the issues at the plant at the time this email was sent as it was not notified of the incident until 29th October 2014. e. As outlined in action no.6 in Appendix 1 Galway County Council advised Irish Water on 21st October 2014 of the UVT and other monitoring results (including low residual chlorine) recorded on the SCADA. In spite of the EPA questioning the SCADA the day before Galway County Council and Irish Water relied on the results of the SCADA and did not contact the Health Service Executive for advice. The daily test results for the 21st October (not referred to in Appendix 1) indicate that the UV treatment unit was out of validation at the time (81.7% UVT). f. When the HSE was contacted on 29th October 2014, they advised that a boil water notice should be issued. g. A boil water notice was issued on 30th October 2014 and the EPA was notified via email on the same date. h. During the audit, Galway County Council staff stated that the boil water notice was announced on the local radio station and at local masses in Williamstown on the weekend of 1st/2nd November 2014. i. Boil water notice leaflets were only being distributed to consumers on the day of the EPA audit, i.e. 4 November 2014. Galway County Council's community wardens were observed in the village prior to the audit. Galway County Council stated the reason for the delay in distributing BWN leaflets was because the local community wardens stated that they would not work for Irish Water. Community wardens had to be drafted in from other parts of the county to deliver the BWN leaflets. j. Irish Water had not carried out any investigation into the cause of this incident.
7.	**Management and Control** a. The SCADA system is not available to view at Williamstown water treatment plant. The plant operators only have access to real-time (instantaneous) information on the HMI system, and cannot view parameter trends. Galway County Council staff stated that the SCADA had not been snagged or signed off. b. During the audit it was evident that there are communication issues within Galway County Council and also in the manner in which Galway County Council communicates with external stakeholders such as the HSE, Irish Water and the public. c. Galway County Council staff stated during the audit that they are not providing out of hours cover when incidents occur or alarms are activated. d. The Williamstown water treatment plant is incapable of treating the raw water during incidents where the raw water quality deteriorates. During the audit the ozonation, UV and chlorination system were all operating at maximum capacity. In spite of this, the plant was not producing adequately treated water. The auditors observed that the ozone system was not capable of providing a residual ozone concentration after the contactor, the UV system was operating outside its validated range and the chlorination system was not capable of providing a residual at the extremities of the network.

3. AUDITORS COMMENTS

Irish Water and Galway County Council have failed to manage this incident in a manner appropriate to the seriousness of the situation.

The issues of most concern identified during the audit are:

- The failure of Irish Water and Galway County Council staff to deal with out of hours incidents.
- The failure of Irish Water and Galway County Council to consult with the HSE when there was a clear malfunction of the water treatment plant resulting in the supply of water that was inadequately disinfected and did not meet the required quality standards.
- The failure of Irish Water and Galway County Council/ to issue a boil water notice in a timely manner. When this notice was eventually issued on 30th October 2014, the manner and timeliness of communication to the public was inadequate.
- The failure of Irish Water to actively investigate this incident in advance of the EPA audit.
- Irish Waters dismissal of the EPA's previous concerns regarding the questionable UVT results from the SCADA system and the provision of misleading and incorrect information in response to the EPA's request for an explanation of the flat line UVT results.

The catalogue of failures above resulted in consumers being exposed to inadequately disinfected and potentially contaminated drinking water for 12 days longer than necessary (18th to 30th October 2014) before a boil water notice was issued.

Irish Water has previously communicated to the EPA that Williamstown water treatment plant was operating well and requested its removal from the Remedial Action List, however, this assertion was based on misleading and incorrect information that became apparent during this audit. On the basis of the raw water quality variability noted during the audit, the Williamstown water treatment plant cannot robustly deal with the raw water quality variability to ensure the supply is safe and secure, in particular raw water colour greater than 40 Hazen units.

4. RECOMMENDATIONS

1. Irish Water should prepare and submit to the Environmental Protection Agency an Action Programme for improvement of the Williamstown Public Water Supply detailing the actions taken and planned to improve the security of the supply to ensure that water entering the supply is adequately disinfected at all times, such that it meets the requirements of Regulation 4 of the *European Union (Drinking Water) Regulations 2014*.

   An adequate disinfection system is one where the following exists;

   Where chlorination is in place:
   i. Duty/standby dosing arrangements, with automatic switch over in the event of one of the pumps failing, at all chlorine dosing points;
   ii. Flow proportional dosing and/or dosing linked to chlorine residual monitor;
   iii. Adequate effective contact time (15mg.min/l);
   iv. Automatic shut off of the supply in the event that chlorine level falls below an appropriate prescribed level;
   v. A continuous chlorine monitor and alarm, linked to a recording device.

   Where UV Treatment is in place:
   i. A validated UV treatment system that operates within its validated range at all times;
   ii. A continuous monitoring device recording UVI or UVT. The monitor should be alarmed to notify Irish Water in the event of a drop below the validated range;
   iii. Duty/standby UV units in place with automatic changeover, in the event of failure of one of the UV disinfection units, or alternatively automatic shutdown if the UVT drops below its validated range.

   Or
   Replace the source of the Williamstown Public Water Supply with an alternative source that is adequately disinfected

2. Irish Water should prepare, submit and implement a documented out of hours response procedure covering public drinking water supplies in County Galway. This procedure shall outline the criteria where an out of hours response would be required and shall assign

responsibility to individuals or individual grades/positions. Irish Water shall ensure that a cascade system is in place in the event that the nominated person is unavailable.

3. Irish Water should prepare, submit and implement a documented procedure covering the responsibilities and criteria where it is necessary to consult with the Health Service Executive to determine whether there is a potential danger to human health in supplies in County Galway. This procedure shall outline the criteria where consultation is required and shall assign responsibility to individuals or individual grades/positions. Irish Water shall ensure that a cascade system is in place in the event that the nominated person is unavailable.

4. Irish Water should review the accuracy of the SCADA system and investigate whether similar issues to those outlined in Section 2(4)(c) of this report are present in other supplies in County Galway.

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 Mr. Brendan Wall, Manager (Environmental Enforcement).

A direction has issued by the Agency under a separate cover legally requiring specific recommendations to be implemented by Irish Water.

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:** 21st November 2014

Darragh Page

Inspector

Appendix 1 (as per email to EPA from Irish Water dated 7th November 2014)

No	Date	Action
1	20th of October 2014 – email	GCC advise IW lead That considering placing boil water notice on the supply. The UVt dropped below 74.8%, free chlorine leaving plat is 0.27 and in town 0.05mg/l. The UV is validated at 84%
2	20th October 2014 – email	IW – Lead request networks results and bacteriological test results
3	21st of October	IW Lead to GCC What storage is there in Williamstown, Can the plant be shut down until this event has passed?
5	21st October 2014	IW lead to GCC Arrange crypto testing and continue to carry out microbiological and chlorine testing of the network .
6	21st of October 2014 – email	GCC – IW lead forward the following to IW Readings as per SCADA - UVt = 87.4% Residual Chlorine = 0.29 Raw Water Colour = 65.8 Treated Water colour 65.8 Raw Water turbidity = 1.9 Treated water turbidity = 0.53 We have had spikes in the past that went on for 15 days and it just is impossible to predict how long they might last. In the past few days you can see that it passed quickly. Bankside storage has a huge financial cost and this might not sort out all of the issues here. This scheme solution is an extension from Tuam RWSS.
	21st of October 2014 - email	GCC to IW Lead. We don't do crypto monitoring on the plants that have uv as part of their treatment. Crypto monitoring is not that easy to do and we normally do it ourselves and send the filters to CLS for analysis. We will not be able to organize this until the week after next. In any event I'm not sure if there is any relevance in doing crypto monitoring if the plant is back within validation range.
7	22nd of October 2014 email	GCC – IW Lead The Storage in Williamstown is made up as follows On site Treated Water Storage Tank 560 m3 of fully treated water At Water Tower 32 m3 of fully treated water At Kilnaleg Reservoir 91 m3 of fully treated water Total Storage is 683 m3 Demand is around 500 to 520 m3 per day
8	22nd of October 2014 email	Some samples taken by Sean Quinn this evening in Williamstown. They are conducting flushing at same time and all day tomorrow to try and bring situation under control. Remember no Caretaker for past 3-4 months
9	23rd of October 2014 email	GCC – IW lead Informed by Anne Dolan that she has been verbally informed by CLS that there are no bacteriological issues with samples taken to –date in Williamstown. We set the plant back up in accordance with the IW disinfection manual criteria to shut down if any breaches occur. Over last weekend we knocked off that system to try and keep water flowing. Note that we have no caretaker and no response available to such a shut down
10	24th of October 2014 email	If high turbidity and low chlorine levels are still being detected within the distribution system, please continue to carry out bacteriological testing of the supply.
11	29th of October 2014 email	GCC – Lead and Compliance Water quality results for Williamstown for 29th of 10/2014 Raw Water Colour = 100 Treated Water Colour = 13.7 Treated Water Turbidity 1.51 UVt 49% Free Chlorine 0.53

		Ozone residual is zero
12	29th of October 2014	GCC to IW lead Situation deteriorating seeking advice on precautionary boil water notice
13	29th of October 2014 17.14 pm email	GCC to IW lead and compliance We are not in compliance. Chlorine dose on manual request to put on precautionary boil notice
14	29th of October 2014 17.28pm Email	IW request copy of results , bacteriological test , SCADA screenshot
15	29th of October 2014 18.43pm	IW – Compliance Seek HSE advice with regard to disinfection and forward copy of advice and sampling to IW. Urgent that you also arrange total and free chlorine of network.
16	29th of October 2014 19.41pm email	GCC confirm to Compliance and Lead Issue of precautionary boil water Notice.
17	29th of October 2014 email	Lead - Confirm bacteriological testing carried out and forward copy of results
18	29th of October 2014 20.37pm email	GCC – IW lead and Compliance Copy of HSE advice and issue of precautionary notice
19	30th of October 2014 email	IW request copy of HSE advice and copy of the criteria for lifting of notice
20	30th of October 2014	GCC – lead Confirm notice to radio , website to inform public
21	30th of October 2014 email	IW lead request that GCC arrange leaflet drop
22	30th of October 2014 email	IW - inform communications IW of precautionary Boil Notice, bacteriological monitoring on going and to date no bacteriological contamination is evident.
23	31 October 2014 19.13pm email	GCC – Lead and Compliance Network sample results received
24	31 October 2014 email	IW compliance – ask for bacteriological results of test and map of network to identify where samples taken
25	1st November 2014 email	GCC emailed compliance inform that got call from CLS of 15 oocytes and 6 existing un-viable but problem with sample meter reading not working.
26	1st November 2014 Telephone	IW compliance requested by telephone that GCC continue to monitor for crypto and consult with HSE to place full boil Water Notice on the site IW notified IW communications of crypto detection and that precautionary Boil Water Notice was now Boil Water Notice and that GCC were to ensure that public were notified
27	4th of November 2014 Email	GCC confirmed with lead that leaflet drop on Boil water Notice was undertaken
28	6th of November 2014 email	IW compliance request copy of Boil Water Notice from GCC
29	6th of November 2014 email	IW Compliance review copy confirming crypto test results from the Williamstown supply sample of the 31st of October 2014

Photo 1. Ozonation Panel (note Ozone Residual After Contact Tank is 0.00 ppm)