



Drinking Water Audit Report

County:	Galway	Date of Audit:	26 th November 2015
Plant visited:	Kilconnell PWS Scheme Code 1200PUB1030	Date of issue of Audit Report:	9 th December 2015
		File Reference:	DW2015/209
		Auditors:	Mr Darragh Page Ms Aoife Loughnane
Audit Criteria:	<ul style="list-style-type: none"> • The <i>European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014)</i>. • The <i>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>. • The recommendations in any previous audit reports. 		

MAIN FINDINGS

- i. **Kilconnell PWS borehole source is vulnerable to contamination, as proven by the detection of *Cryptosporidium* in the final water on 17th November 2015.**
- ii. **The disinfection system at Kilconnell WTP is not robust and the plant alarm settings are inadequate. The UV unit has operated outside its validated range on several occasions in 2015, meaning that the plant's *Cryptosporidium* barrier has been compromised and the water supply is not adequately disinfected. For this reason, this supply was placed on a boil water notice on 13th November 2015.**
- iii. **There are inadequate procedures for alarm response and escalation of drinking water incidents within Galway County Council, and to Irish Water and the HSE.**
- iv. **The lessons learned from previous disinfection incidents in Galway (Williamstown PWS in November 2014 and Leenane PWS in July 2015) do not appear to have been applied. Furthermore, Irish Water has indicated that a number of other plants in Galway may be at similar risk of operating outside their validated range. This is an unacceptable risk to consumers and the EPA has required Irish Water to identify such plants as a matter of urgency.**

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 to assess the performance of Irish Water in providing clean and wholesome drinking water, and in response to the notification by Irish Water of the imposition of a Boil Water Notice on the Kilconnell public water supply on 13th November 2015.

Kilconnell public water supply provides approximately 134 m³/day to a population of 233 people, including Ballyboggan group water scheme. The source of the supply is a groundwater borehole at Kilconnell water treatment plant. Treatment consists of pre-filtration and disinfection.

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 10.00 am at Kilconnell 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 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:

Anne Bonner, Drinking Water Compliance Specialist, Irish Water
 Shay Walsh, Engineer, Operations & Maintenance, Irish Water
 Diarmuid Croghan, Senior Engineer, Galway County Council
 Adrian Raftery, Executive Engineer, Galway County Council
 Tara Meehan, Technician, Galway County Council
 Christy Mannion, General Supervisor, Galway County Council

Representing the Environmental Protection Agency:

Darragh Page, Senior Inspector
 Aoife Loughnane, 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.	<p>Source Protection</p> <ul style="list-style-type: none"> a. The source is a groundwater borehole at the water treatment plant. No borehole construction records were available during the audit, however Galway County Council (GCC) representatives stated that it is approximately 80 feet (25 metres) deep and was constructed approximately 40 years ago. b. The wellhead is located in a locked chamber above ground level, however the borehole is not adequately capped and sealed (see photo 1). c. The surrounding land use is mainly agricultural. Cattle were grazing in the adjacent field and a water trough was located in close proximity (<5 m) to the borehole chamber (see photo 2), which draws the animals into the immediate vicinity of the abstraction point. The ground was poached in the vicinity of the trough. d. GCC could not confirm if any source protection work has been carried out, including whether farmers had been notified of setback distances under the <i>European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No. 31 of 2014)</i>. e. The borehole source is vulnerable to contamination, as proven by the detection of <i>Cryptosporidium</i> (13 oocysts in 1617 litres) in the final water on 17th November 2015. However, no raw water monitoring had been carried out on the borehole recently.
2.	<p>Filtration</p> <ul style="list-style-type: none"> a. The first stage of treatment is pre-filtration in a membrane cartridge filter.
3.	<p>Disinfection – UV treatment</p> <ul style="list-style-type: none"> a. Primary disinfection is by UV treatment in a Trojan Swift B03 unit. The UV system comprises a duty unit only, with no standby arrangement in the event of failure of the unit. b. There is a bypass facility on the UV unit but GCC confirmed it has never been used, and the plant is shut-down when maintenance is being carried out on the UV unit (e.g. replacement of lamps).

	<p>c. The validated operating range of the UV system is as follows:</p> <table border="1" data-bbox="456 248 1209 378"> <thead> <tr> <th>Volume Flow (m³/hr)</th> <th>Minimum UV Intensity (W/m²)</th> <th>Minimum UV Transmissivity (%)</th> </tr> </thead> <tbody> <tr> <td>0 - 7</td> <td>17</td> <td>80.2</td> </tr> <tr> <td>7 - 10.5</td> <td>21</td> <td>85.1</td> </tr> </tbody> </table> <p>d. During the audit, the flow through the UV unit was approx. 9 m³/hr and the UVI was 28.59 W/m². However, the UVT was 84.5%, indicating that the unit was not operating within its validated range and therefore the water leaving the plant was inadequately disinfected (the supply remains on a boil water notice).</p> <p>e. The UVT alarm is set at 80% which is below the minimum validated UVT (85.1% at flows between 7 to 10.5 m³/hr), meaning that no warning is given before the unit drops outside its validated range. Thus, the alarm setting is inadequate.</p>	Volume Flow (m ³ /hr)	Minimum UV Intensity (W/m ²)	Minimum UV Transmissivity (%)	0 - 7	17	80.2	7 - 10.5	21	85.1
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<p>4.</p>	<p>Disinfection – Chlorination</p> <p>a. Secondary disinfection is by chlorination using sodium hypochlorite.</p> <p>b. The chlorination system comprises duty and standby chlorine dosing pumps with automatic switch-over in the event of pump failure. The dose is flow proportional.</p> <p>c. The clear water tank on site does not provide the required 15 mg.min/l chlorine contact time to ensure that the first connections are receiving appropriately disinfected water. Irish Water confirmed that a new sufficiently sized chlorine contact tank is due to be installed at the plant.</p>									
<p>5.</p>	<p>Treated Water Storage</p> <p>a. Kilconnell reservoir was visited during the audit. There were a number of cracks on the roof of the reservoir (see photo 3). Irish Water stated that Kilconnell Reservoir is included in the reservoir refurbishment programme.</p>									
<p>6.</p>	<p>Exceedances of the Parametric Values</p> <p>a. <i>Cryptosporidium</i> (13 oocysts in 1617 litres) was detected in Kilconnell PWS final water on 17th November 2015. This had not been notified to the EPA (as required by the <i>European Union (Drinking Water) Regulations 2014</i>) by the day of the audit. The notification was subsequently submitted to the EPA on 01/12/2015.</p>									
<p>7.</p>	<p>Housekeeping</p> <p>a. Standing water has collected in an underground chamber located in front of the plant control building, and the pipework in the chamber was submerged. GCC indicated that a flow meter might be located in this chamber but could not confirm it.</p>									
<p>8.</p>	<p>Management and Control</p> <p>a. A review of plant performance data shows that Kilconnell WTP operated outside its validated range on several occasions in 2015 (turbidity >1.0 NTU, chlorine levels <0.3 mg/l (the alarm setting), UVT <85.1% and UVI < 21 W/m²). There was no evidence provided during the audit that these plant performance issues were reported internally in GCC, or communicated to Irish Water and the HSE.</p> <p>b. A specific recent example (24th October 2015) was examined where the turbidity levels rose above 1.0 NTU, chlorine levels dropped below 0.3 mg/l and UVT dropped below 80%. While the caretaker was not available on the day of the audit, there was no record of this incident in the caretakers logbook, GCC Water Services Engineers were not aware of it and could not confirm whether an alarm had been activated, or what action (if any) was taken. GCC confirmed that the caretaker has not been provided with documented procedures outlining what incidents should be reported and escalated.</p> <p>c. The UV alarm settings at the plant are outside the validated range of the UV unit, which has resulted in the failure to alert the caretaker when the UV operating conditions are inadequate.</p>									

	<p>d. The disinfection system at the plant was recently reviewed under Irish Water’s disinfection programme for County Galway. However, that review did not highlight any deficiencies with the operation of the UV system and did not identify that the plant was operating outside its validated range on a regular basis, or that the alarm settings were inadequate.</p> <p>e. Irish Water has a service contract with EPS for the maintenance of all instrumentation at the plant. GCC confirmed that EPS have no role in responding to plant alarms, except when called upon by GCC.</p> <p>f. The plant monitoring data supplied to the EPA on 25/11/2015 shows no borehole flow from 21st to 24th October 2015. During the audit, GCC stated that the plant could not have been shut-down for 3 days because they would run out of water. This questions the validity of the flow monitoring data and whether the borehole flow meter is working properly.</p> <p>g. The map published on Irish Water’s website (https://www.water.ie/news/boil-water-notice-issued--3/Kilconnell-BWN-Map-WSZ-Nov-2015.pdf) to identify the area affected by the boil water notice was not clear or easy to understand. The EPA brought this to Irish Water’s attention and a revised map was provided, however it was still not satisfactory for the purposes of communicating clearly and effectively to the public.</p>
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3. AUDITORS COMMENTS

This audit was carried out in response to the notification by Irish Water of the imposition of a Boil Water Notice on the Kilconnell PWS on 13th November 2015. The audit found that the borehole source is vulnerable to contamination (as proven by the detection of *Cryptosporidium* in the final water on 17th November 2015), and the disinfection system is not robust. A review of plant performance data demonstrates that the UV disinfection system operated outside its validated range on a number of occasions this year, including 29/03/15, 05/05/15, 07/08/15 and more recently 24/10/15. There was no evidence provided during the audit that these plant performance issues were reported internally in Galway County Council, or communicated to Irish Water or the HSE.

This is a repeat of similar incidents at other plants in County Galway (Williamstown in November 2014 and Leenane in July 2015) where there were failures to communicate and escalate disinfection incidents, resulting in delays in the imposition of boil water notices and an unacceptable risk to public health. The EPA is seriously concerned that the lessons learned from the previous incidents do not appear to have been applied in Galway. Furthermore, Irish Water has indicated that other plants in Galway may be at similar risk of operating outside their validated range. This is an unacceptable risk to consumers and the EPA has required Irish Water to identify such plants as a matter of urgency.

The EPA is also concerned that Irish Water’s recent review of the disinfection system at Kilconnell WTP did not identify that the plant was operating outside its validated range, or that alarm settings were inadequate. Irish Water must ensure that plant performance and control settings are thoroughly examined under the disinfection programme.

Kilconnell PWS was previously removed from the RAL in November 2013 following the installation of UV disinfection at the plant. This supply will now be placed back on the RAL due to inadequate treatment for *Cryptosporidium*.

4. RECOMMENDATIONS

The EPA has issued a Direction to Irish Water requiring the submission of an action programme no later than 8th January 2016, to improve the security of Kilconnell PWS to ensure that consumers receive adequately disinfected water at all times. The recommendations set out below are in addition to that which is required by the Direction.

Source Protection

1. Irish Water, in conjunction with Galway County Council, should undertake the following source protection measures at Kilconnell PWS:
 - (i) Ensure the borehole is adequately sealed and capped in order to prevent contamination of the groundwater source.
 - (ii) Examine the feasibility of moving the animal water trough away from the immediate vicinity of the abstraction point.

- (iii) Ensure the current zone of contribution to the source is delineated.
- (iv) Review the available records to confirm the groundwater flow direction, vulnerability and depth of abstraction.
- (v) Ensure that farmers have been advised of the setback distance requirements under the *European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014)*.
- (vi) Ensure that a programme of farm and septic tank inspections is undertaken in the zone of contribution, and follow up any failures with appropriate enforcement actions.

Disinfection

- 2. Irish Water should ensure that the UV disinfection system operates within its validated range at all times.
- 3. Irish Water should ensure that there are duty and standby UV disinfection arrangements with automatic changeover in the event of failure of one of the UV disinfection units.
- 4. Irish Water should ensure that a continuous UVI or UVT monitor is alarmed and linked to a recording device to ensure that any deviation of the quality of water outside the validated range for the UV treatment system or a failure of the UV disinfection system is immediately detected.
- 5. Irish Water should ensure that an effective chlorine contact time of 15 mg.min/l is achieved and that the first connections are receiving appropriately disinfected drinking water. Irish Water should submit a calculation of the effective contact time to the Agency.

Treated Water Storage

- 6. Irish Water should carry out an integrity assessment of Kilconnell reservoir to ensure that there is no ingress into the reservoir. Any maintenance and repairs should be completed as soon as possible after the need has been identified.

Housekeeping

- 7. Irish Water should remove the standing water from the underground chamber in front of the plant control building, and ensure that any equipment in the chamber is maintained in working order.
- 8. Irish Water should ensure the borehole flow meter is calibrated and maintained in accordance with manufacturer's instruction.

Management and Control

- 9. Irish Water should undertake a full review of all alarm settings to ensure the plant operator is alerted to abnormal operating conditions and potential failures, in particular the alarm settings on the UV disinfection system.
- 10. Irish Water should ensure that documented alarm response procedures are in place to ensure that all alarms are acknowledged, assessed and responded to appropriately, and all alarms are logged and any corrective action taken is formally recorded and reported.
- 11. Irish Water should ensure that a documented procedure is in place for the communication and escalation of incidents affecting drinking water supplies in County Galway. The procedure should cover 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.
- 12. Irish Water should ensure that all maps used for public communications are clear and effective in presenting information.

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 Darragh Page, Senior Drinking Water Inspector.

Irish Water 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.

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 DW2015/209 in any future correspondence in relation to this Report.

Report prepared by:

Aife Laghuane

Date:

9th December 2015

Inspector



Photo 1: Uncapped borehole at Kilconnell water treatment plant



Photo 2: Proximity of water trough in adjacent field to the borehole chamber.



Photo 3: Cracks on roof of Kilconnell reservoir.