Site Visit Report

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 to assess the performance of Irish Water in providing clean and wholesome water to the visited public supply.

The audit process is a sample on a given date of the facility's operation. Where a finding against a particular issue has been reported this should not be construed to mean that this issue is fully addressed.

Water Supply Zone

Name of Installation	Hospital PWS
Organisation	Irish Water
Scheme Code	1900PUB1050
County	Limerick
Site Visit Reference No.	SV22949

Report Detail

Issue Date	15/12/2021
Prepared By	Orla Harrington

Site Visit Detail

Date Of Inspection	16/11/2021	**Announced**	Yes
Time In	10:30	**Time Out**	12:40
EPA Inspector(s) **Additional Visitors**	Orla Harrington		
Company Personnel	Irish Water: Deirdre O'Loughlin, Derek O'Toole Limerick City and County Council (acting under service level agreement to Irish Water): Diarmuid O'Dea, Willie Hurley, Neil Boyle.		

Summary of Key Findings

1. The UV disinfection system has not been operational at Hospital Water Treatment Plant since 12/03/21 and the EPA and HSE were not notified by Irish Water of this incident until 08/10/21. The audit found that the incident was not suitably escalated and managed in order to maintain water quality and protect human health. The UV disinfection system was not operational on the day of the audit and at present there is no treatment barrier in place to prevent *Cryptosporidium* entering the supply. Irish Water advised at the audit that arrangements have been made to replace the duty and standby UV units by 31/01/22. This work should be completed without delay.
2. The chlorine monitor in use at the water treatment plant was found not to provide a reliable reading of chlorine levels in the final treated water. Irish Water should ensure that the chlorine monitor provides accurate results as a matter of priority. In the interim, the frequency of hand-held chlorine monitor measurements taken in the network and at the water treatment plant should be increased to verify adequate disinfection of drinking water in the supply.
3. There is no residual chlorine monitor at the reservoir outlet to verify that the minimum chlorine concentration requirement after contact time has been achieved.
4. The audit found significant failures in the management and communication of incidents by Irish Water. Irish Water failed to notify the EPA and HSE promptly of the switching off of the UV disinfection systems at 4 water treatment plants in Co. Limerick; Hospital, Bruff, Castletown/Ballyagran and Herbertstown. The failure to notify these incidents promptly meant that the risk assessment of the incidents did not commence in a timely manner.

Introduction

The Hospital water treatment plant (WTP) is located north of the village of Hospital, Co. Limerick and supplies water to approximately 1,110 people. The plant currently produces approximately 490m3/day of treated water and is operating within its design capacity. The supply is served from two borehole abstractions referred to as borehole 1 and borehole 3 producing approximately 8m3/hr and 20m3/hr respectively. Treatment at the plant consists of cartridge filtration followed by UV primary disinfection (currently not in operation) and chlorination with sodium hypochlorite providing secondary disinfection. Treated water then travels to a reservoir approximately 450m from the plant.

The audit of Hospital WTP was carried out in response to the notification by Irish Water dated 08/10/2021 outlining that the UV disinfection system had been out of operation since 12/03/21.

Supply Zones Areas Inspected

The auditor inspected the treatment processes at Hospital water treatment plant.

1. Incident Management

		Answer
1.1	Was the incident suitably alerted to the plant operators, escalated and managed in order to maintain water quality and protect public health?	No

Comment

A UV disinfection system was installed in 2018 under the County Limerick Disinfection Programme to provide primary disinfection including 3 log inactivation of *Cryptosporidium* at the Hospital WTP. Limerick City and County Council advised at the audit that there have been frequent operational and maintenance issues with the UV since it was installed. Problems included; UV wiper faults, critical lamp fault, digital alarm faults and no maintenance and servicing schedule in place.

Limerick City and County Council stated that the UV disinfection system was shutdown on the 12/03/21 and that this decision was taken in consultation with Irish Water. At the audit, Irish Water Compliance personnel indicated that they were not aware of the UV shutdown at that time and of the subsequent potential *Cryptosporidium* risk to the supply. A service engineer was called to attend the site on the 15/03/21 and discovered a leak at the chlorine injection point which had caused rusting in the control panels and UV units. The leak has since been repaired and a new tapping off the main has facilitated a new injection point.

The shutdown of the UV disinfection system went unreported for 7 months before the EPA and HSE were notified by Irish Water on 08/10/21 of inadequate treatment at Hospital WTP. The shutdown of the UV disinfection systems at 3 other public water supplies in County Limerick; Bruff, Castletown/Ballyagran and Herbertstown was also notified to the EPA and HSE on 08/10/21 and these incidents went unreported since 18/05/21, 10/08/21 and 03/05/21 respectively. Irish Water stated that the incidents only came to light following Irish Water's refresher training on incidents and alarms delivered to Limerick City and County Council staff on 08/10/21.

On 16/11/21 Irish Water outlined to the EPA that the following work is to be carried out at the plant: (i) increased routine *Cryptosporidium* sampling is to be maintained until the UV is back in operation; (ii) microbiological sampling is be undertaken at the plant and on the network and (iii) additional monitoring for residual chlorine on the network. Irish Water provided two *Cryptosporidium* sample results for 10/10/21 and 17/11/21 since notification of the incident. No exceedances were detected. Irish Water advised at the audit that arrangements have been made to replace the duty and standby UV units by 31/01/22.

The EPA is very concerned at the failure of Irish Water to notify the EPA and HSE of the switching off of the UV disinfection systems at four water treatment plants for a prolonged period of time. This meant that a risk assessment of the incidents on water quality and risk to public health did not commence in a timely manner.

2. Source Protection

		Answer
2.1	Is the abstraction source(s) adequately protected against contamination?	No

Comment

The supply is served by two borehole abstractions referred to as borehole 1 and borehole 3. In the past there was a borehole 2 on the site, which was permanently sealed off and decommissioned in 2018 and replaced with borehole 3. Irish Water advised that borehole 3 has been drilled in accordance with EPA guidance and is located 100m north of the plant boundary in the middle of a private field. Borehole 1 is located within the boundary of the water treatment plant. Limerick City and County Council estimated that this borehole was drilled back in the 1970's and that the UV disinfection system was installed to provide a *Cryptosporidium* barrier while this borehole is in use.

Both boreholes are adequately protected to prevent contamination from surface water ingress and capable of providing a combined flow of 28m3/hr. Flow rates, pH, turbidity and temperature are continuously monitored and linked to SCADA.

On the day of the audit, the pH monitor on the raw water was was not operating correctly. Limerick City and County Council advised that plans are in place to address the issue. There are turbidity monitors on each borehole, which alert the operator to any changes in raw water quality. When the raw water turbidity level reaches 0.8NTU an alarm is triggered and there is automatic shutdown at 1NTU. A combined final water turbidity of 0.02NTU was noted on the day of the audit.

3. Disinfection

		Answer
3.1	Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?	No

Comment

Irish Water advised on 19/10/21 that primary disinfection is provided by duty/standby UV units at the plant. However the UV disinfection system has been shutdown since 12/03/21. Irish Water have confirmed that new duty and standby UV units will be installed by 31/01/22 which would provide primary disinfection including 3 log *Cryptosporidium* inactivation at the plant and meet the EPA's criteria for UV Disinfection.

Secondary disinfection is provided by dosing of sodium hypochlorite (10-12% concentration). There are duty and standby chlorine dosing pumps in operation with automatic switchover. The chlorine dose is flow proportional and linked to the chlorine monitor (CL001) in use at the WTP located post chlorine dosing, where a chlorine residual of 0.65mg/l is aimed for before leaving the plant. This chlorine monitor was reading 0.64mg/l on the day of the audit.

At the audit, the following alarm set-points were identified for the chlorine monitor (CL001): (i) low: 0.3mg/l; (ii) low shutdown: 0.28mg/l; and (iii) high shutdown: 1.1mg/l. These alarm settings are currently too low to allow the plant operators react in time when chlorine levels drop below the target level and may not ensure treated water at the extremities of the distribution network contains at least 0.1mg/l to ensure adequate disinfection. On the day of the audit, the chlorine monitor was found not to provide reliable readings of chlorine levels in final treated water from 11/10/21 to 10/11/21 which trended between 0.08mg/l to 1.06mg/l, dropping below levels that would ensure adequate disinfection in the network. Limerick City and County Council stated that the chlorine alarms were being received and advised that a contractor was scheduled to be onsite on 17/11/21 to investigate the reason for the ongoing issues with the chlorine monitor.

Chlorine levels in the network are verified daily at one location and every second day at a second location close to the end of the network by the caretaker using a hand held chlorine monitor. The results meet the minimum recommended chlorine residual concentration of 0.1mg/l in the distribution network. However the frequency of hand held chlorine monitor measurements taken should be increased until the chlorine monitor is operating correctly. Irish Water stated that microbiological samples would be taken in the network on 17/11/21 and weekly thereafter until the issues with the chlorine monitor are resolved.

In light of the fact that UV disinfection is not in operation, Irish Water provided recalculated chlorine contact times (Ct) by including the rising main and reservoir 450m from the WTP. There is no chlorine monitor on the outlet of the reservoir serving the distribution network to verify continuously that the minimum chlorine concentration is being achieved for optimum disinfection in the network. Irish Water confirmed at the audit that they are investigating the feasibility of installing a chlorine monitor post reservoir. At present, there is no reliable indicator of adequate chlorination performance at the plant for the inactivation of microorganisms.

		Answer
3.2	Are monitors and alarms operational via dial out and being responded to with a suitable cascade system in place?	Yes

Comment

There are three people on the cascade system; caretaker, foreman and engineer. If a chlorine alarm is triggered, all three people on the cascade receive a text alert. Alarm process flows and contact lists have been developed and provided to Limerick City and County Council. Irish Water and Limerick City and County Council confirmed that staff training has been undertaken to address failures to escalate process critical alarms for appropriate and timely action.

		Answer
3.3	Is the residual chlorine monitored at a suitable sample location after contact time has been completed?	No

Comment

When there is UV disinfection in place, a monitor to verify residual chlorine after contact time is not deemed necessary, as chlorine only provides a residual disinfectant within the network. However the UV disinfection system was switched off on 12/03/21 due to ongoing operational and maintenance issues, resulting in the need to provide adequate chlorine contact time at the plant.

A revised chlorine contact time calculation was provided by Irish Water, dated 12/10/21, that takes into account the rising main and reservoir in order to achieve adequate Ct, before the first customer is reached. There is no residual chlorine monitor at the outlet of the reservoir to verify the chlorine concentration after contact time has been achieved.

It is the auditors opinion that the EPA and the HSE should have been notified of the inability of the plant to verify chlorine contact time, until such time as Irish Water could confirm the proper installation and commissioning of the new UV system in accordance with EPA guidance.

		Answer
3.4	Is there a chlorine residual ≥0.1 mg/l throughout the network?	Yes

Comment

Chlorine residual monitoring is being carried out on the network and at the plant on a daily basis using a handheld chlorine monitor. On 17/11/21 Irish Water provided chlorine residual monitoring results for the period 01/10/21 to 17/11/21, which were satisfactory.

4. Management and Control

		Answer
4.1	Is the plant suitably managed and controlled to maintain the designed log credit on each treatment stage?	No

Comment

Information provided in support of the audit states that the protozoal log credit requirement for the source water is 3 log. The UV disinfection system provides 3 log credits if operated in accordance with the EPA's Water Treatment Manual: Disinfection. The UV disinfection system is currently out of operation indicating that there is currently a -3 log deficit at the plant.

		Answer
4.2	Is there a documented alarm response procedure?	No

Comment

On the day of the audit, there was a copy of the Irish Water Water Incident Communication Response Chart on the bench in the kiosk. This chart outlines who is to be contacted in the event of an incident that is likely to have an effect on the quality of drinking water and provides details for relevant personnel. Irish Water have advised that the Water Incident Communication Response Chart is now displayed prominently on the notice board of the kiosk wall for ease of reference. There is no detailed documented procedure for response to low, medium and high level (priority) alarms at the WTP.

		Answer
4.3	Are suitable alarm settings in place to alert operators to deteriorating water quality and/or the failure of a critical treatment process?	No

Comment

The chlorine target is 0.65mg/l immediately post chlorine dosing. The low chlorine alarm (0.3mg/l) is below the target of 0.65mg/l chlorine residual concentration in the final water and should be raised to ensure it provides adequate warning of an issue with chlorine dosing.

5. Drinking Water Quality

		Answer
5.1	Is Cryptosporidium monitoring being carried out in accordance with Irish Water's 'Rationale for Determining the Frequency of Cryptosporidium Monitoring in Public Water Supplies'?	Yes

Comment

There is a weekly *Cryptosporidium* monitoring programme in place in the final treated water as currently the protozoal barrier cannot be verified until the validated duty and standby UV disinfection units are installed and commissioned at the plant.

Recommendations

Subject	Hospital Audit Recommendations [16/11/21]	Due Date	10/01/2022
Action Text	**Recommendations** **Irish Water is responsible for ensuring a safe and secure supply of drinking water. To address these issues, Irish Water should implement the following recommendations without delay:** 1. Iris Water should (i) ensure that a validated duty and standby UV disinfection system is installed at Hospital water treatment plant; (ii) complete the verification testing of the duty and standby UV disinfection system and submit 30 days performance data to the EPA to verify effectiveness of the works and (iii) ensure that UV unit training is completed for relevant plant operators. 2. Irish Water should ensure that there is a documented communications protocol for the reporting of incidents in Hospital PWS so the relevant parties involved are alerted promptly and a timely assessment of the risk to public health can be undertaken. Irish Water should ensure that all relevant staff are trained in the protocol and understand the incidences in which it should be used. 3. Irish Water should install a residual chlorine monitor at a suitable location after contact time has been achieved. The monitor should be alarmed and linked to SCADA. 4. Irish Water should investigate the reasons behind the fluctuating residual chlorine levels in the chlorine monitor (CL001) and ensure that the monitor provides reliable monitoring of chlorine residual in the final water 5. Irish Water should ensure that there is a maintenance programme in place for the servicing and calibration of all plant monitors and equipment. 6. Irish Water should ensure that the chlorine alarm set points are set at an appropriate level to ensure that the target residual concentration in the final water leaving the plant is met. 7. Irish Water should ensure that the pH monitor and sensor are fully operational, alarmed and linked to SCADA. 8. Irish Water should continue to undertake *Cryptosporidium* monitoring in Hospital public water supply in accordance with *Irish Water's Rationale for Determining the Frequency of Cryptosporidium in Public Water Supplies.* 9. Irish Water should ensure that there is a documented alarm response procedure in place for Hospital WTP. This procedure should include the actions to be undertaken in response to low, medium and high (priority) alarms. **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 Regina Campbell, Drinking Water Team Leader. Irish Water should submit a report to the Agency on or before 15/01/22 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 time frame 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 Action Reference Number DW20210165 in any future correspondence in relation to this Report.		