Drinking Water Audit Report

County:	Limerick	**Date of Audit:**	06/02/2018
Plant(s) visited:	Croom Public Water Supply (1900PUB1023)	**Date of issue of Audit Report:**	15/02/2018
		File Reference:	DW2016/49
		Auditors:	Cliona Ní Eidhin Regina Campbell
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) (as amended)* • *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 *Drinking Water Report*. • EPA Drinking Water Advice Notes No.s 1 to 15. • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. ***A barrier to Cryptosporidium should be installed at the borehole source to prevent the entry of the parasite into the supply should it arise in the source water.***
ii. ***Two main sources are in use; a borehole and a spring. The audit found that upgrade works are required at both locations to establish a secure well-head and spring chamber that prevent ingress of contaminants, animals or insects to the sources. These improvement works should be progressed as a priority.***
iii. ***Chlorine residuals were reported to drop below 0.1 mg/l in the network extremities on occasions. A review of chlorine alarm levels and chlorine residual management is required to prevent this occurring.***

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 of the detection of Cryptosporidium in the Croom Public Water Supply (PWS) on 08/02/2016, the subsequent inclusion of the supply on the EPA's Remedial Action List and slippage in timeframes for completion of remedial actions.

The Croom Public Water Supply produces an average of 725 m^3/day and serves a population of 1764 people in village and its surrounding rural area. The supply has two main raw water sources; the 'Bypass' borehole (so called as it is located on the Croom Bypass road, 560 m^3/day) and the Skagh well (a spring, 130 m^3/day). A third source, a borehole located in Cois Srutháin housing estate, is used as an occasional supplementary source for a portion of the network of the supply. This supplementary source was used twice in the past year. Treatment is in place at all three locations. The Cois Srutháin

borehole is in the process of being taken in charge by Limerick County Council and Irish water and was not examined during the audit. The two main sources feed treated water to a water tower reservoir via separate rising mains. The water tower is located along on one of the northern approaches to the village and was not examined during the audit.

The opening meeting commenced at 10:30am at the Croom "Bypass borehole" Drinking 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. Photographs taken by Cliona Ní Eidhin during the audit are attached to this report and are referred to in the text where relevant.

The following were in attendance during the audit.

Representing Irish Water:

Deirdre O'Loughlin Drinking Water Compliance Specialist

Salvador McNamara – Water Engineer

Representing Limerick County Council:

Tony Dillon - Caretaker

Willie Hurley – Foreman

Diarmuid O'Dea – Engineer

Peter McEvoy – Assistant Scientist

Sinéad Kennedy – A/Senior Executive Engineer

Representing the Environmental Protection Agency:

Regina Campbell - Inspector

Cliona Ní Eidhin – 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** "Bypass" Borehole a. A Geological Survey of Ireland Groundwater Source Protection Zone report was published for this borehole in 1995. The report contains useful information on the zone of contribution (ZOC) and potential pollution sources. Details of any actions undertaken in response to the report's recommendations were unknown to those present at the audit. An examination of potential hazards in the ZOC has not been undertaken in recent times. b. Farmers operating within the Good Agricultural Practice Regulations buffer zones have not been written to in recent years regarding obligations affecting their activities. c. The well head is located inside a locked, dry building within a secure compound. There is, however, no sealed cap on the well head presenting the potential for ingress to the borehole from the surface. The annulus is not grouted. The borehole casing is made of steel, the above ground portion of which is rusting and corroded. The auditors were informed that the pump is 9 years old and that it is intended to replace it in the coming months at which time a camera survey will be undertaken and well head improvement works completed. Rusting pipework conveying abstracted water from the borehole will be replaced at that time also. Skagh Well (Spring) d. The Skagh spring is enclosed within a circular, covered concrete chamber. The integrity of

	the spring chamber was inadequate. i. Two inspection hatches were present; one hatch cover could not be closed (See Photograph 1) and the second was not adequately sealed. ii. Two vents were present but it was noted that the built-in screen was not fine enough to prevent ingress by insects. (See Photograph 2) e. The farmer using lands near the spring compound has not been written to in relation to his/her obligations under the Good Agricultural Practice Regulations in recent years. <u>Cois Srutháin Borehole</u> f. This borehole source was not visited during the audit. Whilst it is not currently owned/operated by Irish Water, it is utilised for the public supply during times of high demand. Details on the borehole construction were not available for review at the audit.
2.	**Monitoring and Sampling Programme for raw water** a. Raw water sampling results for the two main sources were provided to the auditors. b. An online turbidity monitor is in place at both locations and both are connected to SCADA. c. Raw water monitoring results for all 3 sources used by this supply show evidence of some contamination with the highest levels of contamination detected at the Skagh Well Spring. "<u>Bypass" Borehole</u> d. The turbidity monitor at the borehole was reading in the region of 0.318 NTU during the audit. According to trend information provided from SCADA, turbidity remained below 1 NTU at all times during the period examined except on two occasions where an elevated reading was verified by the operator to have been caused by power supply issues. e. At the borehole, the off-take point for the turbidity monitor is post-chlorination. The auditors indicated that turbidity should be measured prior to chlorination. <u>Skagh Well (Spring)</u> f. Raw water monitoring results from the Skagh well showed evidence of contamination with high levels of E.coli (613 MPN/100mls on 24/02/2015 and 109 MPN/100mls on 13/09/2016) and coliform bacteria (1553 MPN/100mls on 24/02/2015 and 1046 on 13/09/2016). <u>Cois Srutháin Borehole</u> g. Limited raw water sampling has been completed at this source, however, there was evidence of contamination in one sample taken on 27/06/2017 where *E.coli* was detected at 115 MPN/100mls.
3	**Disinfection** "<u>Bypass" Borehole</u> a. Duty and standby chlorine dosing pumps with flow proportional dosing and automatic switchover were confirmed to be in place. Alarm set-points were reported by Irish Water to be 1.45 mg/l (high), 0.2 mg/l (low) and with automatic shut-down at 0.1 mg/l. Triggering of the alarm is instantaneous. The auditors noted that the low-level alarm set-point afforded minimal allowance for chlorine take-up in the network and presented the possibility of water containing <0.1 mg/l chlorine in the network. b. Chlorine residuals are checked in the network at a remote chlorine monitor (not connected to SCADA) and using a hand-held chlorimeter. Results of these checks are not, however, recorded. It was reported that levels do drop below 0.1 mg/l in the network extremities on occasions. c. Sufficient chlorine contact time is achieved. d. There is currently no barrier to the entry of Cryptosporidium into the Croom PWS from this borehole, should it occur in the raw water. <u>Skagh Well (Spring)</u> a. UV has been in operation as the primary disinfection on this source for approximately 5

	years. A single duty, UV unit is in place with automatic shut-down of the plant in the event of its operating parameters exceeding the validated range. Shut-down at the spring is based on UVI only. b. Duty and standby chlorine dosing pumps with flow proportional dosing and automatic switchover were confirmed to be in place as secondary disinfection. High and low level chlorine alarms were in place. The auditors did not record whether there was automatic shut-down linked to the chlorine monitor.
4.	**Treated Water Storage and Distribution Network** a. The 204m^3 capacity water tower in the Croom PWS network provides approximately 4 hours storage for the supply. It was not examined as part of the audit. Irish Water advised that increased storage capacity would be desirable to ensure security of supply in the event of shut-down. b. The water tower reservoir, constructed circa the 1940s, was fully refurbished and relined in 2010. It was not visited or examined during the audit.
5.	**Monitoring and Sampling Programme for treated water** a. The check and audit monitoring frequencies were verified as correct.
6.	**Exceedances of the Parametric Values** a. The EPA was notified of the detection of 1 No. Cryptosporidium oocyst in the Bypass borehole on 08/02/2016. Monthly Cryptosporidium sampling has been undertaken since then with no subsequent detections.
7.	**Chemical storage and bunds** a. The chlorine day tanks were adequately bunded at both treatment plants. b. One 25 litre drum of sodium hypochlorite is kept on site at each location and both were standing within a bund and were within their use-by dates.
8.	**Management and Control** a. Information on EDEN relating to this supply only refers to the borehole groundwater source and chlorination. b. An alarm response procedure is established and is being followed by the plant operators but is not documented. c. The calibration of dosing pumps, chlorine monitors and the UV unit were out of date by 1 week. The auditors were informed that scheduling of a contractor to undertake this work relied on initiation by Irish Water as a contract for ongoing calibration was not in place. d. Irish Water has identified interim (Q3_2018) and long term (Q4_2019) Remedial Actions for the Croom Public Water Supply. i. Interim actions include the installation of UV and are to be undertaken under the Irish Water's Disinfection Programme for Limerick. Irish Water informed the auditors that an assessment in preparation for this work is to take place in the next 4-6 weeks. ii. Irish Water has informed the EPA of the long-term proposal to connect the Croom PWS to the Limerick City PWS. The auditors were advised that this connection will require the laying of a new 5km distribution pipes.

3. AUDITORS COMMENTS

The Croom PWS is on the EPA's Remedial Action list due to the absence of a *Cryptosporidium* barrier. The supply is monitored monthly for the parasite and has not had a detection since February 2016. The supply delivers drinking water of good quality to the consumers it serves. The supply has two main sources (a borehole and a spring) and one supplementary source (a borehole) and is managed within the constraint of having only 4 hours' worth of available treated water storage capacity. All 3 sources show evidence of intermittent contamination, highlighting the critical importance of reliable disinfection systems and automatic shut-down when key operating parameters are breached.

Immediate improvements to source protection are required at the primary borehole and at the Skagh Well. The well head requires sealing and integrity needs to be established at the Skagh Well spring chamber. The installation of UV at the main borehole should be undertaken without delay.

4. RECOMMENDATIONS

General

1. Irish Water should update the supply details on EDEN for the Croom Public Water Supply to include details on the sources and treatment in place.

Source Protection

2. Irish Water should report to the EPA on whether any source protection measures have been implemented since the Groundwater Source Protection Scheme report was prepared for the Croom PWS in 1995 and provide a summary of ongoing vigilance in relation to potentially polluting activities in the Zone of Contribution (ZOC).

3. Irish Water should ensure that the "Bypass" borehole is capped and sealed to prevent the ingress of surface water and / or any other contaminants. The integrity of the borehole casing should be investigated and undertake any work required to replace damaged or corroded casing. The feasibility of grouting the borehole annulus should be explored and carried out if possible. All borehole linings and seals should be maintained in accordance with EPA Advice Note No. 14: Borehole Construction and Wellhead Protection.

4. Irish Water should undertake works at the Skagh spring chamber to establish integrity and prevent contamination of the spring source.

5. Irish Water should delineate the ZOC associated with the Skagh spring.

6. Irish Water should liaise with Limerick County Council to ensure that all landowners are aware of the setback distances in the European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (S.I. No. 31 of 2014) for the supply sources.

7. Irish Water should gather as much information as possible on the Cois Srutháin borehole when it is taken in charge. Borehole construction logs should be obtained, if available. The *Cryptosporidium* risk assessment should be completed and appropriate measures implemented to reduce risks identified.

Monitoring and Sampling Programme for raw water

8. Irish Water should relocate the turbidity monitor sampling point to before the chlorine injection points at the Bypass borehole.

Disinfection

9. Irish Water should examine chlorine alarm set-points at the Bypass borehole and Skagh Spring to ensure that the operator is immediately alerted to any drop in chlorine levels that may result

in inadequately disinfected water in any part of the distribution network.

10. Irish Water should confirm whether there is automatic shut-down linked to the chlorine monitor at the Skagh spring treatment plant.

11. Irish Water should progress the proposed installation of UV at the "Bypass" borehole. It should be ensured that the UV disinfection system is validated in accordance with an appropriate internationally accepted validation system. The UV system should include a continuous UVI monitor with an alarm 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.

Distribution System

12. Irish Water should ensure that free residual chlorine levels at the end of the distribution network are maintained at 0.1mg/l. and that daily chlorine residual checks in the network are recorded as routine as evidence of this.

13. Irish Water should provide an outline, with approximate timeframes, of any proposals to provide increased treated water storage in the Croom PWS to accommodate potential shut-down of supply and enhanced supply security.

Management and Control

14. Irish Water should prepare a documented procedure for the response to alarms and ensure that appropriate training or briefing is provided to all staff participating in the alarm response.

15. Irish Water should confirm that calibration of all pumps and monitors at the Croom PWS has been completed.

16. Irish Water should ensure that all plant are calibrated in advance of the due-dates and develop a system for alerting the plant operator to an approaching calibration or maintenance due date.

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 Ms. Regina Campbell, Drinking Water Team Leader.

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.

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 DW2016/49 in any future correspondence in relation to this Report.

Report prepared by: CNE **Date:** 15/02/2018

Inspector

Photograph 1: Inspection hatch at Skagh Spring – cover unable to close to protect spring water from contamination or ingress.

Photograph 2: Vents on Skagh Spring chamber – screen not insect-proof.