



Drinking Water Audit Report

County:	Co. Cork	Date of Audit:	14/04/2015
Plant visited:	Crookstown PWS (Cloughduv source) (0500PUB3102)	Date of issue of Audit Report:	25/05/2015
		File Reference:	DW2010/68
		Auditors:	Cliona Ní Eidhin Michelle Roche
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. *The chlorine monitor in use at the treatment plant was found to not provide a reliable reading of chlorine levels in final treated water, reportedly due to the interference of manganese with measurement apparatus. A second monitor measuring chlorine levels post-reservoir (and post disinfection contact time) may be similarly affected by manganese; it was reading a high result of 1.28 mg/l during the audit whilst the target chlorine level in final water is only 0.7 mg/l. The instatement of reliable monitoring of chlorine levels in treated water should be undertaken as an urgent priority. In the interim, the frequency of hand-held chlorine monitor measurements taken in the network should be increased to daily to verify adequate disinfection of drinking water in the supply. Some actions in relation to this finding were taken by Irish Water in the days immediately after the audit.*
- ii. *The batch of sodium hypochlorite disinfectant in use at the plant was suspected by the WSA to be not of the strength documented in the chemical's data sheet.*
- iii. *There was no operational verification of the effectiveness of manganese removal at the treatment plant.*
- iv. *Backwash water from the pressure filters was found to be discharged to a marshy area <10 m from the working borehole from which it percolates, informally, to groundwater. This practice should cease. An alternative method for disposal for this water should be identified and put into practice as a permanent measure.*

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 notifications by Irish Water dating from June 2010 to December 2014 of failures to meet the Lead parametric value (as specified in Table B of Part 1

of the Schedule of the Regulations) in the Crookstown Public Water Supply. Where the text refers to the Water Service Authority this refers to Irish Water in accordance with Section 7 of the Water Services (No. 2) Act 2013.

The Cloughduv / Crookstown Public Water Supply is located some 23 km west of Cork City, 1 km south of the N22. The source of raw water and treatment plant for the Crookstown Water Supply Zone changed in September 2014 from two boreholes in Crookstown to a new source and plant located in Cloughduv. The new Cloughduv source comprises a single borehole which had originally been drilled by a developer circa. 2008. It was subsequently taken in charge by Cork County Council and commissioned as a public water supply in September 2014 by Irish Water to serve the Crookstown Water Supply Zone. The previously used boreholes at Crookstown were put out of use at that stage and are to be decommissioned. The supply serves a population of 846 dispersed within and between the villages of Cloughduv and Crookstown.

Treatment in place at Cloughduv comprises chlorination and manganese removal (2 x manganese dioxide pressure filters). Treated water is pumped to a reservoir at an elevated location to the south of Cloughduv village prior to distribution. The borehole pump's operation is based on reservoir levels; it typically pumps for between 20 and 21 hours per day.

The opening meeting commenced at 09.30am at the Cloughduv Drinking Water Treatment Plant (DWTP). The scope and purpose of the audit were outlined at the opening meeting. The audit process consisted of interviews with staff, the 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 and closing meeting:

Representing Irish Water:
Kevin Murphy – Water Engineer Deirdre O’Loughlin – Compliance Analyst Dennis O’Regan – A/Engineer (Cork County Council) Padraig Thornton – A/Senior Engineer (Cork County Council) Dave Sheehan – Executive Scientist (Cork County Council) Finbarr Harrington – Water Curator (Cork County Council)
Representing the Environmental Protection Agency:
Cliona Ní Eidhin - Inspector Michelle Roche - 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> <ol style="list-style-type: none"> a. No zone of contribution for Good Agricultural Practice (GAP) buffer zones to the Cloughduv borehole have been delineated. b. Landuse in the locality of the borehole is agricultural, being largely grazing for dairy farming. Farmers had not been written to since the commissioning of the new Cloughduv borehole, specifically, regarding their obligations under the GAP Regulations. c. No <i>Cryptosporidium</i> risk assessment has been completed for the Cloughduv borehole. d. The two boreholes at Crookstown have yet to be decommissioned and are presumed to be
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	<p>located within the same groundwater body / aquifer as Cloughduv. The WSA advised that decommissioning was to be undertaken but that this work was not yet scheduled.</p> <ul style="list-style-type: none"> e. Drilling logs and details of borehole construction had not been collated and were not on record at the plant. (This information was obtained and submitted to the EPA in the days immediately following the audit.) f. The in-use borehole was capped but it could not be determined whether the cap was fully sealed. The cap material was noted by the auditor to be rusting. (see Photograph 1) g. A second borehole is situated <10 m from the operational borehole within the Cloughduv treatment plant compound. This borehole is not currently in use, nor has it been decommissioned. No details on the construction of this borehole had been obtained by the WSA from the drilling company, nor was its status, as a back-up borehole or otherwise, known to the WSA. The well head of this second borehole was incompletely capped and was not sealed. (See Photograph 2)
<p>2.</p>	<p>Monitoring and Sampling Programme for raw water</p> <ul style="list-style-type: none"> a. Limited raw water monitoring results were available for review during the audit. b. The range of manganese variability in raw water was not known.
<p>3.</p>	<p>Filtration</p> <ul style="list-style-type: none"> a. Two pressure filters are in place at the Cloughduv treatment plant for the purposes of manganese removal. The filters contain a single media type; manganese dioxide. One filter operates at a time. b. The WSA did not know the depth of sand contained in the filters, whether media loss occurred, when the sand had last been changed or when it was due to be changed. c. In terms of maintenance, the WSA informed the auditors that the filters were subjected to a ‘shock’ treatment twice per year by in-house technicians, but it was not known what this treatment entailed. d. Each filter is backwashed once per day using unchlorinated water. Backwash water is run to waste to a holding tank within the treatment plant compound. The holding tank discharges water to a marshy area just outside the fence of the treatment plant compound, close to the working borehole, from which it percolates to groundwater. (See Photograph 3) The volume of water discharged was not known by the WSA. e. Turbidity monitors were not observed on filtered water during the audit.
<p>4.</p>	<p>Chlorination and Disinfection</p> <ul style="list-style-type: none"> a. Duty and standby chlorine dosing pumps were confirmed to be in place. Dosing is flow proportional based on chlorine residual. b. Chlorination is switched off each day during the filter back-wash. The WSA did not know what controlled the switching off and on of chlorination before and after the backwash. c. Chlorine monitors are in place at the plant and at the outlet from the reservoir, post disinfection Ct. The target chlorine level in final water is 0.7 mg/l. <u>Monitor 1:</u> The chlorine monitor in use at the treatment plant was found to not provide a reliable reading of chlorine levels in final treated water, reportedly due to the interference of manganese with measurement apparatus. During the auditors observation of the unit, the chlorine monitor read as high as 0.8 mg/l and as low as 0.33 mg/l. A recent comparison made between the monitor reading and a measurement using the hand-held / portable chlorine monitor found the monitor read 1.30 mg/l whilst the hand-held device read 1.03 mg/l. <u>Monitor 2:</u> The second monitor measuring chlorine levels post-reservoir (and post contact time) was noted to be reading a high result of 1.28 mg/l during the audit. This monitor may be similarly affected by manganese. <p>Some actions in relation to the above findings regarding chlorine monitors were taken by Irish Water in the days immediately after the audit and communicated to the EPA.</p> <ul style="list-style-type: none"> d. The chlorine monitor at the treatment plant is alarmed with a low-level set-point of 0.2 mg/l. The alarm is triggered in the event that a level of ≤ 0.2 mg/l or lower is sustained for a period

	<p>of ≥ 30 minutes.</p> <p>e. The alarm has a dial-out facility which alerts the curator only. There is no dial-out cascade in place and no documented alarm response procedure is in place.</p> <p>f. Chlorine levels in the network are verified once per week at two locations close to the end of the network by the curator using a portable monitor unit.</p> <p>(See a further finding regarding sodium hypochlorite chemical under Management and Control below.)</p>
5.	<p>Monitoring and Sampling Programmes for Treated Water</p> <p>a. No operational monitoring, continuous or otherwise, for verification of manganese removal takes place.</p>
6.	<p>Treated Water Storage and Distribution Network</p> <p>a. The reservoir was inspected externally as part of the audit. Inspection hatches were confirmed to be secure and sealed. Vents were of good design but did not have insect-proof mesh securing the orifices.</p>
7.	<p>Exceedances of the Parametric Values</p> <p>a. The auditors queried the history of lead, nickel and cadmium exceedances in the Crookstown supply but the WSA did not have details available in order to discuss these.</p> <p>b. The auditor raised that there was some uncertainty within file reference DW2010/68 regarding the exact number of houses subject to a water Restriction notice on the supply. The WSA stated that it was in the region of 30 houses.</p> <p>c. The WSA explained that change over from the former Crookstown source (pH of 6.5) to the less aggressive Cloughduv (pH of 7.6 – 7.0) was hoped to address some of the exceedances. The resampling programme to verify this and identify any remaining lead exceedances was yet to be scheduled by the WSA.</p>
8.	<p>Management and Control</p> <p>a. The WSA informed the auditor that the batch of Sodium Hypochlorite currently in use at the plant was identified to be of questionable concentration. From experience, the curator suspected that its strength was not as documented in the data sheet provided on delivery of the batch. The WSA advised that a new supplier was being sought for future batches of chemical purchased.</p>

3. AUDITORS COMMENTS

The drinking water treatment plant at Cloughduv was taken in charge by Irish Water less than one year prior to the date of the audit. A number of concerns regarding the treatment plant itself were highlighted as priorities during the audit and require rectifying. These include verification of disinfection and concerns regarding source protection, following observation of a disused borehole and the purging of backwash water, both within short distances of the in-use borehole. Gaps in information regarding raw water quality and in the effectiveness of manganese removal at the plant should also be addressed. Irish Water should enact measures to address the recommendations as set out during the audit and in this audit report and report back to the EPA on recommendations as requested, below.

4. RECOMMENDATIONS

Source Protection

1. Irish Water should delineate the appropriate buffer zones around the source and liaise with the

relevant local authority in relation to the requirements of the *European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014)* to ensure, unless an alternative setback distance has been set as per Article 17 that:

- i. Organic fertiliser or soiled water is not applied to land within 200 m of the abstraction point; and
 - ii. Farmyard manure held in a field prior to landspreading is not placed within 250 m of the abstraction point.
2. Irish Water should ensure that the *Cryptosporidium* risk assessment is completed for the Cloughduv source of the Crookstown public water supply.
 3. Irish Water should decommission the now redundant boreholes at Crookstown in accordance with the appropriate best practice guidelines (such as the UK Environment Agency's guidance on Decommissioning Redundant Boreholes and Wells or SEPA's Good Practice for Decommissioning Redundant Boreholes and Wells) to prevent the risk of it presenting a preferential pathway for the entry of contaminants to the aquifer.
 4. Irish Water should establish the status of the second borehole at the Cloughduv treatment plant site and decommission it in accordance with best practice guidelines (see recommendation 3) if it is redundant. If it is to be maintained as a contingency borehole, the borehole should be capped and sealed.
 5. Irish Water should ensure that the well head currently in use is capped with a suitable material and sealed. See EPA Advice Note No. 14 on Borehole Construction and Wellhead Protection. (http://www.epa.ie/pubs/advice/drinkingwater/EPA_DrinkingWater_AdviceNoteNo14b_web.pdf)

Monitoring and Sampling Programme for Raw Water

6. Irish Water should characterise the variability in raw water quality, particularly in relation to manganese.

Filtration (General)

7. Irish Water should document in a plant manual operational and maintenance details pertaining to the two pressure filters including the following:
 - a. Details of the media used, its detailed specification, depth and details of the supplier.
 - b. Dates on when filter media was last replenished and on the criteria for determining when future media replacement or replenishment should take place.
 - c. Filtration rate.
 - d. Details of the schedule for checking media depth in the filters and the effectiveness of the media.
 - e. A filter log book for each filter recording all maintenance and inspection carried out on the filters.
 - f. Details of the routine daily operational backwashing cycle of the filters.
 - g. Details of regular maintenance (including 'shock' treatment) and calibration work required to be undertaken on the filters at certain frequencies by in-house technicians and by contractors and records of its completion.
8. Irish Water should install continuous turbidity monitors on each filter. These monitors should be linked to a recording device and generate an alarm in the event of a deviation from the acceptable operating range of the filters.
9. Irish Water should put in place the means for verifying effective removal of manganese by the filters.

Disinfection

10. Irish Water should install a reliable continuous chlorine residual monitor on the final water. This monitor should be alarmed and linked to a recording device to ensure that either a sudden increase in chlorine demand or a failure of the chlorine dosing system is immediately detected. Reliable monitoring of chlorine residual is required at least after contact time has been achieved.
11. Irish Water should identify the controlling mechanism over the disabling and enabling of disinfection during the backwash cycle and ensure that this cannot result in undisinfecting water being sent to supply without detection. It should be ensured that enabling of chlorination following backwash is robust, reliable and that it cannot be overridden without prompt detection. It should be ensured that a failure of the disinfection system to enable after backwashing results in an alert being raised.
12. Irish Water should appraise the alarm setting requiring a level of ≤ 0.2 mg/l or lower is sustained for a period of ≥ 30 minutes and assess whether this presents a risk of undisinfecting water entering the distribution network.
13. Irish Water should establish a cascaded dial-out configuration on the telemetry unit attached to the chlorine alarm. A Standard Operating Procedure should be prepared and included in a plant manual detailing the response protocol to be followed in the event of a triggered alarm.
14. Irish Water should take action to ensure that sodium hypochlorite in use for disinfection is of verified strength and reliable for use as a disinfectant.
15. Irish Water should increase the frequency of hand-held chlorine monitor measurements taken in the network to daily to verify adequate disinfection of drinking water in the supply. Daily network verification should be undertaken until reliable monitoring of chlorine residual post contact time is in place.

Treated Water Storage

16. Irish Water should ensure that all vents on the reservoirs are secured against ingress of insects.

Exceedences of the Parametric Values

17. Irish Water should confirm the exact number of houses affected by water restriction notices for various parameters exceeded in the Crookstown supply. It should be clarified how many of homes have been subject to a water restriction since 2010 and how many date from 2014.
18. Irish Water should provide a timeframe for completion of resampling in the Crookstown PWS to identify any lead exceedences remaining since the changeover to the Cloughduv source.

Management and Control

19. Irish Water should ensure that the practice of discharging backwash water to groundwater in the vicinity of the borehole ceases. An alternative method for disposal for this water should be identified and put into practice as a permanent measure.
20. Irish Water should prepare a plant manual for the Crookstown PWS's new source and treatment to include the following information:
 - a. Drilling logs and details of borehole construction.
 - b. Standard Operating Procedures
 - c. Maintenance and calibration schedules and records.

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 Yvonne Doris Drinking Water Team Leader.

Irish Water is recommended to put such measures in place as are necessary to implement the recommendations listed in this report. 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 **recommendations numbered 6, 8, 9, 10, 17 and 19**. The report should include details on the action taken and planned to address these recommendations, including timeframe for commencement and completion of any planned work.

The actions by Irish Water to address other recommendations taken will be verified by the Agency during any future audits of this supply.

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 DW2010/68 in any future correspondence in relation to this Report.

**Report
prepared
by:**

Claire Ní Eadhaigh

Date: 25/05/2015

Inspector

Photograph 1: Rusting cap on borehole.



Photograph 2: Second borehole <10 m from operational borehole – unsealed and not decommissioned.



Photograph 3: Adjacent marshy area receiving backwash water. This water percolates to groundwater.

