Drinking Water Audit Report

County:	Mayo	**Date of Audit:**	13th May 2016
Plant(s) visited:	Ballina Lisglennon Water Treatment Plant	**Date of issue of Audit Report:**	23rd May 2016
		File Reference:	DW2013/93
		Auditors:	Ms. Michelle Roche
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 *Drinking Water Report*. • EPA Drinking Water Advice Notes No.s 1 to 15. • The recommendations in the previous audit report issued 30/09/15.		

MAIN FINDINGS

i. **The recommendations from the previous audit report issued on 30th September 2015 have not been implemented. The recommendations include the replacement of filter media and an assessment of the effectiveness of the filters at the treatment plant and timeframes for any upgrade works proposed.**
ii. **Chlorine residuals in some parts of the network were inadequate. Addressing the low chlorine residuals was also a recommendation of the previous audit report and no action has been taken since the previous audit.**
iii. **The final water turbidity readings at the Lisglennon treatment plant were below 0.2 NTU and no *Cryptosporidium* had been detected in the final water up to the 13th May 2016.**

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 10/05/16 of four cases of cryptosporidiosis in the Ballina community. This had increased to 6 cases at the time of the audit.

The Ballina Lisglennon water treatment plant serves a population of 15,500 people at a volume of 8,000m^3/day and operates for 23 hours/day. A portion of the Ballina area is served by the Ballina Wherrew water treatment plant which was also audited on 13/05/16. The Lisglennon plant was constructed in mid-1980's and includes the following treatment; coagulation with aluminium sulphate, clarification in 3 clarifiers, rapid gravity filtration in 3 filters, disinfection with chlorine gas and fluoridation.

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

The opening meeting commenced at 14:00 pm at the Ballina Lisglennon water treatment plant. The scope and purpose of the audit were outlined at the opening meeting. The purpose of the audit was to observe the effectiveness of the plant at providing treatment for *Cryptosporidium* and investigate the implementation of audit recommendations outlined in the audit report issued on 30/09/15. 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:

Mr. Anthony Skeffington – SLA Lead Engineer, IW
Mr. Thomas Gibbons – Compliance Analyst, IW
Mr. Iarla Moran – Senior Engineer, Mayo CC
Mr. Eddie Munnelly – Senior Executive Engineer, Mayo CC
Mr. Mark O'Donnell – Executive Engineer, Mayo CC
Ms. Eileen Cavanagh – Executive Scientist, Mayo CC
Mr. Eddie Walsh – General Service Supervisor, Mayo CC
Mr. Gerard Shally – Electrician, Mayo CC
Mr. PJ Brogan – Senior Caretaker, Mayo CC
Mr. Kevin Maheady, General Operator, Mayo CC

Observers:
Dr. Emer O'Connell – Public Heath Consultant, HSE
Dr. Regina Kiernan – Public Health Consultant, HSE

Representing the Environmental Protection Agency:

Ms. 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.	**Source Protection** a. The Lisglennon PWS is sourced from Lough Conn and raw water is pumped by night from the abstraction point at the Wherrew water treatment plant to a 16,000m^3 raw water tank (uncovered) at Lisglennon. b. There is an online turbidity monitor on the raw water and the caretaker takes a manual colour and pH sample daily. Raw water turbidity at the time of the audit was 1.2 NTU. c. The caretaker stated that the raw water is relatively stable however wind direction can impact raw water colour, particularly if wind directs water from the River Deel into the lake as the River Deel flows through agricultural land. The caretaker at the Wherrew plant closely observes the weather and reports any changes in raw water quality to the Lisglennon caretaker. d. Irish Water stated online UVT and *Cryptosporidium* monitors will be installed on the raw water in June 2016, under the Irish Water Disinfection Programme.
2.	**Coagulation, Flocculation and Clarification** a. A fixed dose of 115 mg/l of 8% aluminium sulphate is applied to the raw water before a static mixer. The dose rate was confirmed as optimal for the plant by on site jar tests carried by Chemifloc on 6th April 2016.

	b. There was no dosing chart on-site in the event of raw water quality changes despite the EPA recommending operating procedures be put in place to determine the correct amount of chemicals to be used in the coagulation process when raw water quality changes. Irish Water had stated in its response to the previous audit in September 2015 that standard operating procedures, dosing charts and monthly jar tests would be carried out monthly from January 2016 at the plant. c. The coagulant dose is adjusted from time to time by the caretaker based on daily colour samples of the raw water. d. Mayo CC stated they will be hiring 3 laboratory technicians in the near future who will carry out regular jar tests at water treatment plants in Mayo, including Lisglennon. e. Polyacrylamide of 10% solution is dosed at a rate of 0.16 mg/l 10 minutes after the coagulant dose. The Polyacrylaminde is dosed into three separate tanks which feed into three clarifiers. f. The three clarifies, which are fitted with lamellae plates, are fully cleaned once a year and the clarifier walls are cleaned every two months. g. Floc was observed on the walls of clarifier 2 (Photograph 1) above the lamellae plates and the caretaker stated that sludge bleeds were at a frequency of every 7 minutes for a duration of 2 minutes.
3.	**Filtration** a. The Lisglennon water treatment plant has 3 rapid gravity filters. The filter media has not been replaced since 1980's and a recommendation to replace the filter media and assess the effectiveness of the filters was made in the audit report issued by the EPA on 30/09/15. Irish Water in its audit report response on 20/11/15 stated filter media would be replaced and an assessment of the filters would be complete by 31/03/16. b. Filter media had not been replaced and an assessment of filter effectiveness was not complete at the time of the audit. The depth of media in the filters was measured in October 2015 and found to be 1100mm. A sample of the existing media was sent for particle size and composition analysis one week prior to the audit. c. Filters are backwashed based on time and brought back into service automatically and without delay as part of the backwash programme. No review of the filter backwash process has been carried out as recommended in the EPA's previous audit report (Recommendation 3b & 4). d. Filter walls were observed to be relatively clean on the day of the audit. The caretaker stated that he washes down the filter walls on a daily basis during the backwash programme. e. Filters are fitted with individual turbidity monitors which are calibrated every 6 months. All monitors were within calibration and the turbidity monitor on the outlet of filter 2 was replaced following the last EPA audit. f. Final water turbidity after the filters was 0.06 NTU on the day of the audit.
4.	**Disinfection** a. Disinfection is by chlorine gas. A chlorine residual of 1.10 mg/l is aimed for leaving the treatment plant and the outfall of the clearwater tank is alarmed with a low level residual of 0.5 mg/l, as is the Ballina Reservoir. b. A number of low chlorine residuals were recorded in the network by the caretaker. On finding a low chlorine residual the caretaker will flush the mains and resample, however a review of the chlorine residual logbook indicates that resampling is not always carried out immediately, and flushing of the mains does not always restore adequate chlorine residuals. There is no procedure in place for dealing with low chlorine residuals and where flushing of the mains is unsuccessful no further actions are taken to address the issue. c. Low chlorine residuals in the network was also observed by the EPA during the previous audit. Recommendation 6 of the EPA's previous audit report requested that the chlorination system at the plant is reviewed to include flow proportional chlorine dosing and linkage of the chlorine dose to the readout of the continuous chorine monitor on the final water. Irish Water responded stating a review of the disinfection process at the plant would be carried out under the disinfection program by the end of March 2016. d. Irish Water stated during the audit that the Irish Water Disinfection Programme will assess

	low chlorine residuals in the network with the possibility of installing a chlorine booster station at Beaufield/Bonniconlon.
5.	**Monitoring and Sampling Programme for treated water** a. Final water is tested for *Cryptosporidium* once every month for six months of the year. Testing of final water in January, February and March of 2016 did not detect any *Cryptosporidium*. b. Following the discovery of cryptosporidiosis in the Ballina community daily testing of the final water for *Cryptosporidium* has been carried out since 06/05/16. No *Cryptosporidium* oocysts had been detected in the final water up to the day of the audit.
6.	**Chemical storage and bunds** a. The concrete bund of the fluorosilicic acid tank was not lined with protective material. This was a recommendation in the last EPA audit report and Irish Water proposed to line the bund by 31/03/16.
7.	**Sludge Management** a. The sludge management process was clarified by Irish Water on the day of the audit. Sludge generated on-site is passed through a picket-fence thickener and plate press prior to being diverted to Rathoreen Landfill for use as a daily cover for waste. The supernatant from the picket-fence thickener is diverted back to the head of the treatment works and the discharge from the plate press discharges to a nearby stream.

3. AUDITORS COMMENTS

While final water turbidity readings at the Lisglennon treatment plant were below 0.2 NTU and *Cryptosporidium* has not been detected in the final water up to the 13th May 2016, the aged filter media, the return of sludge supernatant to the head of the works and lack of slow start or run to waste of the backwash water presents a risk of *Cryptosporidium* entering the final water. As such improvements should be made to the controls in place and treatment at the plant to ensure that changes in raw water quality are dealt with effectively.

A number of recommendations made in a previous EPA audit reported dated 30/09/15 had not been addressed at the plant, including replacement of filter media and an assessment of the operation of the filters and as a result a Regulation 16 Direction was issued by the EPA on 18/05/16. Addressing the low chlorine residuals in the network was also a recommendation of the previous audit report and no action has been taken to address this.

4. RECOMMENDATIONS

Source Protection

1. Irish Water should install the following continuous automatic monitors to alert plant operators of any changes in raw water quality; colour or UVT monitor and pH monitor.

Coagulation, Flocculation and Clarification

2. Irish Water should carry out frequent jar tests at the Ballina Lisglennon water treatment plant and implement the use of dosage charts or tables to determine the correct chemical dose when changes in raw water quality occur. The frequency of jar testing should be appropriate to the nature of supply and changing condition. Irish Water should have regard to the EPA Water Treatment Manual: Coagulation, Flocculation and Clarification and EPA Advice Note No. 15:

Optimisation of Chemical Coagulant Dosing.

3. Irish Water should investigate the efficiency of the sludge bleeds and should establish the optimum regime of sludge draw-off.

Filtration (General)

4. Irish Water should replace the filter media and carry out an assessment of the filters at the treatment plant in line with Recommendation 4 of the EPA's previous audit report and provide a report on the outcome of the assessment including timeframes of any actions planned to improve the filtration process. A Regulation 16 Direction has been issued regarding this recommendation and a response to this Direction is due by 31st May 2016.

Disinfection

5. Irish Water should ensure that free residual chlorine levels at the end of the distribution network are maintained above 0.1mg/l.

6. As sludge supernatant is returned to the head of the works, Irish Water should investigate the feasibility of installing a UV unit to increase the safety and security of the supply and reduce the risk of *Cryptosporidium* entering the supply.

Sludge Management

7. Irish Water should review current methods of handling and disposal of water treatment sludge to ensure that the practice is not in contravention of the *Waste Management Act, 1996-200*3. The discharge from the plate press which goes to the stream should be tested for water quality to assess the impact it may be having on the water quality of the stream.

Outstanding information from previous Audit Report

8. Irish Water should provide an update on the progress to address the recommendations of the previous EPA audit report used on 30/09/15 (i.e. Recommendations 1, 3(b) 5, 6, 7(a) (regarding the THMs file DW2013/93) and 8).

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, Drinking Water Senior 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.

As stated under Recommendation 4 above, a Regulation 16 Direction has issued by the Agency under a separate cover legally requiring specific action to be undertaken by Irish Water in relation to the on-site filters within a timeframe of the 31st May 2016.

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:** 23rd May 2016

Michelle Roche

Inspector

Photograph 1: Floc on walls of clarifier 2