Drinking Water Audit Report

County:	Donegal	**Date of Audit:**	18th January 2018
Plant(s) visited:	Rathmullan Drinking Water Treatment Plant	**Date of issue of Audit Report:**	30th January 2018
		File Reference:	DW2009/172 (THMs) & DW2010/169 (Iron)
		Auditors:	Ms Derval Devaney
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 previous audit reports.		

MAIN FINDINGS

i. **An upgrade to the Rathmullan Water Treatment plant was completed on the 28th of October 2017 to address the EPA's Direction issued in April 2016 regarding THMs non-compliance.**
ii. **THM and iron monitoring results, taken since the plant was upgraded, were compliant with the *European Union (Drinking Water) Regulations 2014*.**
iii. **The EPA awaits the THMs results taken during December 2017 before the supply can be removed from the EPA's Remedial Action List (RAL).**

1. INTRODUCTION

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 drinking water and to determine progress with the EPA's Regulation 10(4) Direction issued to Irish Water on 11th April 2016 and subsequent Action Programme approved by the EPA on 1st July 2016 in accordance with Regulation 10(4) 10(6) regarding compliance with the trihalomethanes (THMs) parametric value.

The Rathmullan Public Water Supply (PWS) is on the EPA's Remedial Action List (RAL), as the supply had continuous THMs failures dating back to April 2010. The source of the supply is taken from Gort Lough where the colour varies seasonally and iron levels are naturally elevated. The raw water is screened at source for the removal of course material. Treatment at the plant operates 24/7 and was recently upgraded to include a MULTIFLO™ clarifier package prior to the rapid gravity filtration and chlorination stages.

The audit found that, due to the completion of the upgrade, the Milford WTP no longer partially substitutes the Rathmullan PWS. The Rathmullan WTP provides on average 631 m^3/day to its headworks reservoir at Glencross and serves a population of approximately 2,000 persons.

The opening meeting commenced at 9:30 pm at Rathmullan 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:

Yvonne McMonagle, Compliance and Martin Temple.

Representing Donegal County Council:

Hugh Kerr, Chief Technician; John McBride, Waterworks Inspector; John McCarron, Senior Executive Engineer and James McHugh, Supervisor.

Representing the Environmental Protection Agency:

Derval Devaney, 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.	**Long-term Solution and Accelerated Works** The long-term solution as outlined in the approved Irish Water Action Programme dated 1st July 2016 included: a. Providing a new WTP at Letterkenny PWS; b. Rehabilitation of water infrastructure and construction of approximately 16 km inter-connecting pipeline to link Letterkenny PWS with adjoining schemes (Cranford, Milford and Rathmullan PWS); c. Decommissioning of existing Rathmullan WTP. Accelerated Works were also outlined in the approved Irish Water Action Programme dated 1st July 2016 which included: a. Advance the tendering of interconnections between Rathmullan PWS and Milford PWS; b. Cease water production at Rathmullan PWS and supply from Milford PWS to comply with the THMs parametric value; c. Commence works in Q3 2016 with construction to be completed by the end of February 2017. In accordance with Regulation 10(4) and 10 (6), the Action Programme submitted by Irish Water dated 14th June 2016 was approved by the EPA on 1st July 2016 and directed Irish Water to complete the proposed upgrade works to ensure compliance with the THMs parametric value in the Rathmullan PWS as soon as possible but no later than 28th February 2017. The 3.25 km interconnection pipe between Milford PWS and Rathmullan PWS was fully completed on the 6th of September 2017, however it was stated during the audit that the Milford WTP no longer substitutes part of the Rathmullan PWS. Due to the drought situation at Milford PWS's source during 2017 and as part of a review of all options as previously advised to the Agency, Irish Water advised the EPA on 22nd of September 2017 that it was instead progressing to provide adequate treatment at Rathmullan WTW through the provision of a package treatment plant along with sludge storage. The installation of a MULTIFLO™ Clarifier Package Plant was completed and delivering treated water to the networks from the 28th October 2017. The

	package treatment plant along with the existing treatment process at Rathmullan aims to provide adequate, compliant water for the Rathmullan Water Supply Zone, therefore reducing the need to rely on the adjacent Milford WTW and in advance of the completion of the interconnection and upgrade of the Letterkenny supply. It is still the long-term plan to make Rathmullan PWS redundant once Letterkenny's WTP is upgraded to provide additional capacity to Milford PWS and the water supply zone of Rathmullan.
2.	**Coagulation, Flocculation and Clarification** a. Aluminium sulphate is dosed in-line upstream of the clarifier after the raw water is pH adjusted with 25% sodium hydroxide to meet a target pH of 6.5. The sodium hydroxide dose is linked to the readout on the pH monitor (at the flocculation tank) and is flow proportional. A coagulation mixer is available in the first stage tank of the new MULTIFLO™ package unit, downstream of the dosing points to achieve adequate mixing of the chemicals. The dose of coagulant is determined by the operator and is based on the level of turbidity and colour in the raw water and the results of jar tests on-site. b. Water is retained in the coagulation tank for approximately 32 minutes before it flows into the flocculation tank where Magnafloc LT25 (0.1 %) polymer (with 0.02% acrylamide) is dosed at 0.36 mg/l. The detention time is this tank is 144 minutes prior to entry to the clarifier. Data submitted by Irish Water stated that the capacity of the plant was 60 m^3/hour but during the audit it was stated that the capacity is 40 m^3/hour (and the package plant was operating at 37 m^3/hr). There is scope, however, to adjust the treatment to cater for up to 60 m^3/hr capacity should the need arise. c. Pin floc was observed in the clarified water being carried over to the filters and some lamellar plates had sludge at its surface. Algae was also present on the decanter channels. The caretaker stated that the pin floc appeared that morning and was due to the change in raw water quality.
3.	**Filtration** a. There is a Rapid Gravity type filter comprising of 14 cells (each cell measures 2.99 m x 0.49 m) with an 80 m^3/hour capacity. Its sand was replaced during the upgrade works in September/October 2017. b. Backwash occurs automatically based time or headloss. During backwash, there is a rotating platform which can individually isolate one of the 14 cells whereby water can enter the cell at a backwash rate of 20 m^3/m^2/hr for 100 seconds. After 100 seconds backwashing then commences on cell no 2 and so on until all 14 cells are backwashed, taking 1 hour in total to complete backwash for the entire filter.
4.	**Monitoring and Sampling Programme for treated water** a. The final water is monitored daily for colour, turbidity aluminium, total and free chlorine. There is an online monitor on the final water for pH (7.77 on the day of the audit), temperature (4.3 ^{o}C on the day of the audit), turbidity (0.05 NTU on the day of the audit), UVT (95.2% on day of audit) and chlorine (free chlorine was 1.02 mg/l). There is also an online chlorine monitor at the Glencross reservoir. b. There is a *Cryptosporidium* rig at the plant where samples were lifted and analysed monthly. Irish Water is in the process of reviewing its *Crypto.* risk score and credit log in light of the new package plant. It is planned, based on the outcome of this review, to reduce the sampling frequency to six times per year due to the added treatment the new package plant affords. Irish Water is consulting with the HSE regarding the amendment of this sampling frequency. c. A monitoring report from Donegal Co. Co.'s lab for the 6th of January 2018 was presented during the audit showing a UVT of 33 % and TOC of 10.26 mg/l for the raw water and a UVT of 95 % and a TOC of 1.59 mg/l in the final water. Such reduction in concentrations are attributed to the new MULTIFLO™ Package Plant installed at the Rathmullan treatment. works.
5.	**Exceedances of the Parametric Values** a. THMs in the past persistently failed to comply with the parametric value of 100 µg/l as set out in the *European Union (Drinking Water) Regulations 2014* (S.I. 122 of 2014).

	b. THMs are monitored monthly by Irish Water and the most recent THMs results for 2017 which were submitted as part for the Q4, 2017 were reviewed during the audit. The values reported since the installation of the package plant on the 28th of October 2017 were complaint for THMs (six THMs samples taken between the 3rd and 28th of November 2017 had results ranging from 90 µg/l to 38 µg/). c. The EPA awaits the THMs results for December 2017 to verify the upgrade of the plant was successful and determine if the supply can be removed from the EPA's Remedial Action List. d. Iron in the past persistently failed the parametric value of 200 µg/l as set out in the *European Union (Drinking Water) Regulations 2014* (S.I. 122 of 2014) due to raw water quality conditions. e. Iron is monitored monthly by Irish Water and the most recent iron results for 2017 and 2018 were presented and reviewed during the audit. The values reported since the installation of the package plant on the 28th October 2017 were complaint in the final water for iron (18 iron samples taken between the 28th of October 2017 and 4th of January 2018 had results ranging from 16 µg/l to 58 µg/).
6.	**Management and Control** a. The raw water is monitored daily for temperature, colour and turbidity. There is also an online monitor on the raw water for turbidity (reading 0.81 NTU during the audit), UVT (47.6% during the audit) and pH. The clarified water is monitored daily for aluminium and there is an online monitor for turbidity (0.18 NTU on the day of the audit). b. There is a turbidity alarm on the raw water set at 1.2 NTU. If levels exceed this value, the plant shuts down. Similarly, there is a plant shut down if the final water turbidity exceeds 0.3 NTU. c. The chlorine residual high alarm is set at 5 mg/l and the low alarm at 0.75 mg/l. The plant shuts down if the chlorine residual falls below 0.7 mg/l. An alarm also activates if chlorine residuals at Glencross Reservoir fall below 0.5 mg/l. The caretaker stated that the chlorine dose has reduced significantly due to the installation of the MULTIFLO™ Unit as the chlorine demand has decreased. The chlorine dose is 1.3 mg/l on-site to achieve the target of 1 mg/l leaving the plant. It was stated during the audit that prior to the upgrade of the plant the chlorine dose was 7 mg/l to achieve the same target chlorine residual concentration of 1 mg/l leaving the plant. The target chlorine residual leaving the Glencross Reservoir is 0.7 mg/l to ensure an adequate residual in the network. d. There is a general alarm on the MULTIFLO™ package plant (on motors, pumps, etc.) which shuts the process down if it's not functioning as required. e. There are level sensors on the Glencross Reservoir which are alarmed. f. There is a cascade system in place to respond to alarms.
7.	**Sludge Management** a. There is an automatic sludge bleed every 11 minutes for 2 minutes from the clarifier to the new sludge holding tank. Sludge is tankered offsite for treatment.

3. AUDITORS COMMENTS

The EPA issued a Direction to Irish Water on 11th April 2016 requesting it to submit an Action Programme to address the persistent THMs failures in the Rathmullan PWS.

In accordance with Regulation 10(4) and 10 (6), the Action Programme submitted by Irish Water dated 14th June 2016 was approved by the EPA on 1st July 2016 and directed Irish Water to complete the proposed upgrade works to ensure compliance with the THMs parametric value in the Rathmullan PWS as soon as possible but no later than 28th February 2017.

Irish Water's most recent progress report dated 19th December 2017 states the Rathmullan PWS was upgraded and commissioned on the 30th October 2017. The audit confirmed that the package plant was in operation with treated water going out to supply from it from the 28th October 2017.

Despite the completion date for the proposed works going beyond the Direction deadline of the 28th February 2017, it is noted that Irish Water's monitoring reports for November 2017 show THMs comply with the parametric value of 100 µg/l as set out in the *European Union (Drinking Water) Regulations 2014* (S.I. 122 of 2014).

The audit highlighted the enhancements put in place at the Rathmullan Water Treatment Plant to ensure its drinking water quality leaving the plant was improved and this was due to the investment made in upgrading this treatment plant with a clarifier package unit within the short process timeframe of 10-weeks. While the long-term solution is to eventually make this plant redundant, it is thought from the THMs and iron results that were available during the audit, that the newly installed package plant will be suffice in ensuring as an interim measure, the water will comply with the Drinking Water Regulations, 2014.

The EPA awaits Irish Water's submission of the THMs results taken during December 2017 to verify that the plant is operating effectively and the Action Programme, as agreed on 1st July 2016, has been implemented and therefore the supply can be removed from the EPA's Remedial Action List.

4. RECOMMENDATIONS

Coagulation, Flocculation and Clarification

1. Irish Water should reduce the dose of polyelectrolytes such that the average dose does not exceed 0.25 mg/l (see Drinking Water Inspectorates List of Approved Products and Processes).

2. Irish Water should carry out an investigation to identify the cause of pin floc formation and floc carryover from the clarifier into the filter. In carrying out this investigation 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 ensure that the settled water outlet channels and the clarifier are cleaned on a regular basis to prevent build-up of algae on the weirs and on the walls of the clarifier.

4. Irish Water should ensure that the coagulation / flocculation processes at the water treatment works are regularly inspected. Jar testing of the raw and coagulated waters as outlined in Section 3.3.1 and Appendix C of the EPA publication "*Water Treatment Manual: Coagulation, Flocculation and Clarification*" should be completed to determine the optimum chemical coagulant dose and pH for the treatment of the water. The frequency of checks should be appropriate to the nature of supply and changing raw water conditions. Results should be recorded at the treatment works and used for control of the treatment plant.

Monitoring and Sampling Programmes for Treated Water

5. Irish Water should submit the THMs results for December 2017 to verify the upgrade of the plant was successful and determine if the supply can be removed from the EPA's Remedial Action List.

6. Irish Water should update EDEN to reflect the change in population and volume now being served by the Rathmullan water treatment plant.

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 Aoife Loughnane 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. The actions by Irish Water to address the recommendations taken will be verified by the Agency during any future audits.

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:**

Derval Devaney 30th January 2018

Inspector