

Drinking Water Audit Report

County:	Galway	Date of Audit:	4 th April 2017
Plant visited:	Portumna Public Water Supply	Date of issue of Audit Report:	12 th April 2017
	(1200F 0 D 1042)	File Reference:	DW2008/146
		Auditor:	Aoife Loughnane
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 any previous audit reports.		

MAIN FINDINGS

- i. Significant works have been carried out to minimise the potential for THM formation in Portumna PWS, including efforts to optimise coagulation, upgrade of filters, cleaning of storage reservoirs and unidirectional flushing in the distribution network. However, further process optimisation needs to be carried out at the plant to address the carryover of floc from the clarifiers to the filters, which was evident during the audit.
- ii. Portumna PWS will remain on the RAL until process optimisation has been completed and verified. However, the RAL heading will be changed from 'Elevated levels of THMs above the standard in the Drinking Water Regulations' to 'EPA Audit Observation -Treatment & Management Issues'.
- The plant failure incident that occurred from $11^{th} 13^{th}$ March 2017 which resulted in iii. elevated levels of organics entering the network and subsequent THM exceedances was entirely avoidable and would not have occurred if the necessary alarm response cascade system was in place.

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. Portumna has been on the EPA's Remedial Action List (RAL) since 2008 due to persistent THM exceedances. This audit was carried out to assess the upgrade works carried out at Portumna water treatment plant and to assess whether the supply can be removed from the RAL.

Portumna water treatment plant supplies water to approximately 2,719 people. The raw water source is Lough Derg. Treatment comprises pH adjustment, coagulation, flocculation, clarification, rapid gravity filtration, UV disinfection, chlorination, final pH adjustment and fluoridation.

The opening meeting commenced at 10.30 am at Portumna 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 Aoife Loughnane 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:

Pat O'Sullivan, Drinking Water Compliance Specialist, Irish Water Eoin Hughes, Drinking Water Compliance Analyst, Irish Water Shay Walsh, Engineer, Operations & Maintenance, Irish Water Diarmuid Croghan, Senior Engineer, Galway County Council Adrian Raftery, Area Engineer, Galway County Council Anne Dolan, Executive Scientist, Galway County Council Tara Meehan, Technician, Galway County Council Pat Lambe, Technician, Galway County Council Billy Hourigan, General Services Supervisor, Galway County Council Gerry Fallon, Caretaker, Galway County Council

Representing the Health Service Executive:

Dr. Emer O'Connell, Consultant in Public Health Medicine Seamus Mitchell, Senior Environmental Health Officer

Representing the Environmental Protection Agency:

Aoife Loughnane, Inspector

2. AUDIT OBSERVATIONS

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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 raw water abstraction point in Lough Derg is located approx. 220m at a depth of $1.5 - 2$ metres. The intake pipe has been damaged by passing boats on a number of occasions. Irish Water stated that a diving company surveyed the damaged pipe 3 weeks ago and found that a 2 metre section of the pipe is missing approx. 70 metres offshore. Pipeline repair works are due to be completed this week.			
	D.	A temporary raw water intake point is currently in operation, abstracting water from the immediate shoreline (see photo 1).			
	с.	A hydrocarbon monitor and alarm has been installed on the raw water to manage the risk of hydrocarbon contamination from the adjacent marina.			
2.	Coagulation, Flocculation and Clarification				
	a.	The first stage of treatment is pH correction by dosing sulphuric acid into the raw water to achieve the target 6.1 pH for optimum coagulation. This is lower than the previous target of 6.7 pH. This is automatically controlled by monitoring the pH post coagulant addition and adjusting the pH dose accordingly.			
	b.	New sulphuric acid dosing lines have been installed following an incident on 11 th March 2017 where the dosing lines blocked. The new duty & standby dosing lines have a wider bore to prevent future blockages.			
	с.	Aluminium sulphate coagulant and poly are dosed into a contact tank prior to the 2 no. clarifiers.			
	d.	On the day of the audit, there was a problem with the clarification process as both clarifiers had substantial amounts of floc rising to the surface, through the tube settlers, and carrying over onto the filters (see photo 2).			
	e.	Sludge is drawn off the sludge blanket in each clarifier for 1 minute every 7.5 minutes, from a single sludge bleed point.			
	f.	GCC confirmed that the clarifiers are cleaned every 3 months and are due to be cleaned again shortly.			

3.	Filtration				
	 a. The clarified water passes to 2 no. circular tank rapid gravity filters. b. The filter media was replaced 3 months ago, and consists of silica sand and anthracite. c. As a result of the recent filter upgrade, backwashing is now triggered by turbidity and head loss, in addition to time (usually one backwash per day) and manual activation. d. Following backwashing, the filters are run to waste until a target turbidity level is achieved. e. A backwash of Filter No. 2 was observed. The air scour was even across the bed. The water wash did not run completely clean during the backwash process. There was evidence of sludge build-up on the inside wall of the filter, which remained after the backwash (see photo 3). f. The turbidity level post-Filter No. 2 was 0.051 NTU. 				
4.	UV Disinfection & Chlorination				
	 a. A new UV disinfection system was installed at the plant 3 months ago. The single UV unit is a Trojan Swift SC D06 reactor, validated to 90 m³/hr and 77% UVT. The UV system is serviced & maintained under contract by EPS. b. The UV low alarm setting is 78.5% UVT, with shutdown/inhibit at 77% UVT, which prevents inadequately disinfected water entering into supply. The UV system was not in operation at the time of the audit, following the filter backwash process. c. The chlorination system comprises duty & standby chlorine dosing pumps. GCC confirmed that automatic switch over between the pumps has been installed, as recommended in the previous EPA audit. d. The residual chlorine reading at the outlet of the clear water tank was 1.41 mg/l. Irish Water confirmed they are still working to optimising the chlorine dose at the plant, to minimise THM formation potential whilst ensuring adequate disinfection is achieved at the 				
	 network extremities. e. There are 5 continuous chlorine monitors at the network extremities. A review of the HMI data showed that >0.1 mg/l was being achieved at these locations. f. The expiry dates for the sodium hypochlorite are clearly identified on the Chemifloc bulk delivery certificates. g. Irish Water is no longer proposing to install a secondary chlorination station at the outlet of the reservoir in the network, as identified in the previous audit. 				
5.	 Final pH adjustment a. A new final pH adjustment stage has been introduced at the plant, where caustic (25% sodium hydroxide) is dosed to achieve a target 7.3 pH in the final water. b. The pipeline to the clear water tank has become blocked with caustic soda (see photo 4). Temporary pipework and access manhole is now in place (see photo 5) while Irish Water investigates the problem & implements the best solution. No timeframe was confirmed for this work but Irish Water expects it to be completed by end Q2 2017. 				
6.	Treated Water Storage and Distribution Network				
	 a. Treated water is stored in the clear water tank on-site, following which it is pumped to two reservoirs at Gallas Hill. These reservoirs were visited during the audit. b. The clear water tank, two reservoirs at Gallas Hill and Killimor reservoir were all cleaned. 				
	 in 2016. c. Unidirectional flushing of the distribution network has been completed and the programme is now being repeated. 				
7.	Monitoring and Sampling Programme				
	 a. Irish Water has submitted 2 months of compliant THM monitoring results for February & March 2017 to support the removal of the supply from the RAL. The data shows results ranging from 29 µg/l at the plant to 82 µg/l at the network extremity in Killimor. b. Four THM exceedances detected in samples on 14th March 2017 were caused by the acid dosing failure incident which is considered to be an isolated event, with appropriate corrective actions taken to prevent a reoccurrence. 				

8.	Chemical storage and bunds			
	a.	The current arrangement of the hydrofluorosilicic acid day tank bund presents a risk that any potential acid spillage or leakage may not be contained within the bund (see photo 6).		
9.	Management and Control			
	a. b.	The incident response to the acid dosing failure on Saturday 11 th March 2017 was unsatisfactory. When the high pH alarm activated at 09:00 am, a text alarm was sent to the caretaker's phone, which was not picked up. There was no alarm response cascade system in place, which meant that no-one else was alerted to the incident. The plant shutdown on high pH at 09:48 am that Saturday morning. Nobody visited the plant until 08:30 am the next day (Sunday) when the caretaker realised that the sulphuric acid pumps had failed due to a blockage in the dosing lines, which resulted in the alum pumps being inhibited and the loss of coagulation. At that stage the plant was restarted while allowing the treated water turbidity inhibit to rise to 1 NTU to facilitate water production. This led to elevated levels of organics entering the distribution network which then resulted in the detection of 4 THM exceedances in the network. This incident could have been avoided if the first alarm had been responded to. During the audit Irish Water confirmed that a cascade system is now in place to ensure the immediate response to various plant alarms. A new SCADA system has been installed at the plant since the last audit. A review of SCADA data showed large fluctuations in the turbidity levels post clarification from 01/03/2017 to 04/04/2017, the cause of which could not be explained during the audit.		

3. AUDITORS COMMENTS

The audit found that significant works have been carried out since the previous EPA audit to minimise the potential for THM formation in Portumna PWS, including efforts to optimise coagulation, upgrade of filters, cleaning of storage reservoirs and unidirectional flushing of the distribution network. However, further process optimisation needs to be carried out at the plant to address the carryover of floc from the clarifiers to the filters, which was evident during the audit.

Portumna PWS will remain on the RAL until process optimisation has been completed and verified. However, the RAL heading will be changed from '*Elevated levels of THMs above the standard in the Drinking Water Regulations*' to '*EPA Audit Observation – Treatment & Management Issues*'.

The plant failure incident that occurred from $11^{th} - 13^{th}$ March 2017 which resulted in elevated levels of organics entering the network and subsequent THM exceedances was entirely avoidable and would not have occurred if the necessary alarm response cascade system was in place.

RECOMMENDATIONS

Source Protection

1. Irish Water should ensure that the raw water intake pipe is repaired and safeguarded from any future damage by passing boats.

Coagulation, Flocculation and Clarification

- 2. 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 Water Treatment Manual: Coagulation, Flocculation and Clarification* 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 condition. Results should be recorded at the treatment works and used for control of the treatment plant.
- 3. Irish Water should carry out an investigation to identify the cause of floc carryover from the clarifiers into the filters, to include an assessment of the sludge bleed regime and whether the clarifiers are being operated above their design capacity.
- 4. Irish Water should investigate and report on the cause of the large fluctuations in the turbidity levels post clarification, as shown on SCADA for the period 01/03/2017 to 04/04/2017.

5. Irish Water should ensure that the clarifiers are cleaned on a regular basis to prevent the excessive build-up of sludge.

Filtration

6. Irish Water should ensure that the backwash is even across the filters and the water wash runs completely clean during the backwash process.

Disinfection

7. Irish Water should continue to optimise the chlorine dose at the treatment plant in order to minimise THM formation whilst ensuring adequate disinfection is maintained at the network extremities.

Treated Water Storage

8. Irish Water should implement a permanent solution to the caustic blockage of the pipeline entering the clear water tank. Irish Water should ensure that all access hatches on the clear water tank are sealed and locked.

Chemical Storage and Bunds

9. Irish Water should review the hydrofluorosilicic acid day tank bunding arrangements to ensure that any potential acid spillage or leakage will be contained in the bund.

Management and Control

- 10. Irish Water should submit details of the alarm response procedure and cascade system to ensure that plant alarms are immediately detected and responded to.
- 11. Irish Water should complete the process optimisation works at the plant and submit two months SCADA operational data to demonstrate satisfactory plant performance, to support the removal of Portumna PWS from the RAL.

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, Senior Inspector, Drinking Water Team.

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 in any future correspondence in relation to this Report.

Report prepared by:

Apife Laghnare Date:

12th April 2017

Inspector



Photo 1: Temporary raw water abstraction point on Lough Derg shoreline



Photo 2: Clarifier No. 2 showing floc rising to the surface & carrying over onto the filter



Photo 3: Filter No. 2 showing uneven flow of backwash water/cleaning of filter & sludge build-up on filter walls



Photo 4: Build-up of sodium hydroxide in the treated water pipeline prior to clear water tank



Photo 5: Temporary pipework & access manhole at clear water tank



Photo 6: Hydrofluorosilicic Acid day tank bunding arrangement