



Drinking Water Audit Report

County:	Co. Mayo	Date of Audit:	06/09/2016
Plant(s) visited:	Lough Mask Water Treatment Plant, Tourmakeady, Co. Mayo Scheme Code 2200PUB1032	Date of issue of Audit Report:	09/09/2016
		File Reference:	DW2016/152
		Auditors:	Ms Ruth Barrington Ms Pauline Gillard
Audit Criteria:	<ul style="list-style-type: none"> • The <i>European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014)</i>. • <i>The 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>. • EPA Drinking Water Advice Notes Nos. 1 to 15. • The recommendations in the previous EPA audit report dated 20/05/2016. 		

MAIN FINDINGS

- i. **Irish Water has made significant improvements to the filtration management and control since the previous EPA audit. There was no evidence that filter breakthrough had occurred during the two weeks prior to the date of the *Cryptosporidium* detection based on the EPA's assessment during this audit.**
- ii. **Irish Water is undertaking an upgrade of the plant, due for completion in May 2017, which will provide enhanced coagulation with pH control to further improve the quality of water treated prior to filtration.**
- iii. **Irish Water should install a turbidity monitor on the combined water presented for treatment (raw water plus recycled water). Data from this should be assessed and used to manage the potential risk of the current recycled water management.**

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 03/09/2016 of the detection of *Cryptosporidium* in the final treated water and a subsequent Boil Water Notice placed on the supply on 02/09/2016.

The Lough Mask Regional PWS supplies a population of approximately 46,500 as stated by Irish Water. The plant has a design capacity of 39,000 m³/day and following recent successful water conservation measures the working production of the plant has been reduced to 29,000 m³/day, a reduction of up to 5,000 m³/day since the previous EPA audit. Treatment at the plant consists of coagulation with ferric and poly, clarification, rapid gravity filtration, chlorination and fluoridation. The processes examined during the audit, as they relate to the detection of *Cryptosporidium*, were coagulation, clarification and filtration, along with consideration of the maintenance of chlorine residual in supply as it relates to adequate disinfection.

The opening meeting commenced at 11.30 a.m. at the Lough Mask Regional Water Supply Water Treatment Plant at Tourmakeady, Co. Mayo. 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 audit 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 Pat O’Sullivan – Drinking Water Compliance Specialist
- Mr Anthony Skeffington – Lead Engineer Irish Water
- Mr Sean Higgins – Regional Engineer Irish Water

Representing Mayo County Council:

- Mr Tom Gilligan – Director of Services, Mayo County Council
- Ms Eileen Cavanagh – A. Executive Scientist, Mayo County Council
- Ms Olivia Feeney – A. Executive Scientist, Mayo County Council
- Mr Conor O’Toole - Caretaker Lough Mask WTP, Mayo County Council
- Mr Kieran Shally – Water Services Mayo County Council
- Mr Iarla Moran – Head of Water Services, Mayo County Council
- Mr Simon Talbot – Environmental Technician, Mayo County Council

Representing the Environmental Protection Agency:

- Ms Ruth Barrington – Inspector
- Ms Pauline Gillard - Inspector

Audit Observers:

- Drs. Regina Kiernan, Katharine Harkin and Breda Smyth (Public Health HSE West)
- Ms Denise Roddy and Ms Marie Tonra (Senior Environmental Health Officers HSE West)
- Mr Maurice Mulcahy (Regional Chief Environmental Health Officer)

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>Coagulation, Flocculation and Clarification</p> <ul style="list-style-type: none"> a. Since the previous EPA audit, paddle mixers have been installed in the flocculation tank. This combined with the previously installed static mixer and bar within the flocculation chamber appears to have improved the chemical coagulant mixing in the chamber. b. The area of the flocculation tank which was observed to be the site of a “dead zone” at the previous EPA audit has been isolated and removed from service. c. The level sensor installed on the clarifier water channel has eliminated previous issues with clarifiers and filters flooding/ running dry. This was completed in August 2015 following the previous EPA audit. d. Water flowing into the clarifier channels appeared clear and free from floc carryover. e. Interim works planned at the plant, due for completion in May 2017, include the provision
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	<p>of a new larger flocculation tank in tandem with a switch to coagulation using aluminium sulphate due to concerns in relation to manganese build up in the network which is linked to customer complaints. It is noted that manganese levels do comply with the parametric value in the Regulations.</p> <p>f. During the audit, the planned switch in coagulants was discussed however information supporting the switch was not available at the time. Information collated on behalf of Irish Water by Jacobs and Tobin on coagulation and effective organics and turbidity removal was provided by Irish Water to the EPA later in the day on 06/09/2016 and was assessed for the purpose of this audit report.</p> <p>g. The Jacobs/ Tobin study reports the optimum pH range for ferric as 5.5 to 6.0, with the Lough Mask Water Treatment Plant raw water pH at the time of the study being outside the optimum range at around 6.9.</p> <p>h. The Jacobs/Tobin study found that turbidity removal will be improved by the switch to aluminium sulphate (based on jar tests), and it will be combined with pH correction via acid dosing to provide enhanced coagulation at the optimum pH range. The provision of this dosing has not taken place as yet due to Health and Safety concerns.</p>
<p>2.</p>	<p>Filtration</p> <p>a. An examination of the performance of the filters was carried out during the audit by examining the results of turbidity monitors via SCADA records from 16/08/2016 to 31/08/2016, two weeks prior to the date the sample in which <i>Cryptosporidium</i> was detected. While a number of minor turbidity peaks were seen (up to 0.17 NTU), these were all within backwash cycles.</p> <p>b. Filter management and control has been significantly enhanced since the previous EPA audit. Filter backwash is now programmed on detection of a high turbidity level of 0.2 NTU for 10 minutes, while a high-high turbidity level of 0.5 NTU for 10 minutes is programmed to take a filter out of service.</p> <p>c. Irish Water indicated that the alarm settings may be reviewed again to allow these controls to be set at lower turbidity trigger levels.</p> <p>d. Following filter backwash there is a further automatic review of turbidity levels to ensure that a filter is not brought into service until the turbidity is less than 0.15 NTU.</p> <p>e. Filter No. 2 (one of the old filters) was out of service during the audit since 08/08/2016 awaiting a new inlet valve. However this did not appear to be impacting on the performance of the other filters. Filter 2 is expected by Irish Water to return to service during the week commencing 12/09/16.</p>
<p>3.</p>	<p>Disinfection</p> <p>a. A detailed residual chlorine assessment was being carried out in the network at the time of the audit. Results of the first day of the survey (05/09/2016) were provided to the EPA. The results presented all showed adequate levels of free residual chlorine, i.e. >0.1 mg/l. The survey was to continue on the 06/09/2016 and 07/09/2016.</p> <p>b. Chlorine residuals monitored at the plant remain as at the previous audit, with the two streams from old and new sides of the plant not being directly comparable. The fix for this is being dealt with under Irish Water's Disinfection Programme and is scheduled to start in October 2016.</p>
<p>4.</p>	<p><i>Cryptosporidium</i> Monitoring and Sampling Programme</p> <p>a. Daily <i>Cryptosporidium</i> sampling is being undertaken at the plant since the Irish Water became aware of the detection of <i>Cryptosporidium</i>. This frequency was increased from the previous weekly sample of final treated water. Samples taken since 02/08/2016 of raw water, final treated water, and grab samples at locations throughout the plant have all been clear for <i>Cryptosporidium</i>.</p>

5.	<p>Management and Control</p> <ol style="list-style-type: none"> a. Filter backwash water and supernatant from the sludge bleeds are recycled to the head of the works as discharge from the plant is not permitted. b. The flow rate of filter run to waste has been reduced from full bore to 50 m³/hour for the small filters and 100 m³/hour for the large filters to reduce turbulence in the filter washwater tank. A rest period of 90 minutes has been implemented between backwash ceasing and forward feed from the filter washwater tank to the balance tank to allow for further settling. c. Turbidity monitoring has been provided by Irish Water on the recycled water streams which provide approximately 5% of the total water treated. However, there is no turbidity monitoring of the combined water presented for treatment. This is particularly relevant as the recycled water is pumped forward to the raw water balance tank intermittently thus leading to an inconsistent raw water quality presented for treatment. d. Measurement of turbidity levels in the combined untreated water had been commenced on the 31/08/2016 and turbidity readings of up to 1.5 NTU obtained on 24 hour composite samples. e. Satisfactory calibration certificates were provided by Irish Water for the filter turbidity monitors, supporting the assessment of the turbidity data referred to above in Observation 3 Filtration.
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3. AUDITORS' COMMENTS

The auditors acknowledge the significant actions taken to improve the management and control of the filtration process at the Lough Mask Water Treatment Plant since the previous EPA audit, along with the water conservation measures in the network which have reduced demand on the plant by up to 5,000 m³/day over the last twelve months.

In relation to the *Cryptosporidium* detection, there was no evidence of a route for *Cryptosporidium* breakthrough within the plant in the period 16/08/2016 to 31/08/2016. However, the robustness of the treatment could be further improved by the provision of enhanced coagulation within an optimum pH range. A contract has been awarded by Irish Water for this work which is scheduled to be complete in May 2017.

4. RECOMMENDATIONS

***Cryptosporidium* Monitoring and Sampling Programme**

1. Irish Water should continue the increased frequency of *Cryptosporidium* monitoring (daily sampling of raw and treated water) until the Boil Water Notice is lifted. The frequency may then be reviewed following consultation with the HSE and EPA.

Coagulation, Flocculation and Clarification

2. Irish Water should ensure that the interim upgrade is completed to provide the additional capacity in the flocculation tank and the provision of enhanced coagulation operating within an optimised pH range as scheduled by May 2017.

Filtration

3. Irish Water should review the turbidity alarm settings on the filters to ensure that they reflect any departures from the normal operating conditions of the plant.
4. Irish Water should ensure that the necessary repairs are made to Filter No. 2 to return it to service.

Disinfection

5. Irish Water should ensure via the Disinfection Programme for Co. Mayo that the chlorine residuals in each treated water stream are directly comparable to enable the chlorine demand to be accurately assessed.

Management and Control

6. Irish Water should install continuous turbidity monitoring on the combined water presented for treatment at the plant, that is raw water abstraction plus sludge bleed supernatant and filter washwater. The monitoring 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.

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.

Irish Water should submit a report to the Agency within one week of the date of this audit report (by 19/09/2016) 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:



Date:

09/09/2016

Ruth Barrington
Inspector