



Drinking Water Audit Report

County:	Leitrim	Date of Audit:	5 th May 2016
Plant visited:	Carrick on Shannon Water Treatment Plant	Date of issue of Audit Report:	17 th May 2016
		File Reference:	DW2011/60
		Auditors:	Aoife Loughnane
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>. • EPA Drinking Water Advice Notes No.s 1 to 15. 		

MAIN FINDINGS

- i. **South Leitrim Regional Water Supply is on the RAL due to elevated levels of THMs above the standards in the Drinking Water Regulations. The audit found that good progress is being made to improve the operational performance of Carrick on Shannon water treatment plant in order to reduce the risk of THM formation.**
- ii. **Caustic soda dosing facilities have been installed to correct the raw water alkalinity to achieve optimum coagulation conditions. Further works remain to be completed, including commissioning of the automatic dosing control system and the installation of run to waste facilities on the filters.**
- iii. **The completion of the process optimisation works should enable South Leitrim Regional Water Supply to be removed from the RAL by September 2016, subject to verification of the effectiveness of the works to the satisfaction of the EPA.**

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. South Leitrim Regional Water Supply Scheme (SLRWSS) is on the EPA's Remedial Action List (RAL) due to elevated levels of THMs above the standards in the Drinking Water Regulations. This audit was carried out to assess the progress being made to improve the operational performance of Carrick on Shannon water treatment plant in order to reduce the risk of THM formation and to remove SLRWSS from the RAL.

Carrick on Shannon water treatment plant abstracts water from the River Shannon. The plant has a design capacity of 11,000 m³/day and is currently operating at 9,500 to 10,000 m³/day. The treatment processes involve pH adjustment, coagulation, flocculation, dissolved air flotation (DAF), rapid gravity filtration and disinfection by UV treatment and chlorination.

The opening meeting commenced at 3:00 pm at Carrick on Shannon 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:

Patrick O’Sullivan, Drinking Water Compliance, Irish Water

Georgina O’Reilly, Operations & Maintenance, Irish Water

Kevin Love, Process Optimisation, Irish Water

Marie Mulligan, Senior Executive Engineer, Leitrim County Council

David Barry, Scientific Officer, Leitrim County Council

Eithne McDevitt, Technician, Leitrim County Council

Bernie Bohan, Caretaker, Leitrim County Council

Representing the EPA:

Aoife Loughnane, 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</p> <ul style="list-style-type: none"> a. Raw water is abstracted from the River Shannon, which according to Irish Water’s disinfection strategy, is categorised as an S3 raw water source (<i>lowland catchment – high concentration of cattle, sheep, horses or humans in immediate vicinity or upstream or waste treatment outfall upstream</i>). Irish Water’s target for an S3 source is to achieve 5 log credit removal/inactivation of protozoans. Irish Water considers that this plant provides 6 log credit removal/inactivation; 3 log for the coagulation & filtration element and 3 log for UV treatment. b. The raw water is monitored continuously for alkalinity, pH, turbidity, UVT and ammonium. c. On the day of the audit, raw water alkalinity was 86 mg/l CaCO₃, turbidity was 1.305 NTU, and UVT was 35%. The ammonium monitor was not operating and had been off-line since the previous day.
2.	<p>Coagulation, Flocculation and Clarification</p> <ul style="list-style-type: none"> a. The raw water is dosed with aluminium sulphate (coagulant) and polyelectrolyte (flocculant aid). b. Recent jar testing has identified the need to correct the raw water alkalinity when it drops below 65 mg/l CaCO₃. The raw water alkalinity varies from 50 – 100 mg/l CaCO₃. c. An alum dose > 180 mg/l is required to achieve < 2 mg/l TOC in the final water and reduce the risk of THM formation. When raw water alkalinity is < 65 mg/l, the applied alum dose consumes the raw water alkalinity which results in high DAF outlet turbidity and subsequent risk of high turbidity in the final water. d. Caustic soda dosing pumps have been installed and operated from 27th February until 13th April 2016 as the raw water alkalinity levels were below 65 mg/l CaCO₃ during that period. e. The process is being closely monitored to achieve an optimum coagulation pH of 6.6, DAF outlet turbidity < 2 NTU, and final water targets of >92% UVT and <0.25 NTU. d. A new automatic coagulant dosing control system has been installed at the plant and is due to be commissioned soon. This system will use a feed forward signal to control the coagulant dose, based on measurements of raw water spectral attenuation coefficient (SAC) and turbidity. A coagulant dose control curve was provided by Irish Water. e. Coagulant is dosed at a single point on both raw water feed lines and mixing is achieved by turbulence in the pipes. Polyelectrolyte is dosed via two spreader bars and mixing is achieved using flash mixers in the flocculation tanks. f. The coagulation and flocculation processes appeared to be operating well on the day of the audit and large flocs were observed in the flocculation tanks.

	<p>g. The DAF clarifiers appeared to be operated well on the day of the audit and a thick sludge was being scraped from the top of the DAF tanks.</p> <p>h. DAF outlet turbidity levels were 1.14 NTU on the 'old' process line and 1.26 NTU on the 'new' process line, which satisfies the target of < 2 NTU.</p>																				
3.	<p>Filtration</p> <p>a. The clarified water is filtered in 8 rapid gravity filters; 4 serving each process line.</p> <p>b. The filters were refurbished within the last 2 years, including the replacement of silica sand and raising of weirs to prevent sand loss during backwashing. The depth of sand in the filters could not be confirmed and is not measured routinely.</p> <p>c. The filtered water turbidity was observed to be very low:</p> <table border="1"> <thead> <tr> <th>Filter No.</th> <th>Turbidity (NTU)</th> <th>Filter No.</th> <th>Turbidity (NTU)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.068</td> <td>5</td> <td>0.075</td> </tr> <tr> <td>2</td> <td>0.078</td> <td>6</td> <td>0.055</td> </tr> <tr> <td>3</td> <td>0.057</td> <td>7</td> <td>0.052</td> </tr> <tr> <td>4</td> <td>0.096</td> <td>8</td> <td>0.147</td> </tr> </tbody> </table> <p>d. Filter backwashing is triggered by head loss or time. The normal backwash sequence is air scour (10 minutes) followed by water wash (18 minutes). There is no run-to-waste or slow start after a backwash. Irish Water stated that run to waste facilities will be installed by June 2016.</p> <p>e. A backwash of Filter No. 5 was observed. The air scour was even across the filter bed and no problems were observed during the backwash.</p>	Filter No.	Turbidity (NTU)	Filter No.	Turbidity (NTU)	1	0.068	5	0.075	2	0.078	6	0.055	3	0.057	7	0.052	4	0.096	8	0.147
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4.	<p>Disinfection – UV treatment and chlorination</p> <p>a. UV treatment is provided by duty and assist Trojan Swift D30 units. The validated operating range is a minimum of 86% UVT for flows up to 340 m³/hr. A copy of the UV validation certificate was reviewed during the audit.</p> <p>b. The UV units were operating at flow rates of 227 m³/h and 232 m³/hr and 90.3% UVT, indicating that the UV system was operating within its validated range during the audit.</p> <p>c. The UV alarm set point is 90% UVT, however there is no automatic shut-down of the system if the UVT drops below 86%. Irish Water confirmed that an auto-shutdown facility is due to be installed on the UV system.</p> <p>d. The chlorination dosing system was upgraded from chlorine gas to sodium hypochlorite since the previous EPA audit in 2012.</p> <p>e. Sodium hypochlorite is supplied in bulk deliveries by Brenntag. The PCS number was not displayed or available on the delivery docket.</p> <p>f. Duty & standby chlorine dosing pumps are in place and the chlorine residual monitor on the final water displayed 1.56 mg/l during the audit. The target is 1.6 mg/l residual chlorine leaving the plant. The low alarm set point is 1.0 mg/l.</p> <p>g. There are a number of chlorine booster stations at service reservoirs on the SLRWSS network. These were not visited on the day of the audit.</p>																				
5.	<p>Exceedances of the Parametric Values</p> <p>a. Three exceedances of the THM parametric value were notified to the EPA in 2015:</p> <ul style="list-style-type: none"> • 102 µg/l on 07/09/15 in an audit sample at Mong to Reservoir WSZ; • 105 µg/l on 13/10/15 in a check sample at Annaduff WSZ; • 110 µg/l on 13/10/15 in a check sample at Mohill WSZ. <p>b. THM monitoring data for 2016 provided during the audit shows no exceedances in 20 samples taken across the network to date, with results ranging between 27 and 53 µg/l.</p>																				
6.	<p>Hygiene and Housekeeping</p> <p>a. A number of rat bait points were located around the site. This is in contravention of <i>EPA Advice Note No.13 – Pesticides in Drinking Water</i> which states that the use of rodenticides should be avoided unless absolutely necessary and where they are used, it should be for a limited duration until the problem is brought under adequate control.</p>																				

7.	<p>Management and Control</p> <ul style="list-style-type: none"> a. The raw water ammonium monitor and final water aluminium monitor were not operating during the audit. b. A review of the plant performance trends on the SCADA system showed a turbidity spike on 20th April 2016 and a chlorine flat-line from 28th April to 4th May 2016, which could not be fully explained during the audit. c. It could not be confirmed if cleaning of service reservoirs has been carried out recently.
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3. AUDITORS COMMENTS

The audit found that good progress is being made by Irish Water and Leitrim County Council's Implementation Group to improve the operational performance of Carrick on Shannon water treatment plant in order to reduce the risk of THM formation. The process optimisation works include:

- Caustic soda dosing for alkalinity correction;
- Installation of automatic chemical dosing control;
- Provision of run-to-waste facilities on the filters; and
- Implementation of Irish Water's Alarm and Critical Control Criteria.

The completion of these works should enable SLRWSS to be removed from the RAL by September 2016, subject to verification of the effectiveness of the works to the satisfaction of the EPA.

4. RECOMMENDATIONS

1. Irish Water should complete the process optimisation works at Carrick on Shannon WTP in order to meet the RAL completion date of September 2016. These works include:
 - (i) Installation of automatic chemical dosing control;
 - (ii) Provision of run-to-waste facilities on the filters;
 - (iii) Implementation of Irish Water's Alarm and Critical Control Criteria.
2. Irish Water should provide details of the recent filter upgrade works, including the depth of filter media in each bed.
3. Irish Water should install an automatic shut-off of the UV treatment system when the UVT drops below the validated range, in order to prevent inadequately disinfected water entering into supply.
4. Irish Water should review the use of disinfectants at South Leitrim Regional Water Supply to ensure that all disinfectants are authorised in accordance with the EU Biocides Products Regulation (528/2012) and associated Irish regulations (*European Union (Biocidal Products) Regulations, 2013*).
5. Irish Water should review the usage of rat bait at Carrick on Shannon WTP having regard to *EPA Advice Note No.13 – Pesticides in Drinking Water*. The use of rodenticides should be avoided unless absolutely necessary and where they are used, it should be for a limited duration until the problem is brought under adequate control.
6. Irish Water should ensure that all monitors are calibrated and maintained in accordance with the manufacturer's instructions.
7. Irish Water should provide details of the cause of the turbidity spike on 20th April 2016 and the chlorine flat-line from 28th April to 4th May 2016, as identified during the review of plant performance trends on the SCADA system.
8. In order to minimise the risk of THM formation, Irish Water should:
 - (i) Implement a programme to ensure that the service reservoirs are inspected and cleaned out on a regular basis and any maintenance and repairs completed as soon as possible after the need has been identified.
 - (ii) Implement a programme of flushing and scouring of the mains.

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 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 DW2011/60 in any future correspondence in relation to this Report.

Report prepared by:



Inspector

Date:

17th May 2016