

Site Visit Report

Under the *European Union (Drinking Water) Regulations 2023*, the Environmental Protection Agency (EPA) is the supervisory authority in relation to Uisce Éireann and its role in the provision of public drinking water supplies. This audit was carried out to assess the performance of Uisce Éireann in providing clean and wholesome water to the public water supply named below.

The audit process is a sample of the performance of a water treatment plant and public water supply on a given date.

Water Supply Zone	
Name of Installation	Cavanhill
Organisation	Uisce Éireann
Scheme Code	2100PUB1018
County	Louth
Site Visit Reference No.	SV27924

Report Detail	
Issue Date	23/08/2023
Prepared By	Lorcan Farrell

Site Visit Detail			
Date Of Inspection	25/07/2023	Announced	Yes
Time In	10:30	Time Out	15:15
EPA Inspector(s)	Lorcan Farrell		
Additional Visitors			
Company Personnel	Uisce Éireann: Daniel Behan, Joseph Moran. Louth County Council (Working in partnership with Uisce Éireann): Patrick Callan, Martin McEntee, Barry McKenna.		

> Summary of Key Findings

1. There have been recurring exceedances of the manganese parametric value in the Cavanhill Public Water Supply (PWS) since 2020. Different treatment options have been installed or trialed at the treatment plant over this time to increase manganese removal however exceedances of the manganese parametric value continue to occur at the treatment plant and within the supply network.
2. Warning alarm setpoints for some critical treatment processes were not in place at the treatment plant to alert operational staff in the event of deteriorating water quality or the failure of a critical treatment process.

> Introduction

Cavanhill PWS serves a population of 46,155 (EDEN figures) people in Dundalk and the surrounding area. Water is abstracted from the River Fane at Stephenstown Pump Station where potassium permanganate is added to the raw water for manganese control before being pumped to Cavanhill WTP. The treatment plant was recently upgraded with works being completed at the treatment plant in June 2020. Louth County Council took over operation of the treatment plant from the design, build and operator contractor in July 2022. The plant produces approximately 16,020 m³/day (EDEN figures) with treatment consisting of potassium permanganate dosing, pH adjustment, coagulation, flocculation and clarification followed by rapid gravity filtration, UV disinfection, chlorination and fluoridation.

The audit was conducted as a full audit of the water treatment plant with a focus on Uisce Éireann's performance in producing clean and wholesome water in response to elevated levels of manganese detected in the final water at the treatment plant and within the supply network. This included manganese results in excess of the European Union (Drinking Water) Regulations 2023 limit of 50 µg/l.

> Supply Zones Areas Inspected

The audit included a site tour of Cavanhill WTP.



1. Disinfection

		Answer
1.1	Is the UV disinfection system operating within its validated range?	No
Comment		
<p>1. The UV disinfection system in operation at the treatment plant is validated under USEPA criteria. The system was operating within the operation criteria available on the UV system HMI. However, a copy of the UV validation certificate was not available at the audit to cross-check against the UV system operating conditions observed on the day of the audit.</p>		



2. Reservoirs and Distribution Networks

2.1

Are reservoirs adequately inspected and maintained?

Answer

No

Comment

1. Uisce Éireann confirmed after the audit that Rathmore Reservoir was not on Uisce Éireann's Cleaning and Inspection Programme. All other reservoirs at the treatment plant and within the supply are included under the programme and have been cleaned/inspected since 2020.



3. Management and Control

3.1

	Answer
Is the water treatment plant resilient enough to cope with significant variations in raw water quality or demand?	No
<p>Comment</p> <p>1. There have been recurring exceedances of the manganese parametric value at Cavanhill WTP and within the Cavanhill supply network since 2020. The elevated levels of manganese began to occur after upgrade works were completed at the treatment plant to address persistent Trihalomethane (THM) exceedances. A pH adjustment system was installed as part of the upgrade works which lowers the pH to a range of 6.2 - 6.5 to optimise coagulation for increased removal of organics which are a precursor to THM formation. However, it is now thought that this decrease in coagulation pH has altered the ability of the treatment plant to remove manganese that is naturally present in the source water. This is due to lower pH facilitating a higher proportion of manganese to remain in soluble form preventing its removal during the CFC and filtration stages. Louth County Council confirmed that the concentration of manganese in the source water ranges from approximately 30-50 ug/l in winter to 80-200 ug/l in summer.</p> <p>2. In response to exceedances of the manganese parametric value different treatment steps have been introduced or trialed at the treatment plant in conjunction with Uisce Éireann's process optimisation team. A potassium permanganate dosing system was installed at Stephenstown Raw Water Pumping Station in July 2021. Jar tests were completed to create a dosing matrix with dose rate being adjusted based on daily raw water monitoring for manganese. A trial was commenced in November 2022 involving the addition of a layer of manganese dioxide to a filter at the treatment plant. The trial was suspended twice as a result of excess backwash and run to waste volumes overwhelming the capacity of the washwater recovery system. The trial was postponed indefinitely in April 2023. Jar testing with alternative coagulants including ferric chloride and poly-aluminum chloride were completed in February 2023 but the alternative coagulants tested were found not to provide additional benefit. Further jar testing was conducted to establish if changes to pH would provide benefit. These jar tests showed no additional benefit and indicated the potential for increased risk of THM non-compliance. Daily sampling of all process streams at the treatment plant for manganese levels is ongoing to inform current and future treatment and mitigation strategies.</p> <p>4. An additional factor in the ability of the treatment plant to remove manganese is that supernatant water from the washwater recovery system is returned to the raw water balance tank at the headworks of the treatment plant rather than being discharged from the treatment plant. The washwater returned to the raw water balance tank is tested daily and has been found to have a manganese concentration of 150 - 300 ug/l which increases the overall concentration of manganese when added to the incoming raw water.</p> <p>5. The Uisce Eireann process operations team in conjunction with Louth County Council are exploring further treatment and mitigation options at the treatment plant. Individual analysis on all production units including wastewater residual streams is to be completed to ensure that each process stage is optimised in so far as possible to aid the removal of manganese. An option to introduce a mid-process pH adjustment and secondary oxidant dosing is being considered as the next potential step to increase the removal of manganese at the treatment plant. An increase in pH and secondary oxidant dosing after the CFC stage would aim to increase the oxidation of dissolved manganese in the settled water leading to increased removal rates of precipitated manganese in the filters. A secondary effect of this treatment option would be to reduce the levels of dissolved manganese returning to the headworks of the plant via the washwater recovery process as more particulate manganese will be removed in the sludge fraction of the waste stream. No timescales for this project were available at the audit.</p>	

		Answer
3.2	Is there a documented alarm response procedure?	Yes
	Comment	
	<p>1. A Louth County Council alarm response flow chart was present on the wall of the control room of the plant. The document contained up-to-date escalation and contact details for Louth County Council staff. However, it did not contain Uisce Éireann contact details or mention the Uisce Éireann Incident Communications Response Guidance Form (also present) which is an integral part of the alarm response and escalation procedure at the treatment plant.</p>	

		Answer
3.3	Are suitable alarm settings in place to alert operators to deteriorating water quality and/or the failure of a critical treatment process?	No
	Comment	
	<p>1. There was a high turbidity plant shutdown setpoint of 1 NTU with a two minute time delay in place based on the output of the final water turbidity monitor at the treatment plant . However, there was no warning alarm setpoint in place to alert the operator in the event of deteriorating water quality or the failure of a critical treatment process before a plant shutdown occurs.</p> <p>2. There were also high and low final water pH plant shutdown setpoints of 7.3 and 6.8 with a 15 minute time delay in place based on the output of the final water pH monitor at the treatment plant. However, there were no high or low warning alarm setpoints in place to alert the operator in the event of deteriorating water quality or the failure of a critical treatment process before a plant shutdown occurs.</p>	



4. Drinking Water Quality

4.1

Have relevant failures to comply with the requirements of the European Union (Drinking Water) Regulations 2023 been notified to the EPA?

Answer

Yes

Comment

1. In response to a number of manganese parametric failures that were reported to the EPA in June 2023 a new incident management and notification process was introduced at Cavanhill WTP for manganese exceedances detected through operational sampling. Testing for manganese levels in the final water takes place daily at the treatment plant using a non-accredited test in the on-site lab. All non-compliant operational monitoring results for manganese levels exceeding the parametric value are reported to Uisce Éireann via the INR process and emergency sampling is arranged for the same day or next day by an external contractor to re-test final water manganese levels. However, as the emergency accredited sampling is not conducted in the same timeframe as the operational sampling, the accredited re-test is not representative of the original non-accredited failed sample.



5. Site Specific Issues

	Answer
5.1 Were online monitors operational?	No
Comment	
1. Louth County Council stated that the raw water ammonia monitor was not operational. Daily manual sampling is ongoing and plans are in place to review the current raw water ammonia monitor or replace it with a new instrument. No timeframes for the completion of works were available at the audit.	

Recommendations

Subject	Cavanhill - Audit Recommendations	Due Date	25/09/2023
Action Text	<p>Uisce Éireann is responsible for ensuring a clean and wholesome supply of drinking water and should implement the following recommendations without delay.</p> <ol style="list-style-type: none">1. Submit an action programme (with timescales) for the restoration and maintenance of compliance with the manganese parametric value.2. Review alarm and inhibit setpoints at the treatment plant and install appropriate warning alarms, where absent, to alert operators of deteriorating water quality or problems with a critical treatment process before a plant shutdown occurs.3. Submit a copy of the validation certificate for the UV disinfection system in use at the treatment plant.4. Review the recently introduced incident management and notification process for manganese exceedances detected in operational sampling at the treatment plant to ensure that emergency accredited sampling for manganese is representative of the original failed operational monitoring sample.5. Update the alarm response flow chart making reference to the Uisce Éireann Incident Communications Response Guidance Form and its relevance to the alarm response and escalation procedure at the treatment plant.6. Repair or replace the raw water ammonia monitor at the treatment plant. This should include the provision of appropriate alarms/inhibits with the output of the monitor trended on SCADA.7. Confirm all reservoirs within the supply are on the Uisce Éireann reservoir cleaning programme. <p>Actions required by Uisce Éireann</p> <p>During the audit, Uisce Éireann representatives were advised of the audit findings and that action must be taken by Uisce Éireann to address the issues raised.</p> <p>Uisce Éireann should submit a report to the EPA on or before 25/09/2023 detailing the actions taken and planned, with timescales, to close out the above recommendations.</p> <p>The EPA advises that the findings and recommendations from this audit report should, where relevant, be addressed at other public water supplies.</p>		