

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	Clare Island PWS
Organisation	Uisce Éireann
Scheme Code	2200PUB1030
County	Mayo
Site Visit Reference No.	SV27847

Report Detail	
Issue Date	16/06/2023
Prepared By	Derval Devaney

Site Visit Detail			
Date Of Inspection	18/05/2023	Announced	Yes
Time In	10:10	Time Out	14:10
EPA Inspector(s)	Derval Devaney		
Additional Visitors			
Company Personnel	Uisce Éireann (UÉ): Ronan McDonnell Mayo County Council (working in partnership with UÉ): Michael Oliver Moran, Joe McGuire		

> Summary of Key Findings

1. The continuous turbidity monitor on slow sand filter no. 2 was out of operation from December 2022. This was not reported to Uisce Éireann in accordance with its Incident Communication Response Procedure. The lack of a turbidity monitor meant the filter's treatment barrier for parasites such as *Cryptosporidium* could not be verified.
2. There is no continuous headloss monitor on the slow sand filters to assist in determining when the filters should be taken out of service for cleaning. This has been raised in previous EPA audits.
3. The balance tank at the water treatment plant needs to be retrofitted to ensure it does not pose a risk of contamination entering the final treated water.

> Introduction

Clare Island Public Water Supply (PWS) serves a population of over 155 which can rise to 200 during the summer. Raw water is abstracted from Knockmore Stream. Treatment consists of filtration in two slow sand filters (dual media of sand and granular activated carbon) followed by disinfection using sodium hypochlorite generated in an on-site electrochlorination system. Treated water is stored in a reservoir at the plant before entering the distribution network and second reservoir at kill.

The audit was conducted in response to a detection of *Cryptosporidium* in a sample taken at the outlet of the water treatment plant reservoir on the 15th March 2023, and subsequent imposition of a Boil Water Notice (BWN) on the supply from 24th to 31st March 2023.

> Supply Zones Areas Inspected

The audit covered the treatment process at Clare Island Water Treatment Plant, the management and oversight of critical alarms, plant shutdowns and response to incidents.



1. Incident Management

1.1

	Answer
Was the incident suitably alerted to the plant operators, escalated and managed in order to maintain water quality and protect public health?	No
Comment	
<p>1. A water sample, taken from the <i>Cryptosporidium</i> Rig placed at the outlet of the treated water reservoir at Clare Island water treatment plant from 14th to 15th March 2023, detected 2 <i>Cryptosporidium</i> oocysts in 10 litres. The sample result was reported by the testing laboratory on 24th March 2023 and UÉ immediately initiated consultation with the HSE. A boil water notice (BWN) was placed on the Clare Island PWS on 24th March 2023, to protect human health. The EPA was also notified of the <i>Cryptosporidium</i> detection and imposition of the BWN on 24th March 2023.</p> <p>2. There was an unacceptable delay in the reporting of the <i>Cryptosporidium</i> detection by the laboratory. UÉ has taken action to ensure this reporting delay is not repeated. Since the BWN was lifted, <i>Cryptosporidium</i> monitoring has been increased from monthly to bi-monthly on the final water, upon advice from the HSE, and monitoring is being carried out by an alternative accredited laboratory.</p> <p>3. UÉ investigations were unable to determine the exact cause of the <i>Cryptosporidium</i> detection, but have found the following may have attributed to the detection:</p> <p>a. Slow Sand Filter Number 2 did not have an operational continuous turbidity monitor in place from December 2022. An operational continuous turbidity monitor with appropriate set-points on the outlet of each filter is fundamental in the effective operation and verification of the slow sand filter as a treatment barrier for parasites such as <i>Cryptosporidium</i>. The importance of a turbidity monitors on each filter, to verify the filters' treatment capability was raised previously for this treatment plant; in the EPA's audit of 25/06/2021. This audit verified that new continuous turbidity monitors were installed and operational on the outlet of each filter since the incident.</p> <p>b. Both filters were indicating the need for a clean/scrape in the lead up to the incident. Filter No 2 was scraped on 10th February 2023. It was stated that hand held turbidity readings and the combined filtered turbidity montitor were relied upon to return the filter to service as there was no individual turbidity monitor on this filter at the time.</p> <p>c. The open grid decking on the uncovered final water balance tank presents a potential risk of contamination entering the water from footwear during balance tank inspections. There would be a risk of contamination from footwear due to the large number of sheep in the surrounding commonage area and sheep faeces was evident on the ground surrounding the water treatment plant during the audit.</p> <p>d. The balance tank is prone to rust, which presents a risk of rust sediment entering the treated water. The balance tank was cleaned on 6th March 2023 as part of the caretakers routine maintenance. The combined run to waste was activated during the cleaning event, to prevent water entering the on-site reservoir and reduce any risk of contaminating the supply.</p> <p>4. The malfunctioning of Filter No. 2's turbidity monitor was only discovered by UÉ upon investigation of this incident. The audit found that while the issue was reported within Mayo County Council, it was not escalated by Mayo County Council and communicated to UÉ in accordance with the Uisce Éireann Incident Communications Response Guidance Form.</p> <p>5. The Water Incident Communications Response Chart displayed at the plant did not contain site specific reportable incidents. There was no site specific alarm response procedure in place documenting what to do in the event of a critical alarm.</p>	



2. Source Protection

2.1

	Answer
Is the abstraction source(s) adequately protected against contamination?	Yes
Comment	
<p>1. While the source (Knockmore Stream) was not visited during the audit its variance in water quality was discussed. There is a continuous pH, temperature and UVT monitor on the raw water. Knockmore stream is fed from a spring originating in the higher lands of Knockmore Mountain. Heavy rainfall can negatively impact on the raw water quality.</p> <p>2. The stream was visible from the water treatment plant and is surrounded by common agricultural land which is not farmed intensively. Sheep grazing is the main agricultural activity in the vicinity of the raw water source.</p> <p>3. The auditor discussed the possibility of using an alternative nearby source during periods when water quality deteriorates in the current raw water source. This may also assist in prolonging the GAC media in the slow sand filters and reduce the chlorine demand at the disinfection stage and in the network; further reducing THM formation potential. UÉ stated it would investigate this option and the feasibility of it further.</p>	

> 3. Filtration

		Answer
3.1	Are the filters designed and managed in accordance with EPA guidance?	No
Comment		
<p>1. Filter cleaning is initiated based on headloss when the bellmouth can no longer be adjusted downwards in the balance tank post filtration. There is no continuous head loss monitor on each filter. This issue was raised in previous EPA audit reports (2011 and 2021). This is a key parameter to monitor during the filtration stage. The EPA's <i>Water Treatment Manual: Filtration Manual</i> (Section 4 Slow Sand Filtration) recommends that a continuous headloss and water level monitor is in place. It also recommends that a filter is removed from service for cleaning when the water height above the top of the bed reaches a value between 0.6 m and 1.2 m.</p> <p>2. Since the last EPA audit in November 2021, sand depth level markers were installed in the slow sand filters to enable visual checks during cleaning to ensure the filter media bed has a minimum of 0.6 m depth at all times.</p> <p>3. Both filters were fully refurbished after the <i>Cryptosporidium</i> detection on 15/03/2023 as follows:</p> <p>(a) Filter No. 1 was taken out of service on 20/03/2023, drained down, emptied of sand and GAC media and fully replenished and run to waste until turbidity returned to levels below 0.3 NTU. The filter was returned to service at 2pm on 26/03/2023.</p> <p>(b) The same sand replacement criteria was followed for Filter No. 2, which was taken out of service on 27/03/2023 and returned to service on 11am on 05/04/23 with turbidity levels at 0.23 NTU. It was reported during the audit that additional depths of sand (1000mm) and GAC media (approximately 600 mm) were installed in both filters.</p> <p>4. Currently there is no protocol in place to determine when to replace the GAC filter media. There is a need for a review of water quality data (e.g. the organic removal capabilities and UVT % data) to determine trigger values to inform when the GAC media is spent and requires replacement.</p> <p>5. When refilling the slow sand filters post cleaning, water is now being refilled from the top of the slow sand media as opposed to the bottom, as UÉ believe filling from the top has less impact on the sand and GAC media. There is no slab on the slow sand filter media to resist potential scouring and disturbance of the filter media by inflowing water.</p>		

		Answer
3.2	Does monitoring indicate that the filters are operating effectively?	Yes
Comment		
<p>1. While turbidity readings from the raw water, Filter 1, Filter 2 and the combined filtered water continuous turbidity monitors are displayed on-site at the water treatment plant, there is no remote access to this information.</p> <p>2. The time displayed on the memograph (HMI display) at the plant was out by one hour (the turbidity readings were recording GMT + 2 Hours).</p>		



4. Disinfection

4.1

Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?

Answer

Yes

Comment

1. The disinfection system at Clare Island PWS uses an onsite electrochlorination system (OSEC) to ensure a secure supply of sodium hypochlorite disinfectant on the island. Modifications were made to the process since the EPA's audit on 25/06/2021 and sodium hypochlorite generated on-site now meets the 1.5 day recommended storage time outlined in the *EPA Disinfection Manual*.

2. Chlorine residual results are trended at the plant and the disinfection upgrade completed in 2019 at the plant has enabled the trends to be reviewed remotely.

3. Since the EPA's audit on 04/11/2021, the plant will now automatically shutdown on low or high chlorine readings as recommended in the audit report.



5. Management and Control

		Answer
5.1	Has the protozoal compliance log treatment requirement been identified for the water treatment plant?	Yes
Comment		
<p>UÉ confirmed that a survey completed in recent years identified that the protozoal compliance log treatment requirement of the Knockmore Stream source is log 3. Where slow sand filtration treatment meets the requirements outlined in EPA <i>EPA Water Treatment Manual: Filtration</i> Guidance it provides a log treatment value of 2.5 log credits, meaning the Clare Island PWS has a prozoal log deficit of 0.5 log. UÉ currently has a bi-monthly monitoring programme in place on the supply, in agreement with the HSE, to monitor the final water <i>Cryptosporidium</i> risk posed by this deficit.</p>		

		Answer
5.2	Are suitable plant shutdowns/inhibits in place to prevent the entry of inadequately treated water entering the distribution network?	Yes
Comment		
<p>During the audit the plant was shutting down intermittently for a few minutes and re-startng again. The shutdowns did not appear to be related to any water quality event as the caretaker was not receiving an alarm by text to alert him of a breach of water quality set-points.</p>		

		Answer
5.3	Are instrument calibrations within date?	Yes
Comment		
<p>While the UVT continous monitor on the raw and final water was calibrated on 24/04/23, the raw water UVT monitor was signalling a lamp fault during the audit. Mayo Co. Co. stated that it was aware of the issue and a new HACH monitor is to be installed.</p>		



6. Drinking Water Quality

		Answer
6.1	Have failures of the parametric values or the detection of pathogenic micro-organisms or parasites in the water supply been adequately investigated?	Yes
Comment		
<p>Clare Island PWS has a history of trihalomethane (THM) failures. Most recent failures occurred during 2022 (4 failures in total) on 05/10/22 and 25/10/22. The EPA's audit of 15/11/2021 recommended that UÉ implement a THM investigative monitoring programme at Clare Island PWS, having regard at the time to the elevated levels of chlorine in the final water at the water treatment plant. A response to that audit report provided on 13/12/21 stated monthly THM investigative monitoring would be put in place. However during the audit it was unclear if THM monitoring was being carried out at a monthly frequency.</p>		

Recommendations

Subject	Recommendations	Due Date	17/07/2023
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. Update the Uisce Éireann Incident Communications Response Guidance Form displayed at the plant with site specific reportable/notifiable incidents and ensure all staff involved in the communications response are trained on its use. 2. Ensure that (a) there are documented site specific alarm response procedures and (b) training is provided to all relevant staff on the procedures. 3. Investigate the cause of water treatment plant intermittently shutting down during the audit and report to the EPA on the findings and actions taken to rectify the matter. 4. Install a continuous headloss monitor on each slow sand filter and investigate the need for a splash plate to prevent disturbance of the filter media, in accordance with the <i>EPA Water Treatment Manual: Filtration</i>. 5. Take action to ensure the continuous UVT monitors at the plant are in good working order. 6. Ensure (a) that operational personnel have remote access to plant performance trends to assist in the protection of treatment barriers, and have been adequately trained in the use of SCADA to inform their work, (b) the time on the memograph / HMI display at the water treatment plant is reading accurately. 7. Retrofit the balance tank as planned to ensure rust and potential contamination from footwear does not interfere with final water quality. 8. Confirm the frequency of final water THM monitoring and submit results obtained during 2022. Review the organic removal process and efficiencies at the plant and submit criteria to be used to inform future GAC media replacement. 9. Investigate the potential use of an alternative source water during periods of adverse weather conditions and report on the outcome. 10. Continue to monitor for <i>Cryptosporidium</i> in the final water as advised by the HSE, and identify how the 0.5 log protozoal compliance deficit will be addressed at Clare Island PWS. <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 17/07/23 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>		