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	Arklow Public Supply
Organisation	Uisce Éireann
Scheme Code	3400PUB1004
County	Wicklow
Site Visit Reference No.	SV29626

Report Detail

Issue Date	24/05/2024
Prepared By	Derval Devaney

Site Visit Detail

Date Of Inspection	25/04/2024	**Announced**	Yes
Time In	11:00	**Time Out**	15:10
EPA Inspector(s)	Derval Devaney Chris Fennell		
Additional Visitors			
Company Personnel	Uisce Éireann (UÉ): Edward Haythornthwaite, Jessica Evans, Trevor Smullen Murphy Ireland (Contractor working in partnership with Uisce Éireann): Sean Devoy, Ellen Cassidy		

Summary of Key Findings

1. The turbidity monitor on Filter No. 2 was not operating. The plant is undergoing upgrade works including the installation of continuous turbidity monitors and a disinfection upgrade. Works are due to be complete within 6 weeks.
2. The Log 3 validation certification for the UV system was unavailable to determine if the alarm and inhibit settings were appropriate. Data suggests there were two brief incidents where undisinfected water exited the UV unit during March 2024.
3. There was no alarm and inhibit in place for final water low pH and minimum UVT that protects statutory limits and the UV validated criteria respectively.
4. There was no daily log book available for inspection that documented plant maintenance works.

Introduction

Arklow public water supply (PWS) has been rationalised and now also serves the areas of Aughrim Annacurra and Ballymorris enabling the rationalisation of the latter two public water treatment plants which are currently on the EPA's Remedial Action List (RAL).

Arklow PWS produces on average 4,200 m3/day to a population of approximately 15,105 (from EDEN for all 3 supplies) from a wellfield at Woodenbridge. There are additional boreholes at Glenart and Ballyduff wellfields, but these are not currently being used. The Goldmine River is no longer used and its raw water pipe was re-purposed and now delivers treated water to Ballymorris and Aughrim Annacurra.

Treatment at Arklow Water Treatment Plant (WTP) consists of cascade aeration for the removal of manganese, rapid gravity filtration, chlorination, fluoridation, pH correction and UV treatment. Treated water from Arklow WTP feeds the Lamberton, Arklow Mountain Bay, The Maples and Aughrim Reservoirs and a small tank at the redundant Ballymorris WTP. Secondary chlorination occurs at Aughrim Reservoir. Murphy Ireland operate the WTP under a Design, Build and Operate (DBO) contact with Uisce Éireann.

The audit was undertaken to assess Uisce Éireann's performance in producing clean and wholesome water with a focus on management, control and procedures in place to ensure appropriate oversight of treatment processes.

Supply Zones Areas Inspected

The Arklow WTP and and associated treatment processes were inspected during the audit. Monitoring and control systems including parametric trends and alarm set-points were reviewed.

1. Filtration

		Answer
1.1	Are the filters designed and managed in accordance with EPA guidance?	No

Comment

1. The filter turbidity readings submitted in advance of the audit illustrate turbidity was > 1 NTU on many occasions between 05/03/2024 and 15/03/2023, lasting up to 90 minutes. While these elevated readings appear to coincide with a filter backwash, a backwash generally lasts just 30 minutes. This indicates filtered water with turbidity > 1 NTU is entering the treatment process which has the potential to compromise the disinfection process.
2. The current filter turbidity inhibit set point of 1.5 NTU after 10 minutes should be revised downwards to prevent filtered turbidity > 1 NTU entering the disinfection treatment process.
3. While the turbidity monitors on the filters were within calibration, turbidity monitor on Filter No. 2 was not operational during the audit. This issue was captured in UÉ's alarm and inhibit review and new turbidity monitors are due to be installed on all filters and the combined filtered water.
4. A review of trends on the SCADA system during the audit found a spike in filtered water and final water (> 2 NTU) on 17th April 2024 (from approximately 8 am - 8:57 am). The Contractor believed this was not representative of water entering supply, but was due to maintenance of the turbidity probes. There was no log book available for inspection to determine if such maintenance works were carried out at this time.
5. Algae was present in the filter's inlet channel and on the walls and backwash trough of the three rapid gravity filters. UÉ confirmed there were no complaints relating to the supply and in particular no taste and odour complaints.
6. The filters comprise of approximately 1m of sand media which has not been replaced since the filters were commissioned in 2015. The *EPA's Water Treatment Manual: Filtration* recommends "that, over 5 years, the media is tested every 1-2 years to confirm that no significant degradation has occurred".

		Answer
1.2	Does monitoring indicate that the filters are operating effectively?	No

Comment

1. It was not possible to determine the performance of Filter No. 2 as its turbidity monitor was not operating. See Point 1.1 above.
2. The new turbidity monitor should be installed without delay and handheld readings taken daily to ensure the turbidity of filtered water is < 1 NTU.

2. Disinfection

		Answer
2.1	Are duty and standby chlorine pumps/ UV units in operation?	Yes

Comment

1. The filtered water is disinfected using 10 -12 % sodium hypochlorite and ultravoilet light (via a SX-425-10 UV Reactor).
2. Chlorine is used as a primary disinfectant with contact time (Ct) achieved on site within an underground contact tank and clearwater tank. UV treatment is operated as a barrier to deal with *Cryptosporidium* (to provide a Log 3 barrier) and not as a broad range disinfection system.
3. There are duty and standby chlorine pumps that automatically switchover if a fault occurs.
4. The site is currently undergoing a programme of works to upgrade the disinfection system. This includes automatic switchover of chlorine dosing pumps based on time, installation of a CL001 chlorine monitor (post dose) and an upgrade to the CL002 chlorine monitor (post Ct) and linking the dose to CL002. These works are expected to be complete within 6 weeks.

		Answer
2.2	Is the UV system suitably validated?	No

Comment

1. UÉ provided the USEPA UVDGM validation criteria for a 4 log inactivation of *Cryptosporidium* by the UV system. The UV unit requires a dose of 22 mJ/cm2 to achieve a 4 log inactivation.
2. However the UV unit is operated to achieve a 3-log *Cryptosporidium* inactivation and UÉ stated a dose of 16 mJ/cm2 is required to achieve this. The validation criteria for Log 3 treatment was not available for inspection to determine if the UV alarms and inhibit set points were adequate for disinfection. This information was requested after the audit, but was not received within the timeframe requested to be included in the audit report.
3. A plate was absent from the UV unit outlining the name of the unit and the specifications it must operate within to achieve a validated dose.
4. There is no UVT monitor on the final water. UÉ stated there are plans to install this monitor.
5. The UV units automatically switchover, but only if a fault occurs (e.g. if the dose falls < 20 mJ/cm2).
6. The UV trends reviewed during the audit illustrated UV Unit 1 was operating since the 17th April 2024 (i.e. for 9 days). A manual switchover of the UV units should occur more frequently (for e.g. every 24 - 48 hours) to ensure optimal performance.

		Answer
2.3	Is the UV disinfection system operating within its validated range?	No

Comment

1. The auditors were unable to determine if the unit was operating within its validated range as the validation criteria for a log 3 *Cryptosporidium* inactivation was not available. This information was requested after the audit, but was not received within the timeframe requested for inclusion in the audit report.
2. UV monitoring data submitted to the EPA in advance of the audit suggested there were two incidents on 02/03/2024 and 30/03/2024 where water flowing through the UV reactors (11.6 m3 and 34 m3 and respectively) was not disinfected. These instances appear to be of short duration in advance of a UV reactor shutdown. UÉ was unable to explain the cause of the incidents.

		Answer
2.4	Was the chlorine contact time calculation correct?	No

Comment
1. The contact time calculation (Ct) includes a max. flow of 193 m3/hour. The flow data submitted in advance of the audit illustrates final water flows can reach 262 m3/hr. The contractor stated this was likely due to pump surges which would not last long. 2. UÉ should investigate the flow data for the plant and ensure the Ct calculation accurately reflects max. flow to ensure adequate disinfection.

3. Treatment Process Chemicals

		Answer
3.1	Are treatment process chemicals appropriately managed and stored?	No

Comment

1. The fluoride and chlorine bulk storage tank fill points are located outside their bunds. The contractor stated a Standard Operating Procedure (SOP) is in place and a mobile bund is placed below the fill point when the tanks are being filled and all deliveries are supervised.
2. The EPA requested the SOP be submitted after the audit for review, however this was not received wtihin the timeframe requested to be included in the audit report.

4. Management and Control

		Answer
4.1	Has the protozoal compliance log treatment requirement been identified for the water treatment plant?	No

Comment

1. A source and sanitary survey has not been completed for the groundwater sources serving the Arklow PWS.
2. UÉ has not identified the protozoal compliance log treatment requirement for the water treatment plant.
3. There is no raw water monitoring programme in place for the supply.

		Answer
4.2	Is there a documented alarm response procedure?	Yes

Comment

1. While there is a critical alarm response procedure which identifies personnel response duties; it does not list the critical alarms. It also includes email as a form of notifying UÉ of an incident rather than relying on verbal contact alone.
2. An Incident Response procedure was not displayed at the water treatment plant which includes contact details and site specific trigger levels that protect critical processes at the WTP. Such procedure should be aligned with UÉ's Incident Communications Response Guidance Form and displayed at the WTP.

		Answer
4.3	Are suitable plant shutdowns/inhibits in place to prevent the entry of inadequately treated water entering the distribution network?	No

Comment

1. Due to the absence of a UV validation certicate (for a log 3 inactivation of *Cryptosoridium)*, it was not possible to assess if the plant's UV alarms and inhibits were suitable.
2. There is no UVT monitor on the final water to ensure UV treatment operates within its validated range.
3. There is no alarm and inhibit in place for final water low pH.

		Answer
4.4	Are suitable alarm settings in place to alert operators to deteriorating water quality and/or the failure of a critical treatment process?	No

Comment

1. See 4.3 above.

		Answer
4.5	Are online monitors operational?	No

Comment
1. See Section 1.2.

		Answer
4.6	Are instrument calibrations within date?	No

Comment
1. There were no calibration stickers on the final water pH correction pumps (using sodium hydroxide 30%), chlorine dose pumps, the UV control panel and the UV unit to enable the auditor to confirm if these instruments were within calibration.

		Answer
4.7	Is continuous monitoring data accessible?	No

Comment
1. Secondary chlorination occurs at Aughrim Reservoir. The chlorine target at the booster station for the Aughrim Reservoir was reduced from 1.5mg/l to 0.8 mg/l as per UÉ's report from 12th January 2024. Chlorine trend data for this reservoir was not accessible during the audit and details could not be provided of the dosing arrangements there. This information was requested after the audit but has not been received within the timeframe requested for inclusion in the audit report.

5. Supply on the Remedial Action List

		Answer
5.1	Is further information needed to assess completion of the Remedial Action List upgrade?	Yes

Comment

1. The Arklow PWS now serves Aughrim Annacurra area (since 18/12/2023) and Ballymorris area (since 21/03/2024). The latter two water treatment plants and their water sources are no longer in use.
2. Aughrim Annacurra PWS is on the EPA's RAL due to elevated levels of THMs above the standard in the Drinking Water Regulations. A compliance round of sampling for THMs on 10/01/2024 in the Aughrim Annacurra PWS was provided to the EPA. The EPA request another round of THM sampling at previously failed locations to inform the EPA's assessment of the removal of this supply from the EPA's RAL.
3. Ballymorris PWS is on the EPA's RAL for inadequate disinfection and poor turbidity removal. There are also persistent failures for manganese, iron and colour since 2017. The Boil Water Notice on this supply was rescinded on 19/04/2024. Some further flushing is required to clear the Ballymorris network of sediments which accumulated when the network was served by the Ballymorris WTP. The EPA has requested further monitoring at locations which have previously failed to verify sedimentation no longer poses a risk to the supply and ensure compliance with water quality standards.

6. Site Specific Issues

		Answer
6.1	Was supply information submitted to the EPA accurate?	No

Comment

1. The volume documented on EDEN for this supply is incorrect and needs to be updated (3,514 m3/day in EDEN versus 4,200 m3/day provided at the audit).
2. EDEN documents that the supply serves a population of 13,500 persons. This figure should be reviewed to ensure it includes customers in the Aughrim Annacurra and Ballymorris areas which are now served by Arklow PWS.

		Answer
6.2	Was adequate information provided on the Water Supply Zone's distribution network?	No

Comment

1. While maps of the water supply zone and reservoirs were provided in advance of the audit,to illustrate the expansion of Arklow PWS to supply Ballymorris and Aughrim Annacurra areas, there was lack of clarity on flow direction and interconnection via the reservoirs in the distribution network. This information was requested after the audit but has not been received within the timeframe requested for inclusion in the audit report.
2. Pre audit information states that there are chlorine monitors on the inlet and outlet of Lamberton, the outlet of Mountain Bay and Aughrim Reservoirs. It could not be confirmed if a continuous chlorine monitor was present at The Maples Reservoir. This information was requested after the audit but has not been received within the timeframe requested for inclusion in the audit report.

Recommendations

Subject	Arklow PWS Audit Recommendations	Due Date	24/06/2024

Action Text

Uisce Éireann is responsible for ensuring a clean and wholesome supply of drinking water and should implement the following recommendations without delay.

1. Filtration

1. Install Filter No. 2's turbidity monitor without delay. Carry out daily handheld testing for turbidity on Filter No. 2 until such time as the monitor is in place to ensure turbidity is < 1 NTU going into supply;
2. Adjust the turbidity alarm, inhibit set points, and time delay on the filters to ensure they are run to waste for an appropriate period to prevent turbidity of > 1 NTU entering the treatment process;
3. Ensure that the filter's walls, backwash trough and its inlet channel are cleaned on a regular basis to prevent build-up of any biological growth including algae and avoid negative impact on the filter's performance and water quality;
4. Investigate the spike in turbidity on 17 April 2024 on filters and final water and ensure the cause is determined and remediated;
5. Ensure filter media is tested at the frequency outlined in the *EPA's Water Treatment Manual: Filtration* to determine if media replacement is required.

2. Disinfection

1. Review plant flow data and ensure the Ct calculation accurately reflects maximum flow to ensure adequate disinfection;
2. Submit the Log 3 validation certification for the UV system and ensure the UV plate or certificate is held on site and available for inspection;
3. Put in place a procedure to ensure the UV units are switched over frequently;
4. Investigate the brief incidents where undisinfected water appeared to exit the UV unit during March and, if warranted, take remedial action to ensure this does not reoccur;
5. Confirm the presence of a chlorine monitor at The Maples Reservoir, the dosing arragements, alarm setpoints and chlorine trends since 17th April 2024 at the Aughrim Reservoir;
6. Inform the EPA when disinfection upgrade works are complete.

3. Management and Control

1. (i) Provide the protozoal log treatment requirement following completion of a source and sanitary survey; (ii) details on how a protozoal log deficit, if identified, will be addressed; (iii) ensure *Cryptosporidium* monitoring is undertaken as per Irish Water Rationale for Determining the Frequency of *Cryptosporidium* Monitoring in Public Supplies until a protozoal barrier at the plant can be verified;
2. Put in place a raw water monitoring programme;
3. Ensure (i) the Incident Response procedure is aligned with Uisce Éireann's Incident Communications Response Guidance Form and is displayed at Arklow WTP and includes contact details and site specific trigger levels protecting critical processes at the WTP; (ii) the Critical Alarm Response procedure is amended to ensure email is not used to notify an incident and critical alarms are listed; (iii) staff involved in incident response are trained on the procedures;
4. Ensure there is a Standard Operating Procedure in place for the bulk delivery of chemicals that specifies deliveries are supervised and mobile bunds are in place to contain any potential spills. Provide training to relevant staff on the procedure;
5. Ensure any maintenance works carried out at the plant are logged in a daily log book at the water treatment plant and available for inspection;
6. Ensure instrumentation is within calibration and affix service/calibration stickers with appropriate service interval dates to critical treatment plant infrastructure;
7. Implement the findings of the Alarm and Inhibit review. Ensure alarm and inhibits are in place for final water low pH and minimum UVT that protects statutory limits and the UV validated criteria respectively;
8. Inform the EPA when the following continuous monitors are installed and operational: pH and turbidity on the raw water; turbidity on the filters and post filtration, Cl001 post chlorine dose and UVT on the final water;
9. Submit THM monitoring in the network to include sampling points that previously failed in the Aughrim Annacurra distribution network;
10. Update EDEN with the correct supply volume and population for Arklow PWS.

	Actions required by Uisce Éireann 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. Uisce Éireann should submit a report to the EPA on or before the above due date detailing the actions taken and planned, with timescales, to close out the above recommendations. The EPA advises that the findings and recommendations from this audit report should, where relevant, be addressed at other public water supplies.