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	Avoca Ballinaclash Public Supply
Organisation	Uisce Éireann
Scheme Code	3400PUB1024
County	Wicklow
Site Visit Reference No.	SV29621

Report Detail

Issue Date	02/05/2024
Prepared By	Derval Devaney

Site Visit Detail

Date Of Inspection	12/04/2024	**Announced**	Yes
Time In	14:20	**Time Out**	17:15
EPA Inspector(s)	Derval Devaney Chris Fennell		
Additional Visitors			
Company Personnel	Uisce Éireann (UÉ): Linda Doran, Jessica Evans Wicklow County Council (working in partnership with Uisce Éireann): Tony Byrne, Shane Kinsella, Noel Doody.		

Summary of Key Findings

1. There is a dual alarm system in place (Countywide SCADA and a plant based HMI system) which has different alarm settings for the same critical equipment, which has the potential to make management of the plant ill defined.
2. It was unclear if there are appropriate UV alarms and plant inhibit set points built into the UV's PLC system to ensure adequate disinfection, as such set points did not appear to be displayed on the system.
3. Uisce Éireann could not confirm it has implemented the recommendations of it's alarm and inhibit review. The audit found some alarm and inhibit set points did not adequately protect treatment process targets and statutory limits.

Introduction

The Avoca Ballinaclash public water supply produces on average 425 m3/day (from site log book) to a population of approximately 1,382 (from EDEN) from a stream tributary of Avonbeg River.

Treatment at Ballinaclash Water Treatment Plant (WTP) consists of pH correction, coagulation, flocculation, dissolved air flotation and filtration (DAFF), UV disinfection and chlorination. Chlorination treatment occurs at the inlet to the Ballinaclash Reservoir which is located a few kilometres from the WTP. Treated water from Ballinaclash Reservoir is also sent to Ballymurtagh Reservoir. Secondary chlorination occurs in a contact tank post that reservoir.

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

Supply Zones Areas Inspected

The Ballinaclash WTP and off-site Ballinaclash Reservoir and associated treatment processes were inspected during the audit. Monitoring and control systems including alarm set-points were reviewed.

1. Management and Control

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

Comment

1. UÉ could not confirm if a source and sanitary survey had been completed for the stream source serving Avoca Ballinaclash PWS.
2. UÉ could not confirm if the protozoal compliance log treatment requirement had been identified for the water treatment plant.
3. UÉ stated monthly raw water monitoring had commenced at the source.

2. Alarms, Inhibits & Oversight Audits 2024

		Answer
2.1	Is there a chlorine residual monitor located after contact time for verification of primary disinfection?	Yes

Comment

1. UV treatment is the primary means of disinfection at Ballinaclash Water Treatment Plant.
2. While secondary disinfection is achieved at the Ballinaclash reservoir by chlorinating the water with sodium hypochlorite, it was explained that chlorination also meets the contact time (Ct) requirements for primary disinfection and therefore provides an additional treatment barrier for the water supply.
3. The minimum free chlorine concentration required at the Ct validation point on the outlet of the Ballinaclash reservoir is 0.6 mg/l to meet the Target Ct of 34.32 mg.min/l. The chlorine monitor CL002 on the outlet of the Ballinaclash reservoir, read 0.78 mg/l day of the audit.

		Answer
2.2	Is suitable continuous monitoring in place to verify treatment performance?	Yes

Comment

1. There is a turbidity monitor located on the outlet of the DAFF unit pre UV treatment but it is not being used to determine the operation of the DAFF unit. For example when to automatically backwash the DAFF unit or return the DAFF unit to service following a backwash. The DAFF unit is backwashed based on time or water level/headloss.
2. It was not known if the DAFF unit contributes to log credits for a protozoal treatment barrier at the plant.

		Answer
2.3	Were online monitors within their calibration dates?	Yes

Comment

1. UÉ stated that the UV units were due to be calibrated in May 2024. However there were no stickers affixed to the UV units detailing when they were last calibrated.

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

Comment

1. Dual Alarm System

- Alarms are displayed on countywide SCADA (available remotely). Another set of alarms are displayed on the local HMI system at the plant. Alarm set points across the dual system do not correlate. For eg, on HMI the outlet UVT has an alarm set point of 75% and a plant inhibit at 85% after a 5 minute time delay and on SCADA the alarm set points are different; at 87% (low alarm) and at 80% (lowlow alarm).

2. UV Alarms and Inhibits

- Primary disinfection is achieved by a duty/standby Trojan Swift D03 UV system. The units are validated to both the DVGM and USEPA (UVDGM) certification criteria. Alarm set points are aligned with USEPA standards.
- The USEPA validation sizing table for the UV unit specifies a flow of 33 m3/hr and a minimum UVT of 70% is required to achieve a UV dose of 40 mJ/cm2. Documentation submitted by UÉ states certain UV faults will inhibit plant flow; such as if the UV dose falls below 40 mJ/cm2 for 2 minutes, the UVI drops below a calculated low alarm set point (this set point was not provided), the UVT falls below the alarm set point of 70% or if multiple lamps fail. The maximum flow and low UVI inhibit set points were not provided to ensure the unit only operates within its validated criteria.
- The dual alarm system displayed alarm and plant inhibit settings (outlined in Point 1) for the outlet UVT only. It was unclear from the UV's PLC controller what, if any, alarm and inhibits were in place to meet the validation criteria outlined in Bulletpoint 2 above, as they were not displayed.
- On the day of the the audit monitors indicated the water was adequately disinfected.

3. Chlorine Alarms and Inhibits

- The site specific target for chlorine residual leaving the Ballinaclash Reservoir (at CL002) is 0.8 mg/l to ensure adequate disinfection and at least 0.1 mg/l is achieved in the network.
- Secondary chlorination provided at Ballymurtagh Reservoir has a target residual chlorine of 0.6 mg/l at the outlet.
- The following chlorine alarms should be revised as they do meet the EPA Water Treatment Manual: Disinfection guidance and protect the site specific targets above: CL001 (post dose) low alarm (0.5 mg/l) and lowlow alarm (0.2 mg/l) and 30 minute time delay; CL002 low alarm (0.35 mg/l) and lowlow alarm (0.3 mg/l); Ballymurtagh Reservoir low alarm (0.35 mg/l).
- There is no automatic shutdown in the event of an issue with the chlorination system to prevent inadequately disinfected water or inadequate chlorine residual entering supply.

4. Turbidity Alarms and Inhibits

- The turbidity monitor after the DAFF unit and pre UV treatment has a high alarm set point of 0.3 NTU which alarms after 300 seconds (5 minutes) on SCADA. The HMI system has a turbidity high alarm set point of 0.35 NTU with no time delay. There is a plant shutdown at 1.1 NTU with a 2 hour time delay on HMI.
- The Ballinaclash Reservoir has a high alarm of 1 NTU with a time delay of 1800 seconds (30 minutes).
- The plant inhibit settings should be amended to meet the regulatory 1 NTU (with a maximum delay of 3 minutes) as detailed in the *EPA Water Treatment Manual: Filtration* and alarm time delays reduced to ensure alarms are responded to without delay.

5. pH Alarms and Inhibits

- Raw water is pH corrected using sodium hydroxide. The pumps are not alarmed if they fail.
- A pH target of 6 is required for optimum coagulation. The pH low alarm (5 pH units) on the DAFF unit could be revised upwards to ensure a drift from the optimum pH is addressed without delay.
- The final water pH monitor at the Ballinaclash water treatment plant is alarmed on SCADA to protect protect statutory limits. The HMI alarms differ however with a high alarm of 9 pH units and a low alarm of 5.7 pH units, the latter does not protect the statutory limit.
- A final water low pH set point inhibits the plant at 6.5 pH units after 1 hour and at 9.5 pH units after 10 minutes. The time delays should be revised downwards to ensure incidents are responded to without delay.

Answer

2.5	Are critical alarms dialled out to operators?	Yes

Comment

1. The alarms on the countywide SCADA dial out to three persons at the same time.
2. The alarms on the HMI dial out to the same three persons as above, but cascade from person to person if there is no acknowledgement of the alarm.

		Answer
2.6	Were all findings of the UÉ alarm and inhibit review implemented?	No

Comment

1. UÉ could not confirm if the findings of the alarm and inhibit review were implemented.
2. The review does not appear to have addressed the alarm and inhibit issues observed by the EPA during the audit.

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

Comment

1. Other than UVT, it was unclear from the UV PLC at the water treatment plant what plant inhibits are programmed for the UV units.
2. The plant inhibit settings for final water turbidity do not meet the regulatory 1 NTU (with a maximum delay of 3 minutes).
3. The time delay on the plant inhibit settings for final water pH are not appropriate.
4. There is no plant inhibit relating to the chlorination system.
5. Additional details on inhibit settings are outlined in Point 2.4 above.

		Answer
2.8	Is there a documented alarm response procedure?	No

Comment

1. There is no documented site specific procedure setting out how alarms are responded to in order to protect water quality and public health.

3. Site Specific Issues

		Answer
3.1	Was supply information submittted to EDEN accurate?	No

Comment

1. The water treatment plant schematic submitted in advance of the audit was not entirely accurate. For example the schematic illustrated the turbidity monitor is positioned after the UV units when it was located after the DAFF unit and prior to UV treatment.
2. The volume documented on EDEN for this supply is incorrect (261 m3/day in EDEN versus 425 m3/day from an average of flow readings taken from the daily log book during April).
3. EDEN documents that the supply serves a population of 1,382 persons. The population served should reviewed to ensure the figure is accurate.

Recommendations

Subject	Avoca Ballinaclash PWS Audit Recommendations	Due Date	12/06/2024

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. Provide:
   i. the protozoal log treatment requirement following completion of a source and sanitary survey and clarify if the DAFF unit contributes towards log credits;
   ii. details on how a protozoal log deficit, if identified, will be addressed;
   iii. for *Cryptosporidium* monitoring 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.
   i. Submit UÉ's Alarms and Inhibits Review and clarify what has been implemented and what remains outstanding with timelines for completion;
   ii. Streamline the alarm and inhibit set points on critical infrastructure across the two control programmes to prevent conflicting setpoints;
   iii. Submit the UV alarm and shutdown criteria (including time delays) for maximum flow and minimum UV dose/UVI. Confirm settings are in place on its PLC to meet the UV units' validation criteria;
   iv. Review alarm and time delay settings to ensure they protect site specific target levels (e.g. for pH, chlorine and UV) for critical treatment processes and statutory limits and allow for adequate time to respond to an incident;
   v. Ensure that the plant shutdown based on final water turbidity is controlled by the regulatory 1 NTU (with a maximum delay of 3 minutes) as detailed in the EPA Water Treatment Manual: Filtration.
3. Examine the feasibility of (i) installing an alarm in the event of pH or chlorine dose pump failure; (ii) operating the DAFF unit (e.g. when to backwash, return to service, etc.) based on the filtered turbidity monitor readings. The latter is required in accordance with the EPA's Water Treatment Manual: Filtration if the DAFF unit contributes to the protozoal log treatment credits for the supply; (iii) installing a plant inhibit on the chlorination system to prevent inadequately disinfected water / chlorine residual entering supply.
4. Affix service/calibration stickers with appropriate service interval dates to critical treatment plant infrastructure (e.g. the UV units).
5. Put a documented procedure in place for responding to and escalating all alarms generated and incidents occurring at the WTP. The procedure should clearly document th e corrective actions and set out delegation of responsibilities for operational and relief staff. Ensure all staff are trained on the procedure.
6. Amend the Uisce Éireann Incident Communications Response Guidance Form with site specific information including relevant trigger levels protecting critical processes at the water treatment plant.
7. Update the water supply's schematic to accurately reflect critical equipment in place.
8. Update EDEN with the correct supply volume and population for Avoca Ballinaclash 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.