Drinking Water Audit Report

County:	Wicklow	**Date of Audit:**	29th August 2016
Plant(s) visited:	Arklow Water Treatment Plant	**Date of issue of Audit Report:**	31st August 2016
		File Reference:	DW2008/431
		Auditors:	Mr Darragh Page Ms Michelle Roche
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014).* • *The EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7)* • The recommendations specified in the EPA *Drinking Water Report*. • EPA Drinking Water Advice Notes No.s 1 to 15. • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. **The water treatment plant operators were found to be using the disinfectant sodium hypochlorite inappropriately at the Arklow Water Treatment Plant. In particular, the current regime for the management of sodium hypochlorite means that it is being used up to five months past its expiry date. This presents a risk of chlorate formation in the final water due to the decay of sodium hypochlorite into chlorate that occurs with excessive storage. Irish Water should cease the practice of disinfecting the Arklow water supply with expired sodium hypochlorite without delay and ensure that such chemicals are used in an appropriate manner.**

ii. **The replacement of the source of the Arklow water supply and the upgrade of the treatment for the new source has ensured that the Arklow water supply is safe and secure with the exception of the disinfection system for the reasons outlined in the main finding above. The removal of the supply from the RAL will only take place once the necessary operational changes to the disinfection system have been implemented.**

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. This audit was carried out to assess the performance of Irish Water in providing clean and wholesome drinking water and to determine whether the Arklow PWS can be removed from the EPA Remedial Action List.

The Arklow PWS was placed on the EPA Remedial Action List as the HSE had concerns about the vulnerability of the source of the supply (the Goldmine River). This source and treatment plant associated with it has been replaced by a groundwater source (with 13 boreholes) and a new water treatment plant has been constructed. The new WTP has the option of bringing in the Goldmine River. Treatment consists of cascade aeration, rapid gravity filtration, pH correction, fluoridation and

disinfection using sodium hypochlorite and UV. There is also a Dissolved Air Flotation plant which has been designed to take water from the Goldmine River should it be required although this is dependent on potential future demand of the supply. Irish Water stated that it does not foresee the demand increasing to require this plant in the short to medium term. The design capacity of the plant is 305 m^3/hr and current throughput is 170 m^3/hr and it supplies water to approximately 15,000 persons.

The opening meeting commenced at 10.00 am at Arklow 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:

Andrew Boylan, Compliance Specialist (Irish Water)
Aoife Lambe, Compliance Analyst (Irish Water)
Liliana Mereacre, Functional Support Officer (Irish Water)
Tom Griffin, Senior Executive Chemist (Wicklow County Council)
Mary Cahill, Senior Executive Engineer (Irish Water)
Michael McLoughlin, Executive Engineer (Wicklow County Council)
Allan Murray, Plant Supervisor (AECOM)
Michael Mahoney, Plant Operator (AECOM)

Representing the Environmental Protection Agency:

Darragh Page – Senior Inspector
Michelle Roche - 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.	**Source Protection** a. The source of the Arklow PWS is 13 boreholes in the Avoca River Basin. Currently, 3 of the boreholes located in Woodenbridge are used to supply water. The Goldmine River is not in use at present as the boreholes are sufficient to supply the required demand as the unaccounted for water in the Arklow supply has been significantly reduced. Irish Water does not forsee using the Goldmine River in the short to medium term and is unlikely to use it unless the demand on the supply increases. b. The boreholes were not examined on the day of the audit due to Health and Safety reasons (IW advised that training was required before entering the sites). However, photographs of the boreholes were provided and reviewed by the audit team. The boreholes are above ground with the electrics on a raised platform (due to the risk of flooding). The wellhead was sealed and concreted and there was a secure cap on the borehole. c. Borehole logs for the Woodenbridge boreholes were provided and examined during the audit. The first 10 metres of the boreholes is sealed off from shallow groundwater ingress with between 3 and 6 metres of steel casing and additional plain PVC casing. The boreholes draw on deeper groundwater from the productive sand and gravels.
2.	**Coagulation, Flocculation and Clarification** a. A Dissolved Air Flotation plant was constructed as part of the upgrade to utilise water from the Goldmine River in the event of the supply from the boreholes being inadequate.

	However due to reductions in the unaccounted for water in the Arklow supply, Irish Water stated that it is unlikely that the Goldmine source (and therefore the DAF plant) will be used in the near future. As this plant was not operational on the day of the audit, it was not examined in detail. b. The turbidity monitors did not have stickers demonstrating when they were last calibrated and when the next calibration was due. The certificates were not available at the time of the audit and Irish Water agreed to forward them on following the audit.
3.	**Filtration** a. The raw water from the boreholes enters a cascade aerator for the removal of manganese. b. Aerated water is distributed among 3 no. rapid gravity filters which are comprised of approx. 1 metre of sand media. The filters are backwashed 4 times per week manually but a backwash will also take place automatically if the headloss exceeds a trigger level. A backwash of filter no.2 was observed and it was noted that the air and water scour was even across the filter and no issues were observed during the backwash. At the time of the audit the filtered water turbidity was 0.038, 0.052 and 0.045 NTU on filters 1, 2 and 3 respectively. The combined filtered water turbidity was 0.059 NTU. The results from the SCADA were observed and noted to be low (<0.1 NTU) the majority of the time. The pH of the filtered water is then corrected from around 6 to 7 using caustic soda.
4.	**Disinfection** a. The filtered water is disinfected using sodium hypochlorite and UV. The bulk storage tank is filled approx. every six months by Chemifloc. AECOM stated that when it is delivered by Chemifloc it has a one month expiry date. This means that for five months expired chemicals are used to chlorinate the water. AECOM stated that this meant that the sodium hypochlorite had a reduced strength but they appeared unaware of the risk of disinfectant byproduct (i.e. chlorate) formation. Irish Water stated that they would investigate this matter immediately and cease this practice. b. The UV is being operated as a treatment barrier to deal with Cryptosporidium and not as a broad range disinfection system. Accordingly, the UV system is validated to 16 mJ/cm2. Two months data from the plant including the UV dose, UV intensity, turbidity, flow and chlorine residual were provided by Irish Water prior to the audit. This data was assessed by the EPA and a spreadsheet sent to Irish Water in advance of the audit highlighting all incidents where the UV dose was <16 mJ/cm2 and where the flow was >0 (i.e. all instances where water was flowing through the UV reactors but was not being disinfected). The instances highlighted appear to be brief readings of short duration. Irish Water or AECOM were unable to definitively state during the audit the cause of this but stated that it was likely that the cause was water flowing through the reactor after the lamps were turned off or switched. AECOM stated that a change to the process control was implemented approx. 2 weeks ago which prevents this from happening in the future. A review of the SCADA indicated that no such incidents appear to have happened in the past two weeks. Irish Water agreed to review the data and provide data to determine whether this action had prevented these incidents from happening. c. The control philosophy for the UV and chlorination systems was submitted to the EPA prior to the audit and indicates that AECOM respond to all critical alarms automatically (e.g. autochangeover of UV units) and that the plant operator is automatically notified.
5.	**Fluoridation** a. Fluoride is added to the final water prior to disinfection in the range of 0.6 to 0.8 mg/l. The fluoride bulk storage tank fill point was located outside the bund and there was evidence of staining on the concrete below. AECOM stated that this was from when the plant was first constructed and a mobile bund is now placed below the fill point when the tank is being filled. b. The fluoride day tank was located in a storage area that was not adequately bunded as it was not acid resistant material and there were holes in the wall at ground level to facilitate ducting.

	c. The fluoride day tank had a capacity of 200L and contained approx. 160 L at the time of the audit. AECOM state that approx. 25 L of fluoride is used per day meaning that in excess of the recommended capacity is stored in the day tank. d. Irish Water stated that the bunding of the fluoride day tank is on the snag list for the plant and would be resolved.
6.	**Monitoring and Sampling Programme for treated water** a. Compliance monitoring results for the Arklow PWS for the years 2015 and 2016 to date were examined and found to be fully compliant (with the exception of one moderate fluoride exceedance). Chlorine levels in the network appear to be adequate. b. Daily monitoring at the plant is carried out for chlorine residual and fluoride. These are recorded and checked against the results on the online monitor, however the result from the monitor is not recorded alongside the results from the manual test to enable comparison.

3. AUDITORS COMMENTS

The Arklow PWS was on the EPAs Remedial Action List due to HSE concerns about the use of the Goldmine River as a source for the supply. This source is no longer used. The upgraded treatment plant now provides adequately treated water, however the EPA has concerns about the disinfection systems. In particular, the use of sodium hypochlorite need to be reviewed urgently to ensure that chemicals past their expiry date are not used in treated water. Irish Water also needs to demonstrate that water that all water treated is subject to UV treatment.

4. RECOMMENDATIONS

Disinfection

1. Irish Water should immediately review the use of sodium hypochlorite in the Arklow PWS and ensure that chemicals are not used once they are past their expiry dates.
2. Irish Water should demonstrate to the satisfaction of the EPA that all water entering supply is subject to UV treatment.

Fluoridation

3. Irish Water should ensure that the fluoride day tank is stored in an acid resistant bund capable of storing at least 110% of the capacity of the contents of the tank.
4. Irish Water should ensure that the fluoride day tank does not contain more than the equivalent of 3 days of the required volume of chemicals required.

Monitoring

5. Irish Water should submit calibration certs for the online monitors.
6. Irish Water should ensure that the results from the online monitors are recorded in the log book alongside results of manual testing for comparative purposes.

Dissolved Air Flotation

7. Irish Water should ensure that an appropriate period of validation of the effectiveness of the DAF plant is completed in the event that the DAF plant is to be brought into service.

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 by Ms Michelle Roche, Inspector.

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 in any future correspondence in relation to this Report.

Report prepared by:  **Date:** 30/08/16

Senior Inspector