

# Site Visit Report

Under the European Union (Drinking Water) Regulations 2014 as amended, 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 water to the visited public supply.

The audit process is a sample on a given date of the facility's operation. Where a finding against a particular issue has been reported this should not be construed to mean that this issue is fully addressed.

## Water Supply Zone

<b>Name of Installation</b>	Abbeyfeale PWS
<b>Organisation</b>	Irish Water
<b>Scheme Code</b>	1900PUB1001
<b>County</b>	Limerick
<b>Site Visit Reference No.</b>	SV25730

## Report Detail

<b>Issue Date</b>	18/08/2022
<b>Prepared By</b>	Orla Harrington

## Site Visit Detail

<b>Date Of Inspection</b>	19/07/2022	<b>Announced</b>	Yes
<b>Time In</b>	10:30	<b>Time Out</b>	13:25
<b>EPA Inspector(s)</b>	Orla Harrington		
<b>Additional Visitors</b>			
<b>Company Personnel</b>	Irish Water: Tommy Roche, Derek O'Toole. Limerick City and County Council (acting under service level agreement to Irish Water): Declan O'Connor, Dom Hayes, Martin O'Sullivan, Anne Peters.		

## > Summary of Key Findings

1. A Boil Water Notice was placed on the Abbeyfeale Public Water Supply from 25/06/2022 to 01/07/2022 due to an increase in turbidity levels in the final treated water following an intense rain event that increased turbidity in the raw water. At the time of the incident, there was no automatic shutdown of the water treatment plant linked to filtered water turbidity alarm setpoints and there was no alarm setpoints on the individual filters. As a result treated water with elevated turbidity entered the Abbeyfeale Reservoir and the distribution network from approximately 23:15pm on 24/06/2022 to 1:25am on 25/06/2022. During this period the effectiveness of the treatment plant's *Cryptosporidium* barrier was compromised. However the incident was appropriately escalated once the turbidity and disinfection issues were identified and public health was protected by the placing of a Boil Water Notice on the supply.
2. The current chemical dosing regime is insufficient to cater for the considerable variation in raw water quality. Irish Water should progress further operational improvements to the coagulation process without delay to ensure that the plant is optimised to respond to changes in raw water quality.
3. Irish Water has indicated that the Abbeyfeale Public Water Supply source has a protozoal log credit requirement of 3.5 log. Currently treatment at the plant provides 3 log credit if operated in accordance with the log credit performance approach giving a 0.5 log treatment deficit. Irish Water need to identify how the protozoal log deficit at the plant will be addressed and provide a timeframe for completion.

## > Introduction

The Abbeyfeale Public Water Supply (PWS) supplies on average 3,600m<sup>3</sup>/day of treated water serving a population of 6,886. The source of the supply is the River Feale. Treatment at the plant includes pH correction using soda ash, coagulation, flocculation, clarification (CFC), rapid gravity filtration (RGF), chlorination and further pH adjustment using soda ash.

The audit was carried out in response to elevated turbidity levels at the plant which resulted in the issuing of a Boil Water Notice (BWN) by Irish Water on 25/06/2022 to all consumers of Abbeyfeale PWS.

## > Supply Zones Areas Inspected

The auditor examined the treatment processes at Abbeyfeale water treatment plant and the raw water abstraction intake point on the River Feale.



## 1. Incident Management

### Answer

1.1	Was the incident suitably alerted to the plant operators, escalated and managed in order to maintain water quality and protect public health?	No
<b>Comment</b>		
1. Irish Water issued a BWN on 25/06/2022 for Abbeyfeale PWS, following operational difficulties at the water treatment plant which resulted in inadequately treated water. Trends submitted prior to the audit indicate the raw water turbidity at the River Feale intake started to rise on the morning of 24/06/2022 following an intense rain event. This resulted in an increase in the final filtered water turbidity levels above 1 NTU from approximately 23:15pm on 24/06/2022, thereby compromising the plant's <i>Cryptosporidium</i> removal barrier. At the time of the incident there were no turbidity alarms or automatic plant shutdown linked to settled water, individual filters or the final filtered water at the plant to alert plant operators to the incident. The plant automatically shutdown at 1:25am on 25/06/2022 in response to the chlorine level dropping below the chlorine low level alarm setpoint of 0.5mg/l at the final water sump.		
2. At the time of the incident the usual operator was on leave. The investigations identified that a text alarm notification was not generated to the relief operator when the chlorine dropped below 0.5mg/l and the shutdown went undetected by the plant operator until arrival at the plant on the morning of 25/06/2022. The incident was immediately escalated and the plant was brought back online at approximately 10:10am 25/06/2022.		
3. Irish Water took the following actions following the incident:		
<ul style="list-style-type: none"><li>• All turbidity alarm and shutdown setpoints enabled and functioning on the settled water, individual filters and final filtered water;</li><li>• An additional turbidity monitor is to be installed on the reservoirs main outlet;</li><li>• Text alert system has been reviewed and all relief operators have been included in the list of recipients;</li><li>• Initiated a run to waste facility;</li><li>• A <i>Cryptosporidium</i> sampling rig was installed on the final water and a <i>Cryptosporidium</i> monitoring programme put in place.</li></ul>		
4. The criteria agreed with the HSE for the lifting of the BWN were the (i) return to normal turbidity levels; (ii) receipt of compliant samples for <i>Cryptosporidium</i> from the plant and network and (iii) receipt of compliant samples for microbiological, chlorine and turbidity at the plant and network.		
5. Resampling results for microbiological parameters in the network between 27/06/2022 and 01/07/2022 were satisfactory. Sampling for <i>Cryptosporidium</i> and <i>Giardia</i> on 28/06/2022 at the plant were clear and on the network on 30/06/2022 were clear. Irish Water advised that treated water turbidity at the plant has remained < 1 NTU since the incident.		
6. The BWN was lifted on 01/07/2022. The audit found that the lack of turbidity alarms or automatic shutdown linked to filters and final water put consumers at risk of receiving inadequately treated water. However, the incident had been appropriately escalated once the turbidity and disinfection issues were identified and public health was protected by the placing of a BWN on the supply.		



## 2. Source Protection

	<b>Answer</b>
<b>2.1</b>	Is the abstraction source(s) adequately protected against contamination?
	<b>Comment</b> <p>1. The source of the supply is the River Feale serving the Abbeyfeale WTP which feed the Abbeyfeale and Kilcomlea reservoirs located within the WTP. The raw water intake from the River Feale was inspected during the audit and described by Limerick City and County Council as an extremely variable water quality source. On the day of the audit, a volume of 162.2m<sup>3</sup>/hr was being abstracted at the intake. The abstraction rate is linked to the raw water balance tank level and cuts off when the water reaches 2.9m and restarts when the level drops to 2.65m.</p> <p>2. The intake is fitted with 1 coarse screen. Limerick City and County Council advised that this screen is not sufficient to remove debris from the river water which on occasion can cause blockage to the raw water balance tank.</p> <p>3. The landuse in the immediate vicinity of the intake is grassland and agricultural. Limerick City and County Council confirmed that turf cutting and forestry activities are located upstream of the abstraction point.</p> <p>4. On the day of the audit the raw water turbidity was 0.721 NTU and pH was 7.26. There is also online monitoring of ammonia, with automatic shutoff of the transfer pumps in the event the ammonia concentration reaches the high alarm level of 0.3mg/l. On the day of the audit the hydrocarbon oil monitor was not operating. Limerick City and County Council advised that plans are in place to address the issue. Raw water monitoring was available prior to the audit from May 2020 to June 2022.</p>



### 3. Coagulation Flocculation and Clarification (CFC) Stage

	<b>Answer</b>
3.1 Is the CFC process optimised to respond to changes in raw water quality?	No
Comment	
<p>1. Limerick City and County Council confirmed that the river source is very variable in terms of raw water quality. The alkalinity of the raw water is low so sodium carbonate (soda ash) is dosed in-line between the balance tank and the contact tank to achieve optimum pH for coagulation. Aluminium Sulphate is then dosed and water flows into a contact tank where poly is added through a small perforated pipe, suspended above the contact tank. Mixers are mounted on top of this tank to provide slow mixing. The alum dosed water has an approximately 30 minute contact time which is considered adequate.</p> <p>2. Chemical dosing at the plant does not adjust automatically in response to changes in raw water quality. The coagulant dose is manually adjusted by the operator based on raw water colour, pH, alkalinity and operator experience. The coagulant and pH correction chemicals are delivered by duty and standby dosing pumps with automatic switchover between the pumps. All pumps are manually changed over every 12 hours. Due to the variability of the raw water, there is daily jar testing carried out at the plant. All dose rates are recorded in the daily log book, which was inspected on the day of the audit.</p> <p>3. A review of the coagulation process is currently being undertaken by Irish Water in order to provide better control of coagulation in response to rapidly changing pH and alkalinity of the raw water. A streaming current monitor is installed at the plant and work has been undertaken to develop an automatic coagulation dosing system. Limerick City and County Council advised that this has proved challenging due to the substantial and rapid variation in quality of the supply source. A chemical coagulant dosing system will only operate successfully if the quality and variations in the raw water have been properly characterised and assessed. An action plan is required from Irish Water detailing the timeframe for completion of these works.</p> <p>4. Daily aluminium monitoring results from 02/07/22 to 02/08/22 were provided and satisfactory.</p>	



## 4. Filtration

4.1

Are the filters designed and managed in accordance with EPA guidance?

**Answer**

Yes

### Comment

1. There are 3 rapid gravity filters at the plant. The filter media in all 3 filters was refurbished in May/June 2021 and the total depth meets the minimum depth of media set out in the EPA Water Treatment Manual: Filtration.

2. At the time of the incident there was no automatic shutdown of the plant linked to turbidity alarm setpoints and there was no alarm setpoints on the individual filters. On the day of the audit, Irish Water advised that turbidity alarms on settled water, individual filters and final filtered water were installed, operational and linked to SCADA by 29/06/2022. Each individual filter has a high shutdown setpoint of 0.3 NTU (for > 15 minutes). There is no automatic backwashing linked to turbidity or in response to turbidity alarms. On the day of the audit the following turbidity levels were observed: Filter 1 0.00 NTU; Filter 2 0.01 NTU and Filter 3 0.00 NTU. There is also a high shutdown setpoint of 0.9 NTU (for > 15 minutes) on the final water. The SCADA graph of final water turbidity levels leaving the plant from 12/07/2022 to 19/07/2022 observed during the audit indicate consistently levels of <0.1 NTU.

3. Filter backwashing is initiated on a head loss of >2.5 m or every 2 days, whichever occurs first. A backwash of filter no 1 was observed and no dead zones were noted. Limerick City and County Council advised that there is a 20 minute lead in time after filter backwashing. Irish Water are in the process of installing a run to waste which is nearing completion. All backwash water is discharged to sewer.

## 5. Disinfection

5.1	Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?	Answer
		No

### Comment

1. Primary disinfection is via chlorination by dosing sodium hypochlorite at the final water sump. Dosing is flow proportional and is not linked to the residual chlorine monitor. There are duty / standby dosing pumps with automatic switchover in the event of a breakdown of the duty pump. Chlorine monitors are in place at the final water sump and at the outlet from the Abbeyfeale reservoir, post disinfection contact time.
2. The low level chlorine shutdown setpoint is 0.5mg/l and high level shutdown is 1.35mg/l at the final water sump (time delay 3 minutes). Limerick City and County Council advised that the target range for residual chlorine leaving this location is between 0.75mg/l to 0.90mg/l. The chlorine level was reading 1.28mg/l on the day of the audit.
3. The auditor viewed the residual chlorine trend for the monitor located on the outlet of the reservoir for the period 12/07/2022 to 19/07/2022 which indicated stable trends, averaging 1mg/l residual chlorine. However it was noted that there is no chlorine alarm setpoints or shutdowns at the outlet of the reservoir to verify chlorine contact time has been achieved. The chlorine monitor post contact time must be alarmed with a dial out to ensure that an immediate response can be made in the event of inadequate levels of chlorine in the final water.
4. As well as feeding the Abbeyfeale reservoir, the final water sump also supplies the Kilcomlea reservoir located 100m south of Abbeyfeale WTP. Kilcomlea reservoir is used to backwash the filters and supply 6 houses within close proximity to the reservoir. In order to ensure adequate disinfection before water reaches the first customers, a chlorine monitor is required to be installed in an appropriate location (post contact time) with alarm setpoints and shutdowns.

5.2	Is there adequate chlorine contact time before the first connection?	Answer
		Yes

### Comment

1. The contact time calculations provided indicated an effective contact time of 30.46mg.min/l for the Abbeyfeale reservoir and 33.09mg.min/l for the Kilcomlea reservoir both of which meet the required site specific target level of 26.40mg.min/l.
2. The contact time calculation, submitted with the pre audit information, indicated a minimum free chlorine concentration of 0.84mg/l is required at the contact time validation point for Abbeyfeale reservoir and 1.06mg/l is required for Kilcomlea reservoir. There are no chlorine alarms and shutdowns in place at the outlet of the reservoirs (post contact time).

5.3	Is there a chlorine residual $\geq 0.1$ mg/l throughout the network?	Answer
		No

### Comment

Inadequate chlorine residuals (<0.1mg/l) were reported at 3 locations in Athea and Mountcollins between 28/06/2022 and 29/06/2022.



## 6. Reservoirs and Distribution Networks

### Answer

6.1	Are reservoirs adequately inspected and maintained?	No
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### Comment

Limerick City and County Council stated at the audit that they were unsure as to when the Abbeyfeale PWS reservoirs were last cleaned or inspected.



## 7. Treatment Process Chemicals

7.1

Are treatment process chemicals appropriately managed and stored?

**Answer**

No

**Comment**

There are chemical dosing tanks situated indoors unbunded at the plant.



## 8. Management and Control

8.1

Are suitable alarm settings in place to alert operators to deteriorating water quality and/or the failure of a critical treatment process?

**Answer**

No

### Comment

There are no high or low pH alarms for the final water after pH correction in the Abbeyfeale Reservoir.



## 9. Site Specific Issues

### Answer

9.1	Is there a log deficit under the protozoal log credit requirement?	Yes
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### Comment

1. The protozoal treatment requirement for this supply has been confirmed as 3.5 log requirement. The current treatment at the plant with post filter shut down of 0.3 NTU fulfils 3.0 log requirement with a 0.5 log deficit.

2. Irish Water advised that the current post filter turbidity results indicate that the filter shut down can be adjusted down to 0.15 NTU to address the 0.5 log deficit.

## Recommendations

Subject	Abbeyfeale Audit Recommendations [19/07/2022]	Due Date	16/09/2022
Action Text	<p><b>Recommendations</b></p> <p><b>Irish Water is responsible for ensuring a safe and secure supply of drinking water. To address these issues, Irish Water should implement the following recommendations without delay.</b></p> <ol style="list-style-type: none"> <li>1. Irish Water should submit an Action Plan with timeframe for the completion of the upgrade works to the coagulation dosing system.</li> <li>2. Irish Water should a) identify measures to address the 0.5 log treatment deficit, b) provide a timeframe for completion of these measures, c) monitor the supply in accordance with the <i>Irish Water Rationale for Determining the Frequency of Cryptosporidium Monitoring in Public Water Supplies</i> until the log deficit is addressed and d) inform the HSE of the current treatment log deficit at the plant.</li> <li>3. Irish Water should provide confirmation of the installation of appropriate chlorine alarm setpoints and automatic shutdown at the outlets from the Abbeyfeale and Kilcomlea reservoirs. The alarm level should reflect the minimum free chlorine concentration required at the Ct validation point as outlined in the contact time calculations.</li> <li>4. Irish Water should a) review the final water turbidity alarm setpoint and shutdown in accordance with the EPA Water Treatment Manual: Filtration and b) install high ad low alarms based on final water pH.</li> <li>5. Irish Water should ensure that residual free chlorine concentrations in the network are at least 0.1mg/l to maintain adequate secondary disinfection.</li> <li>6. Irish Water should a) ensure that the raw water abstraction intake is screened using a screen, followed by a band screen, drum screen or micro-strainer and b) confirm that the raw water hydrocarbon monitor with alarm is operational.</li> <li>7. Irish Water should complete the installation of a run to waste following backwashing.</li> <li>8. Irish Water should review chemical storage arrangements at the treatment plant. Chemicals must be stored in bunded areas capable of containing at least 110% of the volume of chemicals stored therein.</li> <li>9. Irish Water should a) establish links with the Environment Section of Limerick City and County Council to ensure both parties are aware of the issues potentially impacting on the raw water abstraction point, b) ensure all potentially polluting discharges into the catchment of the water source are identified and implement mitigation measures, where appropriate, to reduce potential impact of these discharges.</li> <li>10. Irish Water should provide a schedule for the inspection and cleaning of all reservoirs on the network.</li> </ol> <p><b>Follow-Up Actions required by Irish Water</b></p> <p>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.</p> <p>This report has been reviewed and approved by Regina Campbell, Drinking Water Team Leader.</p> <p>Irish Water should submit a report to the Agency on or before 16/09/2022 detailing how it has dealt with the issues of concern identified during this audit.</p> <p>The report should include details on the action taken and planned to address the various recommendations, including time frame for commencement and completion of any planned work.</p> <p>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.</p> <p>Please quote the Compliance Plan Number DW20220078 in any future correspondence in relation to this Report.</p>		

