

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	
Name of Installation	Achill RWSS
Organisation	Irish Water
Scheme Code	2200PUB1001
County	Mayo
Site Visit Reference No.	SV20520

Report Detail	
Issue Date	16/09/2020
Prepared By	Michelle Roche

Site Visit Detail			
Date Of Inspection	03/09/2020	Announced	No
Time In	10:00	Time Out	12:00
EPA Inspector(s)	Michelle Roche Orla Harrington		
Additional Visitors			

Company Personnel

Irish Water:
Thomas Gibbons **
Pat O'Sullivan*
Ger Grealley*
Toni Bourke*
Margaret Dunleavy*

Mayo County Council:
Ronan McDonald**
Colette Scahill*
Eileen Kavanagh*
Padraig Molloy***

HSE:
Maria Horkan - Environmental Health**
Dr. Emer O'Connell - Public Health**

*Attended pre-site visit meeting only.

**Attended both the pre-site visit meeting and site visit.

***Attended the site visit only.

> Summary of Key Findings

1. A 'Do not Consume' notice was placed on the Achill public water supply from 7th August 2020 to 4th September 2020, due to exceedances of the aluminium parametric value of 200µg/l. The CFC (coagulation, flocculation, clarification) treatment was not operating effectively due to increased raw water temperatures and an unprecedented level of high water demand.
2. Irish Water's remedial actions included installing additional monitoring equipment at the plant and installing a new plant shut-down facility, to prevent inadequately treated water being supplied to consumers. Irish Water also cleaned all 18 reservoirs to remove any build-up of residual aluminium sediment, before the 'Do not Consume' notice was lifted. These measures will prevent a reoccurrence of the technical issues which led to the aluminium exceedances, under normal circumstances, and protect the public health of the consumers on the Achill public water supply.
3. The audit found that the incident was suitably escalated and managed by Mayo County Council and Irish Water, in order to protect public health whilst maintaining essential water supply for hand-washing and sanitation purposes, in light of enhanced Coronavirus hygiene requirements.
4. There remains a concern about the resilience of the Achill water treatment plant against increases in seasonal water demand, as occurred in August this year. Irish Water and Mayo County Council are currently assessing all options for improving the resilience of the Achill water supply against seasonal increases in water demand.

> Introduction

The Achill public water supply serves a population of 2,373 people on the island of Achill and Achill Sound, Polranny and Corraun on the Achill mainland. The public supply also provides treated water to approximately 440 people served by 10 public group water schemes on the island. The raw water abstraction is from Accroymore Lake and the water treatment comprises of;

- Aeration to remove naturally occurring iron from the raw water,
- pH correction with soda ash before coagulation with aluminium sulphate,
- Clarification across two clarifiers,
- Filtration across four rapid gravity filters,
- Disinfection with sodium hypochlorite, and
- Fluoridation.

There are 18 reservoirs on the distribution network and two disinfection booster stations.

The scope of the audit was to assess the full public water supply from source to tap, however there was an emphasis on assessing Irish Water's remedial response to the recent 'Do not Consume' notice that was placed on the supply from 7th August 2020 to 4th September 2020, due to aluminium exceedances.

The audit consisted of a pre-site visit video conference meeting with all relevant parties on 02/09/20, and a site visit with essential Irish Water and Mayo County Council staff on 03/09/20. The HSE were also in attendance at the both parts of the audit.

> Supply Zones Areas Inspected

The audit included a review of water quality results and online monitoring data submitted by Irish Water and a walk through of the Achill water treatment plant from the first stage of aeration treatment to the final stage of disinfection treatment. The clearwater tank at the water treatment plant was inspected but none of the network reservoirs were inspected. The Accroymore Lake source was not inspected during this audit.



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?	Yes
Comment	
<p>Achill public water supply was placed on a 'Do not Consume' notice from Friday 7th August 2020 to Friday 4th September 2020. The CFC (coagulation, flocculation, clarification) treatment was not operating effectively due to increased raw water temperatures and an unprecedented level of high water demand. Mayo County Council acted quickly to escalate the incident to Irish Water soon after the incident began on 7th August. Irish Water in turn acted decisively and consulted with the HSE to issue the 'Do not Consume' notice on the evening of 7th August, to protect public health.</p> <p>Irish Water and Mayo County Council worked tirelessly throughout the incident to ensure water was available for sanitation, vulnerable customers received deliveries of bottled water and solutions were prioritised to lift the 'Do not Consume' notice and prevent reoccurrence. Further details of the incident are outlined below and in Section 2.</p> <p>On the afternoon of Friday 7th August the caretaker noticed that the sludge blanket in the clarifiers was starting to rise. The Mayo County Council technician was on site at the time and carried out a series of final water aluminium tests. The results of the tests remained below the drinking water quality limit of 200µg/l at that time, however there was an obvious trend of rising aluminium values. The technician contacted the Mayo County Council Operations Engineer who in turn contacted the Irish Water Operations Lead. At approximately the same time, 3:30pm, final water turbidity rose above 0.3 NTU meaning that there was a risk that final water was not adequately treated for <i>Cryptosporidium</i> and other parasites. An aluminium sample taken on the evening of 7th August gave a result of 1010µg/l.</p> <p>Irish Water contacted the HSE to advise them that the <i>Cryptosporidium</i> barrier had been compromised and that final water aluminium results were above the 200µg/l drinking water limit. Irish Water, the HSE, Mayo County Council and the EPA held a conference call at 7:00pm on Friday 7th August and a decision was made by Irish Water and the HSE to issue a 'Do not Consume' notice to the Achill public water supply that night. Mayo County Council issued a similar notice to 10 private group water schemes that receive their water from the public water supply.</p> <p>The cause of the rising sludge blanket in the clarifiers was the increase in raw water temperature from a level of 17.5 to 18.5 degrees Celsius over a very short period of time. Raw water temperature changes have been managed in the past by reducing the flow through the treatment plant to allow the sludge blanket to settle more effectively. Due to unusually high water demand on the island (linked to an increase in staycation tourists because of Coronavirus foreign travel restrictions) the caretakers were not in a position to reduce water flow through the treatment plant during this incident. The current threat of Coronavirus in Ireland meant that water availability for hand-washing and sanitation was prioritised ahead of drinking water quality in this instance, and a 'Do not Consume' notice was deemed necessary to protect public health.</p> <p>The treatment plant was not able to recover from the increased aluminium levels in the final water until water demand on the supply decreased. From Tuesday 18th August the final water at the treatment plant returned to compliance. Irish Water then completed the commissioning of additional monitoring equipment at the plant and a new plant shut-down facility, to prevent inadequately treated water being supplied to consumers. Irish Water also cleaned all 18 reservoirs to remove any build-up of residual aluminium sediment before the 'Do not Consume' notice was lifted on Friday 4th September 2020.</p>	



2. Source Protection

2.1

	Answer
Is the abstraction source(s) adequately protected against contamination?	Yes
Comment The abstraction point for the supply is housed within a dammed area of Acorrymore Lake. Online raw water measurements are taken for temperature, pH, UVT and turbidity. The abstraction point is fitted with a coarse and fine filter screen. The raw water intake pipeline to the treatment plant has had a number of bursts over the past few months. A new raw water pipeline was being layed in the week following the audit. This should provide a more secure raw water feed into the treatment plant and also allow for increased raw water delivery volumes to the plant if required. The raw water contains naturally occurring iron and passes through an aeration tank for iron removal before CFC treatment occurs.	



3. Coagulation Clarification Flocculation (CFC) Stage

3.1

Are the CFC processes appropriately controlled?

Answer

Yes

Comment

Raw water pH is adjusted with soda ash from approximately 5.5 in the raw water to 6.5 - 6.8 before coagulation. The pH dose is automatic with duty/standby dosing pumps in place and automatic switchover between the pumps.

Aluminium sulphate coagulant is then dosed flow proportionately at the outlet of the aeration chamber with duty/standby dosing pumps in place and automatic switchover between the pumps. The coagulant dose rate is manually adjusted based on raw water conditions, but these conditions are largely stable. A static mixer is in place after the dosing point. The flow meter for controlling the flow proportionate coagulant dose is located downstream of the dosing point. Irish Water are investigating the possibility of moving the flow meter upgradient of the dosing point to maximise operational control of the coagulant dose.

The coagulated water enters a flocculation chamber after the static mixer and polyacrylamide coagulant aid is dosed into the flocculation chamber.

Water flow is then divided across two indoor clarifiers. Clarifier 1 is a hopper bottomed clarifier and receives two-thirds of the flow and clarifier 2 is a flat bottomed clarifier with lamellae plates, receiving one-third of the flow. The lamellae plates in clarifier 2 are to be replaced with tube settlers to improve the efficiency and capacity of the clarification process. The replacement is expected to be complete in the coming weeks.

Irish Water's response to the elevated aluminium incident included installing turbidity monitors at the outlet of both clarifiers, and linking the monitors to the SCADA (online telemetry) system. The monitors are currently alarmed at 0.7 NTU and will shut-down the raw water feed into the treatment plant at 1 NTU. The alarms serve as an early warning to the plant caretakers that there may be an issue with the stability of the sludge blanket in the clarifiers, and the shut-down ensures that inadequately treated water is not delivered to consumers.

Clarifier turbidities were inspected during the audit and were 0.199 NTU from clarifier 1 and 0.340 NTU from clarifier 2.

Clarifiers are cleaned four times a year with a full drain down and deep clean once a year, generally in late Spring. Sludge bleeds in clarifier 1 are every 30 minutes for one minute and in clarifier 2 are every 30 minutes for 30 seconds.



4. Filtration

	Answer
4.1 Are the filters designed and managed in accordance with EPA guidance?	No
Comment	
<p>There are four rapid gravity filters at the water treatment plant. Flow from clarifier 1 is filtered across filters 3 and 4, and flow from clarifier 2 is filtered across filters 1 and 2. All filters were integrity assessed in 2016 and are due for a next assessment this year (2020).</p> <p>Filter media is sand and gravel and media depths are between 1100mm and 1300mm.</p> <p>Filter backwash is initiated based on time. Filters 3 and 4 are backwashed every day and filters 1 and 2 are backwashed every second day. Filters are run to waste for approximately 3 to 5 minutes before being brought back in to service following a backwash. Mayo County Council stated there are times in the summer when water demand restricts how long filters can run to waste before being brought back online. The controls are in place to allow filters be brought back into service based on turbidity but this option is not currently being used.</p> <p>Final water turbidities from July and August were assessed during the audit and, excluding the elevated aluminium incident, all final water turbidities were below the recommended set-point of 0.3 NTU to verify an effective <i>Cryptosporidium</i> barrier.</p>	



5. Disinfection

		Answer
5.1	Is the chlorine dosed appropriately?	Yes
Comment		
<p>Sodium hypochlorite is dosed flow proportionately with duty/standby dosing pumps and automatic switchover between the pumps. The dose is also automatically adjusted based on a chlorine residual reading from the outlet of the clearwater tank. A chlorine residual of approximately 1.4 mg/l is targeted at the outlet of the clearwater tank. A chlorine residual of 1.1 mg/l was observed at the time of the audit.</p> <p>There are two chlorine booster stations in the distribution network located at Bunacurry and Pollany. The Pollany booster station is not usually operational and was not operational at the time of the audit, as chlorine residuals in the network were sufficient without boosting. There is a chlorine residual monitor at the outlet of the Bunacurry booster station, however the monitor is not alarmed for low or high chlorine residual readings.</p>		

		Answer
5.2	Does the trend in chlorine residual at the treatment plant indicate adequate and stable levels of disinfection?	No
Comment		
<p>There is a low chlorine alarm set-point of 0.6 mg/l on the chlorine residual monitor at the outlet of the clearwater tank and a chlorine contact time of 18 mg.min/l based on contact time in the clearwater tank. Final water chlorine residual trends from July and August were assessed during the audit and excluding the elevated aluminium incident, a number of low chlorine records, below 0.6 mg/l, were noted.</p> <p>Mayo County Council provided two explanations for the low chlorine records:</p> <ol style="list-style-type: none"> 1. There is no stopcock on the clearwater tank, therefore when the clearwater tank is full the water backs up into the overflow tank inside the water treatment plant. This tank is where the automatic flow meter, measuring flow leaving the plant is located, and where the flow is measured to control the flow proportional chlorine dose. When the water level rises too close to the level sensor on the automatic flow meter, the meter reads zero, and no chlorine is dosed for that period. Mayo County Council and Irish Water have stated that an immediate fix will be installed (stopcock on clearwater tank) and the shut-down of the chlorine dosing system will no longer occur. 2. In periods of high water demand on the supply network, the clearwater tank may empty below the level of the final water chlorine residual sampling point. The chlorine residual monitor is therefore unable to collect a water sample and the monitor reads zero. At this time chlorine is still being dosed correctly at the water treatment plant, however there is a concern that contact time in the clearwater tank is below the minimum requirement of 15mg.min/l. <p>Irish Water were requested on the audit to calculate chlorine contact time to the first consumers with consideration of water flowing through an empty clearwater tank, rather than receiving chlorine contact in a full clearwater tank. Irish Water submitted these calculations to the EPA after the audit. The calculations were applied to 10 properties in Corrymore Village and a further two properties served before the next reservoir after the clearwater tank. All properties are receiving adequate chlorine contact time with consideration of water flowing through an empty clearwater tank.</p> <p>Prior to the audit Irish Water's chlorine contact time calculation was based solely on the volume of a full clearwater tank. Irish Water have now added the volume of the distribution pipe to the properties in question to their calculation. The length and diameter of that pipe is sufficient to provide adequate contact time above the minimum requirement of 15mg.min/l.</p>		

5.3

Is there a suitable monitoring frequency for residual chlorine in the network with records available?

Answer

No

Comment

Chlorine residuals are measured in the distribution network approximately once or twice a month. The EPA recommend a frequency of every 2-3 days as best practice to ensure any water quality issues in the network can be picked up in a timely manner.

All distribution network chlorine residual measurements examined during the audit were above the minimum requirement of 0.1mg/l.



6. Site Specific Issues

	Answer
6.1 Does the supply have adequate resilience against increases in water demand?	No
Comment	
<p>The operational capacity of the water treatment plant at the time of the audit was 90m³/hour. The actions proposed by Irish Water and Mayo County Council in the short-term, i.e. laying a new raw water pipeline and replacing the lamellae plates in clarifier 2 with tube settlers, would increase plant capacity to approximately 120m³/hour. Despite these upgrades, the EPA remains concerned over whether the plant could respond to high water demands in the Summer months, particularly if the Island sees a large influx of tourists as it did in August this year.</p> <p>Irish Water and Mayo County Council are currently assessing all options for improving the resilience of the Achill water supply against seasonal increases in water demand. A initial workshop was scheduled for Monday 7th September between Irish Water and Mayo County Council, and the EPA will request regular updates on progress and outcomes of the workshops.</p>	

Recommendations

Subject	Achill Audit Recommendations	Due Date	17/10/2020
Action Text	<p>Recommendation(s)</p> <ol style="list-style-type: none"> 1. Irish Water should take action to improve the resilience of the Achill public water supply, by ensuring the water treatment plant has sufficient capacity to meet seasonal increases in water demand. 2. Irish Water should relocate the flow meter control for the flow proportional coagulant dose to a location upgradient of the coagulant dosing point. 3. Irish Water should examine the filter backwash process to ensure that filters are brought back into service after an adequate run to waste period. Irish Water should examine and implement the most appropriate method of controlling the run to waste duration, whether that be based on filter turbidity or time. 4. Irish Water should install a stopcock on the clearwater tank to prevent treated water backflowing into the overflow chamber within the water treatment plant, where the automatic flow meter is located. The automatic flow meter controls the flow proportional dose for disinfection and raised water level interference with the meter is currently causing the disinfection treatment to shut-down. 5. Irish Water should establish an appropriate low and high level alarm set-point on the chlorine residual monitors at the Bunacurry and Pollany booster stations. The alarms should be linked to SCADA and call out to plant alarm response cascade system in the event of activation. 6. Irish Water should review the network chlorine residual monitoring programme to ensure that the frequency and sample locations are sufficient to verify that at least 0.1mg/l free residual chlorine is present at the extremities of the distribution network, for adequate disinfection of the water supply. Irish Water should aim to monitor network chlorine residuals every 2-3 days. <p>Follow-Up Actions required by Irish Water</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 Aoife Loughnane, Drinking Water Team Leader.</p> <p>Irish Water should submit a report to the Agency on or before 17th October 2020 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 Action Reference Number DW2020072 in any future correspondence in relation to this Report.</p>		

