

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	Galway City PWS
Organisation	Irish Water
Scheme Code	1100PUB1001
County	Galway
Site Visit Reference No.	SV22632

Report Detail	
Issue Date	18/08/2021
Prepared By	Ruth Barrington

Site Visit Detail			
Date Of Inspection	26/07/2021	Announced	Yes
Time In	11:00	Time Out	16:10
EPA Inspector(s)	Ruth Barrington Noel Byrne		
Additional Visitors			
Company Personnel	Irish Water: Thomas Gibbons Galway City Council: Frank Clancy, Mark Convey		

> Summary of Key Findings

1. At the time of the audit, there was no automatic chlorine pump switchover to protect against a failure of the duty chlorine pump at the Terryland water treatment plant. This switchover is one of the minimum chlorine disinfection criteria set out by the EPA and should be provided by Irish Water without delay.
2. The filtration monitoring and controls do not meet the standards set out in the EPA "*Water Treatment Manual-Filtration*" (2020). In particular, there are no alarms or inhibits on individual or combined filtered water, no turbidity backwash triggers and no run to waste after filter backwash, to verify and protect the barrier to *Cryptosporidium* provided by filtration. Irish Water should implement a programme to address these risks to the filtration barrier.
3. A number of signal drop outs were identified in a sample of SCADA turbidity trends from June 2021 assessed during the audit. These were linked to the return to service of the plant following planned maintenance. Irish Water should implement alarm facilities or a check system to ensure SCADA is registering the expected signals during plant start up operations.

> Introduction

The Galway City public water supply is served by the Terryland water treatment plant, providing water to a population of over 80,000 people. Water is abstracted from Lough Corrib via the Terryland River and treated at the plant with processes including coagulation, flocculation and clarification (CFC), filtration in rapid gravity filters, and disinfection by chlorine and ultraviolet (UV) systems. The water treatment plant operates within its design capacity. This audit was carried out as part of the EPA's routine assessment of the operation of large scale public water supplies throughout the country and was not linked to any failure at Terryland water treatment plant in the production of drinking water.

> Supply Zones Areas Inspected

The raw water abstraction and treatment plant processes were inspected as part of the audit.



1. Source Protection

	Answer	
1.1	Is the abstraction source(s) adequately protected against contamination?	Yes
Comment		
<p>1. The raw water intake is located on a small canal adjacent to Terryland River. Planning permission has been granted to move this to a location on the main river channel, which will assist in preventing raw water pH variability which is currently experienced on a daily and seasonal basis. Irish Water stated that funding has not yet been made available to progress this project.</p>		



2. Coagulation Clarification Flocculation (CFC) Stage

		Answer
2.1	Is the CFC process optimised to respond to changes in raw water quality?	No
Comment		
<p>1. Irish Water has identified via the Drinking Water Safety Plan that further optimisation of the treatment processes is warranted to deal with pH fluctuations in raw water. A programme is in place to reinstate an acid dosing pH adjustment step which was provided originally as part of plant upgrade works in 2009, but which was not operated due to health and safety concerns. The dosing system and associated chemical storage and handling facilities will be rebuilt to address these concerns. Irish Water stated that a completion date for the works was not available at the time of the audit.</p>		



3. Filtration

3.1

	Answer
Are the filters designed and managed in accordance with EPA guidance?	No
Comment <p>1. There are six rapid gravity filters in place at Terryland water treatment plant. The media used is a dual sand and anthracite media with a suitable total depth of 1000 mm.</p> <p>2. Backwashing of the filters is carried out on the basis of time or headloss. In practice, time is used as the backwash trigger with a frequency of backwashing each filter every 48 hours. There is a half hour filter ripening period after the backwash, before it is brought back into service. Turbidity is not used as a trigger for initiating backwash. Neither slow start or run to waste is currently possible for the filters following backwash. These aspects of the filtration process should be reviewed having regard to the EPA <i>Water Treatment Manual: Filtration</i> (2020).</p> <p>3. Turbidity is monitored on the outlet of each filter, and on the combined filtered water. During the audit, the individual filters were displaying turbidity between 0.06 and 0.09 NTU. Combined filtered water was 0.109 NTU.</p> <p>4. Filtered water turbidity is not currently used to inform site processes (e.g. as a backwash trigger) or as a tool to verify the performance of the filtration barrier. Alarms and inhibits are not set up to alert operators to a deterioration in filter performance. This issue has been recognised under the Drinking Water Safety Plan risk assessments for the water treatment plant and provision of appropriate alarms and inhibits is underway. A completion date for the work could not be provided by Irish Water or Galway City Council on the day of the audit.</p> <p>5. SCADA trends for filtered water turbidity during June were provided to the EPA as part of the pre-audit information and were also checked on site. The trends showed acceptable turbidities less than 0.3 NTU on each filter outlet, however there were issues with the trends on Filters 1, 2, 5 and 6 during the period 22/06/2021 to 25/06/2021. On investigation during the audit, the plant had been shutdown for planned maintenance on 22/06/2021, and when it restarted, the signal from Filters 1, 2, 5 and 6 failed to connect to SCADA. There is currently no formal check system or failsafe in SCADA to recognise a missing signal. The signal link to SCADA was restored manually for Filters 1, 2, 5 and 6 on 25/06/2021.</p>	



4. Disinfection

		Answer
4.1	Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?	Yes
Comment		
<p>1. The Terryland water treatment plant includes both UV treatment and chlorination as disinfection processes. The UV system was installed as a barrier to <i>Cryptosporidium</i> and at the time of the audit it was achieving doses in excess of that required to inactivate <i>Cryptosporidium</i>. The chlorine disinfection, achieved via sodium hypochlorite, is designed as the primary disinfectant for the supply.</p> <p>2. A chlorine contact time calculation was provided as part of the pre-audit information. The calculation was prepared in 2017 during which time the disinfection system used was On Site Electrochlorination (OSEC). In 2019 the process was changed to use bulk storage sodium hypochlorite. It was not clear whether the contact time was revised for this change in use, or whether the existing calculation was assessed as still being relevant.</p> <p>3. The low level chlorine residual alarm setting at the time of the audit was 1.00 mg/l. According to the 2017 chlorine contact time calculation, a minimum chlorine residual of 1.1 mg/l is required for adequate disinfection after the site retention time is complete. The alarm settings should be revised having regard to the requirements of the contact time calculations, to ensure that the disinfection process is protected.</p>		

		Answer
4.2	Are monitors and alarms operational via dial out and being responded to with a suitable cascade system in place?	Yes
Comment		
<p>1. Alarm settings for the chlorine disinfection system were set on the basis of a low chlorine residual of 1.0 mg/l triggering an alarm, once this trigger level is sustained for 30 minutes. There is then a further 60 minutes for alarm response (the operator switches to standby chlorine dose pump, and the on-call maintenance team fixes the issue). If the chlorine residual can not be restored after 60 minutes, the plant shuts down.</p> <p>2. These alarm delay times were considered by the auditors to be too long and should be reviewed in conjunction with the other works on chlorine disinfection processes and on the alarm and inhibits settings review (refer to section 3.1, 3.3 and 4.1 of this audit report) planned at the site.</p>		

		Answer
4.3	Is the chlorine dosed appropriately?	No
Comment		

1. Sodium hypochlorite duty and standby dosing pumps are in place, but the two pumps share a single dosing line and there is no automatic switchover between pumps in the event of the failure of the duty pump. The chlorine dosing facilities have been identified for an upgrade due to these deficiencies. A date for completion of the work was not available from Irish Water or Galway City Council at the time of the audit.
2. Automatic switchover between duty and standby chlorine dosing pumps is one of the EPA's minimum criteria for disinfection, as it provides a prompt timed intervention to continue adequate disinfection in the event that one of the chlorine dosing pumps fails. These criteria were set out to Irish Water in 2016.
3. Duty and standby pumps should be served by separate dosing lines in case a pump failure is due to a dosing line blockage.



5. Management and Control

		Answer
5.1	Is the plant suitably managed and controlled to maintain the designed log credit on each treatment stage?	No
Comment		
<p>1. The filtration stage of treatment requires further upgrades to demonstrate its ongoing performance against filter operational criteria. In particular, the filter outlet monitoring is not supported by alarm and inhibits to verify and protect the filtration barrier at all times. The Drinking Water Safety Plan risk assessments carried out by Irish Water and Galway City Council have identified turbidity alarm issues as a very high risk as referred to in Section 3.1 of this report.</p> <p>2. The filter ripening period of 30 minutes post backwash is currently the only measure available to control turbidity spikes post-backwash. While the filters appeared to be achieving good levels of turbidity removal at the time of the audit, the lack of a run to waste following backwash indicates that turbidity set points may not be achieved during e.g. raw water deterioration or coagulant dosing issues.</p>		

		Answer
5.2	Are suitable plant shutdowns/inhibits in place to prevent the entry of inadequately treated water entering the distribution network?	No
Comment		
<p>1. As in Section 5.1 above, alarms and inhibits on individual and combined filtered water were not in place at the time of the audit.</p> <p>2. Section 3 of this report refers to issues with the alarms protecting chlorine disinfection contact time and the hold-over times of 30 minutes and 60 minutes for certain alarms.</p> <p>3. In addition, a review of the alarm settings during the audit showed a discrepancy in holdover times for alarms on pH at various stages during the process, listed in time increments of seconds, and variously set out as 100, 120, 160 and 220 seconds. The rationale for the different timescales was unknown.</p>		

Recommendations

Subject	Galway City Audit Recommendations	Due Date	20/09/2021
Action Text	<p>Recommendations</p> <ol style="list-style-type: none">1. Irish Water should ensure that the filtration barrier is protected appropriately in accordance with the EPA <i>Water Treatment Manual: Filtration</i> and should establish a programme with time frames for the following. (i) The provision of suitable turbidity alarms and inhibits on each filter outlet and on the combined filtered water, which should be completed without delay. (ii) The feasibility of providing run to waste on the filters and the use of turbidity as a backwash trigger should be assessed.2. Irish Water should provide for automatic switchover between duty and standby chlorine dosing pumps and install separate chlorine dosing lines without delay, to reduce the risk of inadequately disinfected water entering the network in the event of a pump failure.3. Irish Water should review and implement any necessary changes to chlorine contact time calculations and to turbidity, chlorine residual and pH alarm settings and holdover times, to provide the most useful information to operators and to protect treatment barriers.4. Irish Water should ensure systems are in place for bringing the Terryland water treatment plant back into service after shutdown, to ensure that signals from all designated equipment are received (and trended where relevant) in SCADA, and that all alarms and inhibit settings are ready for service.5. Irish Water should continue to progress the planned works outlined during the audit on the relocation of the raw water intake to the main river channel and the installation of pH adjustment, to regulate raw water pH. <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 Michelle Minihan, Drinking Water Senior Manager.</p> <p>Irish Water should submit a report to the Agency on or before 20/09/2021 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>		