

# 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>	DCC Zone 2
<b>Organisation</b>	Irish Water
<b>Scheme Code</b>	0700PUB1002
<b>County</b>	Dublin
<b>Site Visit Reference No.</b>	SV22835

Report Detail	
<b>Issue Date</b>	05/11/2021
<b>Prepared By</b>	Aoife Loughnane

Site Visit Detail			
<b>Date Of Inspection</b>	08/10/2021	<b>Announced</b>	Yes
<b>Time In</b>	10:00	<b>Time Out</b>	12:40
<b>EPA Inspector(s)</b>	Aoife Loughnane		
<b>Additional Visitors</b>			
<b>Company Personnel</b>	Irish Water: Andrew Boylan, Joe O'Reilly, Dara Chadwick.  Dublin City Council (operating under service level agreement to Irish Water): Larry Callaghan, Ross Pegley, Martin Hession.		

## > Summary of Key Findings

1. The audit found that Ballyboden water treatment was performing very well in producing safe drinking water, as evidenced by the low filtered water turbidity levels and stable chlorine residuals in final water at the plant. The plant is well managed by Dublin City Council, operating under service level agreement to Irish Water. There are suitable alarms in place to alert operators to deteriorating water quality or the failure of a critical treatment process.
2. Ballyboden water treatment plant is an old plant and is very reliant on manual control and intervention in the management of water treatment processes. There are no automatic shutdowns in place at the plant. Irish Water should endeavour to upgrade to automatic control of critical water treatment processes, to ensure the ongoing safety and security of the water supply.

## > Introduction

Ballyboden water treatment plant treats raw water from Bohernabreena Reservoir. The plant was built in the 1960s. Treatment consists of raw water pH correction, coagulation, flocculation, clarification, rapid gravity filtration, final water pH adjustment, disinfection by chlorination, and fluoridation. The plant is currently operating at a reduced production rate of 9 ML/d and has a maximum capacity of 15 ML/d.

No water supply zone is served solely by Ballyboden water treatment plant (WTP) because the treated water is blended with water from Ballymore Eustace WTP in the 16 ML covered reservoir on-site. The blended water supplies the following water supply zones: DCC Zone 2, DLR Zone 2 and South Dublin Zone 1, which have a combined population of approximately 89,000 people.

This audit was carried out to verify if the water supply from Ballyboden water treatment plant is safe and secure.

## > Supply Zones Areas Inspected

This audit comprised of a site visit to Ballyboden water treatment plant, which involved an inspection of the water treatment processes, equipment and water quality data.



## 1. Coagulation Clarification Flocculation (CFC) Stage

	Answer
1.1	Is the CFC process optimised to respond to changes in raw water quality? <b>No</b>
<b>Comment</b>	
<p>1. If the raw water pH drops below 6.25, sodium carbonate (soda ash) is dosed to adjust the pH to between 6.25 to 6.7 pH for optimum coagulation.</p> <p>2. The coagulation process is manually controlled, and the alum and poly dosing rates do not adjust automatically in response to changes in raw water quality.</p> <p>3. Jar testing to determine the optimum CFC criteria at Ballyboden WTP is carried out by Dublin City Council staff at the laboratory facilities at Ballymore Eustace WTP.</p> <p>4. During the audit, a visual assessment of Clarifier No. 1 found rising floc above the sludge blanket, however there was no evidence of pin floc carryover into the clarifier channels. Dublin City Council stated that Clarifier No. 1 is due to be cleaned and this will address the issue of rising floc.</p> <p>5. Clarifier No. 2 was not in operation on the day of the audit due to the current reduced production rate at the plant.</p> <p>6. During the audit, the settled water turbidity was reading 0.193 NTU.</p>	



2.1

	Answer
Are the filters designed and managed in accordance with EPA guidance?	No
<b>Comment</b>	
<p>1. There are 5 rapid gravity filters at the plant.</p> <p>2. Filter No. 1 was refurbished in 2020 however Dublin City Council reported that the backwash is not operating satisfactorily, as there are dead zones in the filter media during a backwash. Irish Water and Dublin City Council plan to replace the filter media in Q4 2021, and to run the filter for a 3 month trial period to determine if this has resolved the issue.</p> <p>3. Filter No. 2 is planned to be refurbished next, after the trial period of Filter No. 1 has been completed successfully. There are no plans to refurbish Filters No. 3, 4 or 5 because Dublin City Council confirmed they have been refurbished in recent years.</p> <p>4. The filters are backwashed based on time (every 48 hours) or head loss. The backwash sequence is manually controlled. There is no run to waste facility after backwashing of filters. The filters are brought back into service after a 30 minute slow start.</p> <p>5. There is an outlet turbidity alarm of 0.3 NTU on each filter, which activates after 3 minutes.</p> <p>6. The previous EPA audit reported cracks in the sand filter media. At the audit, Filter No. 3 was drained down and some cracks were visible in the sand. Dublin City Council has investigated this issue and is satisfied that the cracks are on the surface only, and don't penetrate the full depth of sand (800 mm). They rake the media every week to prevent the small cracks.</p> <p>7. The previous EPA audit recommended that a sand depth level indicator should be installed in the filters. Dublin City Council confirmed that they use the siphon level in the filters to assess the sand depth, and they have not observed any significant sand loss in any of the filters.</p> <p>8. During the audit, the filtered water turbidity readings were:</p> <ul style="list-style-type: none"><li>• Filter No. 1: out of service</li><li>• Filter No. 2: 0.029 NTU</li><li>• Filter No. 3: 0.030 NTU</li><li>• Filter No. 4: 0.029 NTU</li><li>• Filter No. 5: 0.032 NTU</li><li>• Combined filtered water turbidity: 0.035 NTU.</li></ul>	



### 3. Disinfection

		Answer
3.1	Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?	Yes
<b>Comment</b>		
<p>1. The water supply is disinfected using sodium hypochlorite (10% concentration).</p> <p>2. There are two separate disinfection systems on site:</p> <ul style="list-style-type: none"> <li>• Ballyboden water – primary disinfection system;</li> <li>• Ballymore Eustace water (via Saggart Reservoir) - secondary disinfection system prior to water entering the covered reservoir at Ballyboden WTP.</li> </ul> <p>3. Both disinfection systems have duty and standby dosing pumps with automatic switchover.</p> <p>4. The chlorine dose is flow proportional with feedback trim. The chlorine target is 0.83 mg/l in final water. During the audit, the final water chlorine levels were 0.86 mg/l and 0.84 mg/l (double monitors for validation purposes).</p> <p>5. There are 8 chlorine monitors at the plant; Ballyboden post dosing monitor, Saggart pre- and post dosing monitors, contact tank monitors A and B, outlet chlorine monitors A and B, and a monitor on the overflow line to the Owendoher river. The alarm setpoints on all monitors were examined during the audit and were deemed satisfactory.</p>		

		Answer
3.2	Does the trend in chlorine residual at the treatment plant indicate adequate and stable levels of disinfection?	Yes
<b>Comment</b>		
<p>The auditors review of the final water chlorine levels (post reservoir) from SCADA data found stable levels of residual chlorine very close to the target of 0.83 mg/l, as trended on the outlet chlorine monitors A and B (double validation).</p>		

		Answer
3.3	Is there adequate chlorine contact time before the first connection?	Yes
<b>Comment</b>		
<p>1. Irish Water and Dublin City Council provided chlorine contact time (Ct) calculations in advance of the audit. Contact time is achieved in a contact tank prior to water entering the covered reservoir.</p> <p>2. At a maximum design flow of 750 m3/hr, the calculated total effective Ct is 27.72 mg.min/l which meets the site specific target Ct of 27.00 mg.min/l and is well above the WHO recommendation of 15 mg.min/l. The plant is currently operating at a reduced flow of approximately 350 m3/hr so the actual current Ct is well above the target Ct for the plant.</p>		



## 4. Management and Control

	Answer	
4.1	Is the plant suitably managed and controlled to maintain the designed log credit on each treatment stage?	Yes
<b>Comment</b>		
<p>1. Irish Water has calculated the protozoal log removal requirement for Ballyboden WTP as 3 log. The log treatment credit provided by the clarification and filtration processes is 3 log.</p> <p>2. The turbidity alarms on the clarified/settled water and filtered water are set at appropriate levels to verify the log credit performance of the clarification and filtration processes.</p>		

	Answer	
4.2	Is there a documented alarm response procedure?	Yes
<b>Comment</b>		
<p>1. Irish Water provided refresher training on incident management to all local authorities, including the operators of Ballyboden WTP on 06/10/21. The Dublin City Council and Irish Water staff present at the audit were aware of roles and escalation requirements during an incident.</p> <p>2. Contact lists for who to call in the event of an incident were clearly displayed on the walls at various locations throughout the plant.</p>		

	Answer	
4.3	Are suitable plant shutdowns/inhibits in place to prevent the entry of inadequately treated water entering the distribution network?	No
<b>Comment</b>		
<p>There are no automatic shutdowns in place at Ballyboden WTP. The plant was built in the 1960s and is very reliant on manual control and intervention in the management of water treatment processes.</p>		

	Answer	
4.4	Are suitable alarm settings in place to alert operators to deteriorating water quality and/or the failure of a critical treatment process?	Yes
<b>Comment</b>		

1. There are suitable alarms in place to alert operators to deteriorating water quality or the failure of a critical treatment process.
2. Irish Water completed a review of the alarms and inhibits at Ballyboden WTP on 06/10/21.
3. Ballyboden WTP is manned 24/7 on a 3 shift basis. If an alarm activates, it creates an audible alarm in the control room and sends a text to the shift operators phone and the plant managers phone. There is an alarm cascade system in place, and alarms are cascaded to the plant manager.
4. Ballyboden WTP is connected to the National Telemetry System (INTS) and Irish Water has access to view the telemetry data from the plant.
5. Irish Water confirmed that Ballyboden WTP alarms are not being received, monitored or actioned by their National Operations Management Centre.

4.5

		<b>Answer</b>
	Is the data obtained from sampling and monitoring used to actively inform the processes on site and in the distribution network?	Yes
<b>Comment</b>		
<ol style="list-style-type: none"> <li>1. Dublin City Council takes samples of raw water, settled water, filtered water, final water (plant output), final water (covered reservoir outlet) at Ballyboden WTP on all normal working days for microbiological and chemical analysis.</li> <li>2. There is also a weekly parasitology (<i>Cryptosporidium/Giardia</i>) sampling programme at the plant; one raw water sample per week and two final water samples per week.</li> <li>3. The microbiological, chemical and parasitology sample results are reported to the operators of Ballyboden WTP as soon as available. This allows the operators to respond immediately to any issues identified. A summary of the results is also reported to Irish Water and the EPA on a monthly basis by Dublin City Council Central Laboratory.</li> </ol>		



## 5. Site Specific Issues

		Answer
5.1	Is there automatic switchover between the duty and standby dosing pumps for all water treatment chemicals used at Ballyboden water treatment plant?	No
<b>Comment</b>		
There is automatic switchover between the duty and standby dosing pumps at the disinfection system. However, there is no automatic switchover between the duty and standby dosing pumps for aluminium sulphate, polyelectrolyte and sodium carbonate (soda ash) at the plant.		

		Answer
5.2	Having regard to the Drinking Water Safety Plan for Ballyboden water treatment plant, has Irish Water provided details of the “very high” and “high” risks for the supply?	No
<b>Comment</b>		
<p>1. Prior to the audit, the EPA asked Irish Water for the Drinking Water Safety Plan (DWSP) “very high” and “high” risks identified for the supply and plans in place to address these, where available. Irish Water has identified 3 “very high” and 12 “high” risks for the supply, however the details of these risks was not available at the audit.</p> <p>2. Irish Water confirmed that the hazard identification stage of the DWSP is complete for Ballyboden WTP, however the Asset Management Improvement Plan (AMIP) is not yet completed.</p>		

		Answer
5.3	Is <i>Cryptosporidium</i> monitoring being carried out in accordance with Irish Water's 'Rationale for Determining the Frequency of <i>Cryptosporidium</i> Monitoring in Public Water Supplies'?	Yes
<b>Comment</b>		
Until the filter refurbishment works are complete, sampling for <i>Cryptosporidium</i> & <i>Giardia</i> is carried out once per week on raw water and twice per week on final water before it enters the reservoir. There has been no detections of <i>Cryptosporidium</i> or <i>Giardia</i> since 14/10/19.		

		Answer
5.4	Are treatment process chemicals appropriately managed and stored?	No
<b>Comment</b>		
The fill points for the aluminium sulphate bulk storage tank were located outside of the bund. This presents a risk that any potential chemical spillage would not be contained within the bunded area.		



## Recommendations

<b>Subject</b>	Ballyboden WTP Audit Recommendations	<b>Due Date</b>	03/12/2021
<b>Action Text</b>	<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 complete the remedial works on Filter No. 1 as soon as possible, to ensure the filter backwash is operating satisfactorily.</li> <li>2. Irish Water should take action to ensure that there is no rising floc above the sludge blanket in the clarifiers at Ballyboden water treatment plant.</li> <li>3. Irish Water should assess the feasibility of installing automatic coagulation control at Ballyboden water treatment plant.</li> <li>4. Irish Water should assess the feasibility of installing automatic shutdown at Ballyboden water treatment plant as the ultimate failsafe to prevent inadequately treated water being supplied to consumers.</li> <li>5. Irish Water should assess the feasibility of installing a run to waste facility at Ballyboden water treatment plant to allow the filters to run to waste for an appropriate period of time following a backwash.</li> <li>6. Irish Water should install automatic switchover between the duty and standby dosing pumps for all water treatment chemicals used at Ballyboden water treatment plant.</li> <li>7. Irish Water should ensure that fill points for the aluminium sulphate bulk storage tanks are located within the bunded area, to ensure that any potential chemical spillage will be contained.</li> <li>8. Irish Water should provide details of the Drinking Water Safety Plan “very high” and “high” risks identified for the supply, and the plans in place to address these risks.</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 Dr. Michelle Minihan, Senior Inspector, Drinking Water Team.</p> <p>Irish Water should submit a report to the Agency on or before 03/12/21 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 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>		