

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	Glanmire
Organisation	Irish Water
Scheme Code	0500PUB2107
County	Cork
Site Visit Reference No.	SV20335

Report Detail	
Issue Date	16/07/2020
Prepared By	Criona Doyle

Site Visit Detail			
Date Of Inspection	24/06/2020	Announced	Yes
Time In	11:00	Time Out	13:30
EPA Inspector(s)	Criona Doyle		
Additional Visitors			
Company Personnel	Irish Water: Deirdre O'Loughlin, Oliver Harney. Cork County Council: Eimear O'Riordan, Graham Whittaker, Dornic Mc Evoy, Frances Whoriskey.		

> Summary of Key Findings

1. The audit found that Irish Water and Cork County Council have carried out remedial actions following 3 recent incidents at Knockraha water treatment plant: (i) turbidity incident on 14/01/20, (ii) sludge discharge incident on 21/05/20, and (iii) hydrofluorosilic acid spill on 07/06/20. However, further works remain to be undertaken to prevent the occurrence of further incidents at the plant.
2. Remedial works are required on the rapid gravity filters at Knockraha water treatment plant to ensure an adequate depth of filter media is provided. Irish Water should ensure this work takes place without further delay as the minimum recommended depth of filter media, as per EPA Water Treatment Manual: Filtration, is not currently being achieved.
3. Records indicate that sludge removal from Knockraha water treatment plant was not being undertaken at the required frequency. A discharge of sludge took place to the Butlerstown River on 21/05/20. Irish Water should ensure that regular removal of sludge takes place.
4. There was a spillage of hydrofluorosilic acid at Knockraha water treatment plant on 07/06/20 which drained via pipework to the sludge treatment process and ultimately discharged into the river via the sludge supernatant discharge pipe. Irish Water should ensure that the lessons learned from the hydrofluorosilic acid spill incident are applied to other water treatment plants.

> Introduction

The Glanmire Public Water Supply (PWS) serves a population of 5,093 including part of Glanmire village, the area between Glanmire and Knockraha and the Watergrasshill area. Raw water is abstracted from tributaries of the Butlerstown River and is treated at the Knockraha Water Treatment Plant (WTP). Treatment includes coagulation, flocculation, clarification, filtration in rapid gravity filters, chlorination and fluoridation.

> Supply Zones Areas Inspected

The purpose of the audit was to undertake a review of the operation of the water treatment plant and review the proposed remedial works in response to (1) the turbidity incident on 14/01/20, (2) the discharge of sludge to the Butlerstown river on the 21/05/20 and (3) the spillage of hydrofluorosilic acid on 07/06/20.

All areas of the treatment process were inspected during the audit including coagulant dosing, clarification tanks, rapid gravity filters, chlorine dosing, fluoride dosing and chemical storage. The raw water intakes and offsite storage reservoirs were not inspected during this audit.



1. Coagulation Clarification Flocculation (CFC) Stage

	Answer	
1.1	Is the CFC process optimised to respond to changes in raw water quality?	Yes
Comment		
<p>Automatic coagulant dosing (PAC) is provided at the WTP and controlled by the streaming current analyser. Jar testing is routinely undertaken twice a week and more regularly in response to variations in raw water quality and the results were recorded on site. Daily operational testing of aluminium was not being undertaken at the plant since the changeover to the streaming current analyser approximately 10 years ago. The need for daily aluminium testing was discussed at the audit.</p>		

	Answer	
1.2	Are the CFC processes appropriately controlled?	Yes
Comment		
<p>Duty and standby coagulant dosing pumps were present with automatic switchover every 7 days. The dosing pumps are alarmed. Ultrasonic level monitors are in place in each tank to monitor the levels of the sludge blanket.</p>		

	Answer	
1.3	Were the CFC tanks, channels and weirs observed to be clean, level and well maintained during the audit?	Yes
Comment		
<p>The channels were level and clean with even flow observed. The walls of the tanks are cleaned weekly and drained down every 2 to 3 months for a deep clean.</p>		

	Answer	
1.4	Were the CFC processes visually observed to be operating appropriately during the audit?	Yes
Comment		
<p>There was no evidence of floc carry over into the channels and an even flow was observed.</p>		

> 2. Filtration

		Answer
2.1	Are the filters designed and managed in accordance with EPA guidance?	No
Comment		
<p>The depth of the filter media is less than the 800mm minimum depth specified in the 1995 EPA publication "Water Treatment Manual: Filtration" and the 1m minimum depth recommended in the revised EPA Filtration Manual (due to be published soon). Irish Water indicated that the contract for the remedial works to replace the filter media and any required works on the laterals was out to tender with a return date of 20/07/20. Funding has not been committed for this project to date and no timescale could be provided for the completion of this work.</p> <p>Monitoring of <i>Cryptosporidium</i> is being carried out on a monthly frequency until the remedial works have been completed. No <i>Cryptosporidium</i> has been detected to date.</p> <p>Continuous monitoring of turbidity takes place on each of the individual filters. There is no monitoring of turbidity taking place on the final combined filtered water.</p> <p>There was no depth marker in place on any of the filters to assist with the monitoring of the depth of the media. An investigation of the filter media was undertaken in March 2020 and identified an insufficient depth of filter media in all 3 no. filters.</p>		

		Answer
2.2	Does monitoring indicate that the filters are operating effectively?	Yes
Comment		
<p>The plant is being operated using the turbidity approach. Repairs had been completed on the online turbidity monitors in response to the turbidity incident in January 2020. The trends submitted in advance of the audit indicated that the turbidity trends were stable.</p> <p>The turbidity alarm levels had been revised on the day prior to the audit to a high level warning alarm at 0.15 NTU and high high alarm level of 0.25 NTU on each individual filter. The high high alarm triggers run to waste and automatic backwashing followed by automatic plant shutdown in the event the turbidity remains elevated. On the day of the audit the filter readings were as follows: Filter No. 1 0.035 NTU; Filter 2 0.045 NTU; Filter No. 3 0.033 NTU.</p>		



3. Disinfection

		Answer
3.1	Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?	Yes
Comment		
<p>The residual chlorine levels are recorded on a continuous basis. The chlorine trends were submitted in advance of the audit. The low chlorine alarm is set at 0.4mg/l with auto shutdown of the supply after 20 minutes delay. On the day of the audit the residual chlorine level was 0.57 mg/l at Ballinagohig Reservoir and 1.95mg/l in the clear water tank at Knockraha.</p> <p>There was no high chlorine alarm level set at the WTP.</p>		

		Answer
3.2	Are duty and standby chlorine pumps/ UV units in operation?	Yes
Comment		
<p>Chlorine dosing (14-15% sodium hypochlorite) is flow proportional and linked to the residual chlorine monitor. Duty and standby dosing pumps (pump 1 and 2) are provided plus a back up assist pump (pump 3) which provides a boost in the event the chlorine level in the final water drops. The dosing rates for Pump 1 and 2 are manually set based on the flow rate and Pump 3 provides the boost function linked to the residual chlorine monitor. All pumps are alarmed.</p>		

		Answer
3.3	Is there a suitable monitoring frequency for residual chlorine in the network with records available?	No
Comment		
<p>Monitoring of the residual chlorine levels in the network is undertaken once per week with some locations only being monitored on a monthly frequency.</p>		



4. Management and Control

	Answer	
4.1	Are suitable alarm settings in place to alert operators to deteriorating water quality and/or the failure of a critical treatment process?	No
Comment		
There was no high chlorine alarm set point in place at the WTP. An alarm was in place for low chlorine levels.		

	Answer	
4.2	Are suitable plant shutdowns/inhibits in place to prevent the entry of inadequately treated water entering the distribution network?	Yes
Comment		
At the time of the turbidity incident on 14/01/20 auto shutdown of the plant was linked to the settled water turbidity monitor when the level exceeded 1.5 NTU. Since this incident the high high turbidity alarm on each of the individual filters has been set to trigger shutdown of the supply at 0.25 NTU and the generation of a warning alarm at 0.15 NTU. This provides greater protection from inadequately treated water entering the distribution network.		

	Answer	
4.3	Are relevant alarms dialled out via a cascade system to allow a timely response by plant operators?	Yes
Comment		
A cascade system is in place for responding to alarms.		

	Answer	
4.4	Are instrument calibrations within date?	Yes
Comment		
Instrument calibrations were in date however old calibration stickers had not been removed from some of the monitors making it confusing as to which were the most recent service and calibration dates.		
There was no sticker calibration / service due sticker on the streaming current analyser had it had only recently been installed.		



5. Site Specific Issues

5.1

Was the turbidity incident on 14/01/20 alerted to the plant operators, escalated and managed in order to maintain the water quality and protect public health ?

Answer

Yes

Comment

On 16/01/20 the EPA was notified of the discharge of final water from the Knockraha WTP with elevated turbidity to the network serving the Glanmire Public Water Supply on the 14/01/20. Coagulant dosing is automatically controlled by the streaming current analyser at the WTP. A power failure at the plant at 9pm on 14/01/20 damaged the streaming current analyser and the settled water turbidity monitor. At the time of the incident the plant was alarmed to shut down on a high turbidity alarm level of > 1.5 NTU on the settled water turbidity monitor. This monitoring point is located after the coagulation stage and prior to the filtration stage. This monitor was knocked out by the power failure and failed to generate an alarm. The problem was identified by the Caretaker at 9:30am on 15/01/20.

Coagulant dosing had ceased as no power was available to the streaming current analyser which automatically sets the coagulant dosing rates. This resulted in inadequately treated water being supplied to the network. Turbidity levels of 0.5NTU (Glanmire supply) and 0.48 NTU (Watergrasshill supply) were recorded leaving the reservoirs following the incident.

In response to the incident the streaming current analyser was brought back into operation and the plant was run to waste while the sludge blanket was re established. The rising main was scoured and the plant was brought back into production at 7pm on 15/01/20. The settled water turbidity monitor was replaced. The HSE were notified that the *Cryptosporidium* barrier may have been compromised. Sampling of the final water for *Cryptosporidium* was undertaken 15/01/20 and at outlet from each reservoir on 16/01/20. There were no detections of *Cryptosporidium* following the incident.

In response to the incident Irish Water provided SCADA trends from the 3 no. rapid gravity filters. The follow up data indicated turbidity spikes which were investigated by Irish Water and identified as being caused by internal damage to the turbidity monitors. The monitors were repaired on 21/04/20. The turbidity trends provided in advance of the audit indicated the issue with the turbidity monitors has been resolved.

An investigation of the filter media was undertaken in March 2020 and identified an insufficient depth of filter media in all 3 no. filters. At the audit it was confirmed that these remedial works have not been completed to date. Tender documents were issued on 29/06/20 for this work with a tender return date of 20/07/20 however funding to complete the works has not been confirmed by Irish Water.

In response to the turbidity incident the EPA had requested daily aluminium monitoring results. Daily operational aluminium monitoring was not taking place at the WTP on the day of the audit.

5.2

Was the sludge incident on 21/05/20 suitability alerted to plant operators, escalated and managed in order to maintain water quality?

Answer

Yes

Comment

During normal operations supernatant from the sludge treatment process is discharged to the Butlerstown river adjacent to the WTP. On 21/05/20 Cork County Council were notified of a fish kill 1.5km downstream of the Knockraha WTP by Inland Fisheries Ireland (IFI). In response to the notification Cork County Council tested a sample of the discharge from the WTP to the river. The results for aluminium (0.113mg/l) and pH (6.9 pH units) were within levels set for Drinking Water. Cork County Council met with IFI on 25/05/20 at the WTP. A copy of the outcome of the IFI investigations was not available at the audit. At the time of the audit it is could not be confirmed if the discharge of sludge from the WTP was related to the fish kill or if other activities on the catchment had caused the fish kill.

On the day of the audit there was a significant flow of water in the river and no sludge was visible in the river bed or the river bank in the vicinity of the supernatant outlet pipe.

While the audit found that the incident was suitably alerted and investigated it does identify issues with sludge management at the WTP. At the audit Cork County Council outlined that the sludge holding tank should be emptied on a 2 month frequency based on normal sludge production volumes and the material removed offsite for disposal at a suitable facility. The available records indicate that sludge was not being removed at the required frequency due to issues with contractor availability and change of personnel linked to Cork City and Cork County Boundary changes. This means the potential existed for the discharge of sludge to the adjacent river during periods when the sludge holding tank was full.

In response to the incident on 21/05/20 the sludge holding tank was emptied. Remedial measures had been put in place prior to the audit including the sourcing of an alternative contractor, daily inspection and recording of the sludge level in the picket fence thickener and daily monitoring of the aluminium content and pH in the discharge to the river.

5.3

	Answer
Was the hydrofluorosilic acid spill on 07/06/20 suitably alerted to the plant operators, escalated and managed in order to maintain water quality ?	Yes
Comment	

A hydrofluorosilic acid spill occurred at the Knockraha WTP on 07/06/20. The spill was detected on the morning of the 08/07/20 by the Caretaker. Very little acid was observed on the floor and the Caretaker checked the bulk tank level and identified that the bulk tank had emptied. It is estimated that approximately 3.2m³ of fluorosilicic acid entered the sludge treatment system via the drainage system and 28m³ of supernatant/fluorosilicic acid mix entered the river over the 24 hour period.

The incident was escalated to the Production Engineer between 10:30am and 11:00am on 08/06/20. The Caretaker sampled the discharge to the river and received an over range fluoride result and in response the discharge to the river from the WTP was stopped. Irish Water were notified of the incident at 12 noon on 08/06/20. Inland Fisheries Ireland were notified of the incident at 13:00 hours on 09/06/20. IW checked with internal HSQE team and the incident was assessed as not being a high risk as only trace amounts of acid observed on floor of WTP.

In response to the incident the sludge dewatering process was shut down and no supernatant was discharged to the adjacent river for a 3 day period. The material was tested prior to being tankered off site for treatment. Sludge removal records submitted prior to the audit indicated 20 tonnes of sludge was removed offsite for disposal by specialist contractor. Samples were taken upstream and downstream of the WTP in response to the incident by Cork County Council and no impact on receiving waters was reported.

The investigations undertaken since the incident identified that dead man switch (which controls the transfer of hydrofluorosilic acid from the bulk storage tank to the day tank) malfunctioned. This resulted in the continued pumping of acid from the bulk storage tank to the day tank which over topped the bund, flowed across the floor, gained access to the backwash water channel in the adjacent room via space around pipework and ended up in the sludge treatment process.

Prior to the audit a new actuator button and new manual valve were installed and the fluoride dosing pipework was rearranged with the dead man switch moved closer to the door. A tool box talk had also been scheduled for the week after the audit to provide training to staff on procedures for transfer of acid from bulk storage tank to day tank. Further proposed remedial works include the installation of a bigger bund on the day tank and a ultrasonic level controller will be installed in the day tank which will be connected to the SCADA and will alert the Curator to a high level reading in the day tank.

The HSE were not notified of the hydrofluorosilic acid incident.

Recommendations

Subject	Audit Recommendations	Due Date	16/08/2020
Action Text	<p>Recommendation(s)</p> <ol style="list-style-type: none"> 1. Irish Water should take immediate action to ensure a minimum sand depth of 800mm to 1000mm is present in each of the 3 rapid gravity filters. 2. Irish Water should install a continuous turbidity monitor on final treated water at plant. The monitor should be linked to a recording device and generate an alarm in the event of deviation from acceptable operating range of the filters. 3. Irish Water should ensure that depth marker posts are installed in the filters. 4. Irish Water should ensure that daily operational monitoring of residual coagulant (aluminium) in the final water is undertaken at Knockraha water treatment plant. 5. Irish Water should ensure all old calibration stickers are removed and ensure the recently replaced streaming current monitor is included on the service and maintenance schedule. 6. Irish Water should install a high chlorine alarm set point and high chlorine alarm auto shutdown level. Irish Water should provide details of the alarm set points and associated time delays to the Agency. 7. Irish Water should ensure that monitoring of residual chlorine level is undertaken several times a week at different points on the network to include the network extremities. 8. Irish Water should review the current methods of handling and disposal of water treatment sludge to ensure that the practice is not in contravention of the Waste Management Act, 1996 – 2003. The discharge of water treatment sludge to receiving water, where practiced should cease immediately. Leachate from stored drinking water sludge should not give rise to environmental pollution. 9. Irish Water should undertake a survey of the site drainage and pipework on site and based on the findings should carry out works to ensure that leaks, spills or washings from chemical use or storage are contained on site. Irish Water should confirm that the chemical storage areas and associated bunds are isolated from the sludge treatment system. 10. Irish Water should inform the HSE of the hydrofluorosilic acid spillage incident, clean up and subsequent monitoring. Irish Water should have regard to the requirements of the Code of Practice on Fluoridation of Drinking Water. The Code contains guidance on the storage and procedures for dealing with spillage of hydrofluorosilic acid. The lessons learned from the hydrofluorosilic acid spill incident should be applied to other water treatment plants. <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 16/08/20 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 DW2020/5 Glanmire - Turbidity and DW2020/33 Glanmire - Sludge Incident / Acid Spill in any future correspondence in relation to this Report.</p>		

