Drinking Water Audit Report

County:	Cork	**Date of Audit:**	25/03/2019
Plant(s) visited:	Glashaboy (Scheme Code 0500PUB3303)	**Date of issue of Audit Report:**	07/05/19
		File Reference:	DW2019/55
		Auditors:	Ms. Criona Doyle Ms. Regina Campbell
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) as amended*. • *The EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7)* • The recommendations specified in the EPA *Drinking Water Report*. • EPA Drinking Water Advice Notes No.s 1 to 15. • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. *Cryptosporidium* has been detected in the Glashaboy Water Supply. In response to the detections, Irish Water have implemented a number of improvements at the plant. Irish Water should progress further operational improvements to the coagulation process without delay to ensure an adequate barrier to *Cryptosporidium* is provided at all times.

ii. Irish Water should progress the resanding of the rapid gravity filters without delay to ensure an adequate minimum depth of sand is provided at all times.

iii. Irish Water should continue to undertake weekly monitoring of *Cryptosporidium* and *Giardia* until the process optimisation improvements for the coagulation stage of the treatment process have been completed.

1. INTRODUCTION

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 drinking water following the detection of *Cryptosporidium* in the Glashaboy Public Water Supply (PWS) on the 26th of February and 13th of March 2019.

The raw water for the supply is obtained from the Glashaboy River. On average the volume of water produced is 22,000m^3/d which serves a population of approximately 22,500. The supply serves Glanmire, Glounthane, Little Island and parts of Cobh and Carrigtwohill. Treatment at the plant includes coagulation, flocculation, clarification, filtration, disinfection, fluoridation and final water pH correction. The plant was constructed in the early 1970's. It is staffed on a 24 hour basis.

Photographs taken by Regina Campbell during the audit are attached to this report and are referred to in the text where relevant.

The opening meeting commenced at 2pm at the Glashaboy Water Treatment Plant (WTP). The scope and purpose of the audit were outlined at the opening meeting. The audit process consisted of interviews with staff, review of records and observations made during an inspection of the treatment plant. The audit observations and recommendations are listed in Section 2 and 4 of this report. The following were in attendance during the audit.

Representing Irish Water:

Deirdre O'Loughlin, Drinking Water Compliance Specialist.

Tommy Roche, Drinking Water Compliance Analyst.

Robert Kennedy, Process Optimisation Lead.

Oliver Harney, Water Engineer.

Representing Cork County Council:

Eimer O'Riordan, Acting Senior Executive Engineer.

Pauline McAree, Executive Engineer.

Ken O'Keefe, Executive Engineer.

Representing the Environmental Protection Agency:

Criona Doyle, Inspector.

Regina Campbell, Inspector.

Representing the HSE:

Stephen Murphy, Acting Principal Environmental Health Officer.

John Maher, Senior Environmental Health Officer.

2. AUDIT OBSERVATIONS

The audit process is a random sample on a particular day of a facility's operation. Where an observation or recommendation against a particular issue has not been reported, this should not be construed to mean that this issue is fully addressed.

1.	**Exceedances of the Parametric Values** a. On the 01/03/19 the EPA was notified of the detection of *Cryptosporidium* (0.001/10L) in the treated water in the Glashaboy public water supply from a sample taken on the 26/02/19. b. On the instruction of the HSE weekly monitoring of *Cryptosporidium* and *Giardia* has been taking place. A further *Cryptosporidium* exceedance (0.00006/10L) was reported in a sample taken on 13/03/19. Samples taken on the 05/03/19 and 19/03/19 were clear for both *Cryptosporidium* and *Giardia*. c. Cork County Council said that the *Cryptosporidium* risk score for the supply is 110 (December 2016) which is classed as very high risk.
2.	**Source Protection** a. The intake and pump house are located on the east side of the Glashaboy River adjacent to playing fields. The perimeter of both compounds are fenced and secure. The intake is inspected daily. b. There are no agricultural activities in the buffer zones in the vicinity of the abstraction point. c. Historic monitoring for *Cryptosporidium* includes monthly monitoring between 2016 and 2018 and weekly monitoring for the five years prior to this. There previously was a *Giardia*

	detection in 2015 (28/09/15). d. Online monitoring of the raw water includes turbidity, pH and ammonia. All monitors were labelled with calibration / service dates. An alarm is generated when the raw water turbidity exceeds 20 NTU (30 minutes delay). An alarm is generated when the raw water ammonia level reaches 0.15 mg/l, with an additional high-high alarm at 0.25mg/l and automatic shut-off of the intake at 0.30mg/l (300ppb) (10 minutes delay). e. On the day of the audit the following levels were observed in the raw water: pH 7.70, turbidity 1.41 NTU and ammonia 53.9 ppb.
3.	**Coagulation, Flocculation and Clarification** a. Raw water from the Glashaboy River is pumped to the water treatment plant where it undergoes coagulation, flocculation and clarification. b. pH correction is carried out by the addition of soda ash if the pH of the raw water is less than 6. c. Raw water is dosed with 8% liquid aluminium sulphate (coagulant). A bulk storage tank is provided on site. All deliveries are supervised and mobile drip trays are used. Two day tanks are provided (duty and standby). d. The coagulant dose charts were displayed adjacent to the aluminium sulphate dose pumps. The dosing pumps operate on a duty / standby basis. There is no automatic switchover in place in the event of a failure. Jar testing is undertaken 4 times a day (twice on each 12 hour shift). This frequency is increased in response to changing raw water quality as required. Manual dosing is undertaken and the dose rate is entered on the menu system of the pumps by the caretaker based on the results of jar testing. e. On the day of the audit the dose rate was 30ppm. f. Seven minutes coagulant contact time is provided at maximum flow prior to the splitter chamber. g. There is no dosing of coagulant aid. The proposed improvement works will include the addition of coagulant aid (poly) to the treatment process. h. There are six clarifiers in operation at the WTP. i. Daily aluminium testing of the final water is now being undertaken but was not being undertaken prior to the recent *Cryptosporidium* detection. j. A review of the coagulation process is currently being undertaken by Irish Water following the recent *Cryptosporidium* detections. k. On the day of the audit pin floc was visible quite high in the clarifiers and clumps of floc were collecting on the notches of the decanting channels (Photograph No. 1) which may indicate issues with the coagulation process. l. There are two turbidity monitors monitoring the settled water. These were displaying readings of 0.684 NTU & 1.275 NTU at the time of the audit.
4.	**Filtration** a. There are six rapid gravity filters on site. b. The current filter media was installed in 2006 and was last topped up in 2012. c. Following the recent *Cryptosporidium* detection an assessment of the filters was undertaken by Irish Water which indicated the current depth of the filter sand varied from 520mm to 630mm.The assessment identified mud balls in all 6 filters. Irish Water plan to undertake the remedial works on the filters following the completion of the coagulation optimisation works. d. The filter backwashing sequence has been extended to include a double wash. The current sequence includes 10 minutes air blow, backwash until clear, air blow for 15 minutes and backwash until clear. e. On the day of the audit a backwash was observed in Filter No. 2. Backwashing was observed to be even across the filter. f. A turbidity monitor is in place on each individual filter. There is no turbidity monitor on the combined filtered water. g. Backwashing takes place on a timed basis. Prior to the *Cryptosporidium* detection two filters were backwashed each day. This has been increased since 08/03/19 to backwashing of three filters each day. The backwash water is discharged to waste.

	h. There is a delayed start (45 minutes) following filter backwashing. i. On the date of the audit the following turbidity levels were observed: Filter 1: 0.05 NTU; Filter No. 2: 0.09 NTU; Filter 3: 0.065 NTU; Filter No. 4: 0.063 NTU; Filter No. 5: 0.04 NTU and Filter No. 6: 0.04 NTU. j. An alarm is generated on the filtered water if the turbidity exceeds 0.25 NTU (10 minutes delay). During the audit a turbidity alarm was generated on Filter No. 1 which was not related to backwashing operations. Irish Water outlined that there may be an issue in relation to the monitor and said that they would investigate this further.
5.	**Disinfection** a. The water is disinfected using 14-15% sodium hypochlorite. b. Dosing is flow proportional and linked to the residual chlorine monitor. The target level is 0.9mg/l at the outlet from the reservoir. c. Pumps No. 1 and No. 2 operate on a duty and standy-by basis with automatic switchover on a 4 hour frequency. Pump No. 3 provides the residual trim. d. Based on a maximum outflow of 1,400m^3/hr and a free chlorine residual of 0.5 mg/l a contact time of 136.4 mg.min/l is provided when both reservoirs are full. A contact time of 50.5mg.min/l is provided when both reservoirs at 4.0m. e. There are chlorine alarms on both the combined inlet and combined outlet from the on-site reservoirs. The low level chlorine alarm on the inlet to the reservoir is set at 0.4 mg/l with a low low alarm at 0.2 mg/l and the high level alarm at 3.0 mg/l (5 minutes delay). The chlorine alarms on the outlet from the reservoir include a low level alarm at 0.6mg/l, a low low alarm at 0.2 mg/l and a high alarm at 2.5 mg/l (5 minutes delay).
6.	**Treated Water Storage and Distribution Network** **a.** There are 2 no. reservoirs on site (storage volumes 45,500m^3 and 18,181m^3). There are a further 7 reservoir sites supplied by the WTP: Caherlag, Castlejane, Lissinisky, Cobh Low Level, Tower New, Old Tower and Springhill Lower. **b.** Monitoring of residual chlorine levels at the end of the network takes place on a weekly frequency.
7.	**Fluoridation** a. Fluorosilic acid (10.9%) is stored in the bulk storage tank. b. Duty and standby fluoride dosing pumps are provided with automatic change over of pumps. c. Dosing is flow proportional with a target level of 0.7 mg/l. d. A mesh cover has been installed on the vent pipe since the previous audit.
8.	**Chemical storage and bunds** a. At the previous EPA audit in 2009 a recommendation was made in relation to the bund of the gas oil tank and the location of a pipe closed to the bund floor. No improvements appear to have been made (Photograph No. 2).
9.	**Hygiene and Housekeeping** a. Bait boxes for rodents were observed at locations across the site.
10.	**Sludge Management** a. Sludge from the clarifiers is currently discharged to the river.
11.	**Improvement Works** a. Since the initial Crypto detection in February, Irish Water have implemented the following

	interim works in response to the process optimisation investigations and review of the rapid gravity filters:(i) The plant throughput has been reduced from 930 m^3/hour to 800 m^3/hr; (ii mud balls have been removed from the surface of the 6 no. rapid gravity filters; (iii) the backwash sequence has been changed to include double washing of the filters; (iv) optimisation of the coagulant dosing is taking place; (v) 3 no. filters are being backwashed every day (increased from 2 no. per day previously). b. Monitoring of UVT is being undertaken on the raw water, settled water, final water and filters no. 1 to 6 on a daily basis. c. Irish Water are in the process of identifying further improvement works in relation to coagulation dosing and mixing.

3. AUDITORS COMMENTS

Cryptosporidium was detected in the Glashaboy water supply on the 26/02/2019 with a further exceedance on the 13/03/19. The *Cryptosporidium* risk score indicates the supply is classed as very high risk.

In response to the *Cryptosporidium* detection Irish Water has conducted a review of the treatment process and has identified a number of deficiencies in the coagulation and filtration stages. Irish Water have implemented the following interim works: (i) reduction of plant throughput (ii) removal of mudballs from filters (iii) introduction of double washing of filters (iv) commenced investigation for process optimisation of the coagulant dose and (v) increased the frequency of filter backwashing.

Works are continuing in relation to the process optimisation of the coagulation stage. Resanding of the rapid gravity filters is to commence following the completion of the optimisation of the coagulation process.

Based on the current issues identified with the coagulation and filtration stages it is recommended that weekly monitoring for *Cryptosporidium* and *Giardia* continue until the process optimisation works for the coagulation stage have been completed.

4. RECOMMENDATIONS

Coagulation, Flocculation and Clarification

1. Irish Water should progress the operational improvements to the coagulation process without delay to ensure an adequate barrier to Cryptosporidium is provided at all times. Irish Water should provide details on the outcome of the process optimisation investigations together with the details of the proposed improvement works and associated timeframes for completion. In carrying out this investigation Irish Water should have regard to the *EPA Water Treatment Manual: Coagulation, Flocculation and Clarification and EPA Advice Note No. 15: Optimisation of Chemical Coagulant Dosing*.

2. Irish Water should investigate the installation of automatic changeover of the alum dosing pumps and investigate the feasibility of installing an alarm to warn of pump failure.

3. Irish Water should investigate the cause of the clumps of floc observed collecting on the notches of the weirs on the decanting channels. Irish Water should ensure that visual observations of the clarifiers (floc and sludge blanket) are recorded on a daily basis on the plant day sheet.

Filtration

4. Irish Water should install a continuous turbidity monitor on the final treated water (combined filters). This monitor should be linked to a recording device and generate an alarm in the event of a deviation from the acceptable operating range of the filters.

5. Irish Water should progress the resanding of the rapid gravity filters without delay to ensure an adequate minimum depth of sand is provided at all times.

6. Irish Water should undertake a review of the current procedure for bringing the filters back online following backwashing to ensure adequate controls are in place to prevent turbidity breakthrough.

7. Irish Water should investigate the turbidity monitor and alarm settings on Filter No. 1 to ensure it is operating correctly and provide an update to the Agency.

8. Irish Water should continue to undertake weekly *Cryptosporidium* and *Giardia* monitoring until the process optimisation improvements for the coagulation stage of the treatment process have been completed.

Source Protection

9. Irish Water should forward a copy of the current *Cryptosporidium* risk assessment to the Agency.

Treated Water Storage and Distribution Network

10. Irish Water should ensure that the reservoirs served by the supply are included on the Irish Water Reservoir Cleaning Programme.

11. Irish Water should ensure that free residual chlorine levels at the end of the distribution network are monitored several times per week.

Chemical Storage and Bunds

12. Irish Water should confirm if the integrity test of the marked gas oil tank storage bund, as recommended in the previous EPA audit, was carried out and measures enacted to ensure its integrity.

Hygiene and Housekeeping

13. Irish Water should review the use of rodent bait. The use of rodenticides should be avoided unless absolutely necessary and where they are used, it should be for a limited duration until the problem is brought under adequate control. Irish Water should have regard to EPA Advice Note 13 – Pesticides in Drinking Water.

Sludge Management

14. Irish Water should review current methods of handling and disposal of water treatment sludge to ensure that the practice is not in contravention of the *Waste Management Act, 1996-2011*. 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.

FOLLOW-UP ACTIONS REQUIRED BY IRISH WATER

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. This report has been reviewed and approved by Ms. Regina Campbell, Drinking Water Team Leader.

Irish Water should submit a report to the Agency within one month of the date of this audit report 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 timeframe for commencement and completion of any planned work.

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.

Please quote the File Reference Number in any future correspondence in relation to this Report.

Report prepared by: Fiona Doyle **Date:** 07/05/2019

Photograph No. 1: Clumps of Floc On Weirs of Decanting Channels

Photograph No. 2: Gas Oil Storage Bund