Drinking Water Audit Report

County:	Cork County Council	**Date of Audit:**	13/02/17
Plant(s) visited:	Innishannon Public Water Supply – (Scheme Code 0500PUB3501)	**Date of issue of Audit Report:**	07/03/17
		File Reference:	DW2016/177
		Auditors:	Ms. Criona Doyle Ms. Cliona Ni Eidhin
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014).* • *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.		

MAIN FINDINGS

i. **Giardia (0.012 per 10 litres) was detected in the treated water at Innishannon water treatment plant on 27/09/2016. The cause of the exceedance could not be identified by Irish Water and the follow up investigations found no evidence that the treatment barriers at the plant were compromised. A monthly monitoring programme has found no further detections of Giardia or *Cryptosporidium* in the treated water, and this monitoring programme will continue during 2017.**

ii. **A review of SCADA filtered water turbidity data has shown satisfactory operation of the rapid gravity filters at the plant. However, filter management would be improved by installing a system for measuring filter media depth and identifying when the filter media is due to be replaced.**

1. INTRODUCTION

Under the *European Union (Drinking Water) Regulations 2014* 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 Giardia in the treated water at Innishannon on 27/09/16.

The Innishannon Water Treatment Plant (WTP) has been in operation since the 1970's. The water is abstracted from the River Bandon. The plant produces up to 8,950m^3/d and supplies a population of 21,548 in the area extending from Innishannon to Kilbrittain, Garrettstown, Kinsale and Riverstick. Treatment at the plant includes coagulation, flocculation, clarification, rapid gravity filtration, chlorination, fluorine dosing and pH correction. Booster chlorination takes place in the network at a number of locations including Kinsale, Garrettstown, Kilbrittain and Riverstick.

The opening meeting commenced at 10.00am at the Innishannon 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 audits 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, Compliance Monitoring Liaison Specialist, Irish Water.

Jim Fitzgerald, SLA Lead, Irish Water.

Siobhan Clifford, Compliance Analyst, Irish Water.

Pat Kelly, Liaison Office Engineer, Cork County Council.

Padraig Thornton, Acting Senior Executive Engineer, Cork County Council.

Alison Foran, Executive Engineer, Cork County Council.

Mary Hickey, Executive Scientist, Cork County Council.

Eddie Walsh, Water Treatment Plant Caretaker, Cork County Council.

Representing the Environmental Protection Agency:

Criona Doyle, Inspector.

Cliona Ni Eidhin, Inspector.

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 06/10/16 the EPA was notified under Regulation 10(2) of Giardia (result 0.012 per 10 L) in the treated water at the Innishannon WTP on 27/09/16. Weekly resampling for Giardia and *Cryptosporidium* was undertaken for a 4 week period on the instruction of the HSE and all results were clear for Giardia and *Cryptosporidium*. The source of the exceedance was not determined and the follow up investigations found no evidence that the treatment barriers at the plant were compromised.
2.	**Source Protection** a. Surface water is abstracted from the River Bandon. The River Brinny discharges to the River Bandon approximately 200m upstream of the intake. In response to ammonia issues in the raw water during Winter 2015/2016 the Environment Section of Cork County Council undertook a sampling programme at a number of locations upstream of the abstraction. The sampling confirmed ammonia problems in the River Brinny. 72 no. farms in the Brinny River Catchment were inspected between June and September 2016. All farmers received an advisory letter with respect to the protection of public water supply sources from pollution from agriculture and a copy of the summary of the Good Agricultural Practice For Protection of Waters Regulations 2014. b. Land use in the buffer zone at the intake is mainly agricultural and the area of the intake is liable to flooding. The 250m and 200m buffer zones have been identified in accordance

	with the European Union (Good Agricultural Practice for Protection of Waters) Regulations 2014. All landowners within 250m of the abstraction were written to in 2016 and informed of their obligations under Article 17 of the Regulations. c. Online monitoring of ammonia in the raw water is undertaken with automatic cut off (installed in 2016) at the intake in the event the ammonia concentration reaches the high alarm level of 0.30mg/l. A warning alarm is triggered at a level of 0.20 mg/l to notify the plant caretaker and the alarm response operates on a cascade system. d. The Bandon Wastewater Treatment Plant is located approximately 4km up stream of the intake for the WTP. In addition to the online ammonia monitor to warn of any raw water quality issues, a procedure is in place for communication of any potential issues at the wastewater treatment plant which could impact on the raw water quality. e. The screens (coarse & fine) at the intake are regularly inspected and cleaned. The sump is cleaned and drained twice a year at set intervals. f. Raw water quality monitoring at the site includes turbidity, ammonia, colour and pH.
3.	**Coagulation, Flocculation and Clarification** a. Raw water from the River Bandon undergoes coagulation, flocculation and clarification (CFC). b. Raw water is dosed with aluminium sulphate to assist in coagulation. 2 no. alum day tanks are provided in the chemical dosing room. The pumps were within calibration dates. The alarm levels on the day tanks are set at 0.3m low level alarm and 1.0m high level alarm (tank full). c. The caretaker confirmed there was adequate coagulant contact time in the raw water outlet chamber and pipeline prior to in line poly dosing. d. At present manual adjustment of aluminium sulphate dosing is undertaken. Jar testing is undertaken daily at a minimum and more frequently in response to more rapidly changing raw water quality. The aluminium sulphate dose typically varies between 40 to 100 mg/l. A streaming current analyser is in place but is not currently linked to automatic dosing. A dose chart has been developed for the site based on raw water quality conditions to assist with manual dosing. e. Mixing of the 0.15% polyelectrolyte is undertaken in the chemical dosing room. 2 no. day tanks are provided. The polyelectrolyte dosing is flow controlled at a dose rate of 0.1ppm. f. 4 no. hopper bottom clarifiers are provided on site. There are 5 no. sludge bleeds in operation and sludge bleeds are undertaken at a 30 minute frequency for 1 minute duration. There is sufficient capacity at the plant to allow for one of the clarifiers to be isolated during cleaning operations. The tanks are drained down every 6 to 8 weeks for cleaning which involves power washing of the side walls and decanting channels. g. The decanting channels were clean with balanced flows and there was no visible floc carry over. The sludge blanket was visible.
4.	**Filtration** a. The clarified water is filtered via 4 no. rapid gravity filters. b. It is approximately 9 years since the filters were last resanded. c. There are turbidity monitors on each of the filters. The turbidity alarm level on the combined filtered water is 0.6 NTU. In the event the turbidity level of 0.6 NTU is triggered a text generated alarm is sent to the caretaker. The site is staffed for 16 hours per day. d. On the day of the audit the turbidity levels were as follows: • Filter No. 1: 0.024 NTU, • Filter No. 2: 0.027 NTU, • Filter No. 3: 0.027 NTU, • Filter No. 4: 0.026 NTU and • Combined filtered water 0.10 NTU. e. It was not possible to observe a filter backwash cycle at the plant on the day of the audit. The backwash cycle starts with 10 minutes air scour followed by a water backwash until the water runs clear. Details on the filter backwashing including the visual observations are recorded in the filter log book. f. Following backwashing there is a slow start system in operation with the filters being

	brought back online after a rest period of generally 1 to 2 hours. g. The backwashing is generally triggered on a timed basis but head loss can also trigger backwashing. All filter backwashing requires manual start up by the plant caretaker. h. There are currently no sand depth markers in the filter media.
5.	**Disinfection** a. Sodium hypochlorite is used for chlorination. Duty and standby pumps with auto changeover are present which operate on a flow proportional system with trim chasing (3rd pump). b. All pumps had calibration date stickers displayed. c. The residual chlorine level on the date of the audit was at the outlet from the reservoir was 0.69 mg/l. The target residual chlorine concentration at this location is 0.5 mg/l to 0.7 mg/l. d. Monitoring of chlorine level takes place in the sump prior to the reservoir and at the outlet from the reservoir. There is a low level chlorine alarm on the sump set at 0.40mg/l and a high level alarm at 2.0mg/l. On the outlet from the reservoir the low level alarm is set at 0.35mg/l and the high level is 1.0 mg/l. There is no automatic shut down in response to high or low chlorine levels.
6.	**Treated Water Storage and Distribution Network** a. The reservoir at the WTP is composed of two cells and is an above ground structure with earthern embankments extending up the side walls in places. The storage volume is 2,250m3 which provides approximately 6 hours storage. b. The reservoir is reported to have been last cleaned 6 years ago. c. The access hatches were locked and mesh was present on the vents. d. Monitoring of the residual chlorine levels in the network is undertaken in Innishannon Village, Upton, Crossbarry and at the Rising Sun. Due to the extent of the network other crews have responsibility for monitoring of the residual chlorine levels in the outlying areas (for example Kilbrittain and Kinsale). **e.** There are additional storage reservoirs provided at Ballinadee, Dunderrow, Kilgobbin, Ballinspittle, Corpse Cross, Kilbrittain and Garrettstown. The scheme is linked to but not currently supplying Carrigaline.
7.	**Monitoring and Sampling Programme for treated water** a. The audit and check monitoring results for 2016 were reviewed and were compliant. b. Monthly monitoring of Giardia and *Cryptosporidium* is undertaken on both the raw water and treated water. Since the detection of Giardia on 27/09/2016, neither *Cryptosporidium* or Giardia have been detected in the treated water in the monthly samples between October 2016 and January 2017.
8.	**Chemical storage and bunds** a. 2 no. alum dissolving tanks are housed indoors. Adequate bunds were present on the day tanks. There was no drip tray in place at the external fill point but the area is surfaced and the caretaker reports that there is no potential for spillage as the delivery line is blown out prior to being disconnected. b. Polyelectrolyte powder is stored on a pallet in the chemical dosing room adjacent to the mixing point. The 2 no. day tanks were adequately bunded. c. The bunded bulk storage sodium hypochlorite tank is located outside. The tank has a high level fill point and sodium hypochlorite is fed to the day tank from the base of the bulk storage tank. Bulk delivery takes place every 3 weeks and the delivery dockets are filed on site. d. A 10,000 litre fluorine bulk storage tank is located inside the fluorine store which is vented to the outside. e. Lime dosing is undertaken for final pH adjustment using 2.5% hydrated lime. The stock is stored on a pallet adjacent to the mixers in the lime dosing room.

9.	**Hygiene and Housekeeping** a. The site was maintained in a clean and tidy state with good signage.
10.	**Management and Control** a. The site is operated under 2 daily shifts by 2 no. full time caretakers with a third caretaker providing cover. b. The design capacity of the plant is reported to be between 1,100 and 1,200 m^3/hr. The plant is currently operating at a significantly lower production volume of 520m^3/hr to provide a total daily demand of 8,950m^3/d. Production at the plant is controlled by the water level in the reservoir. c. The SCADA system is available to view locally and countywide. The SCADA includes monitoring of alum pumps, filter turbidity, filtered water flow rate, chlorine level in sump pre reservoir, chlorine level after reservoir and reservoir outflow rate. 7 day and 1 day trend data is available to view.

3. AUDITORS COMMENTS

The audit found that the Innishannon WTP is being well operated by dedicated caretaking staff with good record keeping procedures.

No cause was identified for the presence of Giardia in the treated water on 27/09/16. There is no evidence that the treatment barriers at the plant have been compromised. There were no further detections of Giardia or *Cryptosporidium* in the treated water weekly sampling during October 2016 or the monthly monitoring between October 2016 and January 2017. The monthly monitoring for Giardia and *Cryptosporidium* is to continue for 2017.

Irish Water should take action to improve filter management, including the installation of a system of measuring filter media depth, and identifying when the filter media is due to be replaced. A reservoir inspection and cleaning programme should also be put in place.

The source protection awareness raising measures undertaken in the catchment by Cork County Council Environment Section are welcomed and have been very effective at reducing the raw water ammonia levels. In addition, the installation of the automatic shutdown facility at the plant intake when an ammonia concentration of 0.30 mg/l is exceeded has improved the security of the supply by allowing short-term ammonia spikes to pass downstream without compromising the performance of the water treatment plant.

4. RECOMMENDATIONS

Filtration

1. Irish Water should ensure that a filter media depth indicator is installed, or a procedure be put in place for regular measurement and recording of the depth of filter media present.
2. Irish Water should identify when the filter media in the rapid gravity filters is due to be replaced.

Treated Water Storage

3. Irish Water should ensure that a regular programme of reservoir inspection, cleaning and maintenance is in place, in accordance with EPA Drinking Water Advice Note No. 10.

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 Aoife Loughnane, 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:** 07/03/17