Drinking Water Audit Report

County:	Donegal	**Date of Audit:**	21 August 2014
Plant(s) visited:	Rosses Regional PWS (Crolly WTP)	**Date of issue of Audit Report:**	19 September 2014
		File Reference:	DW2013/88
		Auditors:	Ms Derval Devaney
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 Report on *The Provision and Quality of Drinking Water in Ireland.* • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. **The EPA was notified of THMs failures in the supply due to raw water quality characteristics and insufficient TOC removal at the plant and iron failures due to cast iron pipework in the distribution network. The report recommends that action is taken to ensure compliance with these parameters.**

ii. **The cause for the presence and carry-over of pin-floc to the filters should be investigated and measures put in place to optimise the clarification process.**

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. The Rosses Regional PWS has failed to meet the trihalometahanes and iron parametric values (as specified in Table B of Part 1 of the Schedule of the Regulations) and these matters were addressed during the audit. Where the text refers to the Water Service Authority this refers to Irish Water in accordance with Section 7 of the Water Services (No. 2) Act 2013.

This plant is operating since the 1950's and was expanded in 1978 and currently serves a population of 10,000 with a daily average water production of 4,329 m^3 (2013 figures). Current treatment includes abstraction and screening from Lough Keel and Lough Keel stream, pH adjustment, coagulation (3 No. clarifiers), filtration (6 No. rapid gravity filters), disinfection and pH correction prior to entry into the final water reservoirs. There are 8 (7 active) service reservoirs on the supply with appropriately 230 km of distribution mains.

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

The opening meeting commenced at 10am at Crolly Water Treatment Plant. 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: Jimmy O'Donnell, Caretaker; John O'Donnell, John Gallagher, Area Manager; Paul O'Donnell, Area Supervisor; Brendan Dempsey, Electrician; Danny Meehan, Hugh Connolly, Student, Hugh Kerr, Senior Technician; Patrick Gallagher, Laboratory; Martin Temple, Irish Water. Representing the Environmental Protection Agency: Derval Devaney, 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.	**Source Protection** a. The Lough Keel stream is main source of the supply which is abstracted close to the plant (at 165 m^3/hr – max capacity 180 m^3/hr). There are rotating mechanical screens at the streams intake point (see Photo 1) and the direct abstraction area was fenced to prohibit animal (e.g. sheep) access. b. The original source for the supply from Lough Keel is still in use with abstraction rate of 35 m3/hr (max. capacity is 45 m3/hr) which has a catchment that appears to have limited habitation and agricultural use (see Photo 2). Water is also piped from the lake to the Lough Keel stream and any overflow from the weir (see Photo 3a and 3b) from the lake also flows into this stream which is abstracted further downstream as outlined in Point 1 above. c. The stream is a flashy source and temperature fluctuates. The piped stream water flows by gravity to the raw water tank near the abstraction point and the lake source is piped directly to the plant. The combined flow to the plant, rises to the contact tank at 200 m^3/hr. The plant's capacity is 225 m^3/hr. d. The source in general has a low alkalinity, low turbidity, a pH of 5.9 and can have elevated colour. There is a turbidity meter on the raw water and it read 1.04 NTU on the day of the audit.
2.	**Coagulation, Flocculation and Clarification** a. The combined flow is dosed with soda ash at ~ 34 mg/l to adjust the pH and is then dosed with liquid ferric aluminium sulphate (Chemifloc 101) at ~ 150 mg/l prior to contact tank. Poly aluminium chloride, 0.1 % strength, is added (at ~ 0.186 mg/l) upon water exiting the contact tank approximately 5 minutes later (see Photo 4). b. Concern regarding the high cascade directly post addition of poly was expressed by the auditor and the possibility of any floc already formed breaking up due to the aggressive nature of the mixing this cascade induced (see Photo 5). c. There are 3 no. clarifiers (2 No. flat bottom installed in 1978 and 1 No. hopper bottom installed pre-1970). The flat bottom clarifiers have an upflow rate of 1.79 m rise / hr and the hopper bottom clarifier has an upflow rate of 0.44 m rise / hr. d. There are turbidity monitors on the combined clarified water from the clarifiers which read 0.63 NTU on the day of the audit. e. Pin floc was observed being carried over to the filters form the clarifiers. f. The sludge bleeds are sent to a lagoon on-site which is divided into 3 cells. One (middle) cell contains this sludge from the clarifiers, one contains backwash water which is pumped to the 3rd cell on the east side of the lagoon. Overflow from the cell with sludge also flows into the 3rd cell. Discharge from the 3rd cell enters the outlet chamber and is discharged to the nearby stream which is monitored downstream of the discharge (see Photo 6). The sludge that settles in the middle cell is transported off-site to Letterkenny Waste Water

	Treatment Plant for treatment.
3.	**Filtration** a. There are 6 No. rapid gravity filters four of which were installed with the upgrade to the plant in 1978. The four "new" filters have a filtration rate of 2.79 $m^3/m^2/hr$ and the two older filters have a filtration rate of 1.33 $m^3/m^2/hr$. The "old" and "new" filters are not interconnected. b. Backwash is carried out manually every 24 hours with air scouring for the first 4 minutes and then water for 8-10 minutes. c. The filters were refurbished in 2010 and sand was replaced to a depth of 750 mm. The water supplier stated that there is 650 mm of sand currently (100 mm of sand media was lost due to the shallow depth of the weir). d. Backwash was observed on Filter No. 3. During this time other filters in operation took the loading (Filters 1 and 2) but it was stated that the filters had the capacity to do so. e. Water from the treated water reservoir is fed to two tanks on-site to supply the backwash water for the "old" and "new" filters. f. Even air scour was evident during backwash however it appeared that an air valve wasn't closing during the wash cycle as bubbles were forming during the water cycle (see Photo 7). g. There is no slow start or run to waste on the filters, once backwash is complete the filters go directly back into service. h. There is a turbidity meter post each filter and on the day of the audit they ranged from 0.08NTU to 0.27 NTU (Filter 3 which had been backwashed read the highest at 0.27 NTU). The monitors on the filters are set to alarm at 0.5 NTU.
4.	**Chlorination and Disinfection** a. Disinfection is carried out using 14 -15% sodium hypochlorite. There is a duty & standby dosing arrangement in place which switches over automatically every 24 hours. The concentration of chlorine dose is proportionate to the readout from the online chlorine residual monitor (by 30%) and the flow (by 70%). b. Water is chlorinated prior to entry into one of 2 No. reservoirs on-site which has a total volume of 1,090 m^3. The contact time is 50.78 mg/min/l. There is chlorine process control monitor post the reservoir and another 0.5 mile into the network (at the chapel). Both monitors are linked to a dial out alarm with a cascade system in place for contacting relevant staff in the event of an alarm. c. The target chlorine residual in the final water at the plant is 1.4 mg/l. The residual chlorine on the day of the audit was 1.52 mg/l. The residual monitor at the chapel on the day of the audit was 1.48 mg/l. The chlorine residual low alarm is set at 1.2 mg/l at the headworks and 1.15 mg/l at the chapel. d. There are no chlorine booster stations on the network. e. Treated water is pH adjusted using soda ash post disinfection.
5.	**Monitoring and Sampling Programme for treated water** a. The final water turbidity monitor is set to alarm at 0.3 NTU. On the day of the audit the final water turbidity was 0.13 NTU and 0.1 NTU in the network at the chapel.
6.	**Exceedances of the Parametric Values** a. The EPA have an THMs file (DW2013/88) open for this supply as a result of audit samples failing the parametric value of 100 ug/l on 19/08/13 (132 ug/l) and on 10/07/14 (103 ug/l). It was stated during the audit that re-samples taken at the community hospital on 14/07/14 were 143 ug/l. It was stated that THMs form post the Meenbanad Reservoir which has 15 hours storage. It was also stated that the combination of the approximate 70 % TOC removal rate at the plant and raw water TOC of 10 mg/l has resulted in final water TOC becoming raised in the summer months of June to August. The elevated final water TOC appears to correspond with the periods of raised network THM levels being detected but this is being further investigated by the Water Supplier. It was stated that TOC removal to below 2 mg/l is a challenge for the plant. b. The EPA have an Iron file (DW 2009/174) due to iron failing the parametric value (PV) of 200 ug/l due to a cast iron mains network. Pipe replacement was carried out over past few

	years however there remains ~22km of cast iron mains in the network. The EPA await an update regarding funding and timeframe for removal of cast iron mains to ensure compliance with the Drinking Water Regulations PV for Iron.
7.	**Chemical storage and bunds** a. The diesel tank bund on-site did not appear to be adequate in containing the contents of the tank if there was an accident, spill or leak. b. The three bulk tanks for ferric aluminium sulphate (Chemifloc 101) are due to be tested for integrity.
8.	**Management and Control** a. Brenntag supply sodium hypochlorite drums to the plant for use as a disinfectant. The label of biocidal detergents is to contain all the relevant elements specified in Article 69 of the Biocidal Products Regulation (EU) No 528/2012 (e.g. the notification or approval number PCS 9xxxx or IE/BPA 7xxxx). The label did not appear to have such number displayed nor did it have an expiry date. Irish legislation requires that all biocides on the market in Ireland must as a first step be notified with DAFM. It is the responsibility of any company wishing to place a biocidal product on the market in Ireland to ensure that the product is notified in accordance with Statutory Instrument S.I. No. 625 of 2001. Further information can be found at http://www.pcs.agriculture.gov.ie/biocides.htm and by contacting the Pesticide Registration and Control Division at biocides@agriculture.gov.ie

3. AUDITORS COMMENTS

This supply was on the EPA's Remedial Action List for elevated turbidity but was removed in Q2, 2011 due to action taken to ensure compliance. The THMs failures became evident in 2013. There are two files open for this supply relating to THMs failures and iron failures. Action, as recommended below, should be taken to ensure compliance with these parametric values.

The bunds which surround the chemical storage tanks on-site should be tested for integrity and remedial works undertaken to ensure that they are fit for purpose.

4. RECOMMENDATIONS

Coagulation, Flocculation and Clarification

1. The Water Services Authority should carry out an investigation to identify the cause of floc carryover from the clarifier into the filters. In this regard the Water Services Authority shall consult Table 2 on Page 41 of the EPA publication "*Water Treatment Manual: Coagulation, Flocculation and Clarification*" and investigate the use and management of polyelectrolyte and pH correction in line with the designed plant's operating procedures. The cascade system in place post addition of poly should be investigated to ensure it does not result in the break-up of flow post clarification.

Filtration

2. Due to the loss of filter media since the filters were re-furbished, the Water Services Authority should ensure that the current depth of filter media at 650 mm is sufficient to ensure adequate filtration.

3. The Water Services Authority should ensure that air nozzles are fully functional and not blocked or damaged.

4. The Water Services Authority should ensure that, following backwashing, the filters are run to waste for an appropriate period of time or that there is a slow or delayed start when the filter is brought back into use.

Disinfection

5. The Water Services Authority should ensure that the disinfectant product used for the treatment of this water supply is notified to the Pesticide Registration and Control Division of DAFM in accordance with Statutory Instrument S.I. No. 625 of 2001. The label of biocidal detergents is to contain all the relevant elements specified in Article 69 of the Biocidal Products Regulation (EU) No 528/2012 which is to include the expiry date.

Exceedences of the Parametric Values

6. The Water Services Authority should submit information requested by email on 10/07/14 and as discussed during the audit regarding the open THMs file DW2013/88 (i.e. THMs network survey results, final TOC results, chlorine residual results, plans to improve TOC removal efficiency and an action programme to address the exceedance of the trihalomethane parametric value.

7. The Water Services Authority should submit information as discussed during the audit regarding the open iron file DW2009/174 (i.e. update on cast iron pipe replacement work and timeframe for removal) to ensure compliance with the iron parametric value.

Chemical Storage and Bunds

8. The Water Services Authority should review chemical storage arrangements at the treatment plant. Chemicals must be stored in bunded areas capable of containing at least 110% of the volume of chemicals stored therein. Refer to EPA guidance document –"*IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities*".

FOLLOW-UP ACTIONS REQUIRED BY IRISH WATER

During the audit the Water Services Authority representatives were advised of the audit findings and that action must be taken as a priority by the Water Services Authority to address the issues raised. This report has been reviewed and approved Mr Darragh Page, Drinking Water Team Leader.

The Water Services Authority 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: Derval Devaney **Date:** 19/9/14

Derval Devaney 19/09/14

Inspector

Photo 1 Water abstraction point from Lough Keel Stream

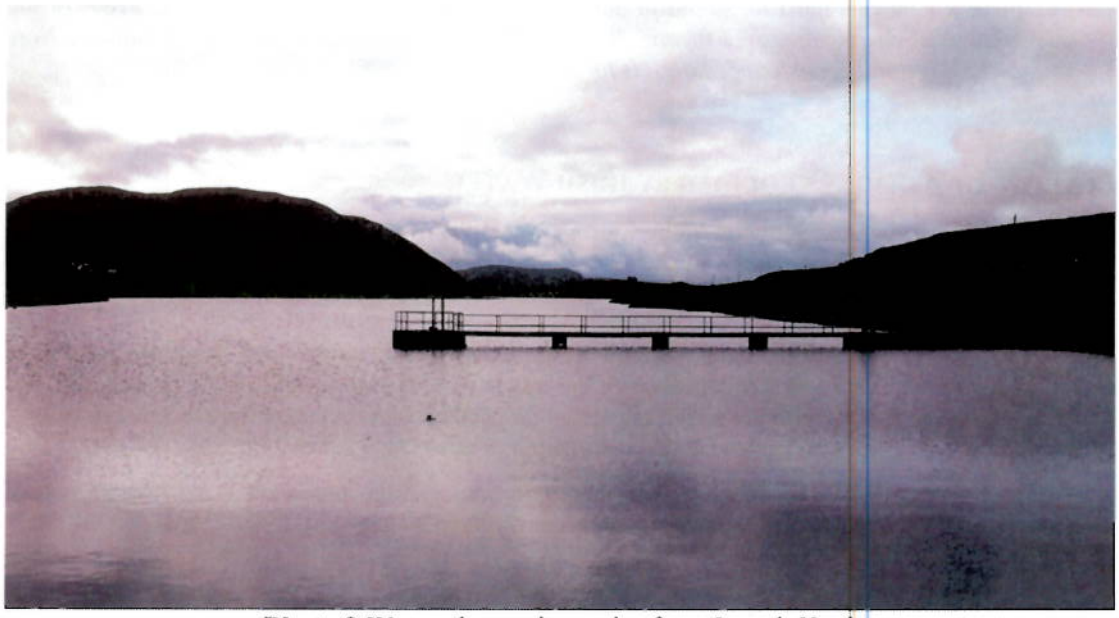

Photo 2 Water abstraction point from Lough Keel

Photo 3a Weir at Lough Keel, where overflow feeds Lough Keel stream

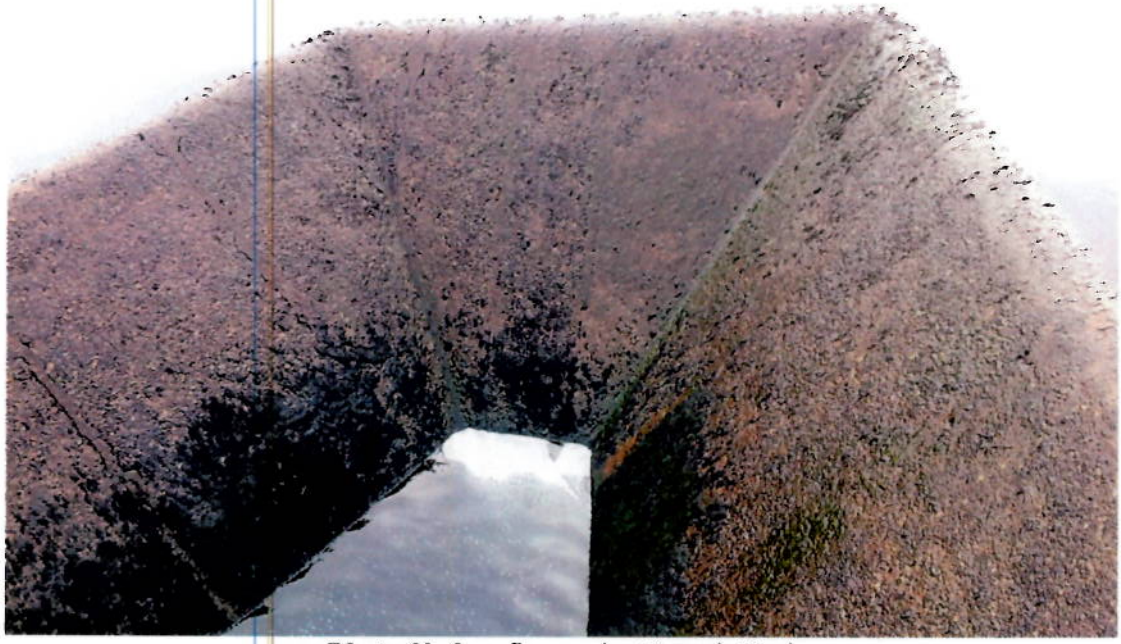

Photo 3b Overflow weir at Lough Keel

Photo 4 Poly being dosed in contact tank prior to clarifiers

Photo 5 Cascade post contact tank prior to entry to clarifiers

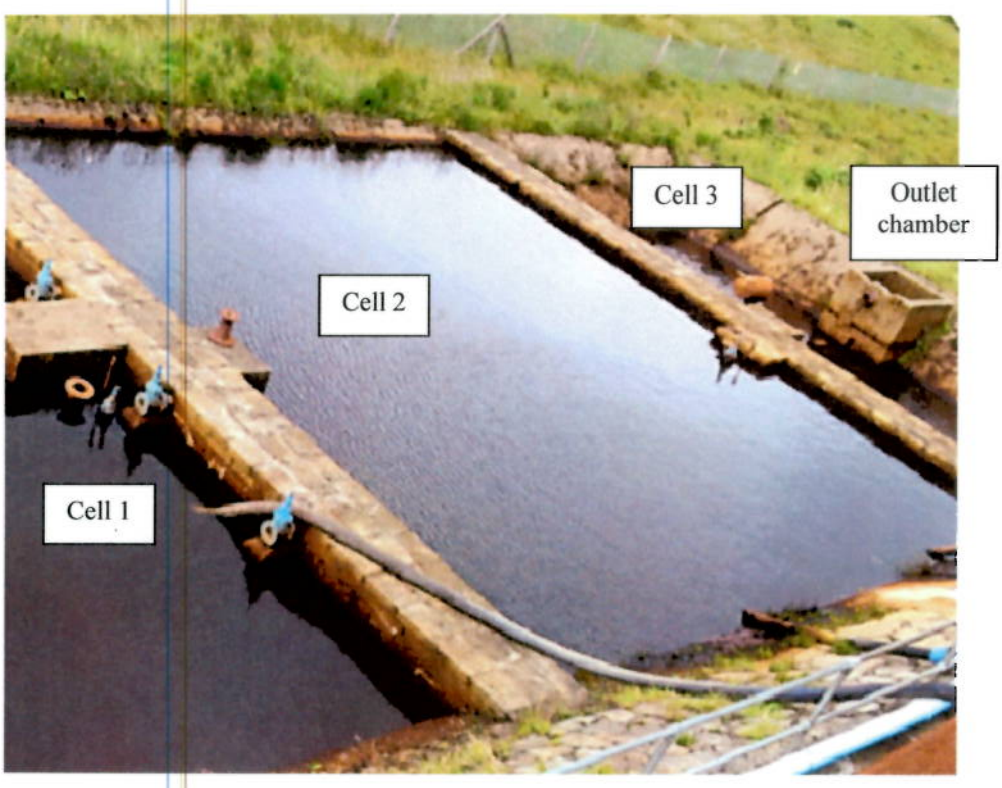

Photo 6 Cell 3 of lagoon receives backwater from Cell 1 and supernatant which overflows from Cell 2 (originating from sludge bleeds from clarifiers).

Photo 7 Air valve not fully closed giving rise to air bubbles during the wash water stage at backwash of Filter No. 3.