



# Drinking Water Audit Report

<b>County:</b>	Donegal	<b>Date of Audit:</b>	19 <sup>th</sup> January 2018
<b>Plant(s) visited:</b>	Lettermacaward Drinking Water Treatment Plant	<b>Date of issue of Audit Report:</b>	30 <sup>th</sup> January 2018
		<b>File Reference:</b>	DW2017/3 (DW2010/160 Portnoo- Narin PWS)
		<b>Auditors:</b>	Ms Derval Devaney
<b>Audit Criteria:</b>	<ul style="list-style-type: none"> <li>• The <i>European Union (Drinking Water) Regulations 2014, as amended.</i></li> <li>• <i>The EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7).</i></li> <li>• The recommendations specified in the <i>EPA Drinking Water Report.</i></li> <li>• EPA Drinking Water Advice Notes No's 1 to 15.</li> <li>• The recommendations from the previous audit report.</li> </ul>		

## MAIN FINDINGS

- i. An upgrade to the Lettermacaward Water Treatment plant was completed in September 2017 and the Portnoo-Narin PWS was replaced by Lettermacaward PWS in October 2017 to address the EPA's Direction issued in December 2014 regarding THMs non-compliance.
- ii. THMs monitoring results, taken since the plant was upgraded, were compliant with the Drinking Water Quality Regulations 2014, as amended.
- iii. The EPA awaits the THMs results taken during December 2017 before the supply can be removed from the EPA's Remedial Action List.
- iv. Further works are proposed by Irish Water under their Statement of Needs to improve the operation of the treatment plant and raise it to a Log-4 credit protozoal compliance treatment status.

## 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.

The Portnoo-Narin Public Water Supply (PWS) is on the EPA's Remedial Action List (RAL), as the supply has continuous Trihalomethanes (THMs) failures dating back to October 2010. The source of the supply was Lough Birroge with treatment consisting of filtration (via three slow sand filters) and chlorination. On the 20<sup>th</sup> of October 2017, the supply was replaced by Lettermacaward PWS. This audit was carried out to assess the performance of Irish Water in providing clean and wholesome drinking water and to determine progress with the EPA's Regulation 10(4) Direction issued to Irish Water on 11<sup>th</sup> December 2014 and subsequent Action Programme approved by the EPA on 11<sup>th</sup> February 2015 in accordance with Regulation 10(6) regarding compliance with the THMs parametric value in the Portnoo-Narin PWS.

The opening meeting commenced at approximately 10:40 am at the Lettermacaward 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:**

Yvonne McMonagle, Compliance; Kevin Love

**Representing Donegal County Council:**

Hugh Kerr, Chief Technician; Pat Gallagher; Paul McCloskey and Frankie Rodgers.

**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.*

<b>1.</b>	<p><b>Interim Solution</b></p> <ul style="list-style-type: none"> <li>a. The interim solution, as outlined in Irish Water's 2<sup>nd</sup> progress report dated 23<sup>rd</sup> December 2015, was to connect the Portnoo-Narin PWS to the Lettermacaward PWS and thereby making the Portnoo-Narin Water Treatment Plant redundant. The stated completion date in this progress report was by Q3, 2016. Irish Water stated that Portnoo-Narin PWS will be compliant for THMs once the plant is replaced by the Lettermacaward PWS.</li> <li>b. Irish Water proposed to install tube settlers at the Lettermacaward WTP by Q2, 2016 to provide the extra capacity required to allow the Portnoo-Nairn supply to be connected.</li> <li>c. In accordance with Regulation 10(6), the Action Programme submitted by Irish Water dated 30<sup>th</sup> January 2015 was amended and approved by the EPA on 11<sup>th</sup> February 2015 and directed Irish Water to complete the proposed upgrade works to ensure compliance with the THMs parametric value in the Portnoo-Narin PWS as soon as possible but no later than 11<sup>th</sup> February 2017.</li> <li>d. During the EPA's meeting with Irish Water on 6<sup>th</sup> March 2017, Irish Water stated that progress with pipe laying was slow due to encountering rock and 500 m of the 4.5 km interconnection to Lettermacaward PWS was complete at that time.</li> <li>e. This audit found that the tube settlers were installed in Lettermacaward WTP in September 2017 and pipe laying works were also completed at this stage. Filter media and nozzles were also replaced as part of this upgrade. The Portnoo-Narin PWS was replaced with the Lettermacaward PWS on 20<sup>th</sup> October 2017.</li> </ul>
<b>2.</b>	<p><b>Long-term Solution</b></p> <p>The long-term solution as outlined in the approved Irish Water Action Programme dated 11<sup>th</sup> February 2015 included:</p> <ul style="list-style-type: none"> <li>a. A doubling of the Lettermacaward WTP capacity to 2.8 MLD;</li> <li>b. Impoundment of Derkmore Lough to increase safe yield;</li> <li>c. Approx. 4 km of new pipework to supply Portnoo from Lettermacaward allowing the existing Portnoo WTP to be decommissioned.</li> </ul> <p>In accordance with Regulation 10(6), the Action Programme submitted by Irish Water dated 30<sup>th</sup> January 2015 was amended and approved by the EPA on 11<sup>th</sup> February 2015 and directed Irish Water to complete the proposed upgrade works to ensure compliance with the THMs parametric value in the Portnoo-Narin PWS as soon as possible but no later than 11<sup>th</sup> February 2017.</p> <p>Irish Water's progress report dated 31<sup>st</sup> October 2017 states the long-term works, as set out in items a. and b. above will be complete by 2021 as part of a rationalisation plan.</p> <p>Irish Water stated during the audit that the interim works were put in place to address the THMs issue</p>

	<p>in Portnoo-Narin PWS and the long-term plan is at planning stage. Further THMs monitoring in the previous Portnoo-Narin PWS network area was undertaken in December 2017 and Irish Water awaits the results which will be submitted to the EPA as soon as they are received. Irish Water, upon receipt of satisfactory results, are requesting that the Portnoo-Narin PWS is removed from the EPA's Remedial Action List (RAL).</p>
<p><b>3.</b></p>	<p><b>Treatment</b></p> <ol style="list-style-type: none"> <li>a. The raw water is sourced from Lough Derkmore at a rate of 1,735 m<sup>3</sup>/day (85 m<sup>3</sup>/hr). It was stated that colour can be elevated to 200 Hazen. Raw water samples are taken and recorded daily for colour, pH and turbidity. There are online turbidity and UVT monitors on the raw water. The turbidity monitor was reading 0.65 NTU and the UVT monitor was reading 38.38 %.</li> <li>b. The alkalinity of the raw water is low so sodium carbonate (soda ash) is dosed in-line upon entering the plant and achieve a target pH of 6.7. Kibble alum is then dosed in-line and mixed with a static mixer. Poly Magnafloc LT25 is dosed at a weir to aid mixing and flocculation. There is one sedimentation tank. Sludge bleeds were also upgraded and run every 15 minutes for 36 seconds on a timer. No pin floc was observed on the clarifier. The settled water turbidity monitor was reading 0.68 NTU.</li> <li>c. There are two rapid gravity filters and each have head loss meters and turbidity monitors. Filter No. 1 had a turbidity reading of 0.39 NTU And Filter No. 2 had a turbidity of 0.27 NTU. There is no alarm on these turbidity monitors. Backwashing of the filters is manually activated and occurs daily but is alternated so that each filter gets backwashed every second day. Air scour runs for 3 minutes and water for 10-15 minutes depending on the visual observations during the process. A siphon was installed on each filter to extract additional water from the filter during backwash to avoid the loss of filter media over the weir wall during the backwash phase.</li> <li>d. Irish Water reported that the practice of water bypassing the filter and running incoming water to waste during the backwash of that filter continues, to prevent overloading of the filter that remains in operation during the backwash process. This water is discharged directly, without further treatment, to the adjacent river. Irish Water stated that it plans to install sludge treatment facilities at this plant as part of the long-term upgrade proposed.</li> <li>e. Once the filters are brought back into service, the filtered water is not run to waste nor is there a slow start on the filters. Irish Water stated that it plans, as part of the long-term upgrade, to include a run to waste facility on the filters after backwash.</li> <li>f. A backwash was observed on Filter No. 2 and an even spread of air and water scour was observed.</li> <li>g. Disinfection is achieved at the plant using Sodium Hypochlorite (14/15%).</li> <li>h. There are two chlorine dosing pumps at the plant one on duty and one on standby which are automated to change over every 24 hours and dose is linked to the chlorine monitor. Sodium hypochlorite, fluoride and sodium carbonate are dosed in-line post the filters. The target pH of the final water is 7.5. There is no on-line final water monitor for pH. Instead, pH is manually tested daily by the caretaker. There is a chlorine residual monitor on the final treated water in the clearwater sump which is alarmed at 5 mg/l and 1.2 mg/l and is linked to the dosing pump. The chlorine monitor for the sump was reading 1.83 mg/l on the day of the audit and 1.06 mg/l on the chlorine monitor sampling the outlet from the reservoir. Chlorine residuals are monitored weekly in the network and were reviewed during the audit and deemed satisfactory and above 0.1 mg/l.</li> <li>i. The final water turbidity monitor was 0.18 NTU during the audit. The monitor is not alarmed. The UVT monitor on the final water was reading 81.88 %.</li> <li>j. The clearwater sump on-site is the source for backwash water and during the EPA's previously audit its inspection point was observed to be flush with the ground. This inspection point is now protected with a lip to prevent ingress of contaminated material.</li> <li>k. There is a 1,100 m<sup>3</sup> covered final water reservoir on site which has two cells. There are locks on the inspection points and meshes on the vents. One cell was cleaned one week ago and it is planned to clean the remaining cell shortly.</li> <li>l. The only alarms on the plants processes are the final water chlorine concentrations and high and low water levels in the reservoir.</li> </ol>

	<p>m. Irish water stated that as part of the Statement of Needs process it is proposed to (a) install alarms on the turbidity and pH monitors, (b) have criteria setting out when to bring the filters back into service after a backwash, (c) ensure duty and standby pumps are operating automatically, (d) automate the backwash process with a run to waste facility post the backwashing of the filters and (e) change from kibbled alum to liquid alum, etc.</p>
<b>4.</b>	<p><b>Monitoring and Sampling Programme for Treated Water</b></p> <p>a. The average flow through the plant was 1,450 m<sup>3</sup>/day and this has increased to 1,735 m<sup>3</sup>/day since Lettermacaward connected to the Portnoo-Narin PWS network. It is estimated that the population served is now 4,498 persons based on the number of connections. EDEN will need to be updated to reflect the change in population and volume. This increase may also change the number of compliance samples required for 2018.</p> <p>b. Irish Water's compliance maps show that samples continue to be taken in the old Portnoo-Narin PWS network as well as those in the Lettermacaward PWS network, however, the samples appear to be clustered and not evenly spread throughout the water supply zone to include the ends of the network.</p> <p>c. In the past, THMs levels in Portnoo-Narin PWS persistently failed to comply with the parametric value of 100 µg/l as set out in the <i>European Union (Drinking Water) Regulations 2014, as amended</i>.</p> <p>d. THMs are monitored monthly by Irish Water and the most recent results reported for 2017 since the supply was connected to Lettermacaward PWS are compliant with the THMs parametric value. The values reported are 98 µg/l and 82 µg/l on 03/11/17 and 75 µg/l on 27/11/17.</p> <p>e. Irish Water stated it has undertaken further THMs monitoring in the network during December 2017 and is awaiting these results.</p>
<b>5.</b>	<p><b>Chemical storage and bunds</b></p> <p>a. The 25 litre drum used to fill the chlorine day tank should be banded to contain any spills. All other drums in storage were banded.</p>
<b>6.</b>	<p><b>Management and Control</b></p> <p>a. Unidirectional flushing is carried out twice per year by the caretaker. Scouring records were available to view during the audit. There are no cast iron mains in the network, all are PVC material.</p>
<b>7.</b>	<p><b>Sludge Management</b></p> <p>a. The discharge of water treatment sludge to receiving water continues. Irish Water stated that it plans to install sludge treatment facilities at this plant as part of the long-term upgrade proposed.</p>

### 3. AUDITORS COMMENTS

The EPA issued a Direction to Irish Water on 11<sup>th</sup> December 2014 requesting it to submit an Action Programme to address the persistent THMs failures in the Portnoo-Narin PWS.

In accordance with Regulation 10(6), the Action Programme submitted by Irish Water dated 30<sup>th</sup> January 2015 was amended and approved by the EPA on 11<sup>th</sup> February 2015 and directed Irish Water to complete the proposed upgrade works to ensure compliance with the THMs parametric value in the Portnoo-Narin PWS as soon as possible but no later than 11<sup>th</sup> February 2017.

The audit has confirmed that the Portnoo-Narin PWS was replaced by the Lettermacaward PWS on 20<sup>th</sup> October 2017 and while the completion date has gone beyond the Direction deadline of 11<sup>th</sup> February 2017, the THMs results for November 2017 were compliant in the network. Further THMs results are due to be submitted to the EPA to verify the success of the replacement plant in providing compliant water quality to consumers in Portnoo-Narin.

The Lettermacaward water treatment plant is being well managed and well operated and it is recognised that the raw water quality's changing conditions is challenging to treat. While jar testing is routinely completed on-site it is recommended that the raw water and settled water is monitored online so that chemical dosage can be automated to some degree to respond to any changes in the raw water quality as they occur. Therefore, it is recommended that additional works required are put in place to further improve the treatment process. Irish Water's Statement of Needs should address these matters and will give rise to a greater control of the plants processes.

#### **4. RECOMMENDATIONS**

##### **Monitoring and Sampling Programmes for Treated Water**

1. Irish Water should submit the THMs results for December 2017 to verify the upgrade of the plant was successful and to enable the EPA to determine if the Portnoo-Narin public water supply can be removed from the EPA's Remedial Action List. Irish Water should continue to monitor for THMs monthly in the network of Lettermacaward and Portnoo-Narin area and submit these results to the EPA as part of the Q1 2018 tracker response. Please indicate in the monitoring submission which samples relate to the Portnoo area and which relate to the Lettermacaward area.
2. Irish Water should ensure that compliance sampling locations are evenly spread throughout the water supply zone, and include the ends of the network.
3. Irish Water should update EDEN to reflect the change in population and volume now being served by the Lettermacaward public water supply and assess if additional compliance samples are required to be taken on this supply.

##### **Management and Control**

4. Irish Water should implement those items identified in the Statement of Needs, and discussed during the audit, to further improve and automate the treatment plant processes to bring about greater operational control. For example, Irish Water should ensure the continuous turbidity monitors on each filter and the final treated water at the water treatment plant generates an alarm in the event of a deviation from the acceptable operating range of the filters. There should also be a pH meter on the final water which is alarmed.
5. Irish Water should arrange to clean the second cell (Cell 2) of the on-site reservoir.

##### **Coagulation, Flocculation and Clarification**

6. Irish Water should:
  - (a) Carry out a THMs formation potential (THMFP) study for the Lettermacaward WTP. In doing so Irish Water is requested to monitor the raw water for TOC and alkalinity and final water for TOC and 24 hours' post chlorination for free Chlorine, Bromodichloromethane, Bromoform Dibromochloromethane, Chloroform and Trihalomethanes - Total and from this data calculate the Actual TOC Removal Percentage. Please also submit this information to the EPA once complete. This information would demonstrate that the likelihood of THM formation has been addressed by the works carried out at the Lettermacaward WTP; and
  - (b) Carry out jar tests as outlined in Section 3.3.1 and Appendix C of the EPA Water Treatment Manual: Coagulation, Flocculation and Clarification to determine the optimum chemical conditions in terms of coagulant dose and pH for treatment of the water concerned. The results of the jar tests should be used for control of the treatment plant. Irish Water should ensure that there is only one variable during each run of jar tests to determine the optimum dose.
7. Irish Water should investigate the feasibility of introducing online monitors on the raw water and an automated pH correction system to aid the coagulation process so that treatment processes respond more readily to sudden changes in raw water conditions to achieve the optimum coagulation dose and pH.

### **Filtration**

8. Irish Water should follow the guidance as specified in the EPA publication “*Water Treatment Manual on Filtration*” and in particular the following action is required:
  - i. Generate criteria for backwashing a filter. Irish Water should utilise the monitoring results to ensure that the filter is backwashed when a predetermined turbidity level is exceeded, when a predetermined head loss is exceeded or a time period is exceeded.
  - ii. Ensure that, following backwashing, the filters are run to waste for an appropriate period of time or that there is a slow start when the filter is brought back into use; and
  - iii. Review the operation of the filters to ensure that the levels of turbidity in the filtered water are as low as possible and no greater than 0.5 NTU. If the plant is a high-risk *Cryptosporidium* plant then the turbidity of the filtered water should not exceed 0.2 NTU.

### **Chemical Storage and Bunds**

9. Irish Water should review chemical storage arrangements at the treatment plant. Chemicals must be stored in banded areas capable of containing at least 110% of the volume of chemicals stored therein. Fill points for storage tanks inside the bunds should be within the banded area. Refer to EPA guidance document – “*IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities*”.

### **Sludge Management**

10. 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, as amended*. The discharge of water treatment sludge to receiving water, where practiced, should cease immediately.

## **FOLLOW-UP ACTIONS REQUIRED BY IRISH WATER**

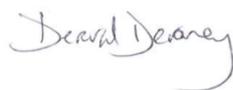
During the audit, Irish Water representatives were advised of the audit findings and that action must be taken as a priority by Irish Water to address the issues raised. This report has been reviewed and approved by Aoife Loughnane, Drinking Water Team Leader.

Irish Water is recommended to put such measures in place as are necessary to implement the recommendations listed in this report. Irish Water should submit a report to the Agency by the 28<sup>th</sup> February 2018 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:**



**Date:**

Derval Devaney  
Inspector

30<sup>th</sup> January 2018