Drinking Water Audit Report

County:	Galway County Council	**Date of Audit:**	28th July 2015
Plant(s) visited:	Letterfrack Water Treatment Plant	**Date of issue of Audit Report:**	4th August 2015
		File Reference:	DW2015/105
		Auditors:	Mr Darragh Page Ms Aoife Loughnane
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*. • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. **There is poor control over chemical dosing at Letterfrack WTP and a lack of understanding about how the plant should be operated. The main operational issues include:**
   a. **A fixed coagulant dose regardless of fluctuations in raw water quality,**
   b. **No routine jar testing to determine the optimum coagulant dose, and**
   c. **No monitoring of the treated water for aluminium.**

ii. **Galway County Council stated that the plant had been performing well prior to the incident, however, a review of the SCADA data 2015 to date for pH and chlorine residual clearly indicated problems in maintaining a stable coagulation pH and a stable chlorine residual.**

iii. **Irish Water must ensure that clear documented incident response and escalation procedures are prepared and implemented in County Galway, with roles and responsibilities assigned to individuals, so that incidents are dealt with in a timely manner and there is no delay in internal and external communications.**

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 in response to the notifications by Irish Water dated 3rd and 8th July 2015 of the failure to meet the aluminium and pH parametric values (as specified in Table C of Part 1 of the Schedule of the Regulations) in the Letterfrack PWS. Letterfrack water treatment plant has been shut-down since 2nd July 2015 due to issues with the chemical dosing arrangements, and water was being supplied to the area from Tully-Tullycross PWS at the time of the audit.

Letterfrack water treatment plant has a treatment capacity of 7.5 m^3/hr and serves a population of 238. The plant was commissioned in 2012. Treatment consists of dissolved air flotation and filtration (DAFF) and disinfection by UV treatment and chlorination.

The opening meeting commenced at 1:30 pm at Letterfrack 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:

Anne Bonner, Drinking Water Compliance Specialist, Irish Water
Shay Welsh, Engineer, O&M, Irish Water
Martin Lavelle, Senior Engineer, Galway County Council
Jim O'Connell, Water Services Supervisor, Galway County Council
Tony Kelly, Senior Executive Engineer, Galway County Council
Tina Ryan, Executive Scientist, Galway County Council
Dave Regan, Caretaker, Galway County Council

Representing the Health Service Executive:

Dr. Emer O'Connell, Consultant in Public Health Medicine
Niamh O'Callaghan, Public Health Registrar
Katherine Harkin, Public Health Registrar

Representing the Environmental Protection Agency:

Darragh Page, Senior Inspector, EPA
Aoife Loughnane, Inspector, EPA

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 water supply source is a bog hole located on the slopes of Diamond Hill in Connemara National Park. The source was not visited as part of this audit. The auditors viewed photographs of the source taken by Irish Water personnel. b. Raw water quality is high in TOC, low in alkalinity, with large variations in colour and turbidity. Galway County Council representatives stated that the design of the treatment plant was based on an insufficient raw water sampling regime and as a result, the plant cannot cope with fluctuations in raw water quality. c. The inlet pipe to the treatment plant recently became blocked due to the build-up of organic matter, which caused the raw water flow to decrease.
2.	**DAFF - Coagulation, Flocculation, Clarification & Filtration** a. Caustic soda (pH adjustment) and aluminium sulphate (coagulant) are dosed into the raw water pipe prior to the DAFF unit. b. The caustic dose is automated to ensure the optimum DAFF pH is 6.2 to 6.5. A recent leak in the caustic pump meant it was not delivering the full dose. This leak has now been

	repaired. c. The aluminium sulphate dose rate is fixed (flow proportional) at 85 to 90 mg/l based on EPS jar testing carried out during plant commissioning in 2012. There is no routine jar testing carried out at the plant to determine the optimum coagulant dose in response to variations in raw water quality. The dose is not adjusted when raw water quality varies.
3.	**Disinfection – UV & Chlorination** a. The filtered water is disinfected using UV and sodium hypochlorite. b. The UV system is a single unit, validated at 8 m^3/hr to 82% UVT. There is no standby UV unit in the event of failure of the duty unit or if the unit is undergoing maintenance. c. Following UV treatment, the water undergoes chlorination using sodium hypochlorite. d. The target chlorine residual leaving the plant is 0.2 to 0.3 mg/l.
4.	**Monitoring and Sampling Programme for treated water** a. Prior to this incident, there was no operational monitoring of the treated water at the plant for aluminium.
5.	**Exceedances of the Parametric Values** a. On 3rd & 8th July 2015, Irish Water notified the EPA of the following exceedances of the drinking water standards in Letterfrack PWS: • 2,200 µg/l aluminium (versus parametric value of 200 µg/l) in an audit sample taken on 15th June 2015. • A pH of 5 (versus parametric value range of 6.5 to 9.5 pH units) in a check sample taken from the distribution network on 1st July 2015. b. Irish Water stated that the incident was caused by variable raw water, lower inlet flow (due to blocked pipe), chemical pump malfunction, problems with chemical dose control (unable to maintain stable pH), critical alarms being inactivated, and the plant shut-down system being disabled. All these operational issues occurred at the same time. c. On 2nd July 2015, Letterfrack WTP was shut-down and the supply was switched to Tully-Tullycross PWS. d. Irish Water is investigating the issues at Letterfrack WTP and undertaking remedial works followed by a 3 day process proving period before the plant can be brought back into supply. e. On the day of the audit, the plant was operational but was being run to waste.
6.	**Management and Control** a. Letterfrack WTP has been shut-down since 2nd July 2015 as Irish Water investigate and carry out remedial works to the chemical dosing arrangements at the plant. On the day of the audit, the aluminium residual had still not stabilised and did not meet the 200 µg/l parametric value in the Drinking Water Regulations. b. EPS visit the plant every 3 months to check and service instruments. c. The plant caretaker does not have access to the SCADA system at the plant. d. SCADA screenshots of plant operational monitoring data for the period 1st January to 29th July 2015 were submitted to the EPA following the audit. The SCADA data shows the following; • UVT dropped below the validated range (82%) at the end of June and early July. • Raw water turbidity spiked at > 5 NTU in June and July. • Cyclical pH spikes in the treated water corresponded (in the range of 6.5 to 8.0) to instances of low chlorine residuals leaving the plant (between 0.2 and 0.4 mg/l). These observations could not be explained by Galway County Council or Irish Water and indicate poor operational control over the treatment processes and the risk of inadequately disinfected water entering the distribution network.

3. AUDITORS COMMENTS

The audit found that there are significant operational issues at Letterfrack water treatment plant. The main issues identified include:

1. Poor control over the chemical dosing including fixed coagulant dose and no routine jar testing to determine the optimum coagulant dose.
2. Inadequate checks on the performance of the chemical dosing including no monitoring of the treated water for aluminium and GCC overlooking the fluctuating pH in the final water.
3. Key performance data of the plant being overlooked including regularly drops in residual chlorine levels.
4. The absence of documented procedures for dealing with alarms at the plant and the absence of clear criteria outlining when they should be escalated internally and externally.

It was of concern that Galway County Council indicated that some of these poor practices (e.g. the lack of monitoring for aluminium in plants using aluminium as a coagulant) are commonplace in Galway. In particular, Galway County Council or Irish Water could not reassure the EPA that similar problems were not present in other plants in Galway.

Irish Water need to ensure that personnel operating water treatment plants are adequate trained and aware of the key performance indicators at each plant that are critical to the supply of safe and secure drinking water.

4. RECOMMENDATIONS

Management and Control

1. Irish Water should replace the Letterfrack supply with an alternative supply of water or implement recommendations 2 to 12 of this audit report.

2. Irish Water should prepare, submit and implement a documented procedure for the communication and escalation of incidents affecting drinking water supplies in County Galway. The procedure should cover the responsibilities and criteria where it is necessary to consult with the Health Service Executive to determine whether there is a potential danger to human health.

3. Irish Water should review the performance of the disinfection systems at all plants in Galway and identify whether there are any other plants operating UV treatment systems outside their validated range or supplying water with inadequate levels of chlorine.

4. Irish Water should ensure that caretakers and/or plant operators have full access to the data pertaining to the performance of the plant. Specifically, access should be provided to raw and treated water quality trends.

5. Irish Water should carry out a review of all water treatment plants in Galway and ensure that adequate incident response procedures are in place and that there is appropriate communication such that incidents are escalated where necessary.

Coagulation

6. Irish Water should ensure that the coagulation / flocculation processes at the treatment plant are regularly inspected. Irish Water should implement routine jar testing of the raw and coagulated waters as outlined in Section 3.3.1 and Appendix C of the EPA publication "*Water Treatment Manual: Coagulation, Flocculation and Clarification*" to determine the optimum chemical coagulant dose and pH for the treatment of the water. The frequency of checks

should be appropriate to the nature of supply and changing condition. Results should be recorded and used for control of the treatment plant.

7. Irish Water should commence a programme of operational monitoring of the treated water for aluminium. The results should be recorded.

8. Irish Water should investigate the setting up of automated coagulant dosing controls at the water treatment plant, having regard to *EPA Drinking Water Advice Note No. 15: Optimisation of Chemical Coagulation Dosing at Water Treatment Works* available online at http://www.epa.ie/pubs/advice/drinkingwater/dwadvicenote15.html.

9. Irish Water should review the reasons behind the fluctuations in the pH and ensure that pH is maintained at optimum levels necessary for coagulation.

Disinfection

10. Irish Water should ensure that the UV disinfection system operates within its validated range at all times.

11. Irish Water should ensure that there are duty and standby UV disinfection arrangements with automatic changeover in the event of failure of one of the UV disinfection units.

12. Irish Water should ensure that the continuous UVI or UVT monitor is alarmed and linked to a recording device to ensure that any deviation of the quality of water outside the validated range for the UV treatment system or a failure of the UV disinfection system is immediately detected.

13. Irish Water should review the reasons behind the fluctuations in the residual chlorine and ensure that residual chlorine is maintained at optimum levels necessary for disinfection.

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.

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:  **Date:** 4th August 2015

Darragh Page

Inspector