Drinking Water Audit Report

County:	Kildare	**Date of Audit:**	8th January 2015
Plant(s) visited:	Srowland Water Treatment Plant	**Date of issue of Audit Report:**	14th January 2015
		File Reference:	DW2014/389
		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 Report on *The Provision and Quality of Drinking Water in Ireland*. • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. **An operational problem with the water conditioning plant (Actisoft™ developed by Veolia Water Technologies) occurred on 5th December 2014. Operator error led to five critical warnings or alarms being ignored at the plant which resulted in drinking water with elevated levels of aluminium being supplied to consumers. Irish Water should review operations at the plant and ensure that similar incidents do not occur at this or other plants.**

ii. **Some alarm settings were found to be set at inappropriate levels. Critical alarm settings at the plant should be reviewed to ensure that the alarms provide the necessary forewarning to the plant operators.**

iii. **There appeared to be poor liaison between the various stakeholders regarding the catchment and protection of the drinking water source. Neither Irish Water, Kildare County Council (Water Section) or Veolia were aware of the hazards to water quality in the catchment or of any works that had been done to assess or reduce risks. Irish Water should ensure that all relevant stakeholders are aware of the risks in the catchment and of the mitigation measures in place to deal with such risks.**

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 notification by Irish Water dated 12th December 2014 of the failure to meet the aluminium parametric value (as specified in Table C of Part 1 of the Schedule of the Regulations) in the Barrow Supply.

The Barrow Public Water Supply is a relatively new water supply zone which commenced operating in August 2013 with the Actisoft™ plant commencing operation at the start of November 2014. Treatment consists of an Actisoft™ treatment unit (for hardness removal), an Actiflo® clarifier followed by rapid gravity filtration through dual media (anthracite and sand), pH correction (CO_2

towers), UV and chlorination. The plant is designed to treat up to 38,400 m^3/d but is currently treating around 750 m^3/hr.

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

The opening meeting commenced at 10.00 am at the Srowland 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: (* indicates that person was also present for the closing meeting)

Ms. Catherine Corrigan, Plant Manager, VWI*
Mr. Matt Kelly, Operations Director, VWI*
Mr. Lorcan Brennan, Executive Engineer, Kildare County Council
Mr. Ibrahim Baryouk, Senior Executive Engineer, Kildare County Council
Ms. Eileen Loughman, Principal Environmental Health Officer, Health Service Executive*
Mr. John Leamy, Compliance Specialist, Irish Water*
Ms. Grainne Carey, Compliance Analyst, Irish Water*
Ms. Alice O'Sullivan, DBO O&M Lead, Irish Water*

Representing the Environmental Protection Agency:

Mr. Darragh Page, Inspector
Ms. Aoife Loughnane, Inspector
Ms. Aoife Crowe, Commission for Energy Regulation (observer)
Mr. Daniel Kennedy, Commission for Energy Regulation (observer)

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 source of the supply is the Barrow River. Raw water is abstracted and stored in 2 no. bankside storage reservoirs which have up to 3 days storage. b. There is agricultural land immediately adjacent to the water abstraction but neither Irish Water, Kildare County Council or Veolia were able to confirm whether the Good Agricultural Practice Regulations were being complied with the in the vicinity of the abstraction point. c. The nearest wastewater treatment plant is Monasterevin WWTP, located greater than 10 km upstream of the abstraction point. No assessment of the potential impact of the discharge from this plant was available during the audit and no protocol was in place in the event of an incident at Monasterevin WWTP. d. During the audit, it was stated that the catchment work was the responsibility of the Environment Section of Kildare County Council. On the day of the audit, neither Irish Water, the Water Section of Kildare County Council nor Veolia were aware of any of the source protection work done in the catchment. e. There is online monitoring of raw water quality for nitrate, conductivity, ammonium, pH and dissolved oxygen. The alarm for the ammonium monitor was set at 3 mg/l at the time of the audit which the auditors pointed out was too high as there would be an impact on the treatment plant at levels lower than this. The operator changed the high ammonium alarm to 1 mg/l during the audit.
2.	**Water Conditioning (Actisoft™ Plant)** a. The source water from the Barrow has a hardness of around 320 ppm. This is considerably

	harder than the Poulaphouca source which it replaced. As a result a portion of the water (75%) is softened and mixed with unsoftened water (25%) to produce a final hardness of around 200 ppm. b. The Actisoft™ system consists of dosing with calcium carbonate to raise the pH to 11 and then the addition of ferric chloride. The water then enters a clarification chamber where the hardness is reduced. The pH of the water coming out of the Actisoft™ treatment plant is 9.5. This is then mixed with the raw water and treated in the Actiflo® clarifier. c. The cause of the incident was related to the operation and management of the Actisoft™ plant. This is outlined in more detail in the "Exceedances of the Parametric Value" section of this audit report. d. The Actisoft™ plant commenced operation in late October/early November 2014 and was turned off on 12th December 2014 as a result of the incident. It has not been brought back into use since and it is not planned to bring this back into service until the issue that caused the incident is resolved (estimated February 2015).
3.	**Coagulation, Flocculation and Clarification (Actiflo®)** a. It is intended that softened water from the Actisoft™ treatment unit will be mixed with raw water prior to clarification. Since 12th December 2014, only raw water has been entering the Actiflo®. b. The raw water is dosed with sulphuric acid (40 mg/l), aluminium sulphate (18 mg/l as Al) and polyelectrolytes (AN905) (0.25 mg/l). Veolia stated that the chemical dosing rates are altered when the raw water changes but this had not been automated at the time of the audit as further data is being gathered prior to the development of an algorithm for dosing.
4.	**Filtration** a. Clarified water is filtered in rapid gravity filters consisting of dual media, anthracite (2.5 m) and sand (0.5 m). b. The filters are backwashed on turbidity (1.0 NTU), loss of head (2.7 m) or time (24 hours). Veolia stated that it is almost always done on time as the turbidity and headloss do not reach the trigger levels before 24 hours is up. c. A backwash cycle was observed and there appeared to be no issues. d. Following backwashing the filters are run to waste for approx. 15 mins until the water quality improves. e. The filtered water is then passed through CO_2 towers to correct the pH.
5.	**Chlorination and Disinfection** a. The filtered water is disinfected with UV and sodium hypochlorite. There is also the facility to dechlorinate should it be required. b. The UV unit is a Wedeco SO 13599 which is validated according to the Austrian Standard. It is validated to operate within the range of 20 – 200 W/m^2. The validation cert was not available during the audit but was forwarded subsequent to the audit. Irish Water confirmed that the UV unit is operated within the range of 30-60W/m^2 (UV intensity). A screenshot was provided of the 11/12th January 2014 which confirmed that the UVI was averaging 37 W/m^2. c. The chlorination system was assessed and meets the recommendations of EPA Advice Note No. 3 – E. coli in Drinking Water available at http://www.epa.ie/pubs/advice/drinkingwater/epadrinkingwateradvicenoteadvicenoteno3.html.
6.	**Treated Water Storage** a. Treated water is stored in a baffled clear water tank on site. There is adequate CT before water is pumped to the reservoirs.

7.	**Monitoring and Sampling Programme for treated water** a. Daily online monitoring of the treated water for total and free chlorine, turbidity, aluminium, fluoride, pH and colour takes place and the results were available on the SCADA. However, the aluminium monitor was reading the incorrect units (mg/l instead of µg/l) b. The alarm settings for turbidity on the individual filters appears to be set too high (1.0 NTU). c. Manual daily sampling is also undertaken for pH, turbidity, UVT, apparent and true colour, aluminium, manganese, ammonium, fluoride, TDS, conductivity, alkalinity and hardness.
8.	**Exceedances of the Parametric Values** a. The Agency was notified of the failure to meet the aluminium parametric value on 12th December 2014 (1,319 µg/l). Irish Water submitted a report to the Agency on 22nd December 2014 outlining the results of its investigation into the cause. This failure was due to an incident at the plant which commenced on Friday 5th December 2014. b. The cause of the failure was a rise in pH in the clarified water which was attributed in the report of 22nd December 2014 to "raw water fluctuations after heavy rainfall". However, during the audit this was found not to be the case and the elevated pH was found to be due to a problem with the lime dosing system in the Actisoft™ plant. c. The report submitted on 22nd December 2014 indicated that five separate alarms or warning signs were ignored by the plant operator on the weekend of the incident including: i. High pH in the Actisoft™ and Actiflo® (12.0 and 11.98 respectively) ii. High turbidity in the Actisoft™ (up to 100 NTU) iii. Frequent backwashing of the filter (at 30 minute intervals) iv. Low chlorine residual monitor alarm (reading -0.10 mg/l) v. High aluminium reading (320 µg/l – this is the maximum the monitor can read) d. Monitoring results on 8th, 9th and 12th December 2014 in the network indicated that aluminium exceedances of up to 1,319 µg/l were detected and the results from the aluminium monitor on the final water indicate that aluminium levels were above the maximum reading of 320 µg/l between 03:02 on Saturday 6th December and 04:48 on Monday 8th December 2014. Monitoring results in the network returned to compliance on 14th December 2014. e. Subsequent investigations have found that the cause of the failure was due to the elevated pH in the Actisoft™ and subsequent problems with the polymer resulting in a failure to remove the lime dosed to remove hardness. This resulted in an elevated pH in the water going from the Actisoft™ into the Actiflo® which meant that the coagulation pH was not optimal, resulting in aluminium carryover. f. It was confirmed that the Actisoft™ plant has been shut off since 12th December 2014 and Veolia stated that it will not be used again until it has been fully checked and verified to be working correctly. This is likely to be in February 2015. A pH meter is also to be put on the inlet to allow earlier detection of similar incidents in the future. g. Veolia stated that the operator has been retrained to prevent a reoccurrence. h. Veolia stated that the facility to override critical alarms has been restricted to the Plant Manager since the incident and therefore the alarms can no longer be overridden by anyone other than the plant manager.
9.	**Chemical storage and bunds** a. All chemicals were stored within adequately bunded areas. b. The fill point for the sulphuric acid bulk storage tank was located on the wall of the bund (Photo 1).
10.	**Hygiene and Housekeeping** a. The water treatment plant appeared to be well maintained and hygiene and housekeeping were good.

11.	**Management and Control** a. Rat bait points were located at numerous locations around the site (Photo 2). Veolia stated that these are used on an ongoing basis. The auditors pointed out that this is in contravention of EPA Advice Note No.13 – Pesticides in Drinking Water which states that 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. b. Alarms at the plant were not being responded to in an appropriate manner at the time of the incident.
11.	**Sludge Management** a. Sludge is currently sent to Lagan Cement for recovery. Veolia stated that it was previously send for composting. The auditors advised that this is not an appropriate method of disposal for the sludge as there is no nutrient value in water treatment sludge.

3. AUDITORS COMMENTS

The Srowland water treatment plant is a new state of the art water treatment plant in operation less than 2 years while the water conditioning (Actisoft^{TM}) plant was in operation for 5 weeks prior to the incident. The incident was caused by operator error and specifically by ignoring or overriding five critical alarms at the plant. The incident resulted in elevated levels of aluminium in drinking water supplied to consumers for a number of days.

Irish Water must ensure that actions are taken to prevent such incidents and that responses to alarms are appropriate and documented. The appropriateness of some of the alarm settings at the Srowland water treatment plant needs to be examined as some alarm settings do not give adequate forewarning and by the time they are activated the plant will already be in difficulty (e.g. raw water ammonium and filtered water turbidity).

4. RECOMMENDATIONS

Source Protection

1. Irish Water should ensure that the requirements of the *European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014)* are implemented in order to ensure, unless an alternative setback distance has been set as per Article 17, that:

    i. Organic fertiliser or soiled water is not applied to land within 200 m of the abstraction point; and
    ii. Farmyard manure held in a field prior to landspreading is not placed within 250 m of the abstraction point.

2. Irish Water should liaise with the River Basin District team responsible for implementing the Water Framework Directive and establish links with the Environment Sections in relevant local authorities in the catchment to ensure that they are aware of the issues potentially impacting on the raw water abstraction point. Irish Water should identify all potentially polluting discharges into the catchment of the water source and implement mitigation measures, where appropriate, to reduce the potential impact of these discharges. These risks should be communicated to all relevant stakeholders.

3. Irish Water should assess the risk of the discharge from Monasterevin WWTP and prepare and implement a protocol to ensure that the operators of Srowland WTP are aware of any discharges from Monasterevin WWTP that could impact on the quality of raw water at the abstraction point.

Coagulation, Flocculation and Clarification

4. Irish Water should ensure that the Actisoft™ plant is not brought back into service until such time as the necessary control measures to prevent a reoccurrence have been put in place and the process has been proven to be secure.

5. Irish Water should investigate the feasibility of introduction of automated chemical dosing at the Srowland WTP. In this regard Irish Water should take account of the recently published EPA Advice Note 15: Optimisation of Chemical Coagulation Dosing at Water Treatment Works available online at http://www.epa.ie/pubs/advice/drinkingwater/dwadvicenote15.html.

Filtration

6. Irish Water should review the alarm settings on the individual filters. The alarm should be set on the monitors to alert the operators of the treatment plants to deviations outside the acceptable range. The alarm settings should have regard to the normal quality of the water and should be clearly defined with appropriate documented actions to be carried out in the event of the triggering of any of the alarm settings.

Chemical Storage and Bunds

7. Irish Water should ensure that fill points for storage tanks inside the bunds should be within the bunded area. Refer to EPA guidance document –"*IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities*".

Hygiene and Housekeeping

8. Irish Water should review the usage of rat bait at the Srowland WTP. 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 No.13 – Pesticides in Drinking Water.

Management and Control

9. Irish Water should review all alarm settings at the Srowland WTP an ensure that they are set at an appropriate level that will forewarn the plant operators of quality issues before they impact on treated water quality. A procedure should also be put in place defining the actions to be taken in response to the different levels of alarm.

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 Yvonne Doris, 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:  **Date:** 14th January 2014

Darragh Page

Inspector

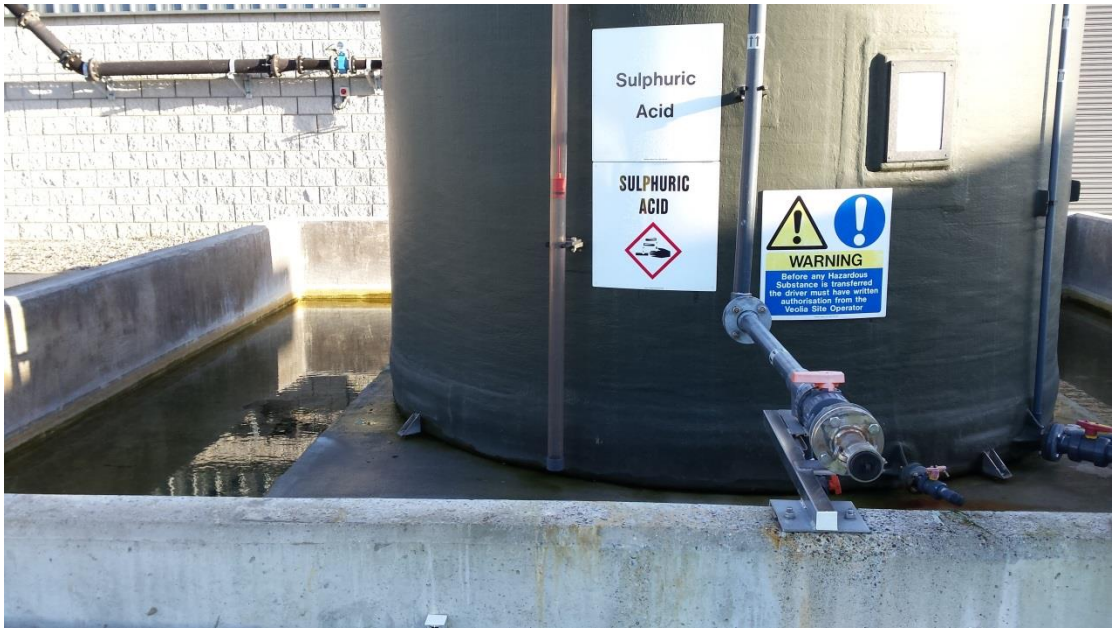

Photo 1. Sulphuric Acid Fill Point.

Photo 2. Rat bait point at Srowland Water Treatment Plant.