



Public Drinking Water Monitoring Programme Audit Report

County:	Galway	Date of Audit:	20 th August 2019
Location visited:	Galway County Council Offices	Date of issue of Audit Report:	9 th October 2019
		Auditors:	Ms. Derval Devaney (EPA) Dr. John Gray (Consultant)
Audit Criteria:	<ul style="list-style-type: none"> • The <i>European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) as amended.</i> • The <i>EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7).</i> • The <i>EPA Information Note on Monitoring issued January 2019 to Irish Water and Local Authorities.</i> 		

MAIN FINDINGS

- **Irish Water did not notify the EPA of an *Enterococci* failure which occurred on 27/08/18 in the Cleggan/Claddaghduff PWS. The EPA became aware of the failure upon a review of the 2018 monitoring data for Co. Galway submitted by Irish Water to the EPA in Q1, 2019.**
- **Weaknesses in procedures were identified, particularly for the selection and taking of compliance samples and pre-determining sampling locations and dates to ensure that compliance samples are evenly spread and representative of water in the supply zone.**
- **Irish Water did not carry out compliance monitoring for nitrite at its public water treatment plants and there was no protocol to determine the concentrations of acrylamide, epichlorohydrin and vinyl chloride in drinking water where these chemicals are used in treatment and supply.**
- **Irish Water did not have a written procedure for identifying the cause of any sample result that exceeds the parametric values outlined in the Drinking Water Regulations (S.I. no 122 of 2014) as amended, and the remedial action required.**

1. Introduction

Under the *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) as amended*, 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 carrying out effective monitoring of drinking water supplies to ensure the provision of clean and wholesome drinking water.

An audit of the Irish Water 2018 monitoring programme implemented in County Galway was carried out at the Galway County Council Offices, CenterPoint Building, Lois Ban Industrial Estate, Galway H91 PY8H. Prior to the audit, the EPA assessed the 2018 monitoring returns submitted by Irish Water to identify any areas of discrepancy between those samples taken and analysed and those reported to EPA. Using a questionnaire as a guide, Irish Water, Galway County Council and Environmental Laboratory Services (ELS) Ltd. staff were interviewed to ascertain the principles and methodology for establishing monitoring programmes, sample point selection, sample classification, integrity of data reporting and notification procedures.

The audit observations and recommendations are listed in Sections 2 and 4 of this report. The following were in attendance during the audit.

Representing Irish Water:

Thomas Gibbons – Drinking Water Compliance Analyst

Louise Flynn - Compliance Analyst

Brian Boylan - Drinking Water Reporting Specialist

Representing Galway County Council:

Michael Timmins - Senior Engineer

Colette Cronin -Executive Technician

Christina Ryan – Assistant Scientist

Representing ELS:

Sinead Kelly - Sampling & Logistics Manager. ELS Ltd. West

Representing the Environmental Protection Agency:

Ms. Derval Devaney - Inspector, EPA

Dr. John Gray - Consultant

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. Compliance Monitoring Programme

- a) The 2018 compliance monitoring programme was prepared by Irish Water and Galway Co. Co. and was based on population (derived from GIS data and Irish Water's data book multiplied by an occupancy rate of 2.5 per property) or volume with specific numbers of Group A and Group B samples identified. The population and volume data are reviewed by Irish Water and the Local Authorities annually.
- b) If the population : volume (P/V) ratio was greater than 2, the number of samples was based on output volume whereas if the ratio was less than 2 then the sample numbers were based on population. A safety factor of 10% was applied to the number of samples required. It is possible that more samples than are legally required may on occasion be taken.
- c) The 2018 compliance monitoring programme included for each of the 38 public water supplies in County Galway a list of: source type; source name; water supply zone (WSZ) cod; a summary of treatment type; population; daily volume supplied; and the ratio of P/V.
- d) Data from the previous 12 months was reviewed in September/October 2017 firstly by Irish Water and subsequently by Galway Co. Co. before the 2018 sampling programme was agreed in December 2017, thereby allowing preparation of monthly sampling plans for 2018.
- e) The minimum number of Group A and Group B samples required were identified and the approximate date on which a sample should be taken recorded. Regulatory changes were identified by Irish Water early in 2018 (with the introduction of the *European Union (Drinking Water) (Amendment) Regulations 2017, S.I No. 464 of 2017*) and the necessary amendments were made to the 2018 compliance monitoring programme in Q1, 2018.
- f) Galway Co. Co. operates the water supply system on behalf of Irish Water under a Service Level Agreement. The sampling programme is carried out by ELS Ltd. with whom there is an Irish Water framework agreement for levels of service. ELS Ltd. is accredited by the Irish National Accreditation Board (INAB) to undertake testing for specified parameters in potable water in compliance with the International Standard ISO/IEC 17025:2005 2nd Edition.
- g) Compliance samples are taken throughout the year on dates determined by ELS Ltd. from a list of predetermined and generally fixed sampling points. Irish Water does not liaise with ELS Ltd. to ensure that a random selection of compliance sample points is established.
- h) Samples are taken from consumer's taps in the network or at drinking water taps in public or commercial buildings. ELS Ltd. is not provided with a water supply zone map for each public water supply. If access to the sampling location is not possible, an alternative location is selected, usually a neighbouring property. There is no protocol for the selection of alternative premises for sampling, when required.
- i) Irish Water reviews annually the spatial distribution of samples. During the audit Irish Water produced maps of the Public Water Supply distribution systems which identified WSZs; delineated district metered areas (DMAs); illustrated the

	<p>locations of treatment works and reservoirs, outlined the approximate residential populations; and mapped the locations of historic 2018 compliance, operational and investigative sampling stations.</p> <ul style="list-style-type: none"> j) The spread of compliance samples in 2018 throughout the public water supply distribution network was limited in places. k) Turbidity (for surface water supplies) and nitrite are required to be monitored for compliance purposes at the water treatment plant in addition to the network. While each water treatment plant has an online and continuous final water turbidity meter, nitrite is not being monitored in the final water at public water treatment plants in Co. Galway. l) No provision has been made to determine acrylamide, epichlorohydrin and vinyl chloride levels in drinking water and reliance is placed on product specification and accurate control of delivery of polymer at the treatment plant although this information was not available to inspect during the audit. Irish Water stated it did monitor all plants for acrylamide during 2018 as a result of a failure being detected in one public water supply in 2017. Irish Water stated the 2018 investigative results were compliant. These results were not available for review during the audit. m) Irish Water and Galway Co. Co. hold quarterly meetings to identify and address any issues arising including potential compliance sampling shortfalls. The HSE attend these meetings and the EPA on occasion, when invited. n) The compliance monitoring results are published on Irish Water’s website (https://www.water.ie/water-supply/water-quality/). o) Details of the source water type; treatment provided; daily output; and population served were reported to the EPA as part of the 2018 Annual Drinking Water Returns for supplies in Co. Galway. p) No WSZs were sampled in 2018 at reduced or increased frequency. Should any changes to sampling frequency be required, they would be determined by Irish Water through a risk assessment and approved by the EPA in accordance with Part C of the <i>European Union (Drinking Water) (Amendment) Regulations 2017, S.I No. 464 of 2017</i>.
<p>2.</p>	<p>Operational Monitoring Programme</p> <ul style="list-style-type: none"> a) An operational monitoring programme was prepared for 2018 for public supplies using the same criteria as for compliance sampling of public supplies. Operational samples were taken as and when required of: raw waters; to monitor plant performance (e.g. aluminium and iron); to optimise treatment (e.g. in the event of high trihalomethane formation potential); or to investigate non-compliant results. Samples are also taken from hydrants in the distribution system for residual chlorine and turbidity to assess the effectiveness of disinfection and flushing programmes. The Group A parameters are generally used for operational monitoring purposes. b) Trihalomethanes (THMs) are sampled monthly in response to previous failures and when treatment upgrades have been completed to verify remedial action was successful. If an MCPA or turbidity failure is detected, and it relates to an open EPA file, this is also monitored in the network on a monthly basis.

	<ul style="list-style-type: none"> c) Samples for turbidity and free chlorine are taken from treatment works from continuous online monitors. d) Water sources that are considered for “return-to-use” after a period of non-use and new borehole sources would be subject to operational sampling to determine the suitability of the source water for water treatment and supply. e) Should a lead sample fail the prescribed concentration, further large volume samples would be taken from the affected property and any adjacent property and letters sent by Irish Water to the affected property. The HSE would also be consulted and the EPA informed. f) Irish Water intend to prepare standard operating procedures (SOPs) for future operational sampling.
<p>3.</p>	<p>Monitoring Programmes for Specific Parameters</p> <ul style="list-style-type: none"> a) Specific monitoring programmes were in place during 2018 for pesticides. Where a pesticide non-compliance is detected in a Group B sample in a water supply, additional monitoring is carried out monthly at times of risk between April and November. b) Monitoring for radioactivity is carried out in accordance with the EPA’s Radiological Monitoring Programme, when required. c) If tankers or bowsers are deployed in an emergency, the sampling protocol according to the EPA handbook would be followed. However, no records are kept of tankers’ use. Notices concerning advice to boil water would be attached to deployed bowsers. Normally, deployed bowsers would be emptied and refilled before 48 hours elapsed.
<p>4.</p>	<p>Sampling Procedures</p> <ul style="list-style-type: none"> a) Galway Co. Co. have in place a “Protocol for implementation of Drinking Water Monitoring Programme by External Laboratories” Issue No. 4 dated November 2012 which includes the requirement to take samples in accordance with the Drinking Water Regulations 2014 and the EPA’s Handbook; confirmation of the need to ensure that all sampling is completed; and the notification procedure for reporting non-compliant results. This protocol was in place for the 2018 sampling programme. b) Irish Water have prepared a detailed Scope of Requirements of laboratory services regarding sampling and analysis of drinking water. The document sets out requirements to be met by providers of laboratory services to Irish Water including the meeting of ISO 17025 for drinking water analysis and monitoring for compliance, investigative, operational and emergency purposes. c) ELS Ltd. has a basic procedure for sampling of all drinking water samples (Doc. Ref. SP04, Revision C, dated 1 August 2019). Although ELS Ltd. claimed it was a controlled document, it does not indicate who is responsible for its upkeep. Individual samplers are given their own copy and sign to say they have received it, although no record is kept on who holds a copy. No details are given of the methods for sampling different parameters or groups of parameters. Some limited guidance is included on the selection of an appropriate tap, disinfection of the taps and some timings. No methods are included for carrying out on-site tests.

	<p>The procedure requires bacteriological samples to be placed in the cooler area for transport, but no guidance is given on the temperature requirements nor the maximum time period within which bacteriological samples should be returned to the laboratory for analysis.</p> <ul style="list-style-type: none"> d) Monthly worksheets are provided by ELS Ltd. to its samplers and include approximate date of sampling; location; type of sample (compliance, operational, etc.); and reference number for the location. If it is not possible to collect the designated sample, an alternative location would be selected. The reasons for selecting a particular alternative sampling point are not recorded and there is no protocol for guiding the selection of alternative addresses should the pre-designated sample point be inaccessible. e) Adhesive sample labels are prepared in the laboratory, printed off the laboratory information management system (LIMS) with the sampling location documented and securely fixed to the sample container. Compliance samples are pre-designated and as the sample bottles are pre-labelled in the laboratory before filling at the customers tap, it is not possible to alter the designation of the sample. The auditors were not able to inspect sample handling as the audit was not conducted in close proximity to the contract laboratory. f) A chain of custody is maintained throughout the sampling process. The LIMS system does not allow the generation of duplicate sample numbers. Individual and unique sample numbers are generated when samples are logged on to the system by laboratory staff.
<p>5.</p>	<p>Data Handling</p> <ul style="list-style-type: none"> a) Galway Co. Co. has a protocol for the submission of results to it from the laboratory, however this was not available for review during the audit. It was stated that the laboratory contacts Galway Co. Co. by telephone and a group email address (which includes Galway Co. Co. and Irish Water staff) if a microbiological failure is detected. Communication is by group email only if a non-microbiological failure is detected. However, the audit found that the email from the laboratory is not acknowledged to reassure the laboratory that it has been received. The laboratory's final report is sent electronically to the group email. b) Analytical and associated data is recorded by the sampler on the sampler's worksheet for on-site tests such as residual disinfectant, taste, odour, temperature and in the laboratory by the relevant analyst. After quality control (QC) checks have been validated, analytical data entered on the STARLIMS system is accepted. Data is transferred to Galway Co. Co. electronically by means of an Excel spreadsheet and data is imported on to the LABWORKS system by Galway Co. Co. staff who are nominated users or administrators of LABWORKS. Users can only import results to LABWORKS while administrators of LABWORKS can change and approve results. c) Galway Co. Co.'s Executive Technician can accept and subsequently approve data entry. No changes may be made to data once it has been approved. The system is capable of producing an audit trail of access to the system and of data entries.

	<ul style="list-style-type: none"> d) If the data from the laboratory is shown subsequently to be incorrect, a new laboratory report would be issued with corrected data to be entered on the system. e) The issue of three THMs failures notified in error to the EPA during 2019 for three public water supplies in Co. Galway was raised during the audit. It transpired upon investigation that there was an issue with the accuracy of the analytical method used by ELS Ltd. Re-sampling of the stored “failed” samples found that the THMs results were compliant. ELS Ltd. did not have details to hand during the audit of the Analytical Quality Control (AQC) procedures that are in place at the laboratory to ensure accurate data is obtained and recorded.
<p>6.</p>	<p>Exceedances of Parametric Values</p> <ul style="list-style-type: none"> a) Galway Co. Co. has a single-page Internal Protocol for the management of drinking water results (V5, 19 August 2019). Irish Water has a protocol (IW-PRT-EPA-001) for the notification of failures of chemical and microbiological parameters and recording the initial consultation with relevant stakeholders. A work instruction was also examined which summarises the use of the Initial Notification Record (INR) template by Galway Co. Co., Irish Water and the Health Service Executive (HSE). There is also a HSE guideline for the management of initial notification of a drinking water issue of potential danger to human health. A Drinking Water Protocol issued jointly by Galway Co. Co. and the HSE (dated June 2012) details: actions to be taken in the event of a non-compliant sample; roles and responsibilities; communications; incident response team; and actions to be taken to protect consumers. Non-compliant data associated with compliance, operational and investigative samples are required to be reported to the EPA. b) Completion of the Irish Water INR protocol would assist in identifying reasons for the non-compliance, however there are no procedures in place to guide the identification of reasons for non-compliant results and remedial actions required. c) Circumstances surrounding the failure to notify EPA as soon as practicable via the EPA’s Online Drinking Water Notification System (ODWNS) of the presence of 4/100 ml <i>Enterococci</i> in a sample from Cleggan/Claddaghduff PWS were discussed. The same sample also contained <i>Clostridium perfringens</i> (1/100 ml) and coliform bacteria (3/100 ml), both being indicator parameters. These failures were reported to the EPA in Q1, 2019 as part of the annual drinking water annual returns for 2018. Irish Water confirmed that the result was reported to the HSE (but not EPA) via the INR process and health advice was sought. A resample taken showed compliant water quality at the failed and adjacent premises and sufficient residual disinfectant in the samples.
<p>7.</p>	<p>Review of Sampling Data</p> <ul style="list-style-type: none"> a) Samples were collected on weekdays with the exception of Fridays. b) Sample collection was generally well distributed throughout the year although slightly fewer samples were taken during the first quarter. c) The first samples in 2018 were taken on 23 January and the last on 13 December.

3. Auditors comments

Arrangements between Irish Water and Galway County Council for assessing the quality of public water supplies for 2018 was generally found to be satisfactory. Weaknesses were highlighted in relation to the selection of monitoring locations and suitable alternative sample locations to ensure samples are randomly selected, evenly spread and representative of the water supply zone. Weaknesses were also identified in the sampling manual, such as the procedures for taking compliance samples, on-site testing, and recording who holds a copy. It is therefore recommended that a review of such procedures is undertaken by Irish Water and the contract laboratory is audited with priority to ensure appropriate analytical quality control (AQC) procedures are in place.

Finally, Irish Water should ensure compliance monitoring is carried out for the required parameters and procedures are put in place and followed to ensure the EPA is notified of failures in a public water supply and appropriate remedial action is taken to ensure clean and wholesome drinking water.

4. Recommendations

Compliance Monitoring Programme

1. Irish Water should ensure that:
 - a) the required number of samples within a public WSZ are distributed equally in time and location to ensure that they represent, as accurately as possible, the quality of water throughout the entire WSZ;
 - b) compliance monitoring for nitrite is undertaken, as required, at public water supply water treatment plants;
 - c) a protocol is put in place to ensure acrylamide, epichlorohydrin and vinyl chloride levels in drinking water are determined at the required frequency where such chemical is used in the water treatment process or where uPVC pipes are used for distribution mains;
 - d) a formal protocol is established and implemented for the selection of random addresses for compliance monitoring at consumer's premises and for the selection of alternative addresses, if required in the event that a sample location is unsuitable or inaccessible;
 - e) the compliance sampling programme includes specific predetermined sampling locations and predetermined narrow window of sampling dates;
 - f) the compliance programme has predetermined alternative sample locations in the event that a sample location is unsuitable or inaccessible;
 - g) samplers are provided with a water supply zone map for each public water supply to ensure sample locations are selected so that they are representative of the WSZ.

Operational Monitoring Programme

2. Irish Water should ensure that its proposed SOP's for operational monitoring are completed as soon as possible.

Monitoring Programmes for Specific Parameters

3. Irish Water should ensure that Section 4, Paragraph 5 of the EPA's Handbook is adhered to in relation to sampling required of water in tankers and that appropriate records are kept of their preparation and deployment.

Sampling Procedures

4. Irish Water should:
 - a) review the procedure for compliance sampling to ensure it is appropriate; a controlled document; up-to-date and subject to regular review;
 - b) ensure the procedure for compliance sampling requires documentation of: the reasons for selecting alternative sample locations; the criteria for alternative sample selection; and a record is kept of who the procedure is issued to;
 - c) prepare and implement a protocol for the reporting of failures by the laboratory to Galway Co. Co. and Irish Water and ensure that when notified of a failure via email by the laboratory, the protocol specifies the requirement to acknowledge such notification;
 - d) ensure that the sampling procedure used by the contract laboratory is adequate and contains all relevant information to ensure that compliance samples are representative of the water supply and that samples are transported under appropriate conditions and in a timely manner;
 - e) audit the external laboratory to ensure (i) analysis is undertaken in accordance with ISO 17025 for all parameters and the that samples are analysed by, or under the supervision of, a person who is competent to perform that task as outlined in Section 5 of the EPA's Public Water Supply's Handbook and (ii) that an appropriate procedure is in place for the recording and validation of analytical results to ensure accuracy of the data recorded.

Exceedances of Parametric Values

5. Irish Water should:
 - a) ensure that the EPA is notified as soon as it becomes aware of a failure to meet the parametric values in Part 1 of the Schedule of the Drinking Water Regulations 2014, as amended;
 - b) develop and implement a written procedure for dealing with sample results that exceed the parametric values outlined in the Drinking Water Regulations (S.I. no 122 of 2014), as amended. The procedure should include (a) actions to be taken to investigate the exceedance and determine its cause, (b) reporting the exceedance to the HSE, the EPA and any other relevant party and (c) remedial action required. The circumstances that constitute trivial and the more serious exceedances should be clearly defined.

Follow-Up Actions Required by Irish Water

This report has been reviewed and approved by Emer Cooney, Inspector, EPA.

Irish Water is recommended to put such measures in place as are necessary to implement the recommendations listed in this report. The actions by Irish Water to address the recommendations taken may be verified by the Agency during any future audits.

The EPA also advises that the findings and recommendations from this audit report should, where relevant, be applied on a national basis to future public water supply monitoring programmes.

Report prepared by:



Date:

09 October 2019

Derval Devaney
Inspector