Site Visit Report

Under the European Union (Drinking Water) Regulations 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 providing clean and wholesome water to the visited public supply.

The audit process is a sample on a given date of the facility's operation. Where a finding against a particular issue has been reported this should not be construed to mean that this issue is fully addressed.

Water Supply Zone

Name of Installation	Gorey Regional Creagh
Organisation	Irish Water
Scheme Code	3300PUB1512
County	Wexford
Site Visit Reference No.	SV22782

Report Detail

Issue Date	12/10/2021
Prepared By	Ruth Barrington

Site Visit Detail

Date Of Inspection	16/09/2021	**Announced**	Yes
Time In	10:30	**Time Out**	14:50
EPA Inspector(s) **Additional Visitors**	Ruth Barrington Jane Power, HSE Environmental Health		
Company Personnel	Irish Water: Patrick Duggan, Ronan Walsh Wexford County Council operating under an Service Level Agreement with Irish Water: Fionnuala Callery, Barry Hammel, Enda Flynn, Paul Delahunty, Darren Murphy		

Summary of Key Findings

The key findings noted at this on-site audit are in addition to those listed in the report of the EPA audit on 07/09/2021.

1. The Dissolved Air Flotation and Filtration (DAFF) package system was in poorly maintained condition. Irish Water plan to upgrade the DAFF during October 2021.

2. Irish Water had reported to the EPA that the National Disinfection Programme at Creagh WTP was complete and commissioned in February 2020. In fact the only element installed at this time was a pH adjustment step. Irish Water plan to re-assess the Creagh WTP under the Disinfection Programme by the end of 2021.

3. Irish Water has not provided any information to consumers in relation to the delayed development of gastrointestinal illness following the drinking water quality incidents at Creagh WTP. This information should be added to the Irish Water website to advise any affected consumers to contact their GP for medical advice.

Introduction

The Gorey Regional Creagh Public Water Supply (PWS) serves a population of over 7,000 people in the Gorey area of Co. Wexford.

This audit was carried out on site as a follow up to the EPA's virtual audit undertaken on 07/09/2021, to assess the treatment processes, controls and supporting data at Creagh WTP in further detail, and to examine details of actions taken by Irish Water and Wexford County Council subsequent to the previous audit and in response to the disinfection failures at the water treatment plant in the period 19/08/2021 to 30/08/2021. The two audit reports should be read in conjunction with each other, and Irish Water will need to address the Recommendations in both audits.

Supply Zones Areas Inspected

Treatment processes, controls and supporting data at Creagh Water Treatment Plant were examined during this onsite audit. The two river water abstraction locations and the treated water distribution network did not fall within the scope of the audit. The HSE was represented at the audit at the invitation of the EPA due to the outbreak of gastrointestinal illness in the Gorey area being assessed by the HSE and linked to the drinking water supply.

1. Incident Management

		Answer
1.1	Was the incident suitably alerted to the plant operators, escalated and managed in order to maintain water quality and protect public health?	No
	Comment	

1. The EPA audit on 07/09/2021 identified through a review of the SCADA screenshots a further period where chlorine residuals in the final water at the verification point dropped below the concentration required for adequate disinfection between 28/08/2021 and 30/08/2021.

2. Inspection of the SCADA alarm history provided by Irish Water as part of this audit showed that low chlorine alarms from the two validation monitors after Clear Water Tank 1 dialed out at high priority from 22.49 p.m. on Saturday 28/08/2021. A response was made by Wexford County Council operational staff on the morning of Sunday 29/08/2021 when chlorine dosing pump 1 was identified as being in need of repair. This repair could not be undertaken by Wexford County Council staff, so dosing pump 1 was removed from service, leaving dosing pump 2 and 3 in operation. A contractor attended the Creagh WTP on Monday 30/08/2021 and carried out repairs to chlorine pumps 1 and 2. Network chlorine residual testing was undertaken at two locations in the Gorey Regional Creagh PWS on 30/08/2021.

3. It appears that since chlorine dosing continued (although at reduced effectiveness) at the Creagh WTP during 28/08/2021 to 30/08/2021, and that the results of the two chlorine residual samples in the network on 30/08/2021 met the minimum recommended concentration of 0.1 mg/l in the distribution network, that a full risk assessment to evaluate the impact of the inadequate chlorine residual on chlorine contact time at the verification point after Clear Water Tank 1 was not carried out in a timely way by Wexford County Council.

4. During this audit, Wexford County Council provided recalculated chlorine contact times dated 16/09/2021, which assess the level of disinfection provided to the Gorey Regional Creagh PWS under a number of different scenarios of chlorine concentration, water flows, and contact tank volumes. These figures were taken from the SCADA trends and were intended to represent the worst case scenarios on a number of dates, 25/08/2021 to 26/08/2021 and 27/08/2021 to 30/08/2021.

5. The auditor's observations in the context of the use of these recalculated contact times in incident response are that (a) they are not considered as an appropriate risk assessment response for the incident, as they are dated over two weeks subsequent to the incident, and were only prepared following the identification of the incident of 28/08/2021 to 30/08/2021 by EPA inspectors during the audit of 07/09/2021. Furthermore (b) the calculations provided for 25/08/2021 and 26/08/2021 make use of a chlorine concentration from the sample point immediately after chlorine dosing. The chlorine concentration after contact time was not available on those dates due to the failure of Chlorine Validation 1 and 2 monitoring equipment. The process for calculating chlorine residuals is set out in the *EPA's Water Treatment Manual: Disinfection*, and requires use of chlorine concentration after contact time is achieved. It remains the EPA's opinion that this incident should have been notified to the HSE and the EPA at the time to allow for a timely risk assessment to protect public health.

6. The management of the incident of 28/08/2021 to 30/08/2021 highlights significant failings of Irish Water and Wexford County Council which must be addressed as a matter of priority.

7. As there is no automatic shutdown of the Creagh WTP on the basis of water quality, a failure of disinfection or a failure of the filtration barrier will allow inadequately treated water into the distribution network. Furthermore, if the failure of critical equipment requires attendance by a contractor or supplier for repair, as happened with the Coag Sense dosing unit and the chlorine pumps, the water entering supply may remain inadequately treated until this repair takes place.

8. An update was provided by the HSE representative during the audit describing the scale of the gastrointestinal illness outbreak in Gorey as of 16/09/2021. At the time of the audit, a total of 52 infections had been identified. A range of age groups from very young to over age 65 were known to be affected with no other common risk factor than either resident in Gorey or having consumed water from Gorey Regional Creagh PWS.

9. Irish Water stated that discussions were in progress internally on how to effectively communicate the issues in relation to Gorey Regional Creagh PWS to consumers. Since this audit, Irish Water has updated their website in relation to Gorey Regional Creagh PWS in terms of the incidents, however there remains no indication that further illness may occur due to extended incubation periods, secondary infection (that is, person to person) or the importance of consumers seeking medical advice if they are experiencing gastrointestinal symptoms.

2. Coagulation Clarification Flocculation (CFC) Stage

		Answer
2.1	Is the CFC process optimised to respond to changes in raw water quality?	Yes

Comment

1. Coagulation, flocculation and clarification (CFC) processes at Creagh WTP are relevant only to the portion of water treated through the Dissolved Air Flotation and Filtration (DAFF) package system prior to Slow Sand Filters Numbers 5 to 9.

2. During normal operations, the optimisation of control over pH adjustment and aluminium sulphate coagulant dose is achieved via the "Coag Sense Auto Coagulation Dosing Unit", which is a streaming current monitor. Dosing is achieved on a flow proportional basis with the streaming current monitor allotting a trim dose based on feedback control.

3. Initial information received from Irish Water in relation to the heavy rainfall and associated high turbidity on the weekend of 21/08/2021 indicated that the unit failed to adjust the required dose in response to changing raw water conditions. The cause of this failure has since been identified by Wexford County Council following repairs to the unit, as blocked sample lines to the streaming current monitor which meant that the feedback control signal did not activate and the trim dose was not applied properly.

4. Wexford County Council has commenced a programme of testing for residual aluminium levels in final treated water since the EPA audit of 07/09/2021. The results of the testing are maintained within the revised daily check sheets at the Creagh WTP, and the results examined on the day of the audit were in compliance with the aluminium parametric value.

		Answer
2.2	Were the CFC processes visually observed to be operating appropriately during the audit?	No

Comment

1. During the audit, the nozzles of the spreader bar for dosing polyelectrolyte were observed to be blocked by a build up of material. This means that instead of the dosing being applied across the width of the tank with optimum contact time, the polyelectrolyte was dripping preferentially onto one side of the tank.

2. The auditor requested during the audit that the DAFF tank be drained down so that the internal condition of the tank and sand filter media could be assessed. Wexford County Council stated that doing so would put the water supply under pressure and that due to demand on the supply, the only time the DAFF water level can be dropped is during a backwash. The backwash for 16/09/2021 had already been performed that day prior to the audit start time. The auditor agreed that rather than putting the supply under further pressure, photographs of the drained down DAFF tank could be taken at the next backwash and provided to the EPA for assessment as part of the audit.

3. Photographs of the drained down DAFF tank were provided subsequently via Irish Water. The inside of the tank had evidently not been cleaned in some time, with a heavy build up of sludge seen on tank walls and filter weirs.

3. Wexford County Council and Irish Water stated that the DAFF package system will be taken off line for upgrading in October 2021. The current high levels of demand on the Gorey Creagh Regional PWS mean that it is not possible to take the DAFF offline for any maintenance (including cleaning) apart from backwashing.

3. Filtration

		Answer
3.1	Are the filters designed and managed in accordance with EPA guidance?	No

Comment

1. The DAFF package unit at Creagh WTP was installed in 2008. This DAFF unit is designed to provide both CFC processes through Dissolved Air Flotation, and filtration process in the sand media at the base of the package plant. According to Wexford County Council, the sand media in the DAFF filter has not been replaced since installation over twelve years ago.

2. At the EPA audit of 07/09/2021, it was stated that sand in Slow Sand Filters Nos. 1 to 4, which are fed directly from the raw water intake, was replaced in 2015. The DAFF outflow water is directed through Slow Sand Filters Nos. 5 to 9. During this audit, Wexford County Council reported that Slow Sand Filters Nos. 5 to 9 were last re-sanded in 2013.

3. The *EPA's Water Treatment Manual: Filtration* recommends a filter re-sanding frequency every 2 to 5 years, and stipulates a minimum sand depth of 0.6 m to be maintained, in the case of slow sand filters.

4. At the EPA audit of 07/09/2021, the failure of a DAFF valve was identified as contributing to high turbidity passing through the DAFF and into Slow Sand Filters Nos. 5 to 9. At this audit, Wexford County Council confirmed that the valve which failed was the DAFF outlet actuator valve, which became stuck on the "open" position during or after a power failure on site, allowing continuous flow through the DAFF of water with a high turbidity, which then entered the slow sand filters as the next stage of treatment.

5. The DAFF filter backwash is performed on a time basis every 24 hours under normal raw water conditions. While turbidity is measured continuously it is not used to control the frequency of backwashing, the return of the filter to service, or the effectiveness of a backwash.

6. The slow sand filters at Creagh WTP are cleaned at approximately one month frequency based on the level of water on the sand. However, the EPA's *Water Treatment Manual: Filtration* states that run times for slow sand filters may be affected by inlet turbidity over 10 NTU. As the turbidity monitors on-site are currently scaled to display and communicate to SCADA readings up to 2 NTU, it is not possible to continuously assess whether the slow sand filter run time is suitable or not. It was however noted during the audit that the DAFF outlet turbidity (i.e. the inflow for Slow Sand Filters Nos. 5 to 9) was 0.04 NTU, which indicates very good DAFF performance.

		Answer
3.2	Was there visual indication that the filters were operating appropriately?	No

Comment

1. As detailed above in this report (Section 2) photographs of the drained down DAFF tank were provided subsequent to the audit via Irish Water. These photographs were taken at the lowest point in the backwash, which would normally mean that the surface of the sand media in the filter can be visually assessed. However in this case, the filter sand is barely visible. This may indicate that there is insufficient media remaining in the filter, as could be expected where the sand has not been replaced for twelve years.

2. The cleanliness of the DAFF tank was extremely poor, with heavy build up of sludge material on the walls and filter weirs. This may have an impact on the filter performance if there is a build up of sludge impacting on the filter rather than being removed by the air flotation process.

3. Wexford County Council and Irish Water stated that the DAFF package system will be taken off line for upgrading in October 2021.

4. Disinfection

		Answer
4.1	Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?	No

Comment

1. The disinfection system at Creagh WTP is verified using monitors and alarms, and the chlorine residuals are recorded and accessible for most elements of the system, with the exception of chlorine pump 3, which is not linked to SCADA, and Clear Water Tank 2, which does not have chlorine validation at the tank outlet.

2. The chlorine alarm setting at the dosing chamber, which also calls chorine pump 3 into operation, remained at 0.7 mg/l at this audit. The time delay for a high chlorine alarm at the validation monitors at Clear Water Tank 1 remain at 20 minutes. Recommendations have been raised in relation to these points in the report of the EPA audit on 07/09/2021.

3. Prior to this audit, the auditor checked Irish Water's reporting to the EPA of progress against its National Disinfection Programme. The report for Quarter 2 2020 stated that Phase 2 of the Disinfection Programme for Creagh WTP was completed and commissioned in February 2020. During the audit, Irish Water and Wexford County Council stated that the only work carried out within the Disinfection Programme was the installation of pH adjustment facilities. As the Disinfection Programme is designed to upgrade disinfection facilities nationwide to current Irish Water specifications, the EPA has found that the programme at Creagh WTP is not complete.

4. Irish Water stated that the Creagh WTP will be reassessed under the Disinfection Programme by the end of 2021.

		Answer
4.2	Are monitors and alarms operational via dial out and being responded to with a suitable cascade system in place?	Yes

Comment

1. Since the EPA audit of 07/09/2021 Irish Water and Wexford County Council have revised the priority settings on alarms to ensure that process critical alarms are dialed out by text to a cascade system of Wexford County Council staff on a 24/7 basis.

2. Irish Water and Wexford County Council confirmed that staff training has been undertaken to address deficiencies in response and the previous failure to escalate process critical alarms for appropriate and timely action.

5. Management and Control

		Answer
5.1	Is the water treatment plant resilient enough to cope with significant variations in raw water quality or demand?	No

Comment

1. The Creagh WTP is under significant pressure in terms of the demand placed on the supply, which is such that routine maintenance cannot be undertaken as needed. The DAFF upgrade is an example of this, where a planned outage is necessary to clean the polyelectrolyte dosing points.

2. Wexford County Council outlined that the new Barnadown WTP which will serve the rural vicinity of Gorey is currently at commissioning stage. This WTP will have the capacity to serve some of the current Gorey Regional Creagh PWS and may be of assistance in taking some demand pressure off the Creagh WTP.

3. The power supply to Creagh WTP was described by Wexford County Council as being subject to frequent power cuts which pose a risk to treatment processes and controls such as those seen between 19/08/2021 and 24/08/2021. There is no permanent standby generator on-site to support the treatment processes in the event of power cuts, although Wexford County Council stated that a generator can be hired to cover planned power outages for which advance notification has been received. Plans are being discussed to provide a permanent on-site generator.

4. The return to service following power cuts can be problematic, as seen in the instance where the DAFF actuator valve remained open following a power cut. A high priority "Mains Power Fail" alarm has been added to SCADA to alert operators to an interruption in power supply. This alarm was not in place during the incidents of 19/08/2021 to 24/08/2021. The new alarm setting should be accompanied by a system of site checks to determine whether all site processes return to normal following a power cut.

		Answer
5.2	Are relevant alarms dialled out via a cascade system to allow a timely response by plant operators?	Yes

Comment

1. The priority settings on the alarm settings have been reviewed since the EPA audit of 07/09/2021 to ensure that process critical alarms such as those on turbidity and chlorine residuals are dialed out to a cascade system of four operators on a 24/7 basis.

2. A daily review of SCADA trends by Wexford County Council is in place to ensure that trends in plant data are identified and overseen.

		Answer
5.3	Is the data obtained from sampling and monitoring used to actively inform the processes on site and in the distribution network?	Yes

Comment

1. The daily WTP log sheets have been revised since the EPA audit on 07/09/2021. Instrumentation readings are now cross checked and verified against manual tests, and daily analysis of residual aluminium is now carried out and recorded. The format of the revised daily log sheets formed part of the operator training carried out by Wexford County Council emphasising the critical importance of the WTP processes.

Recommendations

Subject	Gorey Regional Creagh on-site audit 16/09/2021	Due Date	12/11/2021

Action Text

Recommendations

These recommendations are additional to those specified by the EPA in the report of the audit carried out on 07/09/2021.

Irish Water is responsible for providing safe and secure drinking water to the Gorey Regional Creagh public water supply.

1. Irish Water should ensure that risk assessments of incidents and parametric failures in the Gorey Regional Creagh PWS are carried out in a timely way to allow meaningful assessments of the potential impact on human health. Where chlorine contact time calculations are to be used as a tool in the risk assessment, the methodology should be based on Appendix 2.1 of the EPA's *Water Treatment Manual: Disinfection,* which stipulates the use of a chlorine residual after contact time.
2. Irish Water should ensure that the planned DAFF upgrade is carried out in October 2021. The upgrade should include the maintenance required at the polyelectrolyte dosing points, the complete cleandown of the DAFF tank walls and weirs and the assessment and replacement of filter media. The feasibility of adding turbidity as a backwash control, in addition to the current time controls, should be assessed. Suitable schedules should then be established to allow routine maintenance of the DAFF processes (including the streaming current dose control) as required.
3. Irish Water should review the Disinfection Programme assessments for Creagh Water Treatment Plant and provide to the EPA the rationale for not completing the Programme upgrade to the Creagh WTP to bring it up to Irish Water specification, and why it was reported as complete and commissioned in the Quarter 2 report for 2020.
4. Irish Water should ensure that the requirements of the Disinfection Programme assessments are implemented at Creagh WTP, and that disinfection processes meet the criteria of the EPA's *Water Treatment Manual: Disinfection* and Irish Water's Disinfection Specification.
5. Irish Water should provide updated information through suitable media channels to consumers, in addition to the commentary about the incidents on Irish Water's website, to reflect the fact that gastrointestinal illness may still develop and the importance of seeking medical advice in that event.
6. Irish Water should assess the feasibility of installing a permanent back up power supply at Creagh WTP.

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 Michelle Minihan, Drinking Water Senior Inspector.

Irish Water should submit a report to the Agency within one month of the date of this 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 time frame 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.