



# Drinking Water Audit Report

<b>County:</b>	Co. Kerry	<b>Date of Audit:</b>	20/09/2018
<b>Plant(s) visited:</b>	Central Regional Lough Guitane Public Water Supply (1300PUB1016)	<b>Date of issue of Audit Report:</b>	17/10/2018
		<b>File Reference:</b>	DW2007/538
		<b>Auditors:</b>	Cliona Ní Eidhin Michelle Minihan
<b>Audit Criteria:</b>	<ul style="list-style-type: none"> <li>• The <i>European Union (Drinking Water) Regulations 2014 (S.I. 122 of 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 in any previous audit reports.</li> </ul>		

## MAIN FINDINGS

- i. **The newly constructed Central Regional Lough Guitane Water Treatment plant was found to be fully commissioned and operating well on the day of the audit. No observations of concern were made.**
- ii. **The purpose of the audit was to assess the suitability of the Central Regional Lough Guitane Public Water Supply for removal from the EPA’s Remedial Action List (RAL). The audit findings, along with monitoring results submitted to the EPA, will be considered when revising the next RAL at the next review during October 2018.**

## 1. INTRODUCTION

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 drinking water in the Central Regional - Lough Guitane (H) 400F Public Water Supply.

The Central Regional Public Water Supply sources water from Lough Guitane and the Owgariff River. The drinking water treatment plant is located close to the western shoreline of Lough Guitane, approximately 10km southeast of Killarney. The supply serves a population of 58,488 dispersed north of the treatment plant across the large towns of Killarney, Tralee and Castleisland, smaller villages and rural hinterland. The farthest network extremity is almost 50 km from the treatment plant. The design capacity of the plant is 51,000 m<sup>3</sup>/day and the plant is currently producing 36,000 m<sup>3</sup>/day. Treatment comprises pH adjustment, chemical coagulation and flocculation, dissolved air flotation (DAF) clarification, rapid gravity sand filtration, UV disinfection, pH correction, chlorination and fluoridation.

At the time of the audit, the plant was being operated by Glan Agua Ltd. under a Design Build Operate (DBO) contract, the operation phase of which is 7 years in duration. Year 1 of the operating phase commenced on 15/08/2018 with the introduction of treated water from the new plant to the Sheheree Reservoir

Photographs taken by Cliona Ní Eidhin during the audit are attached to this report, of relevant, and are referred to in the text.

The opening meeting commenced at 10:30am in the new treatment plant building. 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:

<p><b>Representing Irish Water:</b>  Deirdre O’Loughlin – DW Compliance Specialist  Siobhán Clifford – DW Compliance Analyst  John Fox – Operations Contract Manager, Glan Agua Ltd. (DBO Contractor)  Andrew Young – Contract Director, Glan Agua Ltd. (DBO Contractor)</p>
<p><b>Representing Kerry County Council:</b>  Brian Lennon – A/Senior Executive Engineer  Kathleen Casey – Senior Executive Technician  Seamus O’Mahony – Executive Engineer  Seán O’Sullivan – Senior Executive Engineer</p>
<p><b>Representing the Environmental Protection Agency:</b>  Michelle Minihan, Inspector  Cliona Ní Eidhin, Inspector</p>

## 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.*

<p><b>1.</b></p>	<p><b>Source Protection</b></p> <ol style="list-style-type: none"> <li>a. No observations or information of concern were noted in relation to source protection.</li> <li>b. A Cryptosporidium Risk Assessment has been completed for the supply taking into account the new drinking water treatment plant. The assessment yielded a score of -67 indicating low risk.</li> <li>c. The Owgarriff river source was not in use at the time of the audit; only the Lough Guitane source was in use. The intake pipe from the lake was exposed due to drought conditions during the Summer 2018. The intake itself was not inspected. At normal lake levels, the raw water intake is by gravity. Due to low water levels, the intake at the time of the audit was via a pump. The pumping of water had begun during the summer months and remained operational during the day of the audit.</li> <li>d. Farm surveys were completed in the catchment by Kerry County Council in 2015 with no findings of water quality concern reported. The auditors were informed of a high level of awareness amongst landowners and local people with regard to protection of the lake source.</li> <li>e. Online monitoring is in place on raw water for the following parameters: colour, turbidity, pH, dissolved oxygen, conductivity, ammonia. Each of these parameters has associated alarm and pre-alarm set points. The operator confirmed that no pre-alarm or alarm has been triggered based on raw water quality parameters since commissioning on August 15<sup>th</sup> 2018</li> </ol>
------------------	---

2.	<p><b>Sampling Programme for raw water</b></p> <p>a. Kerry County Council advised that 6 raw water samples are taken per year; 4 have been taken in 2018 to date.</p> <p>b. The auditors reviewed raw water monitoring results for Lough Guitane for 2018. Relative stability of the water quality was noted. No parameters of concern were flagged by the results reviewed.</p>
3.	<p><b>Coagulation, Flocculation and Clarification</b></p> <p>a. No observations of concern were noted in relation to coagulation, flocculation and DAF clarification.</p> <p>b. Polyaluminium chloride (PAC) is used as the coagulant and no coagulant aid is used. Coagulant dose is adjusted according to raw water organic content, as determined through the measurement of UV (UVA<sub>254</sub>) absorbance.</p> <p>c. The 6 No. dissolved air flotation (DAF) clarification units were observed by the auditors. On inspection of the turbidity monitor readouts the DAF units were found to be producing clarified water with a turbidity of 0.5-0.6 NTU verifying satisfactory operation at that time. The operator advised that this was the typical turbidity range for the DAFs and that little deviation from 0.5-0.6 NTU has been observed since commissioning.</p>
4.	<p><b>Filtration</b></p> <p>a. The 8 No. dual media (anthracite and sand) rapid gravity sand filtration units were inspected by the auditors and no observations of concern were recorded.</p> <p>b. The operator advised that backwashing is initiated automatically through either:</p> <ol style="list-style-type: none"> <li>High media pressure differential / headloss</li> <li>High filtered water turbidity</li> <li>Elapsed run time (max 35 hours) or</li> <li>Manual override.</li> </ol> <p>Criteria a. and b. had not been met since commissioning so backwashing has been initiated based on elapsed run-time, to-date.</p> <p>c. A backwash of filter no. 3 was observed. No observations of concern were made during the backwash. Following the backwash, the filter runs to waste for 30 minutes following which, if turbidity is not below 0.2 NTU, the filter operates on a run to waste basis for a further 30 minutes. If a turbidity of 0.2 NTU is not reached at that stage, the operator is alerted and a further backwash will be undertaken.</p> <p>d. Sand level markers were confirmed to be in place by the operator but were not visible to the auditors due to water and media within the units.</p>
5.	<p><b>Disinfection</b></p> <p><u>Primary Disinfection</u></p> <p>a. Filtered water is disinfected by 3 No. Wedeco Spektron 2000e-EW UV units. The units operate on a duty, standby and assist basis. There is automatic switchover between pumps. Each unit has a 12-bulb array and 12 spare bulbs are maintained on site.</p> <p>b. Each unit has UVT and UVI monitors in place with associated alarms. At the time of inspection, the UVT reading was 93.7% and the UVI reading was 94.9 W/m<sup>2</sup>.</p> <p>c. The Reduction Equivalent Dose for <i>Cryptosporidium</i> is 13.1 mJ/m<sup>2</sup>. This has been configured as the alarm and automatic shutdown set point. A warning or pre-alarm to the operator is set at 14.41 mJ/m<sup>2</sup>. At the time of the audit, the unit readout indicated that a dose of 66.8 mJ/m<sup>2</sup> was being achieved which was well in excess of the dose required for the deactivation of <i>Cryptosporidium</i>.</p> <p>d. The operator advised that the reference UVI sensors are verified internally monthly and will be verified externally every 2 years.</p> <p>e. Irish Water provided validation details to the inspectors for examination following the audit.</p> <p><u>Secondary Disinfection</u></p> <p>f. Secondary disinfection is achieved through the dosing of sodium hypochlorite. Sodium hypochlorite is generated on site using an electrolysis based system.</p>

	<ul style="list-style-type: none"> <li>g. Duty, standby and assist dosing pumps were verified to be in place with automatic switchover in the event of duty pump failure.</li> <li>h. Dosing is flow proportional and currently aims for 0.7-1.2 mg/l in final water leaving the plant. The operator and Kerry County Council expect the target chlorine in the final water leaving the plant to be reduced over time to manage chlorine residuals in the network which are currently significantly higher than the minimum 0.1 mg/l required. End of line results of up to 0.8 mg/l are currently being detected by network checks.</li> <li>i. Boosting takes place at 3 locations (Scart, Lissardboola, Ballintobeenig) in the network; a reduction from 12 locations when the former plant was in operation.</li> </ul>
<b>6.</b>	<p><b>Fluoridation</b></p> <ul style="list-style-type: none"> <li>a. No observations of concern were noted in relation to fluoridation.</li> </ul>
<b>7.</b>	<p><b>pH Correction</b></p> <ul style="list-style-type: none"> <li>a. Filtered water with a pH of 5.5 is dosed with lime to raise pH to 7.2 for plumbosolvency purposes. No observations of concern were noted in relation to pH correction.</li> </ul>
<b>8.</b>	<p><b>Treated Water Storage and Distribution Network</b></p> <ul style="list-style-type: none"> <li>a. A new twin celled treated water storage reservoir has been constructed and commissioned on site and provides up to 10,800 m<sup>3</sup> (or 4 hours at maximum demand) storage.</li> </ul>
<b>9.</b>	<p><b>Monitoring and Sampling Programme for treated water</b></p> <ul style="list-style-type: none"> <li>a. A final water turbidity monitor is in place and was reading 0.074 NTU at the time of the audit.</li> <li>b. The Central Regional Lough Guitane Public Water Supply now has multi barrier treatment in place for the removal and deactivation of <i>Cryptosporidium</i>. It was proposed that the <i>Cryptosporidium</i> monitoring programme for this supply may now be suspended due to UV treatment being in place.</li> </ul>
<b>10.</b>	<p><b>Exceedances of the Parametric Values</b></p> <ul style="list-style-type: none"> <li>a. The Central Regional Lough Guitane Public Water Supply has had a history of elevated trihalomethanes (THMs) above the 100 µg/l parametric value set by the Drinking Water Regulations. Sampling undertaken in the network for THMs since the commissioning of the new treatment plant and provided for inspection at the audit has shown that all results are now below the parametric value. On reviewing the results, it was confirmed that compliance has now been achieved.</li> <li>b. Irish Water informed the auditors that a THM formation potential assessment was undertaken at the end of August yielding results of 66 µg/l and lower at each location.</li> <li>c. THM levels are expected to reduce further as chlorine dosing is tapered at the treatment plant and boosting stations in order to achieve chlorine residuals closer to the minimum 0.1 mg/l required at the end of the network.</li> </ul>
<b>11.</b>	<p><b>Chemical storage and bunds</b></p> <ul style="list-style-type: none"> <li>a. There were no observations of concern made in relation to chemical storage and bunding.</li> </ul>
<b>12.</b>	<p><b>Management and Control</b></p> <ul style="list-style-type: none"> <li>a. The auditors noted that much information pertaining to the operation of the treatment plant was displayed clearly at locations throughout the plant. The operator advised that many procedures were being developed and would be collated for reference.</li> <li>b. Overall the plant was very well maintained.</li> </ul>
<b>13.</b>	<p><b>Sludge Management</b></p>

	<p>a. The clear supernatant from sludge settlement is subjected to UV treatment and recycled to the raw water blending tank at the head of the works. This recycled process water is flow-controlled to a volume not exceeding 7% of the inflow rate from raw water sources.</p> <p>b. No observations or information of concern in relation to sludge management was recorded during the audit.</p>
--	--

### 3. AUDITORS COMMENTS

The Central Regional Lough Guitane drinking water treatment plant is a state of the art facility with all the necessary infrastructure in place to produce drinking water to a high standard and in compliance with the parametric values of the Drinking Water Regulations. Online raw water monitoring for a range of parameters, with alarms and shut-down, confer a high degree of source security to the plant protecting it from exceptional or extreme events impacting on the source and with the potential to impact on treatment. Further monitoring of key parameters at every stage of the treatment process allow for informed management of all processes in real time. Given the scale of the plant, the plant operator benefits considerably from a mobile tablet-base control interface.

The treatment plant has the advantage of relatively stable water quality in its raw water sources. The plant is designed such that all routine maintenance and calibration is undertaken in-house by the operator which provides for a high degree of autonomy in running it, eliminating potential delays with external contractors.

The new treatment plant has improved the *Cryptosporidium* risk from 62 (moderate risk) to -67 (low risk). While the supply has been in full compliance with the THM parametric value since one week after commissioning, further reduction in THM formation is likely and expected as chlorine dosing and residuals across the network are fine tuned.

### 4. RECOMMENDATIONS

1. Irish water should update the particulars for the Central Regional Lough Guitane Public Water Supply on the EPA's EDEN portal.
2. Irish Water should continue to make adjustments to chlorine dosing at the plant and booster stations to ensure that free residual chlorine levels at the end of the distribution network are maintained at levels closer to 0.1mg/l. It is noted that this was a work-in-progress at the time of the audit.
3. Irish Water should compile a plant manual containing technical specifications for all plant, structures, materials and consumables relevant to the Central Regional Lough Guitane drinking water treatment plant. This should be maintained onsite for reference by future plant operators.
4. Irish Water should develop standard operating procedures for routine and periodic check and maintenance activities to be undertaken by the plant operator. A format and repository for records on the completion of daily/weekly/monthly (etc.) checks should be developed.

**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 Regina Campbell, 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 within **one month** of the date of this audit report detailing how it has dealt with, or how it is planned to deal with the recommendations made.

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 DW2007/538 in any future correspondence in relation to this Report.

**Report prepared by:**

CNE

**Date:**

17/10/2018

---

Inspector