



Drinking Water Audit Report

Local Authority:	Monaghan County Council	Date of Audit:	22 May 2009
Plant(s) visited:	Carrickmacross Drinking Water Treatment Plant	File Reference:	DW 2009/54
		Auditors:	Mr. Darragh Page and Mr. Darren Walsh
Audit Criteria:	<ul style="list-style-type: none"> • The <i>European Communities (Drinking Water)(No. 2) Regulations, 2007</i>. • EPA Drinking Water Regulations <i>Guidance Booklet No. 1 – Regulation 9 and 10</i>. • The recommendations specified in the <i>Handbook on Implementation of the European Communities (Drinking Water) Regulations 2000</i>. • The recommendations specified in the EPA Report titled <i>The Provision and Quality of Drinking Water in Ireland. A Report for the Years 2007-2008</i>. 		

MAIN FINDINGS

- i. **One of the sources of the Carrickmacross public water supply, Spring Lake, does not have an adequate treatment barrier in place capable of removing potential contamination from *Cryptosporidium*. A treatment barrier needs to be installed as a matter of priority.**
- ii. **The disinfection system at the Carrickmacross public water supply is not being operated in accordance with best practice. The operation and management of the system needs to be revised and upgraded as a matter of urgency.**
- iii. **The practice of storing treated water in an open reservoir at Nafferty Reservoir presents a risk to the quality of the treated water supply. This reservoir should be covered to minimise the risk of contamination to this water supply.**

1. INTRODUCTION

Under the *European Communities (Drinking Water)(No. 2) Regulations 2007* the Environmental Protection Agency is the supervisory authority in relation to the local authorities and their role in the provision of public water supplies. This audit was carried out in response to the notification by Monaghan County Council dated 23 April 2009 of the failure to meet the coliform bacteria parametric value (as specified in Table C of Part 1 of the Schedule of the Regulations) in the Carrickmacross public water supply.

The opening meeting commenced at 10.00 am in the offices of Monaghan County Council. 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 following were in attendance during the audit. The audits observations and recommendations are listed in Section 2 and 4 of this report.

Representing Local Authority: (* indicates that person was also present for the closing meeting)

Mr. Dan Doody – Senior Engineer

Mr. Vincent McKenna – Senior Executive Engineer*

Mr. Pascal Rooney – Senior Executive Technician*

Mr. Patsy McKenna – Carrickmacross Town Foreman*

Mr. Matthew Lawlor – Technician*

Mr. EJ Grimes – Plumber*

Mr. Francie Byrne – Caretaker*

Representing the Environmental Protection Agency:

Mr. Darragh Page – Inspector*

Mr. Darren Walsh – Student*

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.

The Carrickmacross water supply originates from a combination of the Nafferty Spring and nearby borehole, the Monanny borehole, Spring Lake and associated boreholes. Treatment in the supply consists of chlorination and fluoridation only. A population of approximately 6,000 persons are served by the supply which distributes approximately 1,200 m³/day.

a) Source Protection

- ❑ An inspection of the four sources of the supply was carried out. The Nafferty Spring is located in a marshy hollow with an industrial estate close to the outflow of the spring with agricultural land upgradient of the source. The spring was covered with a polythene sheet to prevent algae getting into the intake which was below the sheet. There was evidence of algal growth on top of the polythene sheet which was just below the surface of the spring (Photo 1). There was also evidence of earthen fill material dumped below the outflow of the spring (Photo 2). Mr. P. McKenna stated that this was soil and stones that have been excavated from a nearby site and did not contain any C&D waste.
- ❑ Mr. V. McKenna stated that the spring was a karst spring and that a vulnerability assessment of the spring had been carried out which indicated that some of the zone of contribution was extremely vulnerable. However, the local authority had not identified any of the risks to the quality of the spring in the zone of contribution and were unable to say what was causing the algal growth on the surface of the spring. The local authority were unable to confirm whether the requirements of the Good Agricultural Practice Regulations were being complied with in the catchment areas of the various water sources.
- ❑ The spring was supplemented with water from a nearby borehole which was covered by a concrete plinth and appeared to be secure from ingress.
- ❑ The Monanny borehole was taken from a depth of 150 feet. It was located in a covered wellhead that was secure from ingress of water.
- ❑ Spring Lake and two associated boreholes comprised the final source for the supply. Mr. V. McKenna stated that the lake was spring fed but did receive run off from the surrounding lands. The lands bordering the lake were steep and contained cattle as well as at least one house using

	<p>an on-site wastewater treatment system. A catchment assessment had been carried out by the Environment Section and there were some locations of concern within the catchment.</p>
<p>b)</p>	<p>Chlorination and Disinfection</p> <ul style="list-style-type: none"> ❑ Chlorination takes place at three locations in the Carrickmacross public water supply, Monanny borehole, after the Nafferty Reservoir and at Spring Lake. ❑ Water from the Monanny Borehole is chlorinated using sodium hypochlorite at source before being pumped into the Nafferty Reservoir. There is a duty and standby pump in place at the dosing point, however there is no automatic changeover in the event of a failure of the duty pump. ❑ The Monanny borehole water is mixed in the Nafferty Reservoir with the Nafferty Spring and chlorinated after the reservoir using chlorine gas. There is a backup sodium hypochlorite dosing system in place at this location in the event of the failure of the chlorine gas dosing system. A residual chlorine monitor is located immediately downstream of the chlorine dosing point before adequate contact time has been achieved. The readings on the monitor fluctuated between 0.6 and 0.8 mg/l at the time of the audit due to the fact that the disinfection and/or mixing is not complete at the point of monitoring and therefore the results cannot be relied upon to manage the disinfection process. Furthermore, a manual free chlorine test at the same point as the monitor carried out by Mr. P. McKenna at the time of the audit recorded a value of 0.33 mg/l. Mr. P. McKenna stated that he uses the manual test to manage the chlorine dose in conjunction with chlorine readings taken in the town rather than the results on the monitor. ❑ The Spring Lake source is disinfected using chlorine gas and is subject to no other treatment (other than fluoridation). ❑ There is also a chlorine monitor at the end of the distribution network to ensure that there is adequate levels of chlorine at the extremities of the system. However, the response time to this (as it is the only reliably operating monitor) is inadequate as a failure in the chlorination system will only manifest itself at this monitor long after the problem has occurred.
<p>c)</p>	<p>Treated Water Storage</p> <ul style="list-style-type: none"> ❑ Chlorinated water from the Monanny borehole is pumped to the Nafferty Reservoir where it is mixed with water from the Nafferty Spring. This reservoir is not covered (Photo 3). Therefore, treated groundwater is being exposed to potential contamination at the Nafferty Reservoir. ❑ Mr. P. McKenna stated that the reservoir experiences algal blooms in the summer and is cleaned every three weeks. ❑ The reservoir was of a poor structural quality and there was evidence of cracks in the walls of the reservoir at numerous locations (Photo 4). ❑ Chlorinated water from Spring Lake is stored in the Spring Lake Reservoir. Mr. P. McKenna stated that this reservoir is not baffled and is cleaned out twice per year. The local authority were unable to state whether there was preferential flow through the reservoir.
<p>d)</p>	<p>Distribution Network</p> <ul style="list-style-type: none"> ❑ The distribution network of Carrickmacross is comprised of 42 km of mains of which 8 km was in the process of being replaced. Mr. P. McKenna stated that 5 km had been complete so far.
<p>e)</p>	<p>Monitoring and Sampling Programme for treated water</p> <ul style="list-style-type: none"> ❑ The local authority carry out regular daily testing of chlorine levels in the distribution network to manage the chlorination system in the Carrickmacross public water supply. ❑ No monitoring for <i>Cryptosporidium</i> has been carried out on the supply which originates from the Spring Lake source in spite of the absence of a treatment barrier. ❑

f)	<p>Exceedences of the Parametric Values</p> <ul style="list-style-type: none"> ❑ A failure to meet the coliform bacteria parametric value was notified to the EPA on 20 April 2009. Mr. Rooney stated that this was due to mains works that were taking place at the time.
g)	<p>Chemical storage and bunds</p> <ul style="list-style-type: none"> ❑ Chemical storage at the various chemical treatment points in the supply were generally satisfactory, however the fill point for the bulk storage container for the fluoride tank was located outside a bunded area and was located directly above a surface water drain (Photo 5).

3. AUDITORS COMMENTS

The Carrickmacross public water supply is in need of urgent improvements. The most significant issue is the absence of a treatment barrier capable of removing *Cryptosporidium*. This issue needs to be addressed as soon as practicable. The only treatment process in the supply (i.e. disinfection with chlorine) is operated in an unacceptable manner. In particular, the practice of pumping treated borehole water to an open reservoir exposes what is otherwise good quality water to potential contamination. Furthermore, the management of the disinfection process is unsatisfactory (e.g. the inappropriate location of the chlorine monitor at the dosing point after the Nafferty Reservoir) and needs to be revised as a matter of urgency.

4. AUDIT RECOMMENDATIONS

In view of the observations noted during the audit Monaghan County Council is recommended to carry out the following;

1. **Management and Control:** The local authority should install an appropriate treatment barrier capable of removing *Cryptosporidium* on the Spring Lake source or replace this source with an alternative source of clean and wholesome drinking water.
2. **Management and Control:** The local authority should identify the potential risks to the quality of the Nafferty Spring and identify the cause of the algal blooms in the spring. An action plan should be prepared to reduce the risk of contamination of the spring.
3. **Source Protection:** The local authority should implement the requirements of the Good Agricultural Practice Regulations to ensure that:
 - ❑ Organic fertiliser or soiled water is not applied to land within 200 m of the abstraction point; and
 - ❑ Farmyard manure held in a field prior to landspreading is not be placed within 250 m of the abstraction point.
4. **Source Protection:** The local authority remove the material deposited in the vicinity of the Nafferty Spring and dispose of the material in accordance with the appropriate statutory requirements.
5. **Chlorination and Disinfection:** The local authority should review the contact time for chlorine disinfection to ensure that the correct dose and time (0.5 mg/l for at least 30 mins) is being achieved as recommended by the World Health Organisation and that the first connections are receiving appropriately disinfected drinking water. The local authority should submit a calculation of the contact time to the Agency.
6. **Chlorination and Disinfection:** The local authority should install a continuous chlorine residual monitor **after adequate contact time has been achieved** at each of the chlorine

dosing points. These monitors should be alarmed and linked to a recording device to ensure that either a sudden increase in chlorine demand or a failure of the chlorine dosing system is immediately detected.

7. **Chlorination and Disinfection:** The local authority should ensure that there is automatic switchover from the duty chlorine pump in the event of the failure duty pump.
8. **Treated Water Storage:** The local authority should ensure that the Nafferty reservoir is covered to reduce the risk of contamination.
9. **Distribution System:** The local authority should ensure that there is a complete mixing (ie no preferential flows through the tank) in the Spring Lake reservoir and that no stagnant areas exist.
10. **Monitoring and Sampling Programmes for Treated Water:** The local authority should prepare a programme of monitoring for *Cryptosporidium* in the treated water. If any *Cryptosporidium* oocysts are detected during the monitoring programme then the local authority should immediately contact the Health Service Executive.
11. **Chemical Storage and Bunds:** The local authority should ensure that the fill point for the fluoride bulk storage tanks is located within a bunded area.

5. FOLLOW-UP ACTIONS REQUIRED BY THE LOCAL AUTHORITY

During the audit the local authority representatives were advised of the audit findings and that action must be taken as a priority by the local authority to address the issues raised.

The local authority 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 are, where relevant, addressed at all the other treatment plants managed by your Council.

Report prepared by:

Reviewed by:

Darragh Page

Leo Sweeney

Inspector

Senior Inspector

Date:

Date:

Appendix 1



Photo 1. Nafferty Spring.



Photo 2. Nafferty Spring (note fill to rear of photograph).



Photo 3. Nafferty Reservoir.



Photo 4. Crack in the Nafferty Reservoir (note outflow of water from crack).



Photo 5. Fill Point for Fluoride Bulk Storage Tank.