

Lochenkit WTW Disinfection Failure 17th June 2014

DWQR Inspector:
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Event No. 6037

Event Category: Significant

Summary of Incident

At 13:20 on the 17th June 2014, the mains supply to Lochenkit WTW failed. The onsite operator manually started a temporary generator; the site generator with auto changeover had failed in December 2013 and had been replaced by a generator which requires manual changeover. Mains power was restored at 18:45. Low chlorine alarms were generated at 18:09 and 20:35 on the 17th June, which were attributed to chlorine monitor issues and assessed as false alarms. A third low chlorine alarm at 07:13 on the 18th June was determined to be a genuine disinfection failure.

Scottish Water has estimated that the treatment works supplied water which had not been disinfected for up to 9.5 hours. The extent of the impact of the incident on the water quality of the supply to consumers is unknown, as no microbiological sampling was carried out in response to the incident.

Lochenkit WTW has been due to close and be maintained out from a new treatment works for several years, but commissioning issues with this new works has meant that Scottish Water is currently unable to determine how long Lochenkit WTW will remain operational.

DWQR Assessment of Cause of Incident

The cause of the incident was an airlock in the chlorine (sodium hypochlorite) dosing system caused by the time taken for the manual changeover of power from the temporary generator to the mains supply. Delays in understanding the situation were caused by false readings from the flow switch on the sodium hypochlorite dosing system, and the failure of one of the chlorine monitors to register low chlorine levels. The flow switch on the chlorine dosing system, which uses an LED display to signify whether there is a flow of sodium hypochlorite, was missing a bracket to hold the flow switch in a vertical position, and so was lying on its side. It is thought that the pulsing of water back and forth with the pump registered as flow after actual flow had stopped. Although the manufacturer's calibration procedures had been followed when calibrating the residual chlorine monitors, it was discovered after this incident that the monitors do not operate below set levels, and the monitor continued to register a steady chlorine residual, when in fact the chlorine dosing had stopped.

DWQR Assessment of Actions Taken by Scottish Water

1. There was a loss of disinfection at Lochenkit WTW for at least 9.5 hours. The exact time that dosing stopped is difficult to determine from on-line monitoring due to chlorine monitor failings. It is of concern that the chlorine monitors on the site not only failed to record low chlorine levels, but also continued to produce



trends indicating that the chlorine dosing was operating normally after it had ceased. Separately, in the hours prior to the chlorine dosing failure, two final water low chlorine alarms were generated, which Scottish Water has reported were caused by reduced flows to the instrument; the Operator attended site, adjusted flows through the monitor and took manual chlorine samples which showed a healthy chlorine residual at the time. However, repeat false alarms may have increased the confusion at the site when the chlorine dosing did fail, and the DWQR lacks confidence in the chlorine monitoring and dosing systems at Lochenkit WTW.

2. The microbiology sampling carried out in response to the failure of the disinfection system, to determine the risk to consumers and to provide information to Health Board and Environmental Health staff to determine whether any health protection measures were required was wholly inadequate:

a. The Operator, who had been trained to take samples, took two microbiology samples of the final water at the treatment works on the 18th of June, but neither the times that the samples were taken nor the chlorine residual in the supply at the time that the samples were taken were recorded. Both pieces of information are essential to understand the results of the analysis of the samples, rendering them meaningless.

b. The Lochenkit supply for 902 consumers is fed via the Durhamhill Service Reservoir. Following this incident, unchlorinated water entered the tank, and since the service reservoir has secondary chlorination, very low chlorine levels were recorded from the outlet. A microbiology sample was taken at Durhamhill service reservoir. However, records show that this sample was not taken when the chlorine residual was found to be low (free chlorine 0.08mg/l), but after emergency chlorine dosing (free chlorine 0.68mg/l). No samples were taken from consumers' properties supplied from Durhamhill service reservoir. The microbiological quality of this section of the supply during the incident is therefore unknown.

c. Lochenkit WTW also supplies 157 properties, a population of 305, directly from the works. Despite there being no chlorine dosing for at least 9.5 hours, no microbiology samples were taken from any of these properties, and again, the microbiological quality of this section of the supply during this incident is unknown.

The complete lack of microbiology samples following a protracted period of supply of undisinfecting water is unacceptable, and has not allowed Scottish Water to have any insight into the quality of water supplied from Lochenkit WTW during this incident, or any meaningful discussion with Health Board or Environmental Health colleagues on water quality or potential restrictions on the use of the supply. Given that the raw water supply for Lochenkit WTW is a surface water supply, it is highly likely that failures of microbiological standards would have been detected had the supply been adequately sampled.

3. It is disappointing that the chlorine monitors failed to operate when chlorine levels dropped below set levels. Scottish Water has modified the manufacturer's calibration procedure for this type of instrument and has completed an action to roll this procedure to its other assets which use this monitor. However, DWQR is concerned that Scottish Water is operating a chlorination system using instruments which use calibration procedures which have not been recommended by the manufacturer. Also, the sodium hypochlorite at Lochenkit WTW has a dual role, i.e. it is used for the oxidation of manganese prior to secondary filtration as well as for disinfection. Given that manganese levels can vary throughout the year, it is recommended that a review is carried out of the robustness of the existing chlorination system, and whether a post secondary filtration chlorine monitor is needed.

5. The Intelligent Control Centre (ICC) in Glasgow received a low final chlorine alarm at 07:13 on the 18th June, the third in 18 hours. However, the ICC did not review and action the alarm until 08:00, and were then unable to make contact with operational staff until 08:49, by which time the Operator had been on site for 30 minutes. This is an unacceptable delay for a response to an alarm from such a critical process.

6. Scottish Water reported that the procedure for checking the operation of Lochenkit WTW following a power failure is that the generator is left running until the next working day to enable the duty Operator to



check the process once mains power has been restored. This procedure was not followed; mains power was restored at 18:45 on the day of the power failure.

The event has been categorised as Significant. Scottish Water has identified six actions and DWQR accepts that these are appropriate. DWQR has also made eight recommendations and will be monitoring all actions to ensure they are completed prior to signing off the incident

