

Killin WTW Elevated Aluminium and Turbidity 1st December 2021

DWQR Inspector:
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Event No. 12274

Event Category: Significant

The Intelligent Control Centre (ICC) received a filtered water turbidity alarm from Killin WTW on the 1st December 2021 at 01:07, followed by a second alarm four minutes later. The Control Engineer interrogated other trends for the site, saw the treatment works to be operating as expected, and so suppressed the alarm for 40 minutes. From available schematics of the site, the Control Engineer was only aware of a membrane plant on the site and was unaware that the treatment works had two separate process streams; a membrane plant producing around 60% of the flow, and another stream with coagulation, dissolved air flotation (DAF) and rapid gravity filters (RGF) providing the remaining 40% of flow. The high filtered turbidity alarm came out of its suppressed mode at 02:00. The Control Engineer noted that the clear water tanks (CWTs) were full and beginning to drop, and the permeate flow from the membrane had shut down as expected since the tank had been full, and so the works was thought to be under control and the alarm was suppressed until 08:00.

At 02:32, an alarm was triggered for high filtered water aluminium, and interrogation of trends by the Control Engineer showed that filtered water aluminium levels had risen instantaneously from 6 to 563 µg/l. The membrane plant was checked and found to be in the idle position, so again the alarm was suppressed until 08:00.

At 04:50, alarms were generated from the site for poor treated water quality and for emergency shutdown. The ICC Duty Manager picked up these alarms and interrogated the site, and at this stage it was realised that assumptions had been made that it was a simply a membrane plant and that the entire treatment works had shutdown, when in fact the DAF/RGF plant had continued to operate and the auto shutdown for the DAF/RGF plant had been triggered by a low treated water chlorine alarm. The standby operator for the site was contacted, but they were already out at another site, and so an off duty Operator was contacted and arrived onsite at 06:55 and began restarting the treatment works. Manual bench testing showed final water aluminium levels between 80 and 170 µg/l aluminium and telemetry readings of 222 µg/l for aluminium were recorded.

At 07:45 the Public Health Team was notified of the situation by the site Team Leader, and samples were taken from the distribution system.



The DAF/RGF process was started up and run to waste to allow water quality to stabilise, but a power failure shut the works down again. The Operator placed the site on the standby generator, but the generator could only power the membrane plant, and so the DAF/RGF process stream was left offline until mains power was available, and was returned to service at 16:30 on the 2nd December

Investigations showed that there had been a deterioration in raw water quality which the DAF/RGF plant had been unable to respond to, and filtered water levels exceeded the maximum value measurable by the aluminium monitor of 563 µg/l aluminium. Dilution of this process stream by the membrane stream reduced aluminium levels to a peak of 229 µg/l, and while samples taken from the network showed increased concentrations of aluminium, no samples taken failed the regulatory aluminium standard of 200 µg/l at consumers' taps.

The disinfection process on the DAF/RGF stream was impacted by the increase in chlorine demand and an ECt of 1 mg.min/l was calculated – this process stream blended with the membrane stream and final water chlorine residuals remained unaffected.

The treatment works had two Cryptosporidium sample points, one for the membrane plant and one for the DAF/RGF plant. However, the DAF/RGF plant Cryptosporidium sample point had been out of service for around a month as it had been causing the main to scour, thereby increasing filtered water turbidity to increase, triggering backwashes, so no samples were taken for Cryptosporidium.

There were no failures of regulatory standards during this incident and no consumer complaints.

The root cause of the incident was due to poor quality of information available for ICC staff and a lack of appropriate water quality monitoring and suitable alarms from the site.

The event has been categorised as significant. Scottish Water has identified seven actions which DWQR accepts are appropriate and will monitor to ensure they are completed prior to signing off the incident. DWQR made one additional recommendation.

