

Incident Summary

Port Charlotte WTW Loss of coagulation and pH 2 October 2019

DWQR Inspector:
Moirra Malcolm

Event No. 10602

Event Category: Significant

On 2 October 2019 at 04:30hrs the Intelligent Control Centre (ICC) contacted the standby operator with a treatment fault alarm from Port Charlotte WTW. On investigation the operator found both the coagulation and interstage soda pumps in fault. These were reset but immediately failed. The operator discovered that both suction lines to the pumps and delivery lines were blocked with crystallised soda. These were stripped and cleaned, but re-blocked after 15 minutes. A further attempt to strip and clean resulted in both lines failing again another 15 minutes later. The operator called for assistance, and the event was escalated via the team leader to the team manager and the Public Health Team (PHT). They eventually restored soda dosing and coagulation pH returned to within normal operating conditions by 09:15hrs. However, as the loss of coagulation had lasted almost five hours and water with a high concentration of aluminium was passing through the WTW, the escalation team agreed at 13:00hrs further action to minimise non-compliant water quality. A submersible pump was used in the clarifiers to remove poorly coagulated water and minimise forward flow. The combined clarifier water was also scoured to waste. The inlets to all service reservoirs (SRs) were closed to allow final water to back up in the Chlorine Contact Tank (CCT) and overflow to waste as Port Charlotte WTW has no Clear Water Tank (CWT). The escalation team could not find a way of isolating the supply from the CCT to 12 direct fed properties due to concerns over air locking of the main and there was no resource available to switch off customer stop cocks and deliver Do Not Drink water notices. Once water quality had fully recovered (by 19:15hrs), the SR inlets were reopened and full forward flow was re-established. At 22:32 the standby operator was recalled to site due to rising primary filtered colour, with interstage aluminium and turbidity also rising. The operator discovered that the clarifier desludge process had been left in manual mode from the earlier recovery actions and the clarifier blankets had lifted and spilled forwards. The operator reset the desludge process into automatic mode and primary filtered water quality recovered. A second increase in interstage aluminium occurred several hours later when the backwashed filter – still with significant floc from the overflow – came back online. The loss of pH control resulted in elevated dissolved aluminium passing through the works, with the interstage filtered water aluminium monitor exceeding 1000µg/l (the maximum recorded by the monitor) for approximately five hours. There is no final aluminium inline monitor at Port Charlotte WTW, but a final water laboratory test confirmed a result of 1580µg/l. Final water pH was below the PCV for approximately three hours until it recovered when the dosing lines were re-established. Interstage pH dipped again as a further volume of poorly coagulated water with a low pH passed through the works, although final pH remained compliant. The clarifier blankets spilling caused the interstage aluminium monitor to again exceed 1000µg/l for approximately three hours. Sampling was undertaken from final water, service reservoirs and in distribution on 3 October. Aluminium failures were recorded from SRs and consumers' taps, including one direct fed property. Microbiological samples were satisfactory. Samples were not taken for laboratory analysis on the day of the incident or on 4 or 5 October. Resamples for aluminium from consumers' taps taken on 15 October were satisfactory.

The incident was caused by a blockage of crystallised chemical in the soda dosing lines. To minimise handling it is made to a strength of 15%, however at this viscosity it can crystallise at temperatures below 10°C. On the night of 1 - 2 October the minimum temperature was 3.5°C. Trace heating installed to remove this risk had been disconnected during the summer due to an intermittent fault on the thermostat but not reported for repair. The incident was prolonged due to a lack of understanding that the loss of coagulation pH had on water quality. The team leader was contacted at 08:05hrs and the escalation team were aware of the event at 09:33hrs. The issue of poor quality water entering supply was not addressed until 13:00hrs. This meant a delay in running to waste and allowed extremely poor quality water to travel through the works and enter distribution. The interstage filtered water aluminium exceeded 1000µg/l for five hours, and a laboratory test recorded a final water aluminium concentration of 1580µg/l. The PCV for aluminium is 200µg/l. This is a fundamental part of water treatment chemistry and is extremely concerning, particularly since previous incidents have featured loss of coagulation pH and Scottish Water has committed to improving operator training in this critical aspect of water treatment. The second aluminium exceedance was caused by the clarifier desludge being left in manual after the recovery actions of operations and not returned to automatic. This allowed the clarifier blanket to rise and spill forward, which had a knock-on effect in raising the aluminium a third time when the backwashed clarifier came back online, still with excess floc from the blanket spillage.

The event has been categorised as Significant. Scottish Water has identified fourteen actions which DWQR accepts are appropriate and will monitor to ensure they are completed prior to signing off the incident. DWQR made two additional recommendations.

