

Incident Summary

Papa Stour WTW Sample Breach of PCV and THM's November 2021 & March 2022

DWQR Inspector:
Andrew Kennedy

Event No. 12270 & 12482

Event Category: Significant

Two separate events occurred between 24th November - 15th December 2021 and between 23rd – 30th March 2022 with elevated Trihalomethanes (THM's) in the treated water leaving Papa Stour WTW. The initial event in November 2021 was caused by a significant increase in the organic THM precursors of the raw water supply following prolonged adverse weather conditions leading to erosion of the peat banks at Gorda Water. A temporary Inverness filter was in supply, but unable to remove the additional organics, with post-filtration colour increasing from 30°H in November. On the 16th December 2021, the Granular activated carbon (GAC) media was replaced and this began to remove the residual organic material from the raw water supply.

The newly refurbished Inverness filter was returned into service on 9th February, however filtered turbidity reached 1.5NTU on several occasions in February and March, with THM PVC breaches in both the Final Water (THM = 120.9ug/l) and at a customer property (THM = 162.6ug/l).

Scottish Water's investigation found that the root cause of the first incident was a rapid deterioration in colour of the pre-filtered raw water, likely due to prolonged adverse weather conditions. The conditions on Papa Stour through most of October and November 2021 were exceptional, with wind speeds between 40-80mph and gusts of up to 100mph for a sustained period.



The temporary Inverness Filter on site did not have the capability to remove the additional organics from the raw water supply, resulting in higher organic loading on the GAC Media, which in turn led to higher levels of organic THM precursors passing onto the disinfection process, leading to higher THM formation. The formation of THM's is likely to have been exacerbated further due to the lengthy chlorine contact time in the clear water tank (CWT) of over 64hrs.

It is unacceptable that despite the prolonged adverse weather conditions, the known increased risk of THM formation and daily bench samples showing deterioration in colour both pre and post-GAC, the site's emergency action level (EAL) for filtered colour post-GAC was breached for a month before the GAC media was replaced.

Furthermore, Scottish Water's investigation found that the Inverness Filter had been performing less effectively since 2019, as shown by the increased frequency of GAC Media replacement. During this incident, a temporary filter was in supply whilst the Inverness Filter was being refurbished. Despite a temporary filter being in supply, no additional monitoring of the water post-GAC was carried out, nor was the deterioration of post-GAC Bench test results escalated, which could have been used to indicate the GAC contactor being exhausted and requiring replacement. Following the newly refurbished Inverness Filter being returned to service on 9th February 2022, filtered turbidity reached 1.5NTU on several occasions during February and March, leading to the GAC media becoming exhausted and post-GAC colours increasing to between 10 and 16°H.

Further investigation by Scottish Water has identified that the GAC manual backwash process uses the same pre-GAC water, and that the GAC filter is sized for an annual media change with good prefiltration and the plant stopping and starting on CWT level with a run time of approx. 6 hours per day. The plant, however cannot run in automatic and currently runs to overflow, producing 12m³/day rather than the approx.

3.4m³/day to meet demand, which further impacts the exhaustion of the GAC media.

Papa Stour WTW was included in the SR15 enhancement programme for improvements in compliance with the standard for THM's, *Cryptosporidium* removal capability and risk reduction. It is particularly disappointing that despite investment at the site it continues to fail the THM standard and there have been minimal improvements to the filtration, monitoring



capabilities or backwash facilities, which would have been expected to be within the scope of improvements for these investment drivers. It is also disappointing that, whilst remedial works were carried out on the power supply, pipework and cabling for the aeration system in Clean Water Tank (CWT) A, no aeration into CWT B was installed despite the connectivity between the two tanks. I understand that due to the THM failures the investment at the site has not received Regulatory sign off.

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

