

Incident Assessment

Bayhead WTW, North Uist Ammonium Failures May – Oct 2013

DWQR Inspector:
Matt Bower

Event No. 5625
(incorporating 5357 & 5433)

Event Category: Significant

Summary of Incident

A number of samples taken from the Bayhead supply (treatment works final water and storage point) exceeded the regulatory standard for ammonium. This followed the adoption of the chloramination process on the supply, by which chlorine used to disinfect the water is combined with ammonium to produce a stable residual disinfectant. The intermittent, prolonged, failures on the Bayhead system were marginal and unlikely to have any health significance for those consuming the water.

DWQR Assessment of Cause of Incident

DWQR declared these events to be an incident due to the recurring nature of the failures and the inadequate level of process control that they potentially represented. When the chloramination process had been introduced at the site, at the same time as a number of others in the Western Isles, Scottish Water implemented a staged approach to adopting the final chlorine to ammonia ratio. This was done in order to ensure that there was always sufficient chlorine present in the distribution system to keep the supply safe, but it also resulted in the first two failures of the ammonium standard. The cause of the failure in October is less clear to Scottish Water, but the dosing equipment that was initially installed dosed ammonium sulphate at a fixed rate, requiring manual intervention to adjust the dose. This made it vulnerable to any changes in water flow resulting in the incorrect concentration of ammonium, unless a corresponding manual adjustment of the ammonium dose was made. A similar failure also occurred at nearby Benbecula WTW, for this reason. Flow-proportional dosing is now installed at these sites.

In trying hard to introduce chloramination in a staged manner and ensure chlorine residuals were maintained, Scottish Water initially kept chlorine residuals at their original setting while dosing a relatively large amount of ammonium. Subsequently the ratio of chlorine to ammonium was increased and total residuals were reduced over a period of weeks. At the dosing settings used, Scottish Water's own calculations suggest that marginal exceedences of the total ammonium standard could be expected. Because adjustment to the final settings took place over a number of weeks, these conditions existed for an extended period, leading to regulatory sample failures in the supply zone. DWQR understands Scottish Water's desire to proceed carefully but feels that the predictable failures could have been avoided with relatively minor adjustments to the protocol used.

DWQR is also of the opinion that the ammonia dosing equipment initially installed at this site and others in the Western Isles was not entirely adequate as it included minimal alarms and safeguards and relied on operators to remember to change dose settings when flow changes were made. Although this was only a temporary situation Scottish Water needs to ensure that all equipment meets minimal standards to safeguard against unforeseen events.

DWQR Assessment of Actions Taken by Scottish Water

Scottish Water initiated the appropriate resampling programme in response to these failures, but could, perhaps, have been more alert to the potential for continued failures. DWQR is pleased to learn that permanent, flow proportional ammonium dosing is now in place at both Bayhead and Benbecula and working effectively.

DWQR has made one recommendation following this incident:

Recommendation Number	Recommendation	Completion Date
DWQR 1	Scottish Water should develop or modify procedures for changing from free chlorine to chloramine at treatment works, taking into account local conditions, aesthetics and the potential for exceedences of regulatory standards.	

