

Incident Summary

Whalsay Regulatory Supply Zone Restrictions on water use 13 June 2017

DWQR Inspector:
William Byers

Event No. 8540

Event Category: Major

Two consumer contacts received on 7th June 2017, described taste and odour concerns within the Whalsay water supply zone. Localised flushing was carried out on 9th June with the Network Service Operator confirming the water had an unpleasant taste. Tests carried out by the local water treatment works operator showed high pH levels and Aluminium levels above the standard. Laboratory testing of further samples on 13th June confirmed there was an ongoing problem and an incident control team was set up. Following discussions with the Consultant in Public Health Medicine, a decision was taken to impose a 'Don't drink. Don't cook' restriction on the supply affecting 140 consumers. Arrangements were put in place to provide bottled water to distribution points in communities and to vulnerable consumers.

A new water treatment plant for Whalsay had been brought into service on 31st May, replacing the old coagulation and pressure filtration processes with a membrane filtration system. The new reverse osmosis membrane process did not have sufficient provision for the remineralisation and conditioning of the water, and a water that was highly aggressive was put into supply, meaning that it would tend to dissolve metal pipes and fittings as well as any metal deposits in the distribution system. Over the course of the incident, several operational actions were taken to try and resolve the issues at the works to address the perceived cause of the unusual taste and high aluminium values being experienced in the distribution system. At its peak, a sample taken in the northern extremity of the system on 14 June, showed a level of 1368µg/l. The standard for aluminium in Regulations is 200µg/l. Ultimately, the reverse osmosis stage of the new treatment process was isolated which allowed recovery to take place. Restrictions on use were lifted for 120 properties on 15th June and the remaining 20 properties the following day, as confirmation was received of the improving situation.

Thorough cleansing of the distribution system by swabbing, air scouring and flushing was carried out progressively, through to 29th June, although it was not until a new carbon dioxide dosing system was installed at the works on 6th July, to enable a balanced, less aggressive treated water to be fully achieved. All samples taken after the 10th July throughout the distribution system recorded a fully compliant water supply.

In the week preceeding the consumer contacts, a new water treatment works on Whalsay was introduced into supply. On 31st May, the old works, which was an aluminium sulphate based coagulation with pressure filtration process, was replaced with nano-filtration membranes with a subsequent reverse osmosis (RO) stage, disinfection and final pH adjustment through a limestone

contactor tank. These membranes and the RO stage remove unwanted elements from the raw water e.g. *Cryptosporidium* oocysts and organic matter which cause the formation of Trihalomethanes (THMs). The RO membrane stage was required at this site to fully remove THM precursors, but this process also removes other dissolved elements making the water extremely aggressive and subsequent re-mineralisation is required to ensure a balanced, chemically stable water supply. The omission of carbon dioxide dosing into the process meant the conditions for re-mineralisation and pH stabilisation could not be created as the water lacked buffering capacity and the basic remineralisation process that had been installed simply resulted in a water that was chemically unstable and liable to large fluctuations in pH. DWQR considers the aggressive nature of the treated water supplied by the new works to have caused the re-solubilization of aluminium deposits adhering to the water main pipe walls in the distribution system over the life of the old treatment works, creating high aluminium concentrations in the water supplied to consumers. The aggressive nature of the water, and its tendency to dissolve any metals it came into contact with, also put consumers at risk of high concentrations of plumbing metals, including lead.

It is clear from DWQR's investigation of the incident that there have been significant failures in Scottish Water's governance of design of the new works processes; their process for appointment of appropriately qualified contractors; commissioning procedures; water quality testing of the new production stream and a basic lack of understanding of water chemistry and the impact of the new treated water on the wider water distribution system and consumer's pipes.

The event has been categorised as Major. 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 four additional recommendations.