

Are your field equipment choices affecting your results?

AECOM was completing post remediation, porewater and surface water sampling at a site located on a foreshore in the Lower Mainland of British Columbia. Regular porewater and surface water sampling has been completed at this site, with the collection of over two thousand samples, since 2011. Less than ten porewater samples and one single surface water sample had previously exceeded the risk based target for dissolved copper. In one recent sampling event - all surface water samples and 88% of porewater samples exceeded the target for dissolved copper. The concentrations of dissolved copper detected in the surface water samples also exceeded the concentrations of total copper. These results were rechecked and verified by the project laboratory.

To determine whether the Waterra 0.45 micron high efficiency inline filters used for sample collection were a potential source of dissolved copper contamination, AECOM completed a Deionized (DI) water filter assessment consisting of:

- Two samples of DI water were collected (without filtering) directly from two jugs of laboratory supplied DI water for analysis of dissolved copper and dissolved zinc.
- Four samples of DI water were collected after filtering with two different batch lots of Waterra 0.45 micron high efficiency inline filters.
- The two unfiltered samples were non detect (<0.2 µg/L) for dissolved copper, however one sample contained a detectable concentration (17 µg/L) of dissolved zinc.
- Three of the four filtered samples contained concentrations of dissolved copper (ranging from 0.68 to 0.85 µg/L), which were not present in the initial, unfiltered samples of DI water. Dissolved zinc was not detected in any of the four filtered samples (<1 µg/L).

AECOM shared this information with the project laboratory, who in turn, shared the results of an internal study on filters they completed in 2011. They had tested four types of common, industry standard, 0.45 micron inline filters for background levels of a broad suite of metals. An initial sample of ultra pure DI water was collected through each of the four filters ('no rinse' samples); a second sample was collected after each filter had been rinsed with an additional 1.25 litre of ultra pure DI water ('rinse' samples). Detectable concentrations of a number of metals (including barium, copper, lithium, zinc, etc.) were present in the no rinse samples. Concentrations of dissolved metals were still detected in rinse samples. The study concluded that it is necessary to rinse all four types of filters tested prior to sample collection.

As a result of the detection of dissolved zinc in one of the unfiltered samples in the DI water filter assessment, AECOM sent five Showa 6110PF powder free, nitrile gloves to the project laboratory for analysis. As there is no prescribed method for testing gloves, the project laboratory developed the following procedure: an index finger from each glove was dipped into a centrifuge tube containing a 0.3% nitric acid solution for two seconds prior to analysis. Dissolved zinc was detected in all five samples, with concentrations ranging from 14 to 28 µg/L. The project laboratory also tested two different brands of glove: the Medicom SafeTouch Advanced Force Textured nitrile (concentration of dissolved zinc was 8 µg/L), and Safetouch Everstrong powder-free vinyl (concentration of dissolved zinc was 1 µg/L). As vinyl gloves do not provide adequate protection, AECOM is switching to the Medicom SafeTouch nitrile gloves.

As a result of the two filter assessments, AECOM switched to Pall Gelman 12180 0.45 micron inline filters for the next round of samplings for dissolved metals. Pall Gelman filters come with a certification indicating they exhibit non-detectable concentrations of dissolved metals following a 500 ml flush. The following sampling event in which the Pall Gelman filters were used for sample collection, there were no exceedances above the target for dissolved copper and 76% of samples contained concentrations below the laboratory detection limit.