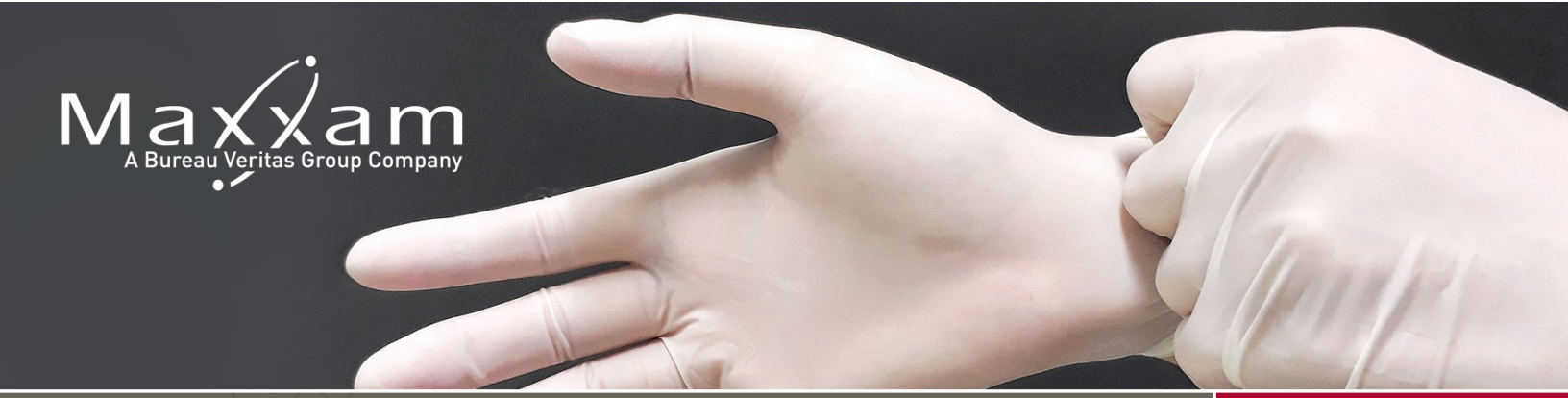

Sample Collection for Trace Level Metals – Are your hands up for the job?

TECHNICAL BULLETIN

Contaminants in wastewater are an unwelcome by-product of the day-to-day activities of our modern society. Laboratories and the industry must continually adapt to ever-changing regulatory restrictions that protect our environment. Scientific research regularly brings to light emerging pollutants or provides new insight into the behaviour of the old and familiar.

To keep up, the industry frequently requests reportable detection limits (RDLs) that can be orders of magnitude below those mandated by regulatory bodies. Such low levels require careful sampling procedures so that samples are representative of the environmental conditions and not of contaminants introduced during sampling.

Why?

Companies that operate in pristine natural areas are keenly aware that negative effects on the environment from their operations can incur huge costs, both to the bottom line and to their corporate goodwill. Complying with federal, provincial and territorial regulations is not simply the cost of doing business, but is an obligation as a fellow environmental stakeholder. Maintaining control of what is released into the environment as a by-product of commercial operations simply makes good sense.

The lowest possible reporting limits, well below regulatory guidelines, and accurate baseline data, require the implementation of strict process controls before negative environmental consequences are felt. Baseline data must reflect existing conditions so that subsequent changes in contaminant levels can be distinguished from the background.

Background

In 1987, the US EPA amended the US federal Clean Water Act to require federally recognized tribes/nations and each state to test, set and monitor water quality standards for each body of water within their jurisdictions. Each body of water would be assigned a “designated use” along with water quality limits based on its designation. Limits were scientifically derived and any pollutant load above those limits would be expected to interfere with the designated use. Theoretically, this was an excellent step towards water protection until it was found that, particularly in the case of select metals, laboratories could not meet the required limits using methods current at the time.

In the subsequent quest for lower instrument detection limits, it was discovered that what laboratories were reporting reflected not so much the concentrations from the sites as contamination introduced during sample collection. In response, the EPA developed Method 1669, “Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels”.[1], referred to as the “Clean Hands/Dirty Hands” sampling technique.

In Canada, a similar and perhaps more ambitious approach was taken to address the entire ecosystem (atmospheric, aquatic and terrestrial resources). The resulting Canadian

[1] U.S. Environmental Protection Agency, Office of Water Engineering and Analysis Division, Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels, July 1996

Environmental Quality Guidelines (CEQGs) also set scientifically-derived numerical limits below which "should result in negligible risk to biota, their functions, or any interactions that are integral to sustaining the health of ecosystems and the designated resource uses they support.[2]" As was the case in the US, attaining RDLs comfortably below these numerical limits became an immediate challenge for laboratories and industry alike.

Trace Level Metals at Maxxam

Maxxam provides the following tools and services to support our customers in proper sample collection that results in reliable and defensible testing for trace level metals:

(1) **Trace Level Metals Sampling Kits**
Each kit includes all supplies necessary for collecting samples for analysis of trace level metals, while minimizing background interferences and extraneous trace level contamination.

(2) **Procedures and Guidance for Sample Collection**
Procedures for collecting samples based on EPA Method 1669 are provided with the sampling kit. Copies can also be downloaded from Maxxam's website.

(3) **Project Plan Assistance**
Maxxam offers guidance in developing site-specific project plans. Of particular importance is ensuring that quality in the field is monitored through the collection of adequate quality control (QC) samples, such as Field Blanks, Trip Blanks, Field Duplicates, and Equipment Blanks.

(4) Sample Handling at the Laboratory
On receipt at the laboratory, samples designated for trace level metals analysis are transferred directly to our ISO 5 (Class 100) clean room[3], constructed expressly for receiving and processing samples for trace level metals.

All subsequent sample handling activities, including labelling, sample transfer, digestion and dilution are performed in the ISO 5 clean room.

[2] Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment, 1999, updated 2001

[3] ISO 14644-1:2015, Cleanrooms and associated controlled environments -- Part 1: Classification of air cleanliness by particle concentration, December 2015

US EPA Method 1669 ("Clean Hands/Dirty Hands")

As the nickname for EPA Method 1669 implies, "Clean Hands / Dirty Hands" sampling is a two-person task. One team member is identified as "Clean Hands" and the other as "Dirty Hands", which reflects their roles and tasks associated with the sampling process. The tasks for "clean hands" and "dirty hands" are summarized below.

We recommend that the team practice their respective tasks together until the roles feel comfortable.

Dirty Hands

"Dirty Hands" is responsible for preparing any sampling devices (except the sample container itself), operating machinery, and all other activities that do not involve direct contact with the sample.

Activities include:

- Operating any necessary sampling equipment (pumps).
- Opening and closing shipping coolers.
- Opening and closing the outer bag of the dissolved metals kit to provide "Clean Hands" access to the inner bag that holds the filter, syringe and sample bottle.
- Holding the outer bag for "Clean Hands" to retrieve the bottle containing the sample from the inner bag for dissolved metals analysis.
- Completing documentation (or better yet, involve a third person).

Clean Hands

"Clean Hands" is responsible for all operations involving contact with the sample bottle, collection of the sample and filtration of the sample for dissolved metals analysis.

Activities include:

- Wearing suitable gear to safeguard the sample from the sampler (shoulder-length gloves, Tyvek coveralls).
- Opening and closing the inner bag that holds the sample bottle.
- Collecting the sample (including uncapping/recapping the sample bottle).
- Returning the bottle to the inner bag and sealing the inner bag.
- Handling the syringe, filter and bottle for collecting filtrate for dissolved metals analysis.

About Us

Maxxam is a leading North American provider of analytical services and solutions to the energy, environmental, food, industrial hygiene and DNA industries. We are a member of the Bureau Veritas Group of companies – a world leader in testing, inspection and certification services. We support critical decisions made by our customers through the application of rigorous science and the knowledge and expertise of over 2,500 employees.

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