EnviroMail™ #93 - Re-release October 2015

Laboratory QA/QC Assessment to Assist Project Quality Review and Reporting

BACKGROUND

While many industry experts are well aware of the benefits of good quality and quality assurance, QA/QC remains a topic that is often raised by new industry staff as being unclear. This EnviroMail is intended to provide some information to assist industry in maximising the quality of results to support **industry recommendations and decisions** for peer or auditor review.

DEFINITIONS

Quality Assurance (QA) (NEPM): *"All the planned and systematic activities implemented within the quality system and demonstrated as needed to provide adequate confidence that an entity will fulfil requirements for quality".*

Quality Control (QC) (NEPM): *"The operational techniques and activities that are used to fulfil the requirements for quality".*

or **Quality Control (QC) (APHA):** *"Set of measures used during an analytical method to ensure that the process is within specified control parameters"*

QA/QC – WHAT CAN BE INCLUDED?

ALS - Lab QC includes method blanks, laboratory control samples, duplicates, matrix spikes, surrogates, calibration, internal standards, CRMs that can be plotted /measured with limits and used to maintain control.

NEPM – Field QA/QC *includes the use of field duplicates and triplicates, field equipment decontamination, field filtration, assessment of holding times, maintaining in the dark, chilling, elimination of headspace, preservation, transport and method selection.*

LABORATORY QA EXAMPLES

Example practices designed to avoid false positives follow;

- ✓ Testing of acids/solvents rather than just trusting
- ✓ Testing of bottles and sample containers
- ✓ Laboratory fridge monitoring to ensure that fridge failures do not cause VOC false positives or negatives

CAUSES OF ANALYE CHANGE POST SAMPLING

There are many reasons why results can change over time even with correct preservation. Some common reasons follow, including whether a false negative or positive occurs;

- Volatilisation of analytes around the seal and out of the container as samples warm (false negative)
- Elevated Temperature (false negative) see *EnviroMail85-Temperature Management Best Practice*
- Headspace for VOCs (false negative)
- Oxidation or Photo degradation of VOCs (false negative or positive)
- Bacterial degradation (consuming the analyte e.g. TRH or nutrients – false negative)
- Precipitation or metals adsorption to bottles (false negative)
- Leaching from containers e.g. metals from low grade plastic or PFCs from Teflon liners in water (false positive)
- Microbial Morbidity (false negatives for micro)
- Incorrect field techniques, often involving filtration of metals (can cause false positive or negative).
- Decanting waters (sediment exclusion) and not solvent rising bottles for SVOCs e.g. PAHs (false negative) refer to *EnviroMail28 - Super Ultra-Trace PAHs in water*

HOLDING TIMES

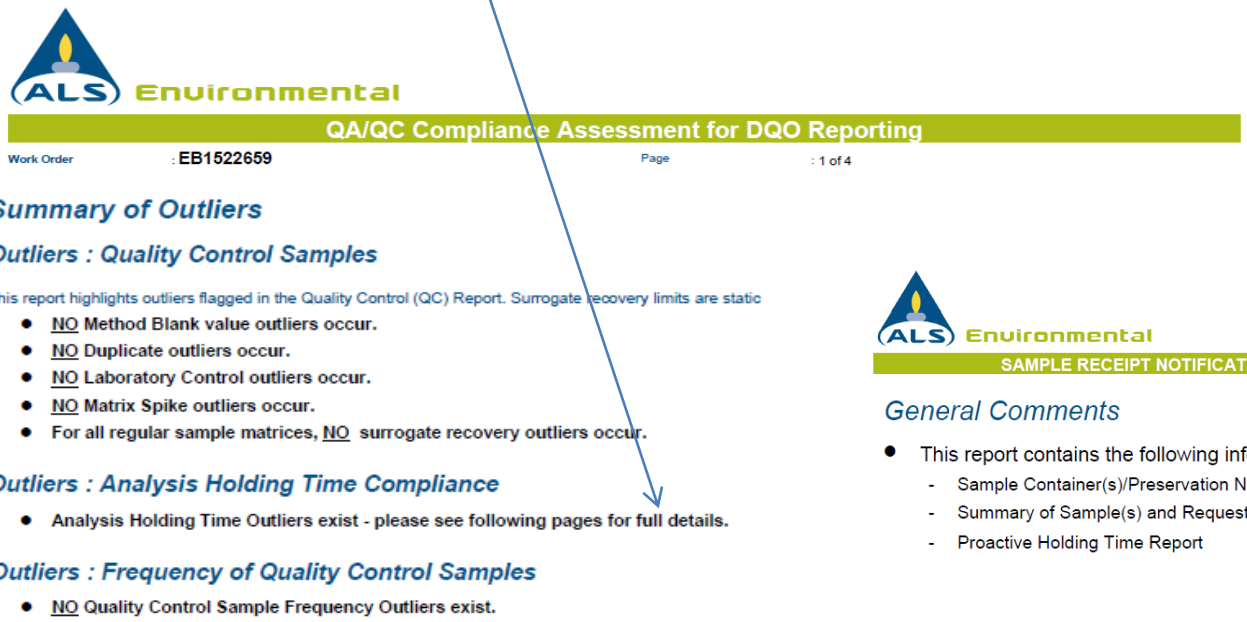
Holding times are like the "Best Before" date shown on perishable foods and are based upon many studies and key industry guidelines. Some test method holding times are long i.e. the analytes are very stable (once preserved). Other analytes degrade rapidly. Holding times are therefore important to allow practitioners to obtain the most accurate target analyte concentration at the time of sampling to assess compliance or monitor change. If field techniques, preservation and holding times are to appropriate standards, then the laboratory QA and QC protocols typically become the next most important consideration. Fifteen years ago a soil sample taken with headspace from the surface of a stockpile might end up in the lab for VOC testing. Today, industry standards are designed to avoid this as clearly key VOCs (e.g. BTEXN) could be long gone by time of receipt/analysis i.e. creating a false negative.

WHAT CAN LABORATORIES DO TO ASSIST IN MAXIMISING YOUR PROJECT OBJECTIVES?

The key here is the information provided back to industry to assist in meeting any project Data Quality Objectives in line with relevant guidelines (e.g. NEPM or NAGD). Given the risk of false negatives and positives, it is crucial that samples are received with appropriate preservation, headspace, chilling and holding times. Every expert knows that you can have good Lab QC, but without the integrity of samples taken or received by the lab the data can be compromised.

Industry should expect a full assessment of the Laboratory internal QC and also comments on holding time compliance and frequency of QC compared with relevant guidelines e.g. NEPM (this may be a self-assessment or Interpretation of relevant industry standards. The example below with a holding time breach indicates test data may need to be flagged.

In addition, the Laboratory should provide a summary statement as to the condition of samples upon receipt – commonly called a Sample Receipt Notification (SRN). This should be reviewed early to highlight any issues (and potential resampling) and any quality assurance issues such as headspace, elevated temperature or incorrect bottles/preservation should be assessed accordingly for potential flagging of subsequent data. The SRN information is important in assessing the overall quality of the results reported and is why site Auditors often request these in reports (see below for excerpts from an SRN).



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QA/QC Compliance Assessment for DQO Reporting

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Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static

- NO Method Blank value outliers occur.
- NO Duplicate outliers occur.
- NO Laboratory Control outliers occur.
- NO Matrix Spike outliers occur.
- For all regular sample matrices, NO surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- NO Quality Control Sample Frequency Outliers exist.

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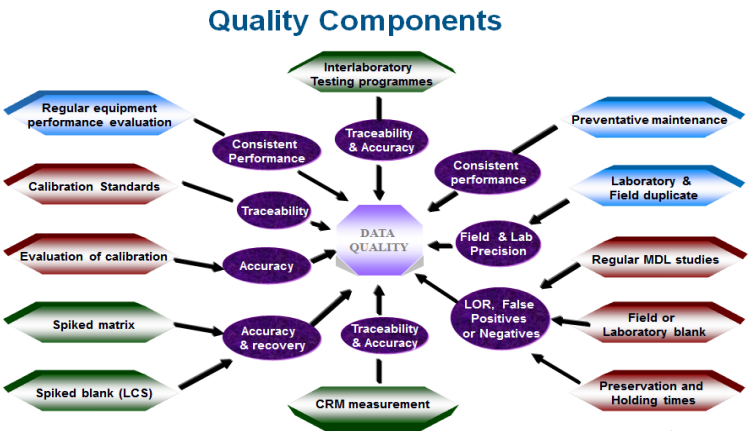
SAMPLE RECEIPT NOTIFICATION (SRN)

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report

WHAT ELSE IS IMPORTANT?

Many industry experts audit their laboratory subcontractor however laboratory QA/QC is a complex area (see adjacent for some components). One approach to assessing compliance is asking for a copy of the last NATA audit for each major laboratory. Typically Organics traceability is the most challenging area, so reviewing this NATA audit can provide insight into a laboratory's quality/traceability and recent PFOS proficiency trials can show just how important this is.



REFERENCES

National Assessment Guidelines for Dredging - 2009
APHA – 22nd Edition 2012
USEPA – SW846 Chapter 1 – Project Quality Assurance and Quality Control
NEPM B3 - Guideline on laboratory analysis of potentially contaminated soils – 1999 (amended 2013)
ANZECC 2000 Guidelines for Fresh and Marine Water Quality (section 7.1.2)

Other useful information

ALS -Environmental-Australia-Sample-Collection-Pocket-Guide.pdf
ALS Recommended Preservation & Holding Times for Waters
ALS Recommended Preservation and Holding Times for Soil and Air