



Southern African Development Community Cooperation in Measurement Traceability

**SADCMET WATER PT SCHEME REPORT on the  
13<sup>th</sup> Evaluation workshop 28<sup>th</sup> - 30<sup>th</sup> November 2016  
Dar Es Salaam, Tanzania**

**NAMWATER**

***Namibia Water Corporation Ltd***

Private Bag 13389, Windhoek

Tel: (+264-61) 71 2257

Fax: (+261-61) 71 2097

E-mail: [conradiem@namwater.com.na](mailto:conradiem@namwater.com.na)

Enquiries: M Conradie Pr. Sci. Nat

## **SHORT REPORT**

### **1. INTRODUCTION**

This report summarizes the outcome of the above mentioned evaluation workshop for the 13<sup>th</sup> PT round on Chemical Analyses.

It will be provided to all participants of the PT round to facilitate corrective actions and improvement in the laboratories. The detailed report will be published on <http://www.sadmet.org>.

### **2. REPORT OF THE LOCAL COORDINATORS**

The local coordinators have to report on their activities to promote the PT scheme on a national level and also on problems that they experienced during the year. During the workshop the local coordinators were requested to give a short report on their activities in their countries. Not all local coordinators were present at the workshop therefore emphasis was put on the local coordinators to complete the quarterly reports as requested. A WhatsApp group was created for all the local coordinators to remind them about the quarterly reports. The updated list of local coordinators is available on [www.sadcmnet.org](http://www.sadcmnet.org).

In general the distribution of the samples were without major problem possible due to the SADC customs documentation that was shipped along with the parcels.

### **3. REPORT OF THE PT PROVIDER**

The PT round was provided by NamWater in the same way as in the years before. The distribution of the parcels are still financially assisted by PTB Germany.

During 2016, 71 participating laboratories came from most of the SADC and EAC countries. Samples were prepared gravimetrically based on pure water by spiking with pure chemicals. THE reference values with small uncertainties could be calculated from the formulation process. Samples were distributed on 08th July 2016 using DHL as courier. The return date for the results was set as the 19th August 2016. Five laboratories (Kenya – 1; DRC – 3; Tanzania – 1) did not submit results.

For the evaluation and assessment the reference value was used as assigned value. A plausibility check was made using results from the National Metrology Institute of South Africa, The University of Stuttgart; Institute for Sanitary Engineering, Water Quality and Solid Waste Management, Germany, IWW Water Centre, Germany

The PT provider faced the following problems

- Laboratories still do not adhere to the stated deadlines.
- Clear and fully completed registration forms are mandatory and if the laboratories do not complete the required forms, it complicates communication proper communication.
- Laboratories that requested extension to submit results caused late distribution of reports to other laboratories.

- Laboratories are still not using the ranges provided to assist them to prevent outliers and report results that are completely out of range.
- The standard deviations are still high for some of the parameters, especially for the low concentrations.
- Laboratories are still reporting in the wrong units for Nitrate, Phosphate and conductivity.
- A list of recommended methods were compiled and it is sent to all participants but all laboratories are not using it.
- Laboratories should identify the gaps that prevent them from applying a proper method and focus on the required method information. “:ICP” and “AA” is not sufficient but proper method information is e.g ISO 11885:1996-ICP-AES
- There are still many labs that are not doing corrective actions after unsatisfactory results.
- Laboratories can use old PT samples to immediately implement corrective action
- Laboratories are still not sending their proof of payments and it makes it difficult to trace.
- Laboratories that registered and requested samples should aim to analyse them.

#### **4. RESULTS OF THE EVALUATION AND ASSESSMENT**

It was decided the annual presentation on the evaluation of the PT results should be shorter and that we have to focus more on training during the annual workshops.

As part of the succession plan for NamWater, it was decided that NamWater will in future include the SADC PT process in the training programmes of our graduates-in-training. Though this training, the knowledge will it be shared and it will also assist with the sustainability of the PT scheme. During 2016, Ms Frieda Nambahu was responsible for the SADC activities under the mentorship of Mrs M Conradie. Mrs Conradie handled the summary of the presentation and handled all the questions. The most important facts are summarized here, for more detailed description please refer to the full report.

For the evaluation and assessment, the reference values from the formulations with an uncertainty budget were used as the assigned value. The algorithm A method from ISO 13528 was used for the statistical evaluation but with a limitation for the standard deviation as a “fitness for purpose” requirement.

To calculate z-scores (the difference between the lab results and the assigned value divided by a standard deviation for proficiency assessment) the standard deviation of the data set (calculated with Algorithm A described in ISO 13528) was used whenever it was smaller than a limit agreed between the participants in the previous evaluation Workshop. This limit can be regarded as a fitness-for-purpose criterion.

A summary of all the parameters were as follows:

##### **Sulphate**

- Average recovery was higher than in the previous round with 95.9 %
- STD are still > 10 %, especially for low conc.
- 47 data points outside the limits
- 28.6 % of methods still classified as “other”

### **Chloride**

- Average recovery was higher than in the previous round with 103.3 %
- STD are still > 10 %, especially for low conc. (13.79%)
- 31 data points outside the limits
- 16.2 % of methods still classified as “other”

### **Fluoride**

- Average recovery was 90.4 %
- STD are still > 10 %, especially for low conc. (20.7%)
- 30 data points outside the limits
- 23.8 % of methods still classified as “other”

### **Nitrate**

- Average recovery was 82.5 %
- STD are still > 10%, especially for low conc. (Sample 1 - 26.8%;Sample 2 24.0%,Sample 3 - 27.2%)
- 69 data points outside the limits
- 41.6% methods still classified as “other”

### **Phosphate**

- Average recovery was 95.9 %
- STD are still > 10%, especially for low conc. (Sample 1 – 31.72%;Sample 2 28.81%,Sample 3 – 23.44%)
- 69 data points outside the limits
- 32.9 % of methods still classified as “other”

### **Total dissolved solids**

- Average recovery was 96.3 %
- STD are between 12.0-21.2 % - for low conc. (21.2%)
- 44 data points outside the limits
- 29.3 % of methods still classified as “other”

### **Conductivity**

- Average recovery was 100.4 %
- STD are all < 10 %, Sample 1 – 6.7%;Sample 2 – 8.2 %,Sample 3 – 6.9%)
- 52 data points outside the limits
- 29.2% of methods still classified as “other”

### **Calcium**

- Average recovery was 98.2 %
- STD > 10 % for all three levels ( lowest level – 23.63 % )
- 52 data points outside the limits
- 28.1% of methods still classified as “other”

## **Magnesium**

- Average recovery was 97.3 %
- STD below 20 % for Sample 5 and 6 Sample 4 ( lowest level – 27.42 % )
- 52 data points outside the limits
- 28.1% of methods still classified as “other”

## **Potassium**

- Average recovery was 106.7 %
- STD > 10 % for all three levels
- 53 data points outside the limits
- 42.2 % of methods still classified as “other”

## **Iron**

- Average recovery was 92.0 %
- STD below 20 % for Sample 5 and 6 Sample 4 ( lowest level – 42.66 % )
- 41 data points outside the limits
- 44.0% of methods still classified as “other”

## **Manganese**

- Average recovery was 93.3 %
- STD below 20 % for Sample 5 and 6 Sample 4 ( lowest level – 20.17 % )
- 39 data points outside the limits
- 50.9% of methods still classified as “other”

## **Aluminium**

- Average recovery was 90.2 %
- STD above 20%, 62.2 for lowest level; sample 4 ( 21.6%) Sample 6 (27.2 % )
- 32 data points outside the limits
- 42.2% of methods still classified as “other”

## **Lead**

- Average recovery was 99.1 %
- STD below 20 % for Sample 5 and 6 Sample 4 ( lowest level – 50.76 % )
- 27 data points outside the limits
- 44.5% of methods still classified as “other”

## **Copper**

- Average recovery was 96.0 %
- STD below 20 % for all three samples ( lowest level – 11.32 % )
- 21 data points outside the limits
- 45.1% of methods still classified as “other”

## **Zinc**

- Average recovery was 91.6 %
- STD below 20 % for all three samples ( lowest level – 15.1 % )
- 22 data points outside the limits
- 42.2% of methods still classified as “other”

### **Chromium**

- Average recovery was 95.6 %
- STD below 20 % for all three samples
- ( lowest level – 16.5 % )
- 29 data points outside the limits
- 40.0% of methods still classified as “other”

### **Nickel**

- Average recovery was 95.6 %
- STD below 20 % for all three samples ( lowest level – 16.6 % )
- 25 data points outside the limits
- 40.0% of methods still classified as “other”

### **Arsenic**

- Average recovery was 93.2 %
- STD above 20 % for all three samples ( lowest level – 27.3 % )
- 20 data points outside the limits
- 39.0% of methods still classified as “other”

### **Cadmium**

- Average recovery was 90.5 %
- STD below 20 % for all three samples ( lowest level – 19.6 % )
- 30 data points outside the limits
- 35.5% of methods still classified as “other”

### **Cobalt**

- Average recovery was 96.5 %
- STD below 20 % for all three samples ( lowest level – 12.29 % )
- 22 data points outside the limits
- 13.3% of methods still classified as “other”

### **Overall success of the anions**

21 Laboratories were 100% successful;  
16 Laboratories were > 80 % successful  
8 Laboratories were > 70 % successful;  
6 Laboratories were > 60 % successful;  
1 Laboratories were > 50 % successful;  
18 Laboratories were < 50 % successful

### **Overall success of the Cations**

24 Laboratories were 100% successful  
16 Laboratories were > 90 % successful  
10 Laboratories were > 80 % successful  
9 Laboratories were > 70 % successful  
2 Laboratories were > 60 % successful  
3 Laboratories were > 50 % successful  
16 Laboratories were < 50 % successful

## **Overall success of the Cations based on the number of parameters analysed**

24 Laboratories were 100% successful

5 Laboratories were > 90 % successful

10 Laboratories were > 80 % successful

9 Laboratories were > 70 % successful

2 Laboratories were > 60 % successful

3 Laboratories were > 50 %

16 Laboratories were < 50 %

10 Laboratories did all 22 parameters and five of them were 100 % successful

## **Conclusions**

- Overall the results of this PT round show a good performance for many labs
- There are still many outliers for most of the parameters.
- Laboratories keep on making the same mistakes.
- Laboratories should work on their method selections
- Assistance is available for laboratories that struggle - The option to put you in touch with a good laboratory for a specific method is still available
- The evaluation and assessment procedure is fit for the purpose
- The SADC MET Water PT plays a vital role in laboratory management for ongoing maintenance of confidence and improvement, irrespective of whether or not the laboratory needs to participate for accreditation.
- The use of the e-mail system as the preferred medium of communication
- Laboratories should go through their reports so that they are able to give feedback to the provider within two weeks after receipt of the report.

## **5. SOFTWARE & REPORT DEVELOPMENTS**

### **Evaluation software**

The software used was exactly the same as in 2015 with the name and address of the PT provider and name of the round was inserted on the printed reports.

- THE software was developed by Dr M Koch to address the changes from ISO/IEC 17043 and ISO 13528.
- Name and address of the PT provider as well as the round is now visible on the report.
- The usage of median is not possible anymore
- Histograms are the usual vehicle for representing medium sized data distributions graphically - but they suffer from several defects
- The kernel density estimate is an alternative computer-intensive method, which involves smoothing the data while retaining the overall structure.
- The kernel density is a good method of reconstructing an unknown population from a random sample of data, overcomes the problems of histograms and has many applications in analytical chemistry.
- A graphical display of kernel densities are included in the report. More information about kernel density diagrams is available on the following site: [http://www.rsc.org/images/data-distributions-kernel-density-technical-brief-4\\_tcm18-214836.pdf](http://www.rsc.org/images/data-distributions-kernel-density-technical-brief-4_tcm18-214836.pdf)
- z-scores are rounded to one digit after decimal point as requested by ISO/IEC 17043 and ISO 13528
- The assessment changed to satisfactory, questionable, non-satisfactory as requested by ISO/IEC 17043 and ISO 13528

To calculate z-scores (the difference between the lab results and the assigned value divided by a standard deviation for proficiency assessment) the standard deviation of the data set (calculated with Algorithm A described in ISO 13528) was used whenever it was smaller than a limit agreed between the participants in the previous evaluation workshop. This limit can be regarded as a fitness-for-purpose criterion.

#### **NamWater Website portal**

NamWater experience a lot of problems with the website that was created for the registration and submission of the results. For 2017, participants will have to register manual again. THE link on the NamWater website will not be available anymore.

## **6. FEES**

There was a discussion on the transport of the samples and payment of the distribution thereof by the PTB. The key discussion point regarding the shipment costs as it was reported that PTB is going to stop support for covering the distribution costs. It was therefore resolved that the shipment costs must be distributed among all the participating laboratories and after the provider worked out the costs, an amount of U\$175 was agreed upon to be added to the current participation fees of U\$250 making the total amount of U\$425 for the Chemistry PT round.

NamWater communicated that the cost estimation was based on the 2016 distribution cost and based on the delivery at the local coordinator. If the parcels are delivered to the local coordinator, it means that all laboratories need to send their proof of payment before the shipment can take place since the cost of the parcels in bulk and the cost of and individual parcels differs significantly.(Up to 50%)

The proposal from the participants was not to start next year (Feb 2017) but the participants did not agree because of the very short notice period and the fact that most labs have already submitted their budgets for 2017. The suggestion was that there should be a proper transition period in order to budget properly.

IT was decided that the issue on the fees will be will be discussed in detail with the PTB and participants will be updated on the outcome thereof during the notification in 2017.

Report prepared by:  
M Conradie