WATER SERVICES ASSOCIATION
OF AUSTRALIA

21 April 2006

Ms S Holmes
Study Director
Standards & Accreditation Study
Productivity Commission
PO Box 80
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Dear Ms Holmes

Standards and Accreditation

Water Services Association of Australia (WSAA) is the peak body of the Australian urban water industry. Our 29 members and 24 associate members provide water and wastewater services to approximately 15 million Australians and many of Australia's largest industrial and commercial enterprises.

WSAA was formed in 1995 to provide a forum for debate on issues of importance to the urban water industry and to be a focal point for communicating the industry's views. WSAA provides a national focus for the provision of information on the urban water industry for all interested parties. The Association aims to encourage industry cooperation to improve the urban water industry's productivity and performance and to ensure the regulatory environment adequately serves the community interest.

WSAA and its members have had long associations with both Standards Australia and NATA and we are well equipped to provide comment on the current enquiry.

As an opening comment WSAA suggests that issues of standards and accreditation of infrastructure cannot be reviewed in isolation from conformance infrastructure since the issues of standards, accreditation and conformance are inextricably linked.

Further it is noted that JAS-ANZ currently manage a number of accreditation programs and that, in principle, laboratory accreditation could be included with these programs provided there were demonstrated resultant benefits. WSAA members deal extensively with both overseas suppliers and national suppliers. As JAS-ANZ are Australia's and New Zealand's principal accreditation and certification body, it would be useful to examine NATA's relationship and possible governance oversight by JAS-ANZ.

Some more detailed comments on the standards setting process undertaken by Standards Australia are outlined below.

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Facilitating international trade
The Issues Paper suggests that "Australia also needs to have an internationally recognised standards and conformance infrastructure …….". WSAA suggests that this is not necessarily the case and that "Australia also needs to **use** internationally recognised standards and conformance infrastructure ……." is more appropriate given the position of Australia in global markets, especially in manufactured goods. It is equally important that Australia have a well documented and transparent mechanism for adopting internationally recognised standards given the range of free trade agreements that we have entered into and are negotiating. WSAA believes that the focus should not be standards setting but rather "standards harmonisation" and that there should be a deliberate and active program of withdrawal and/or modification of Australian standards to achieve harmonisation with appropriate internationally recognised standards.

The Commonwealth should also consider the use of legislation and regulation to achieve strategic standardisation where this is seen to be in the national interest and where it can be demonstrated that market failure has occurred. WSAA is of the view that the adoption of internationally recognised pipe sizes (generally ISO) is an excellent case where there are clear benefits to the nation of bringing Australia into line with the rest of the world.

Standards development process
It is our experience that a cost-benefit analysis on the need for a standard is not undertaken as part of the standards development process. Having said that a cost-benefit analysis is a specialised process that would need to be undertaken by practitioners who had intimate knowledge and experience of the sector within which the standard would be applied. In other words, it is "easier said then done" and we doubt that Standards Australia has the resources to undertaken such analyses whether provided internally or externally.

We would also suggest that in making a determination on the need to develop an Australian standard, and, in particular, in assessing for equivalence of an internationally recognised standard, objectivity is of paramount importance. It has been our experience that objectivity does not always reside in technical committees dominated by vested interests who consistently promote the development of Australian standards when equivalent internationally recognised standards already exist.

It has also been our experience through our active participation in over thirty technical committees that getting the right balance of expertise is now almost impossible given the reluctance of experts to volunteer their time. Representation from end-users, consumer groups and regulators (Commonwealth, state and territory) remains a continuing problem in Australia with most technical committees being dominated by commercial interests, who generally do not caucus with the membership of their nominating organisations. However, there are exceptions and we would nominate the Plastics Industry Pipe Association (PIPA) as being an excellent model for a manufacturers' industry association contributing to standards development.

Standards Australia
Participation in standards development can be a time consuming and unrewarding experience due a lack of project management skills and resources within Standards Australia. The urban water industry has at various opportunities suggested the adoption of a more strategic focus and planning by Standards Australia in standards development, following the lead of other standards bodies such as CEN. It has

further been suggested that technical committees (or groups of technical committees with obvious synergies) develop business plans so that work programs can be developed and resource needs identified. This has yet to eventuate and it is often difficult to determine how Standards Australia sets it strategic priorities and allocates resources accordingly.

WSAA began publishing water industry standards in 2001 as a result of recognising that we could work cooperatively with our industry suppliers to develop standards more cost-effectively and efficiently. Our focus has been on the development of product standards where no standards have hitherto been published either in Australia or overseas. Several WSAA water industry standards have now been adopted as Australian standards, a process that can still take several years. WSAA is currently negotiating a services agreement with Standards Australia whereby WSAA will provide project management of standards development using the Standards Australia process and support tools.

A copy of this agreement, when finalised could be made available to the Productivity Commission (if agreed by Standards Australia) as an example of an approach that could potentially be more widely adopted.

It is our view that the Australian Government should replace the current MoU with Standards Australia with a contractual arrangement reflecting the importance of clarity and rigour in the relationship. Representation at international fora should be selected on a competitive basis given that it is arguable that Standards Australia are always the most appropriate or competent organisation to undertake these tasks, which impact significantly on their ability to manage their core business i.e. standards development efficiently and effectively.

WSAA would also call into question the appropriateness of Standards Australia owning the WaterMark certification mark on behalf of the National Plumbing Regulators Forum given that Standards Australia has divested its ownership of all other previously owned certification marks to SAI-Global and that its residual ownership causes confusion in the marketplace. If the National Plumbing Regulators Forum requires a de facto owner of its regulatory compliance mark JAS-ANZ may be a more appropriate organisation to fulfill that role.

NATA and Laboratory Services to the Water Sector

WSAA would like to make the following comments in relation to NATA's role in accrediting laboratories and undertaking proficiency testing programs.

In the provision of water and sewerage services to over 15 million Australians, WSAA members are critically dependant on high quality laboratory service provision to ensure ongoing quality of these services. The importance of high quality laboratory procedures for the urban water industry should not be underestimated as we are essentially dealing with issues that can impact on the public health of the community. The industry spends many millions of dollars each year on laboratory testing to ensure the public health of the community and the environment are protected. One needs only to look at the Sydney water quality crisis in 1998 to understand the importance of high quality, robust laboratory procedures.

Inaccurate laboratory tests can potentially lead to public health incidents or the industry being forced to over invest in risk management procedures for problems that do not exist. Either outcome is highly undesirable, hence WSAA's vital interest in this topic.

In general, NATA is viewed as a credible organisation with considerable influence over the performance of laboratories. Its size and breadth of operations are unique globally and it is now the largest laboratory accreditation organisation in the world. This allows the organisation to be very influential on the national and international stage. This is partly due to the various government endorsements of the organisation.

In general, WSAA views this as a very positive situation; however, the scope of its operations is now such that NATA's ability to respond sometimes exhibits monopolistic tendencies. WSAA does not wish to overplay this, as a staff of just over 100 can hardly be considered to be large, but there are issues where we believe improvements can be made. These are discussed below.

Accreditation and Proficiency Testing

The performance of the laboratory sector is generally judged to be satisfactory if the servicing laboratory has NATA accreditation.

Accreditation can be viewed as the "hurdle or bar" over which a laboratory must meet, and includes generally a two yearly peer assessment of the technical competence of an organisation to perform its specific duties.

Proficiency testing should be closely linked with the accreditation process by providing an assessment an organisation's ability to actually provide test results that are comparable against standards in test samples. In other words to "actually deliver" on the promised technical competence.

Over a number of years there has been increasing concern by the water industry that there are weaknesses in the accreditation system, which has led to considerable debate throughout the urban water industry and this is the reason that WSAA has convened a working team to analyse the problem.

WSAA has a view that there is a complementary need for both an effective accreditation scheme strongly *supported by a well run, responsive, comprehensive and frequent proficiency testing program.* Our assessment indicates that it is principally weaknesses in the proficiency testing area that are the major causes for concern over NATA's laboratory accreditation process.

The concerns relating to proficiency testing can be summarised as follows:

1. Current proficiency testing programs are too infrequent and when they occur laboratories "roll out the red carpet" and may undertake the same analyses many times to ensure they achieve the correct result. This does not reflect a real life analytical situation.

2. The costs of the proficiency programs are high. As they are currently (mostly) borne by NATA and the laboratories there is an understandable resistance by NATA and laboratories to increase frequency or broaden analytes sufficiently to make this assessment a more routine process and to provide sufficient information for validation of methods across multiple laboratories.

3. The infrequency of the programs also makes the educational component of proficiency testing more difficult which is important to identify the overall reliability of methods and superiority of some methods over others. This also makes feedback to accreditation assessment less timely.

4. While NATA dominates the proficiency testing area by providing their own proficiency testing company, other commercial proficiency testing providers do exist. However, NATA programs are mandatory and results are used in the accreditation assessment process but there is a lack of clarity and transparency as to how the results of the proficiency testing impact on the accreditation status of the laboratory. While other providers of proficiency services to laboratories as a commercial client to laboratories, these results are not made public and may not be incorporated into NATA's laboratory accreditation process and major laboratory clients such as the urban water industry are largely left in the dark.

5. The results of any proficiency program or NATA assessment are not communicated to the client using the laboratory services which, when problems arise, is creating increasing loss of credibility of the system. (This is addressed further in issues associated with transparency).

I have attached a discussion paper outlining in more detail our views on the issue and how some of these issues may be resolved. The key proposals outlined in the paper include:

1. A national coordinated proficiency program for the water sector including the use of standardised contract requirements for proficiency testing.

2. Increased mandatory proficiency testing as determined a steering group comprising client stakeholders.

3. A requirement for laboratories to participate and make results of performance available to NATA and key stakeholders.

4. The development of a competitive proficiency test provider model (rather than rely wholly on NATA providing all mandatory proficiency services).

5. A strengthening of the links between proficiency testing and NATA accreditation to increase the confidence in NATA accreditation by the sector. Laboratories need to be fully aware that they must perform consistently well in proficiency programs to retain accreditation.

Transparency and Accountability

While WSAA appreciates the need for confidentiality in many areas of NATA's operations as their decisions can have significant commercial impact on laboratories, excessive confidentiality can be unhealthy, including risking the loss of confidence of clients in the system. Without transparency, it is not surprising that perceptions develop about the potential conflict of interest NATA has in maintaining its revenue whilst needing to rescind accreditation from under performing laboratories. Most information on the performance of laboratories is kept internally by NATA with little external discussion with key client stakeholders. The urban water industry is instead obliged to adopt a "blind faith" in the "reliance on NATA's systems" when information is conveyed to clients.

In addition, most information transfer takes place between NATA and an individual laboratory with virtually no communication with clients – or alternatively between the individual contract laboratories and clients, with little communication with NATA. WSAA views this is not the most desirable model and mechanisms need to be looked at to involve communication as a three way link between NATA, the laboratory and the clients with large contracts with the laboratories.

Similarly, the governance issues of NATA need careful consideration. NATA is essentially a member funded organisation; that is laboratories fund NATA to operate. This can create an impression with clients that the "tail can wag the dog" with NATA decisions impacted by who funds the organisation, even if this is not the case. As the service to the community is generally done by the client (in our case water utilities) and not the laboratory which is an intermediate player, this potentially creates a distortion of accountabilities.

It is WSAA's view that governance structures at a number of levels (not just the Board or Council), need to incorporate representation from clients, whose vested interests are only concerned with high quality results at a reasonable price. Regular meetings with client sector groups would also assist in this process.

The mechanisms for selection of members of the various committees also need to be more transparent. It is also not clear to WSAA how the various participants of the large committees are selected.

Assessment processes and skill set within NATA

For NATA to do its job properly there is a requirement for highly technically skilled staff. The NATA model of assessment which involves one NATA staff member and highly experienced volunteer technical assessors minimises costs and achieves a good balance for the requirements of the individual assessment.

For this system to continue working it is necessary for specialist volunteers to continue making their time relatively freely available and this becoming increasingly difficult for a number of assessors, both in the public and private sector. WSAA has heard of cases where specialist voluntary assessors are required to take annual leave to undertake assessments. This is not healthy as it tends to bias the assessment being done by someone who has the time, rather than the best technical person for the job.

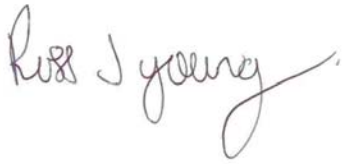
This problem will exacerbate over time as the laboratory sector increases levels of automation. This is resulting in less experienced people generally employed to maintain instrumentation and administratively process samples. Over time this will lead to less numbers of the highly skilled people needed for an assessment.

It is also essential that NATA staff members have sufficient technical experience and training to both understand NATA processes and provide a "balanced judgement" on the performance and capacities of a laboratory. They must also work effectively with the technical specialist(s) to achieve a high quality assessment.

Structures set up to support this process both for NATA staff and the volunteer specialists need to be robust and improved as this is the "core" of NATA activities. If this process is weakened, the assessment process gradually becomes superficial and will weaken the "NATA" name and credibility of the whole system. WSAA does not have a view on improvements to this problem other than to say in some cases a paid technical assessment model may be needed.

Thank you for the opportunity to provide input into your current inquiry and please do not hesitate to contact me if you require further information.

Yours sincerely



Ross Young
Executive Director

Att

WATER SERVICES ASSOCIATION OF AUSTRALIA

NATIONAL WATER INDUSTRY
Proficiency Testing Strategy

Introduction

High quality laboratory analytical information is a fundamental requirement for a water utility. This information serves multiple uses including:

- Provision of operational information to ensure continued high quality service provision;
- Detection and feedback on the resolution of problems identified from utility operations (eg a malfunctioning treatment plant);
- The need for accurate information in the event of a public health incident;
- Fulfilling, regulatory requirements from public health and environmental agencies;
- Validation of the performance of proposed, new or modified plant installed in a utility;
- Assessment of the impacts of actions from a sustainability perspective (eg impacts on a river from a discharge);
- Research needs for the utilities.

For laboratories to demonstrate an ability to provide high quality information, it is usual for laboratories to participate in:

1. Laboratory accreditation by an accrediting body such as the National Association of Testing Authorities, Australia (NATA) and

2. Where possible, an effective Proficiency Testing (PT) program to demonstrate the required technical competence for the range of parameters covered by the scope of accreditation.

Both accreditation and proficiency testing complement each other in supporting high quality analytical information.

NATA's accreditation programs are internationally recognised and its programs cover most national laboratory sectors (water and otherwise). However, less well known are the various PT programs in operation around the country and it is in this area where a workshop earlier in 2005 identified significant issues.

Outline of existing problems in data quality in the water industry

The contracts used by the industry require compliance with a range of quality specifications, including requirements for NATA accreditation of laboratories providing data and some other quality assurance activities.

However, for some time, there has been evidence that the current system for ensuring the quality of data in the water industry was under strain.

Examples are described below.

- A large water authority had specified in its contractual tender documents that laboratories providing data for water quality testing be accredited by NATA. The contract for testing was awarded to a consulting laboratory which was accredited by NATA for a range of analytes determined in water quality testing. After some time, it became apparent to the water authority that there were some problems with the data produced by the laboratory.

  Further independent investigations by the water authority revealed continued significant problems with the data provided, with significant concerns being raised with the laboratory at that time. After some difficulties, the water authority voided the contract and reissued the contract to another laboratory with a revised set of quality assurance protocols. These quality assurance procedures have been developed and implemented into an extensive independent quality assurance program to supplement the existing laboratory accreditation system offered through NATA.

- Access to PT data from non-NATA PT providers, is not generally available to NATA. The results of such laboratories' participation are therefore not available to NATA until the next assessment. Laboratories also cannot be made to provide such data should they choose not to.

- The Victorian Drinking Water Health Regulator identified a wide variation in results in the testing of microbial indicators using differing methods from laboratories that were NATA accredited. The net result was for the regulator to specify a standard methodology for use across Victoria. An effective PT program would have identified this issue much earlier.

- With the recent introduction of the Victorian Safe Drinking Water Act and Regulations, analytical accuracy, precision and methodology problems have surfaced and both water utilities and the Victorian Health Regulator have approached WSAA on the issue of how to coordinate an improvement program for Victorian regulated standards.

- At a recent meeting with Trade Waste Managers, concerns were expressed to WSAA about the lack of comparability of results between differing laboratories. These results are often used for regulatory compliance and charging purposes and for mass balance modelling. In general, PT programs in trade waste areas do not currently exist.

- WSAA was notified of significant concerns by a utility after a laboratory had lost accreditation for a biological analyte and did not notify the utility. The utility was using the information to assess the need or otherwise of a multi-mullion dollar capital works project.

The above problems highlight the need to consider how the accreditation system needs to be improved in order to provide users of laboratory services with increased confidence in test results. They also highlight potential problems with the specifications described within contracts relating to the provision of water quality testing services and the need for education of users in their selection of laboratory services This paper sets out to address these problems in a practical and effective manner.

The Role of NATA Accreditation and Proficiency Testing in the Water Industry

Accreditation

NATA is recognised by the Commonwealth "as the national authority for accreditation of laboratories conducting tests and measurements in all technical fields…". As such, it is a key contributor to Australia's national technical and conformance infrastructure, along with the National Measurement Institute, StandardsAustralia International and the Joint Accreditation System of Australia and New Zealand. NATA's role in laboratory accreditation is outlined in its Memorandum of Understanding with the Australian Government. Under the MOU, the Commonwealth Government:

- uses NATA laboratories to meet its own testing needs, wherever possible;
- encourages State Governments and other instrumentalities to adopt a similar approach;
- commits all Commonwealth Government laboratories to obtain and maintain NATA accreditation, where appropriate[1].

Accreditation is the formal recognition of technical competence of an organisation to perform specific activities. Peer review is the cornerstone of the accreditation process. It is a conformity assessment tool that is widely used by governments and other specifiers of technical capabilities, particularly for testing and calibration activities. Its aim is to assist in providing confidence to specifiers, regulators and government of the quality of data that are used in decision-making processes.

There are usually two components to the accreditation process. The main process involves the on-site evaluation (assessment) of organisations, e.g. laboratories, against the accreditation criteria. For laboratories, ISO/IEC17025:2005 is used for this purpose. These on-site assessments are conducted by an assessment team. In Australia, the team is comprised of a staff member from NATA's Secretariat who acts as the Lead Assessor. In addition, one or more scientists, who are known as Technical Assessors, are drawn from peer organisations to comprise the assessment team.

The task of the Technical Assessor is to evaluate the technical competence of the organisation in terms of aspects such as staff qualifications and training, and their specific knowledge and understanding of the parameters in question; equipment

[1] NATA, 2005, cited from www.nata.asn.au, accessed 19 September 2005.

calibration, maintenance and use; test methods; test results; quality control; facilities for performing testing; and recording and reporting practices.

For laboratories providing analytical services to the water industry, NATA accreditation reassessments generally take place every two years, following the initial accreditation assessment. Where significant issues are identified during this assessment, laboratories may be suspended or have their accreditation cancelled for all or part of their activities. Laboratories may also be placed on a shortened reassessment interval.

Proficiency Testing

A proficiency testing scheme augments the on-site accreditation process, and is an interlaboratory comparison designed and operated to assure laboratory performance in specified areas of testing, measurement or calibration[2]. Its primary purpose is to provide a quality assurance tool for individual laboratories, thus enabling them to compare their performance with similar laboratories, to take any necessary remedial action, and to facilitate improvement. The data from proficiency testing is also used during an accreditation assessment as an objective demonstration of competence and an indication of the laboratory's capacity and commitment to appropriately investigate and address poor performance. This latter purpose is described in ISO/IEC 17011 *General requirements for bodies providing assessment and accreditation*.

Many proficiency testing schemes are offered for a variety of reasons. The three main reasons are:

- To provide laboratories with a means to meet accreditation requirements;
- As an educational/ continuous improvement tool to identify and isolate general laboratory staff, method or instrument problems;
- Development and selection of methods and techniques.
- As a means of determining compliance with specifications.

In the context of accreditation, technical assessors review an individual laboratory's performance in any relevant proficiency testing undertaken since the previous assessment. Largely because of historical reasons, most laboratories in the water testing sector have only participated in proficiency testing programs offered by NATA, These results have therefore been available for follow-up by NATA at the time the results are available. In the case of poor performance, laboratories are asked to respond to possible reasons for poor performance and action that will, or has, been taken. Depending on the response, an earlier reassessment may be scheduled.

At present, it is only through the honesty of individual laboratories that assessment teams become aware of participation in non-NATA programs. This can present problems if a laboratory has been performing poorly in non-NATA proficiency testing

[2] ISO/IEC Guide 43-1 (1997) *Proficiency testing by interlaboratory comparisons – Part 1: Development and operation of proficiency testing schemes.*

programs and does not supply the results in these programs for review by an assessment team.

As with laboratories, proficiency testing scheme providers may also be accredited. There are a number of accreditation bodies worldwide offering accreditation services in this area, including NATA. Hence, users of proficiency testing services may themselves be assured of the quality of the programs in which they are involved or from which data are used. Within Australia, there are a number of proficiency testing scheme providers offering programs in the water testing area, including NATA. It should be noted that, to overcome issues relating to conflict of interest, NATA's proficiency testing activities are accredited by another accreditation body. In order to meet new international standards, NATA has also, as of 1 January 2006 , separated the provision of its proficiency testing services into a subsidiary company, Proficiency Testing Australia .

Current problems in relation to proficiency testing are described below.

1. Most existing Proficiency Testing programs are run on an ephemeral basis and hence are not an adequate tool for ongoing surveillance of laboratory technical competence[3]. For instance, NATA's current program in the water testing area operates over approximately a three-year cycle for chemical analytes and twice a year for microbiological determinands. As these programs are non revenue generating, costs are an impediment to participation at more frequent intervals or for broadening the range of analytes used in PT programs.

   In the case of NATA accredited laboratories, review of performance in NATA PT programs occurs following the completion of these programs. However, unlike the Canadian system or the cryptosporidium testing program operated by NATA with WSAA involvement, no formal publicly available rules exist to identify when laboratory suspension for an analyte is advised.

2. The range of sample matrices and analyte concentrations covered by most existing Proficiency Testing programs generally do not reflect the nature of the samples routinely encountered by testing laboratories.

3. There are a number of important analytes (e.g. cyanobacterial toxins, disinfection by-products) that are not currently covered by any existing Australian Proficiency Testing program.

4. Most existing Proficiency Testing programs lack an adequate educational component. This aspect is critical in identifying industry-wide issues such as method robustness, sampling issues and other problems not related to an individual laboratory's performance.

[3] The Canadian Association of Environmental Analytical Laboratories recommends a PT program frequency of between 2 and 4 times per year to provide adequate feedback to laboratories and accreditation agencies.

As an example, the only Australian programs which serve a wide range of determinands in water are the ones conducted by NATA. Apart from the provision of summary data, there is little educational component associated with these programs.

5. Existing Proficiency Testing programs do not involve the end-user client and other stakeholder (eg regulator) and hence there is no communication with this group as regards laboratory performance. This is a crucial weakness from a WSAA perspective.

Because of the above deficiencies, the overall standard of laboratory performance has not improved significantly in Australia over a number of years.

Specific comments on existing programs are outlined in Appendix 1.

Within the water industry, almost all utilities specify NATA accreditation of laboratories as a means of assuring themselves of the quality of data on which key decisions are made on a daily basis. However, as described earlier in this paper, there is benefit in expanding the provision of proficiency testing in this area as an early indicator for users and laboratories. There is good evidence to suggest that, on average, improvement in analytical quality occurs following participation in a properly designed and operated proficiency testing scheme[4].

The next part of this paper explores ways in which the observed deficiencies can be overcome for the water industry through the use of proficiency testing. This initiative may be used not only for laboratories providing analytical services, but also extended to include process testing, for which there is often little in the way of process control in place.

The Present Initiative

As described above, proficiency testing is likely to present a way forward in resolving a number of the present difficulties in relation to the quality of analytical services in the water industry. In preparing this paper, a review of various systems in place in the environmental arena was undertaken. This review revealed that the system operated by the Canadian Association for Environmental Analytical Laboratories (CAEAL) included key components which deliver improvements to the quality of analytical data used in the environmental industry.

However, studies by CAEAL have identified some shortcomings as to whether improvements to analytical quality were related to how well established a testing procedure is, how rugged the methodology is and whether a specific method is widely used or regulated.[5] It is proposed that these shortcomings be addressed through the inclusion of an educational component to proficiency testing programs.

[4] Middlebrook, K and Morris, M, *The Effect of Proficiency Testing Participation on Laboratory Performance*.
[5] Ibid

Determinands to be covered by the program

An initial assessment of the needs of the water industry has indicated the following parameters should be covered in a more comprehensive PT program. This will need further review by the water industry.

It is proposed that the quality assurance program to be developed will cover the following determinands in water:

Chemical parameters

- Environmental nutrients
- Heavy metals
- Pesticides
- Disinfection By-products (DBPs)
- Cyanotoxins

Microbiological parameters

- *Cryptosporidium*
- *Giardia*
- Cyanobacteria
- Total plate count (including at 21ºC)
- *E.coli and* Thermo-tolerant (faecal) coliform
- *Enterococcus* and faecal *Streptococcus*
- Total coliforms

It is noted that at least some of the above determinands are covered by existing PT programs, as shown in Appendix 2 of this paper. Unfortunately, the industry is not being well served by these programs. The problems with the existing programs were enumerated at a National Workshop, held in Melbourne during February, 2005 and have been discussed above.

Table 1 lists the determinands to be considered during the first phase of the project covering drinking and environmental waters. It is intended to pursue a staged approach. Although, the list of analytes given in Table 1 is relatively short, it is intended that the list will be augmented once the program becomes established. There would be particular interest in adding parameters such as priority pollutant phenols once the initial phase of the project has been established and run successfully say over two years.

Table 1

Proposed program

Parameters	Frequency	Range	Matrix

Nutrients: TN, TP, TKN, TDN, TDP, NH3, NOx, FRP, Si, TOC, DOC	*Twice per year*	Full Environmental Range	Natural Freshwater
Heavy metals and metalloids (including arsenic, cadmium, copper, lead, mercury, nickel, tin, zinc and aluminium)	*Twice per year*	Full Environmental Range	Natural Freshwater
Organophosphorus pesticides, organochlorine pesticides.	*Twice per year*	Full Environmental Range	Natural Freshwater
Trihalomethanes and haloacetic acids	*Twice per year*	Full Environmental Range	Treated potable water.
Cyanotoxins	*Twice per year*	Full Environmental Range	Raw and treated water
Microbial parameters (excluding viruses[6] at present)	*Monthly or quarterly*	Full environmental range	Natural, potable, raw, treated and effluent waters
Cryptosporidium and Giardia	3 times per year	Full environmental range	Natural, potable, raw, treated and effluent waters

The Water industry is also likely to support the commencement of a PT program for Trade Waste analysis. The key parameters to be included, and most importantly the matrices assessed, will need to be determined and added to the table above.

[6] In regard to virus assessment in waters, Australia has a single laboratory focusing on this area and this laboratory is not NATA accredited, nor to our knowledge is involved in any PT program. As viruses are likely to be the major microbial issue of concern in any urban recycling scheme, this is seen as a strategic weakness. Should other laboratories establish in the area, NATA accreditation and associated PT schemes should be encouraged.

This list of parameters will be need to be refined based on input from the water industry and regulators regarding the relative importance of PT for the particular parameter in question.

Criteria

ISO Guide 43 (Parts 1 and 2) and ILAC Guide 13:2000 provide good general guidance on the implementation of proficiency programs.

However, because of the general nature of these documents, there are a number of specific criteria that cannot be covered. Suggested additional specific criteria for the operation of water industry PT programs include the following.

- The concentration ranges of the analytes must reflect those encountered by laboratories in routine testing.

- The matrices of the PT samples must reflect those associated with samples routinely analysed by laboratories. Although in some cases, it is possible to prepare artificial samples by standard addition of analytes to a simple matrix (e.g. deionized water), this practice is inappropriate for more complex matrices such as environmental and wastewaters. Environmental waters, for example, contain significant quantities of particulate matter and also complex ligands that can interact with added determinands. Because the related equilibria are often relatively slow to establish, analytes introduced by standard addition will not necessarily have similar speciation to those encountered in real-time samples.

- Gathering of information on relevant key components of the laboratory analytical and data management processes which have the potential to influence results (e.g. analytical methodology, types of instruments used, data treatment, reporting format, etc.).

Frequency

It is important that proficiency testing schemes be conducted on a regular basis if laboratories are to identify problems in a timely manner and that all stakeholders have confidence in the results produced. For this reason it would be expected that proficiency programs in important areas of operation be run on at a frequency that permits early intervention. CAEAL recommends PT programs running 2 to 4 times per year.

Educational component

Under the proposed initiative, a considerable body of data will be obtained from all PT programs following data submission by the participating laboratories. In order to

maximise the information from a program, it is essential that the data be considered in the greatest detail, interpreted and evaluated.

This evaluation will identify the precision and accuracy of differing methods and problems such as sampling differences, instrumental differences and sample preparation differences.

Flexibility in the design of the program should encourage innovation with new or emerging techniques in parallel with existing technology. The results of the PT program must be communicated to participants in a timely manner and with sufficient information to permit identification and rectification of problems.

Communication with Stakeholders

As regards environmental analytical laboratory data, the stakeholders may be identified as including:

- Clients
- Accreditation bodies
- Regulators
- Industry Associations such as WSAA and enHealth

It is important that results from any proficiency testing exercise be communicated to stakeholders in addition to the laboratory itself, so that confidence in data quality can be maintained.

Logistics of running the Proposed Program

In the first instance, it is intended that implementation of the program would follow the Canadian model, as run by the CAEAL. The PT program is managed out of the Ottawa office but CAEAL contracts with collaborators (mostly government labs) to produce and ship the samples. CAEAL, as the PT provider, is accredited to ILAC Guide 13:2000. In the program, CAEAL attempts to at least address analyte ranges and matrices. It should also be noted that the Canadian accreditation system differs from that in this country in that CAEAL focuses solely on environmental laboratories; the accreditation program offered by NATA is much broader in nature, servicing laboratories across many chemical industries and indeed all scientific disciplines.

It is envisaged that the overall control of the program would be vested in a management committee, consisting of:

Program administrator (1)
WSAA representative (1)
CRC for Water Quality and Treatment representative (1)
National Measurement Institute representative (1)
NATA representative (1)
EnHealth representative (1)

It is proposed that WSAA Chair the Committee as the representative of the Water Industry. The committee would meet on a twice per year basis once the program is established, although more frequent meetings would be required during initiation.

Each proficiency testing program would have to be coordinated by an organisation that is accredited for the provision of proficiency testing programs. Currently, there are a number of organizations in Australia which hold such accreditation including QHSS Environmental Nutrients laboratory, NMI (Sydney), IFM Quality Services and NATA, all of which currently offer PT to laboratories performing water testing. Facilities accredited for the provision of PT would be invited to tender in respect of this type of service provision.

For each round of proficiency testing, an expert technical group will need to be formed to decide upon the conduct of the test. It would be expected that the technical group communicate in the first instance by electronic means and be responsible for stipulating such things as:

- matrix type;
- preferred analyte range;
- content of questionnaire forwarded with samples;
- shipping method;
- assessment/review protocols for data generated from the PT exercise.

At the conclusion of each testing round, robust statistical analysis of the data produced will need to be carried out. All data will need to be reviewed by the expert technical committee and the program administrator. The review will interpret the spread of results in relation to key factors such as:

- effect of matrix type;
- efficiency of extraction/digestion procedures;
- effect of instrument type.

Drafted by the program administrator, the expert technical group will also approve the content of the report issued to all participants and stakeholders.

Funding the Program

For any comprehensive PT system to work properly it must be supported by the key stakeholders, in particular NATA, NMI and the Water Industry.

While laboratories are also very interested in delivering accuracy and precision, the sector is subject to competitive pressures and additional PT programs introduce two additional costs to laboratories:

- the non productive time spent in analysing PT samples; and
- the direct costs of the PT program .

For this reason, WSAA views it as necessary to have a mandatory PT program where clients of water utilities are required to participate in the program at frequencies specified by the Management Committee. This requirement would be implemented by inclusion of a PT requirement in the laboratory contracts specified by the utilities. It could be verified through the return of results to the program administrator and via the NATA assessment processes.

It is envisaged that the fees would be structured at two levels:

1. Participating laboratory. A membership fee would be charged according to the degree of participation in the program. The schedule of fees would be devised according to the number of programs in which the laboratory participated.

2. Stakeholder. Stakeholders would pay an annual membership fee, which would permit them to participate in selected activities (apart from sample analysis). Stakeholders would also have access to all performance data emanating from the program, including laboratory identification.

The fees would be structured to recover the costs associated with the administration of the program as well as the cost of the program itself.

In addition, it is envisaged that certain national interest groups would make contributions to the program, either as cash or in-kind commitments. Depending on the groups concerned, this commitment might be made across the entire scheme or in respect of specific programs. For instance, the NMI has an interest in supporting PT that is deemed to be in the national interest. To qualify for NMI funding, NMI may require additional aspects of the PT to ensure the traceability of the assigned property values and potentially provide a mechanism for delivery of traceability of results to the Australian community.

Additional funding for the activities of the programs would come from the sale of reference materials resulting from the programs.

Further refinement of the PT scheme will involve the generation of a business plan, which will take account of differing levels of involvement and provide financial incentives packages that favour full and more continued involvement.

It is envisaged the Program Administration group would be housed at a participating centre of the Cooperative Research Centre for Water Quality and Treatment. Financial systems (billing, etc) could be housed at either WSAA or the CRC for WQ&T.

Rules for sanctions and rewards

To ensure that the consequences for delivery of poor and good water quality data are properly recognised by the providers of these data, WSAA strongly recommends that a set of rules for sanctions and rewards be developed. Such a system has been successfully used in relation to testing for *Cryptosporidium* and *Giardia* and Asbestos

testing in order for laboratories to maintain NATA accreditation. Similar experiences have been observed by the National Residues Survey for pesticides and anti-microbials in food products.

A starting point as regards sanctions for poor performance may be to implement a policy along the lines of that used by the CAEAL. Following the assignment of Z scores to individual results, points are assigned for each result using pre-determined criteria. In this system, a failure for any parameter results in a possible suspension (warning). A second consecutive failure results in a suspension and a third in withdrawal. For each failure, a laboratory must submit a corrective action report for review by CAEAL. Failure to submit an acceptable report results in advancement to the next level. If a laboratory is accredited by CAEAL, the PT performance is directly linked to their accreditation status.

A more sophisticated option may be to follow the ranking process of laboratories currently employed by the National Residue Survey (NRS). In this system, laboratories are evaluated and a score assigned according to performance, following evaluation of PT performance by an expert panel. The details of these systems are described in Appendix 4.

Proposed Clauses in Laboratory Contracts

The implementation of an enhanced national PT program for the water sector will depend on uniform implementation of PT across the sector.

It must not be possible for a laboratory to be able to avoid participating in a PT program for analysis for which it is NATA accredited. To that end it is important that both NATA and WSAA require participation.

From a WSAA perspective, this is best accomplished by alteration of laboratory contracts to *require* participation in the nominated PT program. From a NATA perspective it is essential that good performance in PT is a necessary requisite for continued NATA accreditation and that this requirement is satisfactorily verified during the assessment process.

A mechanism is also required to ensure poor results from a PT program are provided to by NATA for action as appropriate. A requirement for notification of potentially affected clients should also be considered. This can be specified in laboratory contract clauses.

In addition, there are a number of other clauses that should be specified in any laboratory contract. These will be outlined in more detail at a later date but include:

- Scope of analytical testing services – Tests, Matrices, facilities and equipment.
- Volume of analytical work
- Sampling and delivery of samples

- Test methodology Reporting Requirements to the client

- Method characteristics including
  - Selectivity/ specificity;
  - Limit of Detection;
  - Limit of Quantitation;
  - Working and linear range;
  - Sensitivity;
  - Accuracy;
  - Precision;
  - Recovery;
  - Robustness/ Ruggedness;
  - Confirmation of analyte identity;
  - Traceability;
  - Measurement uncertainty.

- Internal Analytical Quality Assurance and Quality Control

- Laboratory Accreditation and Accreditation Scope

- Mandatory Proficiency Testing Requirements

- Tests (including frequency and reporting) required

- Copies of the last NATA assessment report for the work described in the section on Scope of Analytical Testing Services;

- Results of any interlaboratory testing programs for the last three years.

- Details of the organisational and supervisory structure of the laboratory, including number, qualifications and experience of personnel involved in servicing the contract;

- Details of subcontractors, the services proposed to be subcontracted, the turnaround time and the location of the sub-contracted laboratory;

- Related Sample Result Consistency
  - Examples of related analyses include:
    - Total and reactive phosphorus
    - Various forms of nitrogen
    - *E. coli* and total coliforms
    - Filtered and total metals.

- Sample Turnaround Time

- Client contact regarding matters or concerns with sampling and testing procedures.

Conclusion

A number of initiatives with respect to the standardised organisation of proficiency testing programs have been suggested in an effort to address deficiencies with the current system for quality assurance. These initiatives have been developed with due regard for experiences from other industries and economies and for the resources available within Australia.

Adoption of the proposed program should lead to improvements to the quality of analytical data as well as delivering other important benefits to the water industry such as the mitigation of risk to public health and maintenance of the water industry's reputation in this regard, economic benefits, and the development of a meaningful and consistent database of water quality.

Recommendations

It is recommended that:

1. An item be identified and costed on the WSAA Business Plan to define the details of a business plan for the proposed approach.

2. A paper be prepared by WSAA outlining, in detail, clauses to be inserted into laboratory contracts requiring participation in PT programs recommended by the Management Committee.

3. That the Management Committee be set up comprising:

    WSAA as Chair (Mr Peter Donlon)
    NATA (Mr Tony Russell)
    Cooperative Research Centre for Water Quality and Treatment
    National Measurement Institute
    (Note: the PT Program Administrator would be act as Secretary and support to the committee).

Appendix 1

Comments on the quality of existing Proficiency Testing Programs in the water industry

Environmental nutrients
An extensive environmental nutrient program already exists within Australia (The National Low Level Nutrient Collaborative Trial {NLLNCT}, which employs real-time samples from pristine and impacted environments. Current funding only permits this program to run on an annual basis (see below). The program is educational in terms of feedback supplied to all participants via interim and summary reports. In addition, (approximately) biannual National Workshop Sessions are held to review programs, data and practices.

It is intended that this program form the blueprint for all other proposed programs.

The only other interlaboratory program in Australia which covers nutrients in water is the NATA PT program. This is conducted over approximately a three year cycle and covers a limited range of parameters, uses spiked (as opposed to real-time) samples and analyte ranges beyond normal environmental levels. The educational component of this program is limited.

Heavy metals
At present, Australia has no program equivalent to the NLLNCT in respect of heavy metals in water. NATA programs for these determinands are ephemeral, uses spiked samples and cover a limited range of elements. The educational component of this program is limited. Another provider of PT in this area is Quality Control Technologies. This organisation is not accredited, however, it does use matrix-matched samples with analyte concentration levels similar to those observed by routine laboratories. Because of the importance of these determinations to the water industry, there is an urgent need to address the limitations of the current PT programs.

Pesticides
At present, Australia has no program equivalent to the NLLNCT in respect of pesticides in water. The situation as regards anthropogenic organics in water is deficient. As shown in Appendix 1, the NATA programs have concentrated on persistent organic pollutants (POPs) such as Organochlorine pesticides and PAHs, the dissolved fraction of which in drinking waters is generally fairly low. There has been no program dealing with organic pollutants such as some of the pesticides currently in use (e.g. carbamates, synthetic pyrethroids). None of the programs currently offered runs at the frequency recommended in this proposal and it should be noted that the priority pollutant phenol program runs only on an ad-hoc basis. The analytical range covered by these programs do not reflect those routinely encountered by laboratories and usually far exceed action levels. Further the matrices used in NATA's programs are not representative of those in routine samples. The educational component of the existing programs is limited. Because of the importance of these determinations to the water industry, there is an urgent need to address the limitations of the current PT programs.

Disinfection Byproducts (DBPs)
These compounds are required by many health regulators to be monitored and in some installations controlled to below acceptable levels. They are a key driver of capital improvement programs and operational practices. With the exception of a program for halomethanes in water run by NATA, proficiency testing programs in this area are not available in Australia. Water laboratories and health regulators and utilities are expressing concerns about the lack of comparability of data in this area.

There exists an urgent need to initiate a PT program in this area.

Cyanotoxins
These substances are the subject of increasing concern in the water industry, both as a result of their acute and also sub-chronic effects. Only a limited number of laboratories currently analyse for these substances in Australia but the implications of incorrect analysis are particularly serious. Some of the cyanobacterial toxins (viz. saxitoxin) also have implication as a Chemical and Biological Warfare agent and hence the interest in this type of analytical capability would not be limited to water laboratories. It is proposed that a small cyanotoxin analysis program be run as part of the expanded QA activity in Australian water laboratories.

Microbiological parameters
Microbial parameters area key area of attention by health regulators and water utilities. Contamination of a water supply has major consequences for the community. Previous problems in this area have resulted in the some regulators attempting to address the problem by method standardisation

Current programs

Cryptosporidium and Giardia
The water industry has been very direct in indicating this is an essential PT program that should continue. Temporary loss of accreditation for one laboratory as a result poor PT performance is an example showing effective PT programs can identify weaknesses. There is however a need to consider how laboratories that have had their accreditation suspended for poor performance in this program can be provided with the opportunity to regain their accreditation through the availability of suitable educational and support programs.

The current program should continue, but administration and organisation should become part of the national water proficiency program administration.

Appendix 2
Existing Programs

A list of existing programs is given below. Programs which are offered by non-accredited PT providers are shaded.

Organisation	Parameters	Frequency	Range	Matrix	Educational	Reporting & Dissemination
Nutrients						
NLLNCT	Nutrients: TN, TP, TKN, TDN, TDP, NH3, NOx, FRP, Si, TOC, DOC	Annually	Full Environmental Range	Natural Freshwater & Seawater	Yes, PT results linked to specific questions	Interim & Summary Reports providing detailed assessment. Workshop
NATA	TKN & TP	approx 3 years	Effluent Ranges (at least an order of magnitude above environmental)	Deionised Water	Not Significant	Interim & Summary Reports
NATA	NH3, NO2, NO3	approx 3 years	Effluent Ranges (at least an order of magnitude above environmental)	Deionised Water	Not Significant	Interim & Summary Reports
NATA	Biochemical Oxygen Demand (BOD)	Every 2-4 years	Full range	Deionised Water	Not Significant	Interim & Summary Reports

Organisation	Parameters	Frequency	Range	Matrix	Educational	Reporting & Dissemination
Inorganics						
NATA	Cr, Cu, Au, Fe, Pb, Ni, Th, Zn	2-4 years	0.1 – 20 mg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	Hg, As, Se	approx 3 years	0.1 – 25 µg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	Sb, Be, Cd, Co, Mo, Sn, Ti, & Va	approx 3 years	0.1 – 25 µg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	Br, Cl, F, I		0.1 – 50 mg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	Inorganic Anions (Na, K, Ca, Mg)	Every 3 years		Deionised Water	Not Significant	Interim & Summary Reports
NATA	Physical Parameters (SO4, Conductivity, pH, Colour)	approx 3 years		Deionised Water	Not Significant	Interim & Summary Reports
NATA	Total Cyanides			Deionised Water	Not Significant	Interim & Summary Reports
QC Technologies	Trace metals		Full Environmental Range and Effluent Range	Natural waters and potable and non-potable waters	Unknown	Summary Reports

Organisation	Parameters	Frequency	Range	Matrix	Educational	Reporting & Dissemination
Organics						
NATA	OC pesticides	approx 3 years		Deionised Water	Not Significant	Interim & Summary Reports
NATA	OP pesticides	2-4 years	µg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	PCB's (aroclors)	approx 3 years	µg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	Chlorinated phenoxy acid herbicides	approx 3 years	µg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	THMs	approx 3 years	µg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	PAHs			Deionised Water	Not Significant	Interim & Summary Reports
NATA	Phthalate Esters	approx 3 years	µg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	Priority pollutant phenols	Ad hoc	µg/L	Deionised Water	Not Significant	Interim & Summary Reports
NATA	Purgeable halocarbons	Ad hoc	µg/L	Deionised	Not Significant	Interim &

Organisation	Parameters	Frequency	Range	Matrix	Educational	Reporting & Dissemination
				Water		Summary Reports
NATA	Total Recoverable Oil & Grease	approx 3 years	50 – 500 mg/L	Deionised Water	Not Significant	Interim & Summary Reports
NMI- NARL	Petroleum hydrocarbons. BTEX	Approx 6 monthly	Full Environmental Range	Synthetic and natural matrix	Yes, PT results linked to specific questions	Interim Summary Report providing detailed assessment

Organisation	Parameters	Frequency	Range	Matrix	Educational	Reporting & Dissemination
Phycology						
NATA	Phytoplankton	Annually		Deionised Water	Not Significant	Interim & Summary Reports
Microbiology						
NATA	Water Microbiology *Enterococci* *E coli*	Six monthly		Deionised Water	Not Significant	Interim & Summary Reports
IFM	Water Microbiology	Quarterly with monthly component			Yes, PT results linked to specific questions	Interim Summary Report providing detailed assessment
NATA	Cryptosporidium / Giardia / Legionella	Quarterly		Deionised Water	Not Significant	Interim & Summary Reports

Appendix 3

Supporting infrastructure for a standardised approach to Proficiency Testing in the Water Industry

There are a number of documents and systems which can be used to deliver a more standardised approach to Proficiency Testing in the Water Industry.

Documents describing criteria for technical competence of proficiency testing scheme providers.

- ISO Guide 43 Part 1 (1997) *Proficiency testing by interlaboratory comparisons -- Part 1: Development and operation of proficiency testing schemes* outlines good practices for the conduct of proficiency testing schemes. It is used by some accreditation bodies as the criteria for accreditation of proficiency testing schemes.

- ILAC Guide 13: 2000 *Guidelines for Requirements for the Competence of Providers of Proficiency Testing Schemes*. This document represents an update to ISO Guide 43-1 of expected good practices for the conduct of proficiency testing schemes. Its contents have not yet been approved by ISO, however, a number of the contributors to this document are also on the relevant ISO Committee. The document is used by some accreditation bodies, including NATA, as the basis of criteria for accreditation of proficiency testing scheme providers.

Documents describing criteria for the selection, use and interpretation of proficiency testing schemes.

- ISO Guide 43 Part 2 (1997) *Proficiency testing by interlaboratory comparisons -- Part 2: Selection and use of proficiency testing schemes by laboratory accreditation bodies*. This document is used by laboratory accreditation bodies in relation to the selection and use of proficiency testing schemes for accreditation purposes. It is, however, also applicable to other bodies, such as regulators or industry schemes involved in the selection and use of proficiency testing services.

- Eurachem Guide on the Selection, Use and Interpretation of Proficiency Testing (PT) Schemes by Laboratories (2000).

- ILAC Guide 22: 2004 *Use of Proficiency Testing as a Tool or Accreditation in Testing*. This document seeks to ensure consistent good practice by accreditation bodies and laboratories in the cost-effective use of proficiency testing in accreditation.

These documents provide broad criteria for the operation, selection, use and interpretation of proficiency testing schemes. As such they provide an excellent basis on which the procedures and policies of the proposed initiative could be

based. However, it is imperative that specific criteria are developed which reflect the needs of the water industry and the desired outcomes. Such specifications must describe issues such as:

- Frequency of proficiency testing programs;
- The analytical range and matrix types to be covered by proficiency testing programs;
- The need to include questionnaires in proficiency testing schemes and the broad direction of these questionnaires to allow for an educational focus to proficiency testing and not just a focus of compliance;

It is proposed that one of the initial tasks of the Program Administration would be the development of these criteria, procedures and policies in consultation with the Management Committee.

In terms of verification of the compliance of proficiency testing schemes against the pre-determined criteria, this could be achieved via a number of ways. At a micro-level, the Secretariat should review the design of individual proficiency testing programs in consultation with the relevant technical advisors prior to the conduct of the program. Any concerns could be investigated with the proficiency testing provider and the necessary corrective action taken to address these concerns.

At a macro-level, use could be made of the accreditation process. By using providers who are accredited, assurance could be gained of the broad quality of the services provided by the organisation. A formal agreement that an accreditation body evaluates relevant providers against the criteria of the water industry in addition to the general accreditation criteria applicable to PT providers could also be made.

Appendix 4 – Systems for Assessing Performance – National Residue Survey

There are two systems for assessing performance used by the National Residue Survey, depending upon the number of participants in a given round of PT.

The first system is based on the use of statistics to evaluate performance. In this system, following the statistical analysis of submitted results (completed using robust statistics), a expert technical panel reviews the assigned Z scores to determine whether these appropriately reflect the quality of the results submitted. Once this has been completed, the combined Z scores, including penalties for false negatives, false positives and outliers are considered and gradings assigned across six categories ranging from Very Good to Unsatisfactory and a grade for Not Assessed. Under this system, it is not possible to directly compare the gradings from one round of PT to another because the combined Z scores are influenced by the number of analytes spiked as well as the spikes per analyte. In some cases, results may be assessed against the expected values.

The second 'non-statistical' approach is an analyte by analyte comparison of the submitted results against the expected value, taking into account false positives, false negatives, consistency in relationship between the expected and measured amounts of analyte, and relative consistency between participating laboratories and the spiked value. The "reported versus spikes" value is calculated and scores assigned from a pre-set range of values. The combined scores then are used to assign a grading to the laboratory.

Further, from time to time, additional assessment parameters are developed and implemented in consultation with the expert technical group.[7]

[7] Summarised from the National Residue Survey Proficiency Testing Handbook. Information kindly provided by Dr Wolfgang Korth, Manager, Residue Chemistry and Laboratory Performance Evaluation, NRS.

WATER SERVICES ASSOCIATION
OF AUSTRALIA

Proposed Laboratory Proficiency Testing Process