

# NEW SOUTH WALES ABORIGINAL COMMUNITIES WATER AND SEWERAGE PROGRAM

## IMPROVING THE HEALTH AND WELLBEING OF ABORIGINAL PEOPLE LIVING IN DISCRETE COMMUNITIES BY PROVIDING SAFE AND EFFECTIVE WATER AND SEWERAGE SERVICES

**W Henderson, P Byleveld, J Standen, S Leask**

### ABSTRACT

The New South Wales Aboriginal Communities Water and Sewerage Program aims to improve the health and wellbeing of Aboriginal people living in discrete communities by providing safe and effective water and sewerage services, which are equivalent to the standard expected in the wider community.

The Program is a joint initiative of the NSW Aboriginal Land Council and the NSW Government. More than \$200 million is being invested over 25 years for routine operation, maintenance, monitoring, repairs and replacement of infrastructure.

### INTRODUCTION

Aboriginal people are disadvantaged in health outcomes. The Health of Aboriginal People of NSW: Report of the Chief Health Officer found a significant disparity between Aboriginal and non-Aboriginal people across most population health indicators (NSW Health 2012). The Closing the Gap Prime Minister's Report stated that 'Although there has been some improvement in education

and health outcomes for Indigenous Australians in many areas progress has been far too slow' (Commonwealth of Australia 2015).

Access to clean water is essential to health (WHO 2010). The New South Wales Aboriginal Communities Water and Sewerage Program aims to bring about sustainable improvements by committing to operation, maintenance and monitoring of water and sewerage services in discrete Aboriginal communities.

Before the commencement of the Program in 2008, Local Aboriginal Land Councils (LALCs) were responsible for the water and sewerage infrastructure on their community land. Most had small populations, could not generate sufficient income for routine operations and lacked technical skills to sustain services. These arrangements presented a number of difficulties, especially for very small communities that are a long way from service providers. There was no systematic process to address operation and maintenance. In some Aboriginal communities, water and sewerage services did

not meet general NSW community standards. Inadequate water supply and sewerage systems were identified as a major factor in the poor health status of some Aboriginal communities (NAHSWP 1989). Where water sources were found to be unsafe, often there was no option other than to issue a boil water alert to communities.

The Program was established in 2008 with the signing of an agreement between the NSW Aboriginal Land Council and the NSW Government. Several NSW Government agencies and other organisations have a vital role in the Program. The NSW Government agencies include Aboriginal Affairs NSW, NSW Aboriginal Housing Office, NSW Department of Primary Industries Water (DPI Water), NSW Health, Treasury NSW and NSW Department of Premier and Cabinet. Other key organisations include individual local government councils (water utilities), Local Aboriginal Land Councils, contracted service providers and industry bodies for local Government (Local Government NSW) and water utilities (NSW Water Directorate).

Although the risk to health of poor sanitation is widely known, there is very little Australian data to quantify this risk. Studies elsewhere have shown that the risk of diarrhoeal disease associated with sub-standard water and sewerage systems is between 2.5 and 3.85 times higher than in communities with well-managed systems. There is also an elevated risk for many other diseases such as respiratory infections (Pruss et al. 2002).

### HIGHLIGHTS

Since the implementation of the Aboriginal Communities Water and Sewerage Program:

- More than 6000 people in 61 communities are receiving improved water and sewerage services
- Aboriginal communities participate in developing management plans, meetings and regular inspections
- Local water utilities (predominantly councils) are engaged to provide services to nearby Aboriginal communities
- Regular monitoring ensures water quality is maintained and improved
- Employment and training opportunities for Aboriginal people are being created.

### PROCESS

To establish the business case for the Program, more than 60 communities across NSW containing 1,268

**Table 1. Water and sewerage service arrangements.**

| Service type   | Water     | Sewerage  |
|--|-----------|-----------|
| Own water and/or sewerage system                                     | 9         | 24        |
| Supplied by water utility to community boundary                      | 34        | -         |
| Fully serviced system supplied by water utility to individual houses | 20        | 39        |
| <b>Total</b>   | <b>63</b> | <b>63</b> |

\*63 communities were surveyed

dwellings were visited by experienced personnel to assess the condition and adequacy of the water and sewerage systems. It was found that a number of communities received service from a local water utility while others were entirely responsible for their own services (Table 1).

Discrete Aboriginal Communities in New South Wales are usually one parcel of privately owned land. Water utility services (where provided) generally extend only to the boundary of the community rather than to each dwelling. This left the communities responsible for infrastructure on their land including reticulation networks, pumping stations and tanks. Some communities had their own water treatment system, but often these were not working correctly or had failed. The situation was similar with sewage management facilities, including septic tanks, aerated wastewater treatment systems, and oxidation ponds.

Under the Program, experienced service providers, such as local water utilities (generally local councils), are contracted to provide support to communities. Formal service agreements are entered into by the Local Aboriginal Land Council, service provider and DPI Water for the water utility to provide full water and sewerage services.

The service providers bring their expertise and experience to the Program and take responsibility for the day-to-day operation, monitoring and maintenance activities. The Program is managed by DPI Water and overseen by a Steering Committee with representation from relevant government and non-government organisations.

Engagement with each community is central to the Program. Communities were involved in the establishment of the program and continue to be key stakeholders. Regular consultation meetings between community members, Local Aboriginal Land Councils, DPI Water, Public Health Units and service providers examine infrastructure, identify issues, and discuss actions to maintain and improve water and sewerage services.

Community representatives, DPI Water, NSW Health and other key stakeholders worked together to develop and implement risk-based water and sewerage management plans for each community, based on the Australian Drinking Water Guidelines Framework for Management of Drinking Water Quality (NHMRC/NRMMC 2011).



**Recent infrastructure upgrades in one Aboriginal community. The Aboriginal Communities Water and Sewerage Program ensures ongoing operations, maintenance and monitoring of infrastructure.**

The management plans include an assessment of water and sewerage systems, the steps necessary to manage any risks and verification monitoring of drinking water quality. The management plans also include guidance for the community, water utility and other service providers on responsibilities, communication processes and who to contact if a problem arises.

Local Public Health Units are in regular contact with communities and participate with DPI Water, community members and land councils in four-monthly inspections and reviews.

### OUTCOMES

The Program is providing services to more than 6000 people in 61 eligible communities. Implementation of management plans has improved the understanding and control of risks, resulting in safer, more reliable operation of water and sewerage systems. Management plans were in place for many Aboriginal communities well before this was a requirement of public water utilities by the NSW Public Health Act 2010.

The plans play an important role in assuring the safe delivery of drinking water. A five-yearly review of all management plans commenced in 2015. The plans have prompted improvements through the identification of potential hazards to the water supply. Critical control points have been established and response protocols developed in the event of adverse monitoring results.

Backlog maintenance and capital works have been completed in many communities. This includes repairs and upgrade to treatment infrastructure such as replacement of failed water disinfection systems, and construction of sewerage schemes.

The Program has provided the opportunity to regularly monitor water quality. The NSW Health Drinking Water Monitoring Program was expanded in 2008 to include the Aboriginal Communities. In accordance with the

**Table 2. Water quality before and after Program commencement (% samples free of E. coli).**

| Water supplier                       | Before commencement (average 2001-07) | After commencement (2010-15) |
|--------------------------------------|---------------------------------------|------------------------------|
| Aboriginal communities               | 80.1% <sup>A, B</sup>                 | 98.6% <sup>B</sup>           |
| Local water utilities (regional NSW) | 97.7% <sup>B</sup>                    | 99.28% <sup>B</sup>          |

A. Colisure Monitoring Program, B. NSW Drinking Water Database

Australian Drinking Water Guidelines (ADWG) 2011, water quality monitoring has included a comprehensive screening in all communities including microbiology, inorganic chemistry, a radiological survey (which will be repeated five-yearly for surface water supplies and two-yearly for bore water), pesticides (repeated monthly for 12 months), and disinfection byproducts (repeated monthly for 12 months). Ongoing monitoring includes microbiology (monthly), comprehensive chemical analysis (twice yearly) and regular field tests for free chlorine, turbidity, and pH in reticulation systems (NSW Health 2005).

The national guideline for drinking water quality is the Australian Drinking Water Guidelines (ADWG) 2011. E. coli indicate faecal contamination and the possible presence of more harmful micro-organisms. Monitoring for E. coli has been carried out in some Aboriginal Communities since 1999.

In more remote communities testing was performed by Community Water Samplers, supported by local Public Health Units, using presence/absence “Colisure” test kits. Information from this monitoring led to corrective actions in these communities and supported the case to establish the Program.

The development and implementation of water and sewerage management plans under the Program has established robust preventive measures. There have been marked improvements in drinking water quality since their establishment.

Prior to the commencement of the Program average microbiological results for Aboriginal Communities did

not meet the ADWG target and were well below the quality of mainstream communities. Water supplies in Aboriginal communities were more likely to be contaminated with E. coli bacteria, experience boil water alerts and interruptions to supply.

Almost all the communities now meet the microbiological criteria of the Australian Drinking Water Guidelines (2011) (Table 2).

Three of the sixty communities do not have disinfected drinking water supplies. These are independent supply systems and the Program is aiming to provide disinfection, following community consultation.

The Program has provided some employment and training opportunities for Aboriginal people, although an independent review of the Program indicated greater investment in this area is needed. Water and sewerage plumbing apprenticeships have been partially funded by the Program to provide mentoring opportunities and wages for community members to be employed with a local water utility. One Aboriginal person gained permanent employment with a council after being contracted to work on the construction of a new water treatment plant. Further training and employment strategies are being developed.

Communities have provided positive feedback on the Program. Relationships between many communities and local councils have improved.

Consultation with community members has occurred throughout the development of formal service agreements and management plans.

A mechanism for community feedback is provided via four-monthly meetings, and multiple agency support is assured via the Steering Committee. This strategy of communication and stakeholder engagement is central to the success of the Program. A comprehensive independent review of the Program commenced in 2015. A health outcomes evaluation will also commence soon. The aim of the evaluation is to examine the association between improvements in operation, maintenance and monitoring of the water and sewerage systems and the health outcomes of people living in discrete Aboriginal communities.

The case studies below provide some examples of how the Program has contributed to improvements in the water and sewerage systems in Aboriginal communities.

### CASE STUDY

#### Community 1 (Own Water and Sewerage Systems)

The water supply is sourced from two bores, disinfected with chlorine, and distributed to 17 houses and a peak population of 200 people. A community member was trained to operate and maintain the system. However this person left the community and no one continued the operation and maintenance program.

The sewerage system consisted of two primary digesters, a biological contactor, an effluent sump where chlorine was added, and a rising main to a wet weather pond. However, effluent was being diverted from the rising main to be used for pasture irrigation. The community was generally unaware of the risk of exposure. Due to the immediate risk to health, new effluent application areas were presented to the community, which supported the changes. An interim irrigation system was installed that diverted the effluent away from the pasture and temporary fencing was installed around the old and the new irrigation areas to prevent access. An information pamphlet was

distributed to warn of the health risk (NSWALC NSW Government 2009).

In 2010 an agreement was signed between the LALC, local water utility (council) and the then NSW Office of Water, for the local water utility to provide operation, maintenance and monitoring services for the water and sewerage systems. In 2011 a new effluent irrigation system was completed. The drinking water chlorination system was upgraded and included the provision of a backup dosing pump, connection of telemetry, installation of a wash station, splash protection and a safety shower (NSW Aboriginal Land Council and NSW Government, 2015). Four-monthly meetings and ongoing maintenance and monitoring continue.

#### Community 2 (Own Water and Sewerage Systems)

This community also had responsibility for its own water and sewerage supplies. It consists of over 50 houses and has a population of 300 people. The first site visit to this community uncovered significant operational problems. A broken sewer pipe in the pump station caused recirculation of the sewage. A broken water main was also found nearby. One of the two sewage pumps was constantly turning off due to overload and the other pump was operating almost continuously.

The pumps were repaired and a further breakdown of the system averted. Timely repairs also substantially reduced electricity bills and water disinfection costs (NSWALC NSW Government, 2009). It is likely that some of this cost would not have been incurred if there had been a system of operation and maintenance in place. A service agreement has been signed with the local water utility to monitor and maintain these systems.

#### Community 3 (Own Water Supply)

The community received water from a local creek. It consists of 180 permanent residents and up to 2000 people during an annual festival.

Water was pumped from an infiltration bore near the creek and passed through a river infiltration filter

and ultraviolet (UV) disinfection. The UV system was old and broke down regularly, leading to possible exposure to inadequately treated water.

The management plan process raised awareness of the risks. These were initially controlled with the installation of backup chlorine disinfection if the UV failed, and the use of boil water alerts if back-up disinfection was not available. Under the Program a new UV system was installed in 2013, including telemetry to alert the operator and community of any failures (NSWALC and NSW Government, 2015). Back up chlorination is provided by the service provider if needed.

#### Community 4 (Water Bulk Supplied, Own Sewerage System)

This remote community of 250 permanent residents receives a bulk drinking water supply from the local water utility to the boundary. The sewerage system, however, consisted of very old aerated wastewater treatment systems connected to each of the houses in the community.

The system was designed to enable treated effluent to be pumped to the rear of the properties, to be used for irrigation via a sprinkler system. Outdoor play areas were being spray irrigated with the effluent. Disinfection of the wastewater treatment system was not maintained, leading to risks of disease on exposure. The local water utility agreed to take responsibility for the operation and maintenance of the water and sewerage systems. With capital funding from the Program, a new reticulated sewerage scheme was completed and connected to the town system in 2014. New water supply mains were also completed in early 2015 (NSWALC and NSW Government, 2015).

#### Community 5 (Own Water and Sewerage Systems)

The community had its own drinking water supply sourced from an infiltration bore close to a local creek. The supply was disinfected with chlorine and distributed to the community of up to 300 people. The disinfection unit often failed and boil water alerts were issued in 2000, 2005, 2007, and twice in 2009.



A boil water alert was in place when the Program commenced in this community. A service agreement was signed with the local water utility in 2010 and in the same year an upgraded chlorine disinfection system was installed. Further work has also been carried out on this community's sewerage treatment plant (NSWALC and NSW Government 2015).

### CONCLUSION

This Program is a unique partnership between the the NSW Aboriginal Land Council and the NSW Government to help close the gap in services for discrete Aboriginal communities. The Program provides a mechanism to address long standing operation and maintenance issues that put the health of communities at risk. As a result Aboriginal communities are now benefiting from improved water and sewerage services.

### ACKNOWLEDGMENT

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### THE AUTHORS



**Dr Paul Byleveld** manages the New South Wales Health Water Unit, which is responsible for public health regulation and advice on drinking water, waste water management, water recycling, and recreational waters.

Paul has coordinated statewide monitoring programs and helped investigate and rectify water contamination. Paul has contributed to the development of the Australian Drinking Water Guidelines and the WHO Guidelines for Drinking Water Quality. Paul was responsible for co-leading the business case and is helping oversee implementation of the \$200 million

Aboriginal Communities Water Supplies and Sewerage Program. Paul has also worked with the Australian Government and the Red Cross in post-conflict and natural disaster settings (including tsunami, earthquake, typhoon and floods).



**Wendy Henderson** joined the NSW Health Water Unit in 2012 as a Project Officer and holds a Bachelor of Science, and Master of

Public Health from the University of Sydney. Wendy has over 14 years experience in the water industry, including 10 years with Sydney Water as a Water Quality Scientist.

In her current position Wendy is responsible for supporting water utilities in NSW in relation to drinking water safety provisions under the Public Health Act 2010 and Public Health Regulation 2012.



**Jeff Standen, Manager NSW Health Aboriginal Environmental Health Unit and Chair of the National Aboriginal and**

**Torres Strait Islander Environmental health Working Group**

Jeff Standen is the Manager of the NSW Health Aboriginal Environmental Health Unit and Chair of the National Aboriginal and Torres Strait Islander Environmental Health Working Group.

Jeff has been working in the field of environmental health for the past 30 years, most of that time with Aboriginal communities in NSW and the NT. He has a Bachelor of Applied Science (Environmental Health) from the University of Western Sydney and a Master of Public Health from the University of Sydney.

He is currently responsible for the development of evidence-based environmental health policy and programs in Aboriginal communities in NSW, including the Housing for Health program and Aboriginal Environmental Health Officer Training Program and Jeff was responsible for co-leading the business case and is helping and assists with overseeing the implementation of the \$200 million Aboriginal Communities Water and Sewerage Program.



**Sandy Leask** began working with water in 1995 doing macroinvertebrate surveys with the NSW EPA. He joined

the NSW Health Water Unit in 2005 after completing a Masters of Public Health. In this role he has been involved in the NSW Aboriginal Communities Water and Sewerage Program, the implementation of risk-based drinking water management systems, NSW Health's support for drinking water monitoring, the re-development of the web based NSW Drinking Water Database, and water fluoridation

### REFERENCES

- Commonwealth of Australia 2015. Closing the Gap report [http://www.dpmmc.gov.au/sites/default/files/publications/Closing\\_the\\_Gap\\_2015\\_Report\\_0.pdf](http://www.dpmmc.gov.au/sites/default/files/publications/Closing_the_Gap_2015_Report_0.pdf)  
Accessed 01/02/16.
- NAHSWP (National Aboriginal Health Strategy Working Party) 1989. A National Aboriginal Health Strategy: report of the National Health Strategy Working Party. Canberra: Department of Aboriginal Affairs.
- National Health and Medical Research Council (NHMRC) and Natural Resource Management Ministerial Council (NRMMC) 2011 Australian Drinking water Guidelines. NHMRC, Canberra.
- NSW Aboriginal Land Council (NSWALC) and NSW Government 2009 Aboriginal Communities Water and Sewerage Program Highlights and Achievements Brochure
- NSW Aboriginal Land Council and NSW Government 2015 Aboriginal Communities Water and Sewerage Program Highlights and Achievements 2008-2014
- NSW Health 2012. Centre for Epidemiology and Evidence. The Health of Aboriginal People of NSW: Report of the Chief Health Officer <http://www.health.nsw.gov.au/epidemiology/Publications/Aboriginal-Health-CHO-report.pdf>  
Accessed 01/02/2016
- NSW Health 2005. Drinking water monitoring program. NSW Department of Health
- Pruss A., Kay D., Fewtrell L., Bartram J. 2002 Estimating the burden of disease from water, sanitation and hygiene at a global level. *Environ Health Perspect.* 110(5):537-42
- Public Health Act 2010 No 127 (NSW) <http://www.legislation.nsw.gov.au/inforcepdf/2010-127.pdf?id=e20f1d11-6a0d-ec9a-fe79-d31ae57c52c3>
- World Health Organization 2010 Guidelines for Drinking Water Quality 4th ed [http://www.who.int/water\\_sanitation\\_health/publications/dwq\\_guidelines/en/](http://www.who.int/water_sanitation_health/publications/dwq_guidelines/en/)