

REPORT ON GAP CLOSURE FOR MODERNISATION AND EXTENSION PROJECTS

Introduction

This is a summary of Northern Territory Projects funded through the Bureau of Meteorology's Modernisation and Extension Program (M&E) and the extent to which gaps identified through this program have been addressed.

The Northern Territory has elected to address this topic outside of the 2011 SWIMP as the gaps addressed in this report are specific gaps (or tasks) identified by the NT that could attract external funding through the Bureau's M&E Program. The gaps highlighted in the SWIMP are at a higher level and therefore consisting of a number of specific tasks that need to be undertaken to meet the "gap".

Reporting and Common Report Outputs

This Report is an addendum to the two Section C's of the 2010 SWIMP. Section 1.C addresses gaps in 'Information' while the section 2.C addresses gaps in 'Data and Monitoring' gaps.

The gaps identified in the relevant sections of the 2010 SWIMP are summarised below. These gaps remain the same in the 2011 SWIMP.

Gap No	Gap description
	M&E Gaps
1	Risk of instrumentation being obsolete and incapable of integrating with communication mediums
2	Some monitoring of groundwater network still undertaken by discrete measurement on an opportune basis
3	Some data and communications systems on inadequate infrastructure
4	Reinstatement & modernisation of remote indigenous community water supply aquifer monitoring still required
5	Still some sites requiring improved mechanisms for measuring accuracy of water velocities
6	Upgrade of PWC data management infrastructure
7	Still need to identify a reference datum for a considerable number of monthly sites within the NT
8	NGIS in the NT
9	Strategic Water Information and Planning Coordination beyond the M&E Program
	SWIMP 2010 Gaps
10	Significant river spring locations are not known or have not been mapped
11	Insufficient knowledge on recharge quantification, dependency and needs of groundwater ecosystems
12	Insufficient knowledge of the karstic nature and very high permeability in the two major aquifer systems in the Daly River area which pose difficulties in predicting and discerning groundwater movement and response.
13	Need for a monitoring program to investigate changes in groundwater chemistry in the Ti Tree aquifer

14	Need for a monitoring program for indicators of environmental and cultural place health the Ti Tree aquifer
15	Need for a water quality monitoring program in the Alice Springs area
16	Groundwater level monitoring in remote aquifers has a 13 year gap in aquifer information
17	Data capture and transfer not meeting time requirements
18	Streamflow data not meeting all accuracy levels
19	Water storage and surface water data not in electronic format
20	Inability to collate and deliver water accounting data efficiently
21	Gaps in knowledge of the Daly/Roper region attributed to issues of recharge quantification, dependency and needs of groundwater dependent ecosystems which pose difficulties in predicting and discerning groundwater movement and response.
	For Water Allocation Plans: (from SWIMP 2010)
22	Recognition of Native Title and development of SIR
23	Water use requirements for stock and domestic use
24	Confirmation of assumption that cultural flow requirements are the same as environmental flow requirements.
25	Catchments' Characteristics
26	Spatial variation of soil moisture
27	Proposed rezoning
28	Surface and groundwater quality response to extraction
29	Determination of cultural flow requirements
30	Density and location of existing and proposed effluent disposal systems
31	Crop water use model
32	Estimate current rural domestic use (sourced from groundwater bores)
33	Consideration of strategic reserve to support Indigenous economic development opportunities (SIR)
34	Identify and prioritise sites of recreational and aesthetic importance
35	Future rural residential development scenarios
36	GDE locations and Environmental Water Requirements (EWRs)
37	Localised impacts of extraction from production bores or high density of stock and domestic bores
38	Property development plans (PDPs)
39	Aquifer characterisation

For the Water Allocation Plans Gaps please note that these gaps are addressed as each of the Water Allocations Plans are developed. The majority of funding for WAPS is provided by the NTG.

None of the other 2010 SWIMP gaps have not been addressed in the six months since being published in the last SWIMP. Some of these may not ever be fully addressed due to the sheer size of the gap

As the Northern Territory's 2010 SWIMP is less than six months old, there have not been any new gaps identified to date. Work is progressing on the development of a Gap Analysis but will not be finalised before the 2011 SWIMP Review is due.

Therefore there is no listing of revised gaps.

Review of M&E Projects and how well these projects addressed identified gaps

Attached at Appendix 3.1 there is a summary of all the projects that have been applied for and funded through the M&E Program. This includes all rounds to date.

In this table, the projects are numbered so that reporting by project can be undertaken. The following is the summary of how well each of these project addressed the specific gap identified in the M&E applications as well as the extent that these specific gaps have addressed the NT's overall information gap. Where there has been funding for consecutive years for the same or similar gaps, these have been reported together.

Projects 1, 2 and 3 Gauging Station Instrumentation Upgrade and the employment of an Instrumentation Officer to facilitate the upgrades.

The project was originally designed to upgrade the instrumentation at all existing gauging stations. Where gauging stations were not on telemetry, the upgrade was to additionally provide this capability. The project commenced well before completion of the SWIMP and it was always recognised that the upgrade process likely to take several years to implement. The upgrade program was undertaken on a priority basis, the priorities being determined from existing network management analysis tools.

There are a number of the lowest priority gauging stations that had not been upgraded due to particularly low scores affirmed during the SWIMP process. Further upgrades will only be undertaken after further assessment on completion of the WIMS. Of the 125 current gauging stations and 29 rainfall sites in the network, all bar 17 gauging stations and 8 rainfall sites have been upgraded.

Whilst projects 2 and 3 have contributed to the upgrades a considerable proportion of the upgrade program has been undertaken using existing NRETAS funded resources.

100% of priority sites have been upgraded.

Project 4 Acoustic Doppler Meters

Project was designed to provide hardware for the measurement of stream velocities undertaken as gaugings. The equipment consisted of a number of different meters for use in various scenarios replacing obsolete mechanical methods which required regular and costly recalibration. The expected benefit is more accurate gaugings and consequently more precise ratings.

100% of funds were spent on appropriate instrumentation. The funding met 100% of the requirement for this instrumentation, however, the identified gap of improving mechanisms for measuring accuracy of water velocities cannot be fully assessed as this is dependent on a wide range of factors such as hydraulic conditions experienced at individual sites and particular stage ranges at those sites may require a number of techniques and tools to accurately determine velocity measurements. The hardware purchased will significantly improve the Agency's ability to measure velocities at a greater range of sites and conditions.

Project 5 Acoustic Doppler Current Profilers (ADCPs)

Project was designed to continuously measure velocities and thus determine flow at a number of key sites where contemporary methodology (gauging and rating) has not been successful. This has usually occurred due to the difficulty of accessing sites during periods of flow or to practical/safety constraints in undertaking gaugings at particular sites.

Deployment of permanent ADCPs to profile velocity and generate instantaneous time series flow data is in its infancy particularly in Australia. Whilst deployments to date have provided some very encouraging data, NRETAS has had to undertake a considerable amount of R&D in relation to this technology, with very limited capacity for reference with other jurisdictions nationally. As a result and in recognition of the extreme and highly dynamic environment encountered in the NT (eg 20m stage range) successful deployments have involved a number of trial installations, some of which have required several attempts to capture the required data over a complete stage range. In summary the technology will 100% address the identified gap 'Improved mechanisms for measuring accuracy of water velocities' however further systems development is required to integrate this technology with existing monitoring infrastructure.

Projects 6 and 7 Installation of Continuous Logging Systems for Groundwater Monitoring Bores

In Round 2 \$450 000 funding was received. \$1 006 900 was requested to install continuous logging systems for critical sites. Of approximately 700 monitoring sites across the NT, around 200 are considered critical. It is estimated that approximately 100 continuous logging systems were purchased and installed for Round 3. As the start of Round 4 has been delayed, this project is less than 50% complete but will address a further 212 critical sites. This means that we estimate that we have, at best, met around 50% of the gap on our critical sites through round 3 and the remaining 50% of critical sites should be addressed through Round 4 funding. Therefore by the end of round 4 we calculate that we will have updated 100% of our critical sites.

There are still a large proportion of sites not fitted with continuous logging systems at around 70% of total monitoring sites.

Project 8 Hardware for hardware consolidation of Telemetry Systems

This project required the purchase of servers to provide appropriate IT infrastructure for the storage and maintenance of NRETAS water databases. The project included development of system support and backup/recovery particularly for critical data associated with flood forecasting.

The project gap was 100% met on completion.

Projects 9 and 10 Reinstatement, modernisation and extension of remote indigenous community water supply aquifer monitoring

These two projects aim to install continuous logging equipment to monitor the SWL in bores at 37 different remote Indigenous Communities across the Northern Territory. This logging equipment will help fill Gap 4 identified by the SWIMP. Around half of all installed equipment will be telemetered to supply live data to the network.

This project is currently over 50% complete and will be 100% complete by June 2011. Upon completion the project will have rolled out logging equipment into half the communities serviced by PWC and will

provide invaluable information on the effect of extraction on the limited aquifers that remote communities rely on for their water supplies.

Project 11 Upgrade of PWC Data Management Infrastructure

This Round 1 project received funding of \$160,000 towards a \$295,000 project to upgrade PWC's water data management infrastructure. The project saw the purchase and commissioning of OSISoft's PI Historian software system and associated hardware, connection to, and download of data from local Citect SCADA (Supervisory Control and Data Acquisition) systems and connection to the corporate LAN (Local Area Network) to enable dissemination of this data. The Historian was required to provide an automated centralised repository for PWC's water data and a platform to enable the dissemination of this data to PWC staff and, to a limited extent, the public.

PWC uses SCADA telemetry systems to manage the acquisition of data from the field (Darwin, Katherine, Tennant Creek, Alice Springs, Yulara and minor centres). The primary use and development of these SCADA systems has been for the control of asset operation (pumps, valves, tanks, flows etc.) within the water and sewerage infrastructure and the acquisition of data from sensors throughout the network, including dam water levels and bore production.

The capability to archive this data into an on-line system for analysis of performance and reporting was a gap identified limiting the collation and dissemination of data requested to comply with the s.126 regulations of the Water Act 2007.

The successful completion of this project, along with further work by PWC to expand the PI Historian network into other remote centres, has provided the required infrastructure for the management of water data. The SCADA systems in Darwin are fully operational and further work is being undertaken to configure the PI Historian system to archive data from the SCADA systems in Alice Springs, Katherine, Tennant Creek and Yulara.

With respect to filling of gap 6, it is considered that the project has achieved approximately 60%. Of the remaining 40%, 30% will be achieved when the configuration work is completed for Alice Springs, Katherine, Tennant Creek and Yulara and the PI Historian is operational across all Water Services SCADA systems. This is expected to be achieved in the next 18 months. The final 10% is related to development of an automated routine to transfer WDTF compliant data from the PI Historian to BoM. There is currently no plan to address this.

Project 12 Purchase and implementation of Osisof PI Historian ADTF Module

Project was original applied for to tie in with proposals made by both South Australia and Western Australia. These other projects did not proceed so this project was cancelled.

Projects 13 and 14 AHD connection of groundwater and surface water monitoring locations

Installation of permanent survey base stations (CORS) provided infrastructure enabling the survey of primary monitoring locations (gauging stations and groundwater monitoring bores) to a high degree of accuracy particularly in the vertical scale. By surveying these sites to a common datum (AHD) comparison of level data between spatially separated sites can be undertaken. This is critical for any modelling projects such as the interaction between groundwater and surface water in the Daly, or for modelling flow events for flood forecasting purposes.

NRETAS originally contracted the Department of Construction and Infrastructure (DCI), Office of the Surveyor General (OSG) to survey at AHD 56 gauging stations and 78 monitoring bores as part of project 13. To date final corrected AHD values have been supplied for 43 gauging stations and 124 monitoring bores with a further 9 gauging stations and 20 bores in the Alice Springs region still awaiting completion.

Overall considerably more locations will end up surveyed to AHD than was included in the original project management plan and funded by BoM. Therefore the gap for the project 13 was met 100%. As project 14 is still underway and the survey component yet to commence (as per the project management plan) the project is less than 50% complete at this time.

Project 15 Implementation of GIS in the NT

This project has been funded in round 4 but due to difficulties in engaging a suitably qualified professional it has been delayed in its implements. At this point this project is <50% complete but we are working towards having this completed by the due date of the project.

Projects 16, 17 and 18 Strategic Water Information and Planning Coordination

Rounds 2 and 3 funding were for the drafting and publication of an NT Strategic Water Information and Monitoring Plan and ongoing water information and planning coordination. These projects have been met to 100% of requirements under the funding agreements. Round 4 only commenced in October 2010 and is still ongoing at this time. This publication will mark the 50% mark of the projects milestones.

Common report elements

Source data for the above reporting is primarily at Appendix 3.1. This data has been collated and visually displayed in the following Graphs and Tables.

Graph 1 - Gap versus Amount of M&E funding invested.

The gaps in this graph have not been prioritised. The only gaps being reported on are the M&E Program gaps and these are all relatively important projects with each considered important to the delivering organisation. If any were to be considered high priority they would be the “Upgrade of PWC Data Management Infrastructure” and the Instrumentation projects for NRETAS.

Graph 2 - Theme versus Amount of M&E funding invested

Table 1 - For each named organisation, this table shows how many gaps have been addressed through M&E funding and to what extent.

Table 2 - For each gap, this table shows how many M&E projects were funded and to what extend the gap has been closed for the funded organisation.

There is a separate Table 2 for each of the themes that M&E funding addressed in the NT.

Other Benefits flowing from M&E funding

- The majority of the M&E funding has been used for improving or updating the monitoring equipment and instrumentation. Some of this work has allowed for a greater level of frequency of monitoring.
- More timely access through improved telemetry.
- Experience has shown the installation of gauging stations and acoustic Doppler meters have not actually reduced resource inputs and that there remains the need for the equivalent number of site visits as was previously required. However the nature of site visits has changed from a more manual process to a more automated one with a considerable increase in the level of temporal data collected and a decrease in data loss through equipment failure.
- AHD connections. Much of this funding was on forwarded to the Department of Construction and Infrastructure (DCI), Office of the Surveyor General (OSG) for implementation. The result of this was a greater ability to use groundwater information through the use of a common datum. This is now able to be done using a hand held GPS through the installation of a base station allowing differential data to be collected with a vast improvement in accuracy.

With relation to Projects 3 and 4, any subsequent surveying of regions associated with the CORS base stations installed under M&E funded projects will be able to receive real time differential correction meaning that future location and elevation surveys can be undertaken at no extra cost to an accuracy several orders of magnitude higher than would have previously been the case.

- Creation of a WIMS database which will be used to determine a more detailed gap analysis and data monitoring program than was available prior to the SWIMP being developed.
- Auditing and cleaning up of existing databases to improve data quality and to change delivery format to a national standard.

Conclusion

The M&E funding has been very effective in addressing the specific gaps targeted. The foundation that this funding has installed will continue to benefit the NT and will assist the NT in meeting its reporting obligations.

The funding for the Strategic Water Information Coordinator has been very effective in developing the 2010 and 2011 SWIMP's. The coordination role that has been developed over the four rounds to date has created a role within the Agency which should continue to operate as a coordination point even if no further funding is received through BoM however this is dependant on resourcing. It should be noted that this role will be dependent upon the capacity of the staff member undertaking this function in addition to an existing role. There will be occasions where resources may not be available due to the other full-time functions that this person delivers on. This may impact on the quality of service provided in future requests from BoM.

The "Future of Strategic Coordination" paper that is being submitted to the BoM outlines suggestions for the ongoing role for coordination.