BUSH TECH BRIEF #3

Operation **Desert Storm**water Harvesting

PHOTO: STEPHAN RAINOW

Introduction

On any typical day in Kalka or Pipalyatjara in the Anangu Pitjantjatjara (AP) lands, if you take a stroll through the community you may see groups of people sitting, meeting and camping on earthen mounds around some of the houses. Some of the mounds have trees planted on them for shade, wind breaks and shelter (Possible future uses include food and firewood). The trees enhance public contact and promote communication, an important aspect of building social capital, as well as making the community a nicer looking place.

There is a lot more to these mounds than meets the eye though, they are not just "ornamental". Earthen mounds or ponded banks help to control the flow of stormwater to prevent flooding in the community. They act as water banks after a rainfall event. A valuable resource: rainwater, an asset to the community, which would otherwise be left untapped, is harvested for use for vegetation projects. Water is hard to come by in many Indigenous communities, we can't afford to waste it. Erosion and damage to the landscape is prevented by channelling the water and helping to reduce the speed of its flow. Mounds can function as fences and help to define and enlarge the living space around people's homes. By providing a better furnished yard area, they help to reduce functional crowding. They also keep cars a safe distance away. Most importantly, they help to reduce dust nuisances which contribute to illnesses such as trachoma. Not bad for a humble pile of dirt!

Mike Last (a landscaping consultant), assisted by Nganampa Health, has done extensive work in the Anangu Pitjantjatjara/Yankunytjatjara lands. Mike has 35 years of experience and his work dates back to the early 1970s. Stormwater harvesting has been carried out not only in the Anangu Pitjantjatjara Lands, but Charles Nicholson and Wally Edgecombe have implemented stormwater harvesting projects at Karratha in the Pilbara also. Christian Blind Mission International funded the work in the AP lands as part of an eye health project.

As part of a Rio Tinto Fellowship program in 2001, organised by the Centre for Appropriate Technology, Zoe Godjin reviewed the existing technologies for water harvesting, commented on the advantages of different methods, described examples where they are in use in Indigenous communities and made recommendations for their implementation.

Zoe suggested that while the mounds and ponded banks used at Kalka and Pipalyatjara were working very successfully to solve a number of different problems, these techniques should not be considered in isolation. She recommended that other rainwater harvesting techniques including rainwater harvesting from roads and airstrips, and rainwater tanks had high potential. These additional techniques should be considered by any community where water is scarce.

What is the use of stormwater harvesting?

Harvesting of stormwater enables it to be collected for targeted reuse rather than depending on natural aquifer recharge processes which may operate over a longer timeframe and dissipate the water over a larger area. Much of the water from rainfall events never makes it to the aquifer. Instead, it remains close to the surface of the earth and evaporates easily. By channelling stormwater away from environmentally sensitive areas, erosion can be prevented, and this in turn helps to prevent dust nuisances during dry weather. Quantities of water required for aquifer recharge are still captured for this purpose when stormwater catchment systems designed for lower rainfall events overflow.

PHOTO: MIKE LAST

Apart from preventing erosion and dust, stormwater can also be used to replace potable water for non-critical applications such as evaporative coolers and vegetation/landscaping projects. At present the systems used in the APLands are basically for landscaping and vegetation only. There is a huge potential which exists for harvesting water for other uses too, such as toilet flushing, washing clothes, bathing etc.

Operation Desert Stormwater Success Stories

Contoured ponding banks have been successfully used at Kalka to reduce the velocity of stormwater flowing off the catchments, allowing it to disperse and percolate slowly into the soil instead of running off the surface. Ponded banks were built approximately 400mm high with a spilling point at one end. These banks or collection areas are staggered to allow the water to be channelled from one to the other, or to a flood out area. Banks can be constructed using a road grader and a laser level, or alternatively the blade in front of a tractor can be used.

At Kalka, a series of ponded banks alongside the paved road surface is used to collect small quantities of stormwater runoff from the road. Ponded banks are not applicable for use in all communities however. Their applicability depends on the amount of stormwater which flows into a community from the surrounding landscape as well as the amount produced in the community. An assessment of the available stormwater can be obtained from rainfall history and information about creek flows and flooding in the local area. Observation of stormwater damage in the local area also helps to determine the applicability of ponded banks.

In Pipalyatjara and Kalka in the AP Lands, sandy soil procured from outside the community is used for the formation of mounds which serve as a boundary around the perimeter of the house and help to prevent dust problems. Bobcats, shovels, rakes and tractors are used to form the preliminary shape and size of the mounds, which are later trodden on to compact them and watered to form a hard surface top layer. Trees or other vegetation may be planted on the mounds. The stormwater which is diverted from the mounded areas can be directed to areas where trees or other vegetation are planted, and this helps to reduce dust around the community, prevent erosion and improve the appearance.

Rainwater has been harvested from roads at Kalka. The roads were hardened with a roadbase material, and then graded at a shallow angle to encourage sheets of water to run off into a series of ponded banks along the road. This prevents large quantities of water from accumulating on the road, by diverting small quantities away at a time.

What's coming up on the horizon?

Mounds and ponded banks are tried and tested technologies at Kalka and Pipalyatjara. Water has also been successfully harvested from roads at Kalka, and some people are using rainwater tanks. However, in the future, new techniques may be used, such as storing water in underground cells using the 'Atlantis system'[5]. A simple alternative to the Atlantis system for storing water underground is to dig a trench in the ground, line it with plastic and then install a cover made of plastic or tin etc. Greywater from kitchens or washing facilities could also be

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Desert stormwater harvesting (cont)

PHOTO: MIKE LAST

reused for vegetation such as kitchen gardens. More use could also be made of rainwater tanks, for example using them for community buildings such as stores and offices.

In the future, more use could be made of water harvested from roads, for community facilities such as football fields or playgrounds. If water of a higher quality is needed, e.g. for evaporative coolers, then water could be harvested from airstrips, as aircraft have very stringent maintenance requirements. The water from aircraft runways is less likely to be contaminated than water from roads, which may contain heavy metals such as lead and zinc, dissolved organic materials, nutrients, bacteria, dirt and dust.

How do I harvest stormwater for my community?

Firstly the community must identify areas where the water runs off and can be collected. To decide where to site catchments you need to observe the landscape for signs of erosion, flooding, debris and where water accumulates when it rains. Lots of vegetation indicates a wet area. You need to take note of slopes and claypans. Comparing any recent and historical photos of the landscape will help to identify flood-prone areas. Rainwater can then be diverted away from these areas to prevent flooding.

The best method of stormwater harvesting will depend on how much water is available, what it is to be used for and what other resources are available (a bitumen road to collect runoff from, labour for building mounds, access to funds to buy rainwater tanks etc.). It is important for all members of the community to be able to have their say also. For example, if mounds are to be built, then input is needed from each family for the shape, fencing, location, vehicle access and tree planting.

For rainwater harvesting from dirt roads, the next step is to compact the road surface to enable water to run off it more effectively. The road should have a slight slope to enable the water to run off. Where bitumen roads exist, sloped guttering or gaps in the guttering can be used to collect water from the road and channel it to where it can be used. One example of a suitable guttering system is a “Bro-pit curb design”[6].

Water collected from the roads can be stored using gravel or a more expensive underground drainage system such as an “Atlantis” cell.

As an alternative to harvesting water from roads, ponded banks can be used to divert small quantities of water for collection. Mounds can be used to divert water around the house and yard and use the water for the growth of vegetation which is planted on the mound.

Challenges and Opportunities

Just installing a mound or ponded bank or road harvesting system is not enough, though. Regular inspection, monitoring and maintenance is needed to keep the system working for years and make it sustainable. For example, sometimes vehicles wander off the main roadway and flatten banks, which then have to be reconstructed. Or roadside gutters may clog up with leaves and may need to be cleaned.

Future stormwater harvesting potential for the community, when it expands, should also be considered. For example buffer zones can be left around houses to enable mounds to be constructed at some stage in the future.

The potential for stormwater harvesting is enormous. Techniques such as mounds and ponded banks could possibly be used very effectively in YOUR community, just as they have in the Pit Lands.

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Contacts

Stephan Rainow, Nganampa Health Council
Alice Springs Office, 3 Wilkinson Street
ALICE SPRINGS 0870 Tel: (08) 8952 5300

Mike Last, 29 Moore Crescent, St Agnes
South Australia 5097 Tel: (08) 8395 0897

Trish Morrow, Centre for Appropriate Technology
P.O. Box 8044, ALICE SPRINGS 0870 Tel: (08) 8951 4337

Links

Pitjantjatjara Land Management:
http://www.pitcouncil.com.au/1Landmanage/lmframe.htm

Nganampa Health: http://www.healthinfonet.ecu.edu.au/nganampa/

Centre for Appropriate Technology: http://www.icat.org.au/

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3 Hostetler, S., Wischusen, J. & Jacobson, G., *Groundwater Quality in the Papunya-Kintore Region, Northern Territory*, Record 1998/17, Australian Geological Survey Organisation, Commonwealth of Australia, Canberra, 1998.

4 Jacobson, G., Jamieson, M., Lau, J.E., Rose, B., Sollieux, M., Wischusen, J. and Woodcock, L., *The Western Water Study (Wiluratja Kapi): a decision-support system for groundwater resources in Aboriginal lands in the arid zone of central Australia*. Paper offered for ATSIC National Forum, Canberra, February 1997.

5 URL: http://www.Atlantiscorp.com.au *About Atlantis*

6 Goulter, IC, Piorewicz, J, and Lake, AJ, *Hydraulic and Economic Characteristics of the ‘BRO-PIT’Kerb Inlet Unit*, Australian Civil Engineering Transactions, Vol CE35 #3, August 1993.

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