



## From the Chairman

### Blair Lade

On behalf of the interim Council it is my pleasure to welcome you to the first newsletter of the recently formed Seismological Association of Australia Inc.

Forming this Association was something a lot of us have wanted to do for some time, we just needed a little push. That push came and here we are.

What are we about? It's laid out in the 'Objects of our Association' in our constitution, but basically,

We want to promote and engage in the science of seismology and the recording of earthquakes in Australia by persons so inclined, be that professional or amateur.

We want to be able to advise and assist people with what equipment to get, how to set it up and where to send the data so that it can be useful and fill in gaps within the existing monitoring systems across Australia.

We would like to run workshops, design and build instruments and recording hardware, provide demonstrations and training to people and organisations such as schools that are interested in recording earthquakes.

While some of the above are well catered for by commercial entities, information and assistance for the amateur and

secondary educational sector is lacking in Australia and it is here that we really can make a difference.

We have been busy clearing out the remains of the now closed South Australian Geological Survey network and ensuring that the seismic monitoring in South Australia continues.

The passing of Dale Hardy, author and sponsor of the Regional Seismic Users Network website [www.daleh.id.au](http://www.daleh.id.au). has come as a shock to all of us. We offer our sincere condolences to his family and close friends. He, his enthusiasm and his great knowledge about most things will be sadly missed.

As an Association, we must ensure that we look after our members and carry on the legacies that they have painstakingly developed when they are unable to continue being active members .

We need members to take on formal roles in our Association such as Secretary, Web Site manager, Publicity Officer and Editor with other roles becoming evident as our Association matures.

Securing funds to cover operating costs will be paramount, and it will be a while until things settle down.

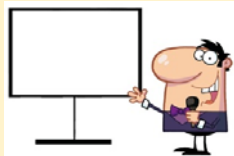
What do you get from joining an Association like ours? From my experience, the more you put in, the more you get out.

Thankyou for being part of the Seismological Association of Australia Inc.

Welcome aboard!

## Notice of General Meeting

Monday 14th August 2017, 6:00pm  
start for 6:30pm meal, at the home  
of David and Heather Love, 30  
Marian Road, Payneham SA 5070



Takeaway Chinese (cost approx \$12 each). Due to space constraints, meeting is limited to 16 people. **Please RSVP to David on 08 8336 8003 by August 12.**

### Followed by talks:

- *Peter Gray and Blair Lade - Raspberry Pi and PSN*
- *David Love - Using AGOS+UoM server*
- *David Love - Discussion on state of the network plus many other things*

Sorry - this will not to be an electronic meeting, however we are working on having this in place for future meetings.

## Your Interim Committee

### Chairman - Blair Lade

m: 0407 189 061 e:blairl@bettanet.net.au

### Chief Seismologist - David Love

p: 08 8336 8003 e: david@earthquake.net.au

### Public Officer - Paul Hutchinson

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### Treasurer/Editor - Joe Grida

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An Annual General Meeting of the association will be held later in the year to elect a full committee.

## Vale Dale Hardy

We are sad to announce the passing of Dale on July 2, 2017.

See Vic Dent's tribute on page 2.



## Locating South Australian Earthquakes

by Alison Wallace

Over the last 12 months we have located 674 events, and of these 40 were felt events.

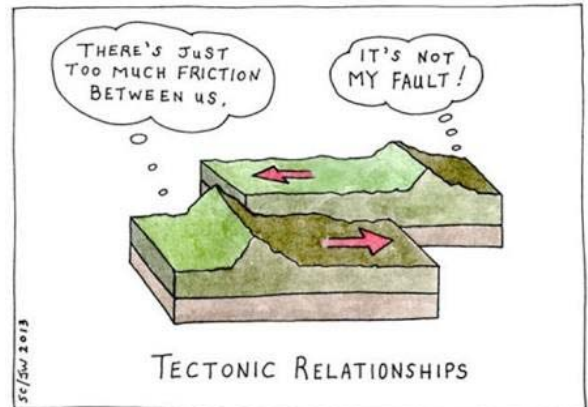
The largest was a mag 4.9 event offshore from Flinders Chase, which was widely felt across Kangaroo Island.

There have also been a number of earthquakes near Adelaide, the most notable, a mag 4.0 near Murray Bridge in February 2017 and 10 days later a mag 3.0 at Flagstaff Hill. There was also a small event mag 1.9 near Adelaide Airport. All of these were felt.

Due to the restructure of Geological Survey and the demise of the Earthquake Group I finished work on the 23<sup>rd</sup> June after locating earthquakes for 33years.

Initially I began at Adelaide then Flinders Universities then after 2 years started at the Department of Mines and Energy where we have been until now. When I first began we had about 12 pen and ink stations and epicentres were located on a Data General Nova3 computer at the rate of about 2 locations a day.

Now (before the closure of the network) we had 22 digital stations with epicentres computed within minutes. Hopefully I will still be able to contribute to the State's Earthquake catalogue through the Seismological Association of Australia.



## Goodbye Dale

Tribute by Vic Dent

We have just lost a tremendous guy, a great friend, and a tireless mind. Dale was critical in building the Public Seismic net to where it is today

I first heard of Dale through Queensland seismologist Russell Cuthbertson. He had heard indirectly of Dale, or maybe it was Colin Stuart, and I think I first contacted Dale, via email, via Colin, maybe in 2007.

After a while I went up to visit Dale to see what he was doing. He was living in a small batch flat with his very pretty and very shy tortoise-shelled cat to which he was very attached. His tiny quarters were crammed with all sorts of fascinating gear. His main interests seemed to be getting live satellite imagery from all sorts of sources/countries, but throw into that live surveillance of volcanoes, and as well he had built himself several seismic sensors from sources in electronic magazines. I showed him our rudimentary PSN gear, and almost immediately he bought one and soon had it adding data to the early network.

I'm not sure of all the details, but Dale had worked in Western Sydney in industrial chemistry. I think he may have been adversely affected by his working environment, and forced to retire early.

A couple of years later, his son or someone suggested he investigate Park homes, and he bought a park home in Redhead, not all that far from his previous rental, and it changed his life. Soon he was editing the residents association newsletter, and then the association itself. He loved it, and they loved him.

I spent quite a few long weekends in Redhead visiting Dale, sleeping in a small camp stretcher in his small workspace area in a corner of his van. We could talk for hours about various things. Then in the evenings we would play euchre or indoor bowls or have trivia nights with his resident friends.

I cannot overstate Dale's keenness, or the contribution he made in hardware, software, websites, making and fixing circuit boards etc. I also cannot overstate Dale's cheeriness in the face of all the health obstacles he faced. He was a truly great individual and will leave a big hole in many hearts.



## Mobile phones for seismographs

by David Love

When the Adelaide network upgrade was beginning in 2005, landline phones were the way to go. As time went by, satellite became attractive if 240V was available. The Hamley Bridge seismograph used satellite. Wireless broadband was developing as a possible option, and CDMA also, if not too much data was sent. So the network used all these options, and direct radio links. The diversity also meant that not all stations would go down if one method had an outage.

In 2017, G3 mobile phone has advanced and become cheaper and more reliable. Thus most of the network is now on 3G. This also simplifies maintenance procedures and spares. If the mobile phone service is out, the recorders back up the

data on site until the service is back on again.

The association has now taken over 8 mobile 3G services from the Geological Survey of SA to keep these stations running.

We are seeking funding from a few sources to cover these costs. Geoscience Australia has also taken over three 3G services.

Jim Deer and David Love converted the Hamley Bridge site from satellite to 3G on 13th April, and are converting the SDAN site from landline to 3G in the near future.

## MYPONGA SEISMOGRAPH

David Love was ably assisted by John and Joan Harris and Ian Newbold to decommission this seismograph on 9<sup>th</sup> March.

Following project funding from SA Water, National Disaster Mitigation Programme, and PIRSA a number of good quality recorders were installed around Adelaide from 2005 to 2008

The Myponga seismograph MYP on Wild Dog Creek Road was the first new one to be established. It sent data on-line from 4<sup>th</sup> August 2006. It was a reliable station with Ian checking any breakdowns fairly quickly, and also putting a mock electric fence wire around it. Cows are intelligent; we had no problems. Unfortunately it was nearly at the end of the local phone line, and suffered occasionally from lightning strikes. Cooked modems do not smell too good. A couple of accelerometers were also damaged. Mobile phone coverage in the area is not good, and the site was inconvenient to access in wet weather, so when the Geological Survey decided not to continue with earthquake monitoring, the decision was made to remove this site.

It was a sad day turning it off, but all the equipment, even the cabinet and solar panel stand have been saved. The equipment is growling in David's yard, wanting to be reinstated and running again.



**Above:** Joan and John Harris, Ian Newbold. Cabinet is between Joan and John. Photo: David Love

## Tales of Tennant Creek

Warramunga Seismic Station Tennant Creek 1974 to 1980

by Blair Lade

I saw an advert in the paper from a company called Geopeko Limited, the exploration arm of the Peko-Wallsend mining company seeking staff for 2 positions, 1 was for 'gridding crew members' and 1 was for a technician who could do just about everything to join the Seismic Station that they maintained in Tennant Creek. I applied for the gridding crew job, not knowing what that involved, but added that I was a technician at Western Teacher's College and could fix things.

About a month later I was interviewed for the 'gridding job' by a man named David Daffin who said he was the OIC of the Seismic Station and he said I wasn't cut out to be a gridding crew member (not tough enough), telling me that they basically cut down and cleared bush (with axes) for the geologist's who would then grid the area and take magnetometer readings looking for possible ore bodies.

He talked to my boss at the College and they both agreed that I could probably do the required work as the new tech at the seismic station. I didn't have much say in it. Dave had dinner with my parents that evening and that was it..

'Kicked out of College and sent to Tennant Creek'. I looked it up on a map and thought 'xxxx it's in the middle of nowhere, what have I let myself in for' or words to that effect.

So in late May 1974, I borrowed \$90 for the airfare from my grandma and flew to a place called Tennant Creek in a TAA DC3 aircraft. I was met at the airport in Tennant Creek by the 'local member' Ian Tuxworth who showed me around the 'town' (population about 2500 people and 10,534,721 flies give or take a few).

Ian introduced me to some of the business owners in Tennant Creek as the 'new tech' who was going to work with Dave Daffin. Everyone seemed most welcoming. He explained that everyone from 'the station' was busy at work and they would catch up with me that night.

I was introduced to the senior geologist (Paul Le Messurier) at Geopeko who showed me where my room was to be in the staff dongas. I met the cook, the handy man, the local fuel agent, the local insurance sales man who also ran the milk bar and the drive-in theatre and finally the local publican Rex Holdcroft. *(They all became very good friends over the next 5 years, especially Rex).*

I met the station staff Dave Daffin, Peter Robinson (a tech from England) and Doug Christie (from the ANU) that night.

The next day I was introduced to the Geopeko workshop manager Floyd Collins who asked if I could repair tyres, I said no and was introduced to the mechanic (Ernie) who said "School's in" and proceeded to show me how to take a split rimmed tyre apart and repair it. I did one and he said "a bit slow, but you'll get the hang of it" pointing to a stack of tyres that filled up ½ the workshop!

A week later I was an expert, could do it blindfolded, could do it with one hand behind my back, could even do it with a hang over. I was shown how to service and do simple repairs on 4wds, all in readiness for my 'new job'.



The Drillers and gridding crews (who were much tougher and tanned than I ever want to be) brought a new lot of flat tyres in each day and dying 4wds were the 'in thing', all being readied for them as soon as Ernie and I could. .. (slave labour or initiation rites, take your pick) but it did teach me a few skills that probably saved my life later on.

I must have either passed well or failed miserably as after a week I was 'moved out' and joined Dave and the team at the Seismic Station where the work really started.

The seismic station at Tennant Creek (-19.9S 134.3E) was established in 1965 and has been operated by the ANU for the

last 30 years. It was originally conceived as a 20 instrument short period array in an L shape with a number of close in sensors near the centre of the array to be run as a coherent detector. 3 Long period vaults were also installed, 1 at the Station, 1 near 'Banka Banka' homestead (100km north of Tennant Creek) , and 1 to the east at 'Frewena' along the Barley Highway. There was a very rundown pub at Frewena (long gone) and the vault was across the road from the pub by the rubbish tip.

When I arrived in May 1974, the array was in the process of being rebuilt, having been burnt out by 2 bushfires which had destroyed all the 'Spiral 4' cable used to get the signals from the instruments back to the recording area. The electronics were very old, and a decision to totally rebuild everything had been made.

The rebuild was proceeding well, shiny new antenna towers were near each site, 100 feet of steel conduit had been laid from the seismic boreholes to the towers, new electronics were being manufactured by the ANU in Canberra, a new building had been erected about 1 mile north of the old recording van and a new power shed was in use.

The plan was to replace the cabled instruments with UHF radio links in the 450MHz band to bring the signals (FM modulated 540Hz tone) to the 'lab'. In the early 70's , UHF radio links were not commercially available and were 'made' by the ANU by scrapping a bunch of ex British police Pye Pocket Phones. Those who remember the British police TV drama 'softly softly' would of seen the 'police' using them. They had a little pop up antenna and were blue in colour.

Power for the transmitters was to be from 'Leclanche Air Cells' with the seismic electronics being powered by 4x6 volt lantern

batteries that would need changing every 6 weeks.

The seismic data was recorded on 1 inch wide magnetic tape, 24 channels at 0.3 inches per second.

The recording format being 20 channels of short period seismic, 1 long period seismic, 2 error correction channels and a time signal from the station clock.

Attached to the seismic array was a 5 channel microbarograph array with its multiple racks of valve amplifiers, discriminators, a 5 channel tape auto correlator, 12 Easterline Angus charts recorders (with red ink pens) and a Cypher products 8 channel 12 bit digitizer / ½ inch digital recording system.

That red ink got everywhere, you only had to look at it and you had red ink on you.

The data from the microbarograph sensors (FM modulated 1500Hz tone) was to be sent from the sensors to the lab via aluminium telephone wires, power for the sensors was to be sent down the telephone wires and stored in 14 volt NIFE cells at the same time as the signals were being sent back.

The 3 Long period vaults, at the bottom about 15 feet below the surface there was a round concrete 'room' about 8 feet in diameter with a 3 foot steel (clam shell) tank in the middle in which the LP instrument was installed. Access to the room was via a vertical ladder on the wall of a 3 door 'conning tower'. The top of the conning tower had a tin lid and there was enough room to put a control box for remote levelling and tuning of the LP instrument. No 'confined space' policy back then.. There was only 1 LP instrument installed in the vault at Tennant Creek. The other 2 vaults were instrument free in 1974 and remained that way during my stay.

Short period instruments were Wilmore Mk11s, installed in



steel pipes that went vertically into the bed rock, a distance between 5 and 30 feet below the surface.

Once I arrived at the 'Station' we began to install the aluminium wire on telegraph poles under the guidance of the local PMG linesman 'Arthur Winger'. He taught me how to put poles up on my own, how to climb poles, how to get the lines all the same tension and to tie the lines up the right way. He later said, I would of made a good PMG linesman, but I worked too hard....

I learnt to overhaul Wilmore seismometers from the UK tech Peter Robinson, wrangle king brown snakes out of pits, service generators, pull and re-bucket bores, drive the Fergie tractor, got a truck licence, and generally was very busy learning the 'trade'.

In the lab, on the 'seismic side' there were many racks of electronics, a 100 amp 24Volt battery charger, a 1000watt GE inverter (a very scary piece of kit to work on it was), 1 rack of filters and amplifiers, 2 EMI TD4 1" magnetic tape drives, an 8 channel hot wire recorder, a rack with the station clock, Eddystone HF radio receiver and oscilloscope and a rack that contained 3 hot wire 'helicorders', wired up so that operations could be maintained over a weekend without personnel visiting the site. The 14 inch reels of analogue mag tape lasted about 3 ½ days, so if staff were careful to change the tape at the right time, that too would run across the weekend with the station unattended.

There was space in a rack for 'The Event Detector' which was at the ANU being rebuilt, it turned up about a year after I arrived.

The seismic transmitter power came from Leclanche Air Cells which produce about 400mA for 2 years and required topping up with distilled water. The air cell terminal voltage is 1.4 volts per cell so there were 8 or 10 cells per site. With 20 sites it required a lot of distilled water. A 2m long solar still was made to allow on site purification of Tennant Creek's (bore) water. It was always a battle to produce enough for the site. Each of these cells were about 6 inches square and about 16 inches tall, so at each transmitter site there was a large battery box to house the cells and all the other necessities that liked to live in the bush. You took your own life in your hand every time you opened these up, not knowing what little (and some times not so little) surprises that nature had in store for you.

The 'station power shed' consisted of 2 3cylinder Lister HR3 diesels with Dunlite alternators rated at 25KVA. 2 1000 gallon tanks above ground tanks supplied fuel, hopefully enough for the duration of the wet season as the station access road became impassable (so I was told) to trucks (and pretty much everything else I later found out!) once it started raining.

By about November, we had nearly 90 percent of the array back up and running and the visiting ANU and English staff returned home leaving OIC Dave and I to run the place.

One morning Dave announced that he'd had enough (10years) of being OIC at the station and I was then on my own. Nearly 20 years old, OIC of the Seismic Station, the wet about to break.

There was an aborigine who frequented the station, Micky Nothing, he'd been around for quite a few years and knew 'most things'.

He knew where the key to the lab was, could 'sort of' read a heliplot and would often be waiting with a billy tea for me to arrive.

He came one morning, it was a warm day, clear sky and announced with great pride that it was going to rain that night and that I needed to do some bush work, change batteries, clean and pressurise the seismic pits, check antennas etc as I wouldn't be able to get there tomorrow.

Being 19, I didn't really believe him but respected his wisdom, and he and I set about servicing the 20 seismic pits. I put the air compressor in the 4wd, chucked in 100 new lantern batteries, 100 gallons of distilled water, a few tubes of grease and a couple of shovels .

The plan, start on the Red arm at the furthest pit over the Goss River (R10) (definitely not accessible if it rained a few drops) and work our way back to the station, then do the Blue arm.

The process was fairly basic, open the seismic pit, clean the dust off the sealing flanges and O-ring, change the 4 lantern batteries, apply grease to the seal and O-ring, seal the pit, start compressor and pump pit up to 15psi, top up transmitter air cells, check and regrease transmitter seals, check station is on air, adjust guy wires if needed, remove nearby weeds and bushes if required and then do the same to the next one.

It was a very long day, and as we started back to Tenant Creek just on dusk, big clouds started to appear to the west on the horizon.

30 minutes later, back in town, the lightening and rain started.... It bloody well pissed down all night. We had almost 10 inches of rain, my 4wd was bogged in the car park, cars and trucks were either bogged in the main street or floating in the new sewer drain on the main road in Tenant Creek.

What was desert yesterday was now a swimming pool.. all pretty surreal.

Micky was sitting under the veranda near my donga looking pretty smug..

"Good rain last night eh boss!"

"Yeah, how'd you know it was going to rain?"

"Secret men's business, Ya owes me a beer"

"Yeah, might come and join you, not much else to do"

"They're not open yet"

See, Micky knew 'most things' ...

I kept asking Micky for several years how he knew it was going to rain that day, he just replied that it was 'secret men's business'.

I didn't get out to the station for a week, had to walk the last 5 miles as the road was too soft...

I got there and shut everything down, and went back to town....

My first wet!

*To be continued.....*