

My View Narrabri Gas Project

*Ken Crawford
21st July 2020*

To the Commissioners Independent Planning Commission

Dear all,

I am a retired Hydrogeologist with fifty years experience in field investigations in the Upper Namoi Valley of NSW. I have attached my CV in order to give credibility to my argument against giving this Project ‘development consent’.

I will make my view and the assessment of the Narrabri Gas Project as simple as I can. We understand the environmental risks to the Great Barrier Reef from new mining and coal seam gas projects very well. However, we seem to strain in the assessment process when examining the ‘hidden resource’ of the Great Artesian Basin (GAB). Why is this so? It seems to me that because the Great Barrier Reef is World heritage listed and well covered in documentaries and tourist guides most people understand its significance.

Now I want to transfer your thoughts to the GAB and its significance as the number 1 Wonder of the Hydrogeological World in Australia. The surface water and groundwater risks to aquifers is extremely high and the consequences of drilling 850 deep gas wells are largely unknown. There are many knowledge gaps. However, we do know that the Pilliga forest forms part of the sideslope recharge of the GAB.

Eric Rolls has written a best selling book entitled a ‘Million wild acres’ which covers the settlement of the land and also the ecology, the birds, the mammals and the plants of this area. The risks to the ecosystems above and below the ground are extremely high if this project goes ahead. Please consider carefully as the consequences to the environment will be irreversible if the Project goes ahead.

Number 1: The Great Artesian Basin

I quote directly from the International Association of Hydrogeologists (Australian Branch) 2020 ‘The Great Artesian Basin (GAB) of Australia is one of the largest groundwater basins in the world covering 22% of the Australian continent. The GAB is an iconic aquifer system of both national and international significance.

The hydrogeology of the Basin supports the world famous GAB Springs. There are more than 600 springs and spring groups mostly around the northern and western margins of the Basin where the water bearing aquifers and aquitards are nearer the surface. These springs range in size from small soaks to spring complexes with large pools and hundreds

of flowing vents. Some springs provide base-flows to rivers during the dry season. Natural discharge from the Basin through springs supports natural communities containing a wide variety of endemic species in isolated water dependent ecosystems surrounded by an otherwise waterless landscape’.

Photo credit: **Blanche Cup** Ken Crawford 2018



‘The isolated nature of the GAB Springs has resulted in the preservation of many endemic, rare and relict species of great ecological, evolutionary and biogeographical significance both to the nation and the world. The Lake Eyre Basin (LEB) is a surface water catchment that overlies the GAB. Many water holes, lakes and rivers within the LEB are supported by upward leakage from groundwater from the GAB aquifers. This interconnection between groundwater from the GAB and surface water in the LEB is of great environmental significance though largely unknown and unexplored’.

Photo credit: **Lake Eyre** Ken Crawford 2018



‘As well as their ecological significance, these natural springs are culturally very important. Historically the GAB springs have provided the only reliable source of fresh water for all human activity in arid parts of Australia. GAB springs were the only reliable water source for aboriginal people in central Australia for thousands of years. These vital water sources set the boundaries for dreaming lines and trade routes and remain important sites of cultural significance for local indigenous groups. The string of springs along the western boundary of the Basin in central Australia also guided European exploration and development through the central inland during the 19th and early 20th centuries; beginning with early explorers to Afghan trading routes, the telegraph and the Ghan railway’.

My view is that the threats to natural and cultural heritage are far too great for this Project to be given ‘development consent’. Concerns around water and salt accumulation in the landscape are widespread. We do not need more coal seam gas but we do need to look after our scarce natural resource of water, above and below the ground. The Project area is also part of the Lower Namoi Groundwater Zone recharge area. This fact alone should disqualify this Project considering the cumulative risk of ‘aquifer interference’.

We should appreciate what we have before we destroy our precious groundwater resource. The risk is too great! The ‘intergenerational equity’ issue has not been addressed by this Project. Ecological Sustainable Development (ESD) has not been given the attention it deserves and so the ‘Precautionary Principle’ must apply to reject ‘development consent’.

Yours Sincerely

Ken Crawford

M Sustainable Agriculture (Sydney Uni)
BA Earth Science (Macquarie Uni)
Hawkesbury Diploma in Agriculture (Hons)



Ken Crawford, KLC Environmental CV 2020

Academic Qualifications

Ken is a retired Hydrogeologist. He has a Hawkesbury Diploma in Agriculture (with Honours), and a Bachelor Degree in Earth Science from Macquarie University majoring in Geological Problems and Australian and World Stratigraphy. He was invited to enrol in a Masters degree by Macquarie University in 1976 but postponed due to family and work commitments. It was about the time plate tectonics was being investigated seriously. Ken was and still is fascinated by the topic.

In 2005 he was accepted for enrolment into the post graduate course Doctor of Sustainable Agriculture, Sydney University. In 2009 he completed a Master of Sustainable Agriculture from Sydney University. Although uncompleted his doctoral topic remains a passion 'Aquifer Recharge Blueprint for groundwater zones; a case study from the Upper Namoi Valley'.

Expertise

1. Floodplain management and soil erosion control

Ken spent 11 years working for the Soil Conservation Service of NSW commencing with a cadetship at Hawkesbury College. He worked on the famous Liverpool Plains. Ken Crawford and Ray Clarke are credited with introducing Strip Cropping into New South Wales (The Dirt Doctors: A Jubilee History of the Soil Conservation Service of NSW 1988). On country of less than 2% landslope Ken recommended strip cropping for erosion control and restricted height earth structures to avoid illegal diversions of surface flow.

Ken wrote the Geology and Topography sections of the Gunnedah District Technical Manual in 1975 as well as his Strip Cropping Report after his secondment to the Queensland DPI. This is a reference text for Queensland DPI and NSW Soil Conservation Service. The widespread adoption by farmers on the Liverpool Plains led to soil erosion prevention without using earth structures on land below 2% landslope. His contribution is well recognised.



2. Hydrogeological Investigations and environmental consultancy

Because of the uncertainty in transient numerical modelling in this area Ken turned his company, KLC Environmental Pty Ltd, to focus on hydrogeological investigations and environmental consultancy in the Upper Namoi Valley. In an attempt to improve our knowledge of aquifer systems, Ken Crawford and his team in the North West of NSW have developed the concept of aquifer recharge blueprint for groundwater zones. Field investigations must be approached in a systematic way by looking at key areas which are constrictions in the underground landscape where the alluvial aquifers of unconsolidated sediment are confined. These provide discharge points for measuring and monitoring groundwater. Gins Leap Gap is a key area. This is a Best Management Practice (BMP) system of assessment and sets a standard for discharge/recharge hydrogeological investigations. It also provides a way of connecting valleys by way of physical surveys all the way to the mouth of the Murray Darling Basin at Goolwa.

3. Surface water/groundwater connectivity mapping

The wider catchment provides the recharge and a water balance can be used to estimate sustainable yield. The process is rainfall driven including major flooding as a recharge source and is invaluable data in formulating Water Sharing Plans. We will have more certainty and confidence in transient numerical modelling in the future after more physical methods are used in investigations. At present there are too many knowledge gaps in the physical data. Therefore we cannot rely on modelling at present to predict future flooding with any certainty.

4. Science writing and project presentations

In 2015 Gins Leap Gap was awarded the Seventh Wonder of the Hydrogeological World (Australia) and published in Geoscience Australia, May 2015. Ken Crawford is the Author and was the first to recognise this area, in the underground landscape as a probable glacier terminal, with further damming of the valley by a lava flow from Mount Kaputar volcano. As the glacier retreated ancient 'Lake Namoi' formed.

Then as the glacier further retreated melt-water and the sediment load it contained filled the lake to the landform we see today. A low-slope plain of Black Earth soils containing precious groundwater underneath. Bedrock is up to 160 m in places. The small cross-section Namoi River meandering across a 'confined valley' is what we observe today. This area is one of the most productive cropping valleys in the world and could be compared with the Central Valley of California. It is also part of the story as to why flooding occurs relatively often and the whole of the floodplain is required to handle the discharge as nature intended. This is the Upper Namoi Valley. The Lower Namoi Valley is quite different.



Ken was also given the work of writing and presenting the original Draft Terms of Reference for the \$4.5m Namoi Valley Catchment Water Study by the government of the day. This he did in 2008 in Tamworth. The water study itself is still incomplete and is prejudiced towards transient numerical modelling instead of using a combination of methods as Ken recommended. Extension projects should not be given 'development consent' until this work is finished.

Ken was involved with workshop presentations for Cotton CRC and Namoi CMA. Ken presented the results of the recent Namoi CMA Gins Leap Gap \$440k Project. He worked with six companies to deliver the project objectives on time and within budget. The two volume report is archived on the Local Land Service (LLS) website.

Ken presented the findings to the Project Discovery Workshop at the Gunnedah Resource Centre. The workshop was organised by NSW DPI in conjunction with the National Centre for Groundwater Research and Training. Kens power point presentation is available on the NSW DPI Website.

Ken made a significant contribution to the Namoi CMA Catchment Action Plan 2010-2020. This document is archived on the LLS Website. Surface water and groundwater is his area of expertise. The issues are complex however our understanding is improving as we see the connectivity of natural resources and our ability to interfere with them, in an adverse way, if we are not careful.

Ken is particularly interested in illegal diversions under the Water Act 1912 and the principles of floodplain management in the Water Management Act 2000. Ken has a new approach to investigating surface/groundwater connectivity mapping. He presented his findings to the IAH NSW Symposium in Sydney in 2011-The challenge of uncertainty. Ken's special interest is 'aquifer interference'. He cares about protecting soil and groundwater.

5. Farm planning and joint schemes for landholders

While with the Soil Conservation Service of NSW Ken was involved with planning group schemes and individual farm plans. Ken did the farm plan for Sylvania Pastoral Company which went on to win the prestigious Brownhill Cup. 'Sylvania' was an amalgamation of five properties under the excellent management of the White family. Many of the banks and dams were constructed with SCS plant operators. Ken was the Supervisor.



Ken was selected to investigate strip cropping techniques on the Darling Downs in Queensland. He was seconded to Queensland DPI for a five week period and then filed his report in 1975. This technique of water spreading using crops and not earthworks proved very popular on black soil country below 2% landslope. Earthworks were creating legal problems on this country and strip cropping was the solution and cooperation between farmers was the key. His report was published by SCS of NSW and Queensland DPI. Later revised by John Marshall of Queensland DPI with Kens reference acknowledged.

6. Irrigation survey, design and layout

Ken and his wife Sue purchased the property 'Gowrie' in the northern area of the Liverpool Plains. This has been their home and business for 43 years. When cotton came to our valley Ken conducted a surveying business to service the industry. He was very successful and gained much experience with the lie of the land. He drew up farm plans for laser scraped fields of constant grade and plane of best fit based on cut and fill excavation ratios.

Ken surveyed and laid out many properties in the area between Emerald Hill and Boggabri. This is the specific area that will be impacted by the spur railway line of the Vickery Extension Project. He was working under the Water Act 1912 as he did in his Soil Conservation days. Ken knows and understands this area very well. Ken also did the initial field testing of CSIRO land levelling computer program.

Gowrie Ag Training Australia obtained Registered Training Organisation (RTO) status and conducted courses for the Pork CRC and other business courses including Environmental Principles for Piggeries and Environmental Systems Management for Piggeries. 'Gowrie' also hosted international Hydrogeological students of the University of NSW as they conducted field investigations in the Namoi Valley under the supervision of Professor Ian Acworth. These were very enjoyable days and Ken has much in common with these students who now have their Doctorates.

'Gowrie' has an area of designated natural vegetation as an 'ecosystem observation site'. This is part of the Terrestrial Ecosystem Research Network (TERN). This is a national AusPlot network used as reference and baseline studies in ecological research. Australian universities have access to these sites for measuring and monitoring the environment.

Ken was a Director of KLC Environmental Pty Ltd for seven years. He was the Principal Consultant. His strength is in collaboration and cooperation with other researches and consultants. He worked together with six companies to deliver the \$440k Gins Leap Gap Project for Namoi CMA. The two volume report is archived on the LLS website.

Ken was the Project Manager and Principal Investigator. Understanding the Gap and underground landscape back to Gunnedah is pivotal in understanding why the location of the spur railway line, in the Vickery Extension Project, is untenable. The Narrabri Gas Project also has serious shortcomings, in terms of surface and groundwater ecological risks.



In 2013 Ken was nominated for the Eureka Prize for Sustainable Agriculture. His research, both theoretical and applied, in the use of dietary natural zeolite is widely recognised in the Australian Pork Industry. His Masters dissertation is entitled 'Recycling waste nutrients in piggery effluent using dietary natural zeolites'.

Ken Crawford received the 2006 MacLean/Iedema Award for services to the Australian irrigation industry. Ken accepted this award at the Brisbane Town Hall as part of the Irrigation Australia Conference. The award is made biennially. It is the highest and most prestigious national award offered by IAL other than life membership. Ken's award was for groundbreaking research in aquifer recharge in the case study area from Gunnedah to Gins Leap Gap. He has a lifetime of knowledge and experience in the Upper Namoi Valley of New South Wales. He has travelled widely and has a good holistic, integrated and multidisciplinary understanding of the Great Artesian Basin of Australia and the Murray Darling Basin.

Publications

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Crawford, K., Ross, J. and Timms, W. (2004) *Implications of Aquifer Recharge for water sharing plans: a case study from the Upper Namoi Valley* Irrigation Australia Vol 19 no 2 pages 21-27

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Notes: