Crawford written submission against the Vickery Extension Project To the Independent Planning Commission

Reference; Crawford submission to the Department of Planning and Environment 284611

Ken Crawford
Retired Hydrogeologist
Former Principal Consultant
KLC Environmental Pty Ltd
25th January 2019

Dear Professor Mary O'Kane
Chair, Independent Planning Commission

I would like an appointment to meet with you in Sydney, at your convenience. I am herein making a personal appeal to ask you to consider my hydrological arguments in speaking out against the Vickery Extension Project. I wish to impress upon you the extremely high environmental risk to land and water with the proposed spur railway location.

My farm [redacted] Boggabri is in the 'zone of affectation' of the Vickery Extension Project and I declare my interest. However, I also wish to declare that I am not being paid consultancy fees by farmers or farming organisations. Equally, I am not being paid by mining companies in respect to this project.

I declare that I have no political affiliations and have made no donations to political parties. Indeed I do not vote. I wrote and delivered the original Draft Terms of Reference for the $4.5m Namoi Catchment Water Study in 2008 at Tamworth in NSW. For this work I was paid as an independent consultant by the NSW Government.

I am prejudiced towards protecting the land and water of the world famous Liverpool Plains and the upper Namoi Valley. I really care!

This is the second time I am presenting my arguments. This location of the spur rail was ruled out in 1984. The case against this location is much stronger now that we have so much more data in this case study area. I am asking that it be permanently removed from raising its ugly head again.

My contribution is as a retired Hydrologist hence all my work is in a voluntary capacity. This is my contribution to the Liverpool Plains and its communities. These are my opinions and mine alone, based on fifty years work experience in my area of expertise in this area of the Liverpool Plains.

My CV is provided to give credibility as to my academic qualifications and practical expertise in hydrogeological investigations and project management in this valley. I am doing this for our children and their children. These plains will be farmed for at least another one thousand years if we look after them. We all must play our part. The Liverpool Plains is in your hands. Please listen.

I am speaking for the land; the famous Liverpool Plains featured in the National Australian Museum in Canberra. I am not against mining and have always sought an accord between mining and agriculture; however there are areas of Biophysical Strategic Agriculture Land (BSAL) where mining and mining infrastructure should be excluded. This is one of them.

Furthermore, the location of the spur railway viaduct bridge crosses the deepest unconsolidated sediments of the alluvial aquifer. It divides Zone 4 West of the Upper Namoi Groundwater Zones. Black Earth soils cover deep sediments of gravel and sand of the Gunnedah Formation. This area is arguably the best zone for aquifer recharge in the Upper Namoi valley. It is highly productive, prime agricultural land.

My work has been acknowledged by Irrigation Australia in awarding me the 2006 MacLean/ Iedema Award. This is the highest national award other than life membership. My contribution was in groundwater research in the Upper Namoi Valley. This work is also acknowledged in Australia's Water Resources (Pigram 2005).

The underground constriction at Gins Leap Gap creates an underground dam and associated lake of precious groundwater in unconsolidated alluvial sediments. The underground lake extends back to Gunnedah.

The proposed railway crosses the 'confined floodplain' where many of the highest producing irrigation bores of the Upper Namoi valley exist. The heavy industry viaduct bridge will be 'walking on water'.

Highly valuable pure white cotton crops are produced here in rotation with other crops of wheat, barley, chickpeas, fababeans, sunflowers and sorghum to name but a few. These export crops are at risk of being contaminated with fine black coal dust. I suggest the area of affectation will be at least seven kilometers from the project and spur railway. These are plains of plenty and must be protected.

The Gins Leap Gap and the underground dam is the Seventh Wonder of the Hydrogeological World in Australia. A national competition conducted by the International Association of Hydrogeologists (Australia) to discover the seven wonders of the 'hidden resource was conducted in 2010. I submitted Gins Leap Gap and the underground dam. There were seven outstanding wonders. Gins Leap Gap is number seven and published in Geoscience Australia, front page Newsletter 120 May 2015.

This area is now recognised as an area of national and international significance and further makes it an exclusion zone for mining and mining infrastructure. Whitehaven Coal must use the northern option and use the existing alternative access at Gins Leap Gap.

The poor location of the spur railway viaduct bridge has a high risk of causing 'aquifer interference'. Under the Water Management Act (WMA 2000) 'aquifer interference' is defined and does not only relate 'to water take' but to interference with storage capacity of aquifers. Mining is not always as aware as it should be that heavy industry infrastructure can cause aquifer compaction and land subsidence in poor locations.

Pile driving piers and continual vibration of laden coal trains can cause a 'preferred orientation' of the sediments thus reducing storage capacity. Aquifers may not recharge again to the same extent. Liquefaction in unconsolidated sediments during earthquakes is a similar process. Here unconsolidated sediments saturated with water and shaking can turn them into slurry that cannot support buildings including railway structures. Compaction of aquifers and subsidence of land is the result.

Porosity and transmissivity is reduced causing 'aquifer interference'. Further engineering investigations should be undertaken before development consent is given to this location.

The key to understanding how aquifer compaction works lies in the particle size analysis. Irregular particle size and irregular particle shape in saturated unconsolidated sediments is the problem. Precious groundwater in naturally occurring aquifer pore-space of approximately 60 % can have reduced storage capacity through compaction. The particles realign themselves under load. If the particles were perfectly spherical and self supporting this may not occur to the same extent but they are not.

I have the results of bore drilling samples submitted to the Scone Research Centre for analysis. These samples show significant particle size irregularity and irregular particle shape at the Gins Leap Gap. Gowrie bore drilling samples from Bore number 1 down to 70 meters have similar particle size and shape irregularities. Compaction and subsidence is a real risk in deep unconsolidated saturated sediments if heavy infrastructure is constructed on them. Porosity and transmissivity will be reduced over time and the deeper the sediments the higher the risk.

This is why the viaduct railway bridge at the Gap is the best place to cross. It crosses at a bedrock-high and is only 1km across. It exists solely for the mining industry. Whitehaven Coal does not need another one at the expense of the Liverpool Plains community. The communities of Gulligal and Emerald Hill need special consideration here as the railway will affect those most.

In this location the major infrastructure will have a high risk of illegal diversion of water under the Water Act 1912 and the principles in the Water Management Act 2000. Surface water interference with flow direction, depth and velocity is highly likely. The location is wrong.

Deadmans Gully is a sinuous ephemeral stream with an ill-defined catchment. It is the western distributor system of the floodway and must not be interfered with under any circumstances. Likewise, the ecology of the Namoi River and Gulligal Lagoon is at high environmental risk. The railway is far too close to the river and lagoon. This is ecology 101.

I am asking for a push-back to the Vickery Coal Project approval 2014 for the sake of soil erosion prevention, aquifer recharge, ecology and the well-being of the communities of the Liverpool Plains. These things are all connected.

The Vickery Coal Project has development consent. The Vickery Extension Project has not and should not be given development consent. It is really a new project and should be considered completely separately to the Vickery Coal Mine. The spur rail proposal will have a much higher environmental impact than the Vickery Coal Mine itself.

Please refer to my submission to the Department of Planning and Environment. I would like to mention that everyone I have dealt with over many meetings have been very helpful. I was eleven years with the Soil Conservation Service of NSW and seconded for a short period to the Queensland DPI, so I have some empathy with them, as I do with you. These are complex issues and we need time to work together with people who have expertise in these matters.

The issues are very similar to the ones I faced as the local soil conservation expert in 1975. On these low-slope black soil plains the special land and water problems have not changed. Decisions have to be made and policies have to be formulated. Major infrastructure on floodplains has serious land and water implications. My work on the northern plains is featured in the Jubilee history of the Soil Conservation Service of NSW. The principles of floodplain management have not changed.

Deadmans Gully is a natural feature of the geomorphology of this area and when Namoi floodwaters combine with Collygra Creek flooding, the floodway requires the whole floodplain for dealing with discharge. This is the safety valve in this 'confined valley' natural system. We do not need any more floodplain development in this location. It is already a 'Hotspot'.

In days to come, extreme weather events will be prevalent. Already we have witnessed the Toowoomba, Murphy's Creek and, Grantham flooding in the Lockyer Valley. Twenty two lives were lost and the flood modelling thrown out the window. These extreme flood events including Brisbane occurred in 2010- 2011. Forget a 1 in 100 year return period: the best estimates for these floods are a 1 in 1000 years return period.

I am referring to these recent floods, not to alarm but to create an awareness of the high risk of man-made infrastructure interfering and compounding flood affects. Short-term thinking in floodplain planning will affect floodplain communities and place them at a higher risk unnecessarily.

Remember Dungog and the manner in which the sideslope catchment run-off was underestimated, or completely overlooked in the models, and three lives were lost. A parallel scenario is possible with Collygra Creek and Rangari Creek in the case study area. This issue has not been addressed in the Project EIS. The railway location is a 'shocker'.

I appeal to the Independent Planning Commission to refuse development consent to this project, under any circumstances. Please do not give development consent with conditions as this would still amount to a tick of approval and would be unfair to the Liverpool Plains communities.

This is the Critical Control Point (CCP) in the assessment process. If given development consent, the point will be reached beyond which no further argument will avoid this perilous location of the proposed spur railway.

I trust your assessment and appeal to you to apply the 'precautionary principle' based on the hydrogeology and geomorphology presented in my submission. These are recent investigations in the Upper Namoi Valley and the Liverpool Plains in the case study area.

I urge you see through the over-emphasis on transient numerical models in the Vickery Extension Project EIS. Numerical models have their place however, must rely on physical data for calibration and verification. There are still too many knowledge gaps in our valley. We are not there yet.

Furthermore, numerical modeling cannot be used to justify location. You must decide whether or not this is a good location for the railway line! Speaking for the land; I say it is an extremely poor location and should not be given development consent under any circumstances.

I know you are well qualified to make that decision. I understand that after this hearing the right to appeal to the Land and Environment court is extinguished. I cannot understand why the process is so rushed when so much is at stake. It all depends on you right now. The Liverpool Plains

community is depending on you. We do not inherit the land from our parents; we borrow it from our children.

The easy accord we all sort between mining and agriculture may not eventuate. Our best endeavors may have been for naught. However, history is written by those with a pen and by those who love the land! I look forward to meeting with you and discussing these matters in person.

Yours Sincerely,
Ken Crawford [redacted]

MSustainable.Ag (Sydney University)
BA (Earth Science) Macquarie University.
Hawkesbury Diploma in Agriculture (Hons)

Notes:

Mobile [redacted]

Email [redacted]

Thank-you for listening.

Ken Crawford, KLC Environmental CV 2019

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.

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 is untenable.

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 specific area of the Vickery Extension Project.

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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Crawford, K. (2011) *A New Approach to Surface/Groundwater Connectivity Mapping* NSW IAH Symposium 2011 Hydrogeology in NSW-the challenge of uncertainty, Sydney, NSW, Australia, 5-6 September 2011.

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Geoscience Australia (2015) Seven Wonders of the Hydrogeological World (Australia) Gins Leap Gap. Newsletter 120 May 2015 Ken Crawford

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KLC Environmental (2010). Gins Leap Gap Project (Hydrogeological Investigation)Volumes 1 and 2 Namoi Catchment Management Authority

Notes:

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Thank you for listening


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