From: Anthony Knapton
To: fracking inquiry
Subject: Comments regarding the interim Fracking Inquiry report
Date: Friday, 18 August 2017 9:50:11 PM
Attachments: Fracking_inquiry_response.docx
ATT00001.htm

Dear Members of the Hydraulic Fracturing Taskforce,

Please find attached comments regarding the Interim Report.

The report provides a good coverage of the areas of most concern.

I understand that it is not the role of the inquiry to undertake detailed hydrological and hydrogeological assessments, however, I feel that the areas around the Roper River near Mataranka and the Flora River should be discussed given that:

1) the report as it stands gives the impression that they are too far away from the areas of exploration and possible development; and
2) the areas are considerably different to the Beetaloo Basin case study area; and
3) the areas are critical to the rivers that the aquifers discharge into.

Kind regards
Anthony Knapton

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Introduction

Although the Beetaloo Basin case study provides valuable insights into the possible impacts that could occur, it is felt by this author that there is insufficient characterisation of areas surrounding the headwaters of the Roper River which are currently under EP153, EP154 & EP167.

As identified by the panel, there are only two major perennial river systems in the Northern Territory, the Daly and the Roper, and flow in these are maintained during the dry season by discharging groundwater systems.

It is hoped that the brief notes presented below describing some of the salient aspects of the hydrology and hydrogeology of the Roper River (the Flora River should also be considered) highlight the considerably different environment closer to the discharge areas of the aquifers described in the Beetaloo Basin case study. The different environment means that the areas closer to the discharge areas are more susceptible to impacts related to excessive groundwater use and surface / subsurface sources of contamination.

Hydrology of the Roper River

The hydrology / flow regime of the Roper River is documented in several studies (Faulks, 2001; Jolly, et al., 2004; Tickell, 2005; Karp, 2008; Wagenaar & Tickell, 2013; Knapton, 2009a; Knapton, 2009b).

A common outcome from the studies is that the hydrology of the Roper River is vastly different to the Daly River. In contrast to the Daly River, which is a gaining system along almost its entire length, the Roper River is a losing river along almost its entire length. Karp (2008) concluded that the analyses of data collected during a comprehensive survey in October 1980 show only small changes in water quality in the non-tidal sections of the Roper River extending some 200 kilometres from the junction of Roper Creek and Waterhouse River to Roper Bar (Figure 4-12). The chemistry data and the flow measurements presented in Figure 4-11 (Karp, 2008) indicate that during the dry season, the limestone aquifers in the Mataranka basin provide the dominant supply of water flow in the Roper River. Thus, the management of the groundwater resources in the Mataranka Basin is crucial to the viability of the downstream reaches of the Roper River.

The end-of-dry season evaporative losses are about 1 m^3/s along the length of the Roper River (Knapton, 2009b section 2.4) and can account for 100% of its flows this is in contrast to the Daly River where these losses account for only 5-10% of end-of-dry season flows. Therefore, depending on the climatic regime and the pumping regime, ceases to flow at Red Rock could become more common. Knapton (2009a) section 7.3 and 7.4 shows how flows at Red Rock can be impacted by allocations of around 30GL/yr, with cease to flow at Red Rock increasing in occurrence from about 5% to just over 20%.

Jolly et al (2004) provides various outcomes for surface water flows in the Roper River at the upstream and downstream ends of the river depending on how the 80:20 rule is applied. The reason the report is important is that it identifies that if the recharge to the groundwater system and the reduction in flows along the discharge zones near Mataranka are the only metric used for management (as indicated in the Inquiry report), then the impacts on the end of dry season flows at the downstream end of the Roper River could be considerable (Jolly, et al., 2004).

Apart from the impacts that reduced flows could have on the users and GDEs along the non-tidal sections of the Roper River, a relatively uncertain aspect of reducing the dry season flows on the Ngkurr water supply. The Ngkurr water supply is obtained from the large fresh water lens in the tidally influenced section of the Roper River, it is unclear the extent to which reductions in the dry season flows could impact on the viability of the Ngkurr water supply.

Hydrogeology

The hydrogeology of the Roper River is discussed in detail in various studies by Jolly (2002), Tickell (2005), Karp (2008), Knapton (2009c) and more recently Bruwer and Tickell (2015).

Figure 7.3 (Bruwer & Tickell, 2015) alludes to the different hydrogeological environments across the area considered by the inquiry. In the area around Mataranka (i.e. 20-40 km) the hydrogeology is considerably different to the Beetaloo Basin. The Beetaloo Basin has a specific hydrogeological environment with deep water table, thick unsaturated zone, intervening clayey strata and lower rainfall and therefore recharge.

The geology of the areas around Mataranka is dominated by weathered Tindall Limestone with a thin cover of Cretaceous sandstone, the water table is shallower, there is a thinner unsaturated zone and reduced or no clayey strata in the unsaturated zone. There is also evidence for preferential pathways as with karstic formations evident (Karp, 2008) this is similar to the geological environment around Katherine. There are also doline features (sinkholes) observed in the Sturt Plateau, which may provide preferential flow paths from the surface to the groundwater.

The thinner and more permeable unsaturated layer and the possibility of preferential pathways is likely to lead to contamination infiltrating to the groundwater table.

The estimated travel times from the Beetaloo Basin are of the order of 100s to 1000s of years, however, there is evidence, such as the inter annual variation in groundwater discharge, groundwater levels and the groundwater chemistry that indicates that the majority of the recharge is local and is related to the geology (as detailed above) and the climate. The distribution of recharge used in the 2009 groundwater / surface water model of the Roper River presented in Figure 18 (Knapton, 2009c) indicate that there could be up to 50km around the headwaters of the Roper River. This is the area where surface contamination may be more likely to infiltrate to the water table.

The karstic nature of aquifers also needs to be acknowledged (that is very high permeability and low storage coefficient) as the implications of such an environment on the transport of contamination could be considerable. For example a Tinopal study conducted in the Katherine area (Karp, 2005) indicated that in karstic terrains contaminant transport can have very rapid with travel times between the source and the receptors (bores and springs) and that it can be dispersed over a wide area (6km in 14 days). The karstic nature of shallow aquifers needs to be considered when assessing risks of contamination to surface water discharge sites such as the Roper River and Flora River. Any buffer or 'no-go' zones need to be determined with this in mind.

Contamination from loss of well integrity or from surface spills are likely to move from the source to the receptor with some dilution, but the rapid travel times are unlikely to result in any level of degradation.

Determination of unsaturated zone geology and the proximity of surface / subsurface contamination source to surface water discharges needs to be considered. The risk assessment in the Beetaloo Basin is distal to surface water discharge sites and has thick low permeability unsaturated zones separating surface spills from the groundwater table.

Concluding remarks

The panel identified that in most cases that more information is required before the risks and any possible mitigation options can be fully assessed.

This assessment is true of the groundwater system discharging into the Roper River. Although there is a reasonable amount of baseline data regarding the hydrogeology and hydrology of the Roper River, the information has not yet been synthesised in a manner to address the issues identified regarding petroleum exploration. Bioregional assessments using the available baseline data and specific studies are required particularly around the northern Wiso and Georgina Basins with emphasis on the Flora and Roper Rivers.

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