



Chief Executive
Goyder Centre
25 Chung Wah Terrace, Palmerston
Postal address PO Box 496
PALMERSTON NT 0831
Tel 08 8999 3662
Fax 08 8932 3849
Email rod.applegate@nt.gov.au

The Commissioner
Hydraulic Fracturing Inquiry
c/- GPO Box 4396
Darwin NT 0801

Dear Dr Hawke

RE: Department of Land Resource Management (NT) - Submission to the Hydraulic Fracturing Inquiry

The Department of Land Resource Management (DLRM) welcomes the opportunity to provide this submission to the Hydraulic Fracturing Inquiry to clarify issues in relation to hydraulic fracturing in on-shore wells in the Northern Territory, which is limited to conventional shale and tight sand gas. Hydraulic fracturing is an extraction process used to stimulate the flow of oil and gas. The focus of DLRM covers the full range of related activities covering precompetitive geoscience, exploration, production and abandonment and rehabilitation of wells and production sites.

DLRM is responsible for relevant legislation and the provision of advice and support for sustainable development of the Northern Territory's land and water resources, and conservation of its unique native flora and fauna. This role is guided by the Northern Territory Government's *Framing the Future* strategic plan, in particular the focus on a "Balanced Environment" and "Prosperous Economy" within the strategic plan.

The current legislative framework for the protection and use of water resources is administered through a range of legislation across several agencies. The Northern Territory Government's rights to the use, flow and control of water resources are exercised through the *Water Act*, *Waste Management & Pollution Control Act*, *Marine Pollution Act*, *Public Health Act*, *Mining Act*, *Mining Management Act* and the *Petroleum Act*; administered by four separate agencies.

The primary tool for managing and protecting the Northern Territory's water resources is the *Water Act*. The *Water Act* provides for the investigation, allocation, use, control, protection, management and administration of water resources on all land throughout the Northern Territory (including Commonwealth land). This includes regulatory functions such as the issuing of permits and licences and the development and implementation of water plans. Specified provisions of the *Water Act* do not apply to mining and petroleum activities which are administered under the *Mining Management Act* and *Petroleum Act*, by the Department of Mines and Energy (DME).

DLRM and DME work closely together to ensure administrative arrangements spanning the *Water Act*, *Mining Management Act* and *Petroleum Act* and associated regulations, policies and guidelines are efficient and effective in meeting objectives of the respective legislation. These administrative arrangements are subject to review

from time to time, as circumstances such as the level of activity, technology and industry practices change. Indeed, there is a strong alignment between the two agencies in the knowledge of geology, hydrogeology, water chemistry, water quality and environmental protection. New opportunities are being explored to enhance the value of information available to assist in the knowledge of groundwater resources and undertaking water planning to account for water used from the consumptive pool for mining and petroleum activities.

There are four primary areas of focus for DLRM in regard to hydraulic fracturing.

1. Environmental regulatory process

A key concern is that DME's operational regulatory process considers all relevant environmental issues including the hydrogeology of fresh water aquifers, the planned water demand for hydraulic fracturing and the source of that water.

The DME Schedule of Onshore Petroleum Exploration Requirements (2012) and Operational Guidelines require that Environment Management Plans (EMPs) are submitted for each activity associated with onshore petroleum well exploration and development, including hydraulic fracturing. The EMPs are submitted to the Northern Territory Environment Protection Authority (NTEPA) which in turn seeks comment from relevant agencies including DLRM. DLRM undertakes an assessment and provides comment on all aspects of the agency's responsibility including weed management, land clearing, soil conservation, native flora and fauna and water resources.

EMPs should include a hydrogeological investigation of known and potential aquifers in the target area in order to inform design of the field operations and the monitoring programme for the time periods before, during and after hydraulic fracturing activities.

The NTEPA also administers the environmental assessment process under the Northern Territory *Environmental Assessment Act* and its subordinate *Environmental Assessment Administrative Procedures*. In considering the scale and complexity of a proposed development, and the significance of potential impacts, the NTEPA will determine if assessment is required in the form of an Environmental Impact Statement. DLRM provides advice to the NTEPA for such assessments.

2. Water resources assessment

The key concern in relation to water resource assessment, planning and allocation is the competition for fresh water and the sustainable extraction of water from the consumptive pool for hydraulic fracturing. The approval process should ensure that, where practical, water for hydraulic fracturing is obtained from sources that are not suitable for the supply of freshwater for other purposes, in addition to measures to maximise the water efficiency of operations.

The Northern Territory has committed to implementing the Intergovernmental Agreement for 2004 National Water Initiative (NWI) through a framework that is best suited to our water resource context and our stage of development. To enable effective planning for water resource development and environmental protection, the Controller of Water Resources has a duty under the *Water Act* to undertake a continuous programme for the assessment of water resources including the

investigation, collection, collation and analysis of data concerning the occurrence, volume, flow, characteristics, quality, flood potential and use of water resources.

DLRM is seeking to continually improve the knowledge of the Northern Territory's water resources. EMPs for oil and gas investigation wells detail the expected water usage and the water source. The EMPs also consider the management of water from flowback water during the hydraulic fracturing stimulation and produced water during the operational life of the well. The water demand is included in water allocations within sustainable yield limits in water allocation plans, where appropriate. The information is also available for collaboration between DLRM and DME when making water extraction authorisation decisions outside water planning areas.

DLRM and DME are considering opportunities to obtain additional baseline water resource data, including water quality, in highly prospective basins for oil and gas and will determine how this data may be best recorded and managed for future access.

The primary beneficial uses for groundwater extractions are for potable water supplies, stock and domestic bores, industrial purposes (including mining & petroleum activities) and agricultural use. The groundwater resources which best meet these needs are referred to as fresh water with a salinity of less than 1,000 parts per million as Total Dissolved Solids, which are generally less than 500 metres deep.

The volume of water required for hydraulic fracturing varies significantly depending on the design of the well (vertical or horizontal) and the number of stages. Estimates of water demand are in the order 2 to 2.5 mega litres per stage, with a vertical exploration well comprising 1 or 2 stages and longer horizontal development wells comprising 10 stages. It is expected that the source of water will be predominantly from groundwater aquifers, given the location of operations and preference for operations to be conducted in the dry season.

Where possible, water used for hydraulic fracturing stimulation should be sourced from saline (considered 1,000 parts per million as Total Dissolved Solids) groundwater systems to avoid competition with demand for potable (domestic) and agriculture use, and the water used efficiently through the adoption of good industry practices for recovery and reuse of flowback water.

3. Well integrity and risk of contamination of aquifers

The key concerns for the protection of aquifer systems are ensuring that:-

- Exploration and well drilling activities clearly identify the presence of aquifers;
- Well construction techniques protect the integrity of the aquifer;
- Hydraulic fracturing stimulation does not result in damage to the aquifer;
- Well abandonment and rehabilitation works provide long term protection; and
- Post activity monitoring considers the hydrogeology of an aquifer system and is designed to identify any changes which may become evident over time.

In order to address these concerns, it is important that a hydrogeological investigation is undertaken at the planning stage in developing the EMPs and all phases on well construction and verification are in line with industry best practice.

DME is responsible for the EMPs which include a monitoring programme. DLRM requires that the monitoring programme is comprehensive covering obligations before exploration drilling to obtain base line data and relevant water quality and aquifer data

during hydraulic fracturing operations, in production and after abandonment on the well. The hydrogeological investigation should be used as the basis for the design of the monitoring programme. The monitoring programme must consider the identification of the likely down-gradient areas within an aquifer and cover a sufficient time period, such that if a contamination was to occur, any contaminant plume would be intercepted by a sampling regime.

In order to address concerns of the well integrity where it passes through an aquifer, DLRM requires surety that wells are designed and constructed to world best practice and that consideration of the protection of aquifers is paramount in the regulatory approval and verification processes. The integrity of the well must be guaranteed for the long term. DME is responsible for the regulation of well design, minimum standards and the verification requirements of the well construction, including where the well passes through an aquifer. These verification requirements include mandatory pressure testing and data logging of the integrity of the physical construction to ensure that protection of an aquifer is achieved. It is noted that these requirements for verification of petroleum wells significantly exceed those required for water production bores.

Water quality baseline data is obtained via conductivity probes (electric wireline logging) during construction of exploration wells. DME requires an operator undertaking hydraulic fracturing to establish a water quality monitoring programme which requires surrounding water bores to be monitored before, during and after the fracture stimulation activity. DLRM advises DME on the most suitable programmes for water quality monitoring. This advice reflects the responsibility held by DLRM under the *Water Act* to regulate off-site water quality impacts.

DME is responsible for regulation of additives (noting that only water-based drilling and fracture fluids are allowed) to improve fracture stimulation and ensuring the additives do not present a risk to high quality water resources including monitoring of any prohibited additives.

DME and DLRM will continue to work closely together to ensure that best practice approaches are applied to all aspects of regulation and monitoring to ensure groundwater assets are protected.

4. Flowback water and produced water

A significant environmental challenge in accessing shale and tight sand gas is the relatively poor quality flowback water from hydraulic fracturing stimulation and produced water. The produced water from the target formations is typically of poor quality (the water quality is often of high salinity incorporating naturally occurring radioactive materials, dispersed oil and soluble organic compounds) and requires special considerations for reinjection, treatment and/or removal from site.

DME has on-site responsibility for regulating this aspect of water management including protection of the environment from hydraulic fracturing stimulation activities and production. DLRM carries off-site (and often longer-term) regulatory responsibility for this aspect of water management.

In summary, this submission has outlined regulatory roles and responsibilities in relation to the Northern Territory's water resources. There is strong and positive collaboration between the two key agencies of DME and DLRM. The collaboration will continue to focus on improving the regulatory arrangements for the protection of water resources and add to the available knowledge of aquifer systems and ground water quality.

Mr Darryl Day, Executive Director Water Directorate can provide additional information if required and can be contacted at darryl.day@nt.gov.au

Yours sincerely

A handwritten signature in blue ink, appearing to read 'R. Applegate', followed by a large, stylized flourish.

ROD APPLGATE

30 June 2014

