February 2013
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

TECHNICAL BRIEF

Groundwater

State of the art: fracking for shale gas exploration in South Africa and the impact on water resources

A WRC-funded study investigated the current knowledge on hydraulic fracturing with regards to the country's water resources.

Hydraulic fracturing for oil production

Hydraulic fracturing was developed in the United States of America in the late 1940s to assist in the stimulation of oil and natural gas wells. The number of wells that incorporate hydraulic fracturing increases by the day since oil and gas production is increased by this technique.

Due to present energy shortfall in South Africa, the requirement for new energy sources has gained momentum in recent years. Part of this new focus is on shale gas in Karoo type formations. There are currently a number of companies that have exploration rights to investigate natural gas resources in Karoo type formations. The most interesting aspect of this is that the area available for natural gas development is substantially larger than just the Karoo, with exploration areas covering six of the nine provinces in South Africa.

Very little data is available in the public domain on hydraulic fracturing in South Africa.

Current tests and exploration

A five-spot pumping test in the Waterberg has been operated since 2004 by Anglo and 20 boreholes have been drilled in the main Karoo since the beginning of 2008 to test for coal-bed methane production potential. Since most of the exploration rights for natural gas resources have been allocated for shale gas development a short description of the exploration and development techniques are described in the report.

Status quo of hydraulic fracturing in SA

The report attempts to address issues which arise from a scientific perspective point, i.e. geology, geo-hydrology and possible contamination matters. Since geology plays such a pivotal role in the development of shale gas in the Karoo an extensive section was included to highlight possible challenges.

Concerns

Following the identification of main concerns the project sought to address them in a systematic methodology which highlighted the likelihood of these impacts occurring.

Implications and managing of impacts

Migration of fluid, surface spills and water use posed the most probable points of impact. The application of good management practices would reduce events from occurring.

Chemicals – No chemicals should be injected into the boreholes without full disclosure of the type of compound used, since it can hamper the monitoring and remediation of these sites. Chemicals should be contained in such a manner that no spillage occurs at the surface.

Waste pits should be avoided but if used it should be lined since it can pose a hazard to the regional groundwater and should be remediated within three months of final drilling activity and in operation for less than six months to reduce the hazard of infiltration. An adequate water board should be maintained at all times and should be commissioned on the principal assumption of a 100-year flood event.

Drilling should be conducted at least 10 km from any residential areas due to the possibility of chemical exposure to atmosphere, surface or hydrological contact.

The main concerns regarding hydraulic fracturing – the highest environmental impact issues are highlighted in red.

Drilling logs should be filed at the Department of Water Affairs and Department of Environmental Affairs, and should be publically available.

All associated ***drilling footprints***, including return water containment structures, should be fully remediated to natural levels before the contractor is allowed to leave the site to avoid health risks to local inhabitants.

Best-practice guidelines should be implemented since the resources are available for the development of gas fields and drilling methods.

A pilot study should be done a year in advance in which a monitoring network of boreholes (both shallow and deep) is installed to monitor the impact of hydraulic fracturing on the area.

A baseline should be constructed before any drilling is done in an area. This would be for liability disclaimers and liability measures if the contractor is careless.

The results must be ***verified*** by an independent body with known competency which is unbiased. The data should be made available to the public for effective monitoring of the exploration companies as one of the greatest drawbacks internationally.

Wastewater containers should be used to store and transport waste water from the site to a suitable water treatment plant that can correctly purify the water.

Legal licensing restrictions should be applied by the government for drilling leased to the drilling company and they should be held accountable for and be banned from drilling in the area if not adhere to, to ensure that no negligent behaviour is tolerated on site.

The Karoo has a relatively low recharge and thus remediation of these areas will be protracted.

Further reading:
To obtain the report *State of The Art: Fracking for Shale Gas Exploration in South Africa and the Impact on Water Resources* **(Report: KV 294/11)** contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.