



GISERA | Gas Industry Social and Environmental Research Alliance

Monitoring microbial communities in aquifers and soils of the Beetaloo Sub-basin

This project provides baseline information about microbial communities in aquifers and soils, and investigates how microbes influence the degradation of chemicals and fluids typically used in the onshore shale gas industry in the Northern Territory.

Key points

- Research results provide baseline information about microbial communities in aquifers and soils in the Beetaloo Sub-basin.
- Results improve understanding of how microbes influence degradation of typical onshore natural gas industry chemicals in soils and aquifers.
- This data can be used to assess the health of an ecosystem.
- The study demonstrates that at the concentrations of chemicals tested, microbes are likely able to readily degrade all the chemicals in soils.
- Similarly in aquifers, microbes are able to degrade the chemicals at a slower rate.
- In soil, chemicals were frequently undetectable after less than one month due to degradation by microbes.
- In aquifers, microbes were able to degrade all chemicals to some extent, however, this degradation was not completed during the time period examined (three months) for any chemical/aquifer combination.
- The extent of chemical degradation varied between different aquifers and different soils.

Community concerns

Proposals for development of onshore gas resources in the Beetaloo Sub-basin in the Northern Territory have prompted concerns from Top End communities about potential impacts on the environment, and specifically about the potential impacts of gas industry chemicals on soils and groundwater resources.

Research results from this project provide valuable information that can help to manage potential risks in relation to soils groundwater quality.

The project also establishes an environmental baseline from which to monitor the environment should the industry progress in the Northern Territory.

The Beetaloo Sub-basin

The Beetaloo Sub-basin lies 180 km southeast of Katherine in the Northern Territory and spans an area of about 30,000 km². The estimated gas resources for the Beetaloo Sub-basin are of similar size to other major gas producing basins in Australia, such as the Surat Basin in Queensland and the Bonaparte/Browse Basins in Western Australia.

The Cambrian Limestone Aquifer system is the major aquifer in the region and provides an important source of water for communities, industry and the environment.



Results

Research results provide baseline information about microbial communities in aquifers and soils, and improve understanding of how microbes influence degradation of typical onshore chemicals in soils and aquifers. This data can be used to assess the health of an ecosystem.

Results include a detailed soil chemistry study of five soil samples, collected at geographically distant points and nominally representing chromosol, kandosol, rudosol, tenosol and vertosol soils of the Beetaloo Sub-basin region.

Results also provide detailed chemistry information, chemistry baseline data, and microbial data from these soils and 38 water bores in the region. These water bores intersected the formations of Gum Ridge, Tindall Limestone, Anthony Lagoon and Montijinni Limestone.

All chemicals tested for degradation using commercially available accredited tests were undetectable in soils after 34 days of incubation, due to microbial degradation.

Degradation may have occurred at a faster rate, however, the single test conducted after 34 days precludes characterising the rate of degradation further.

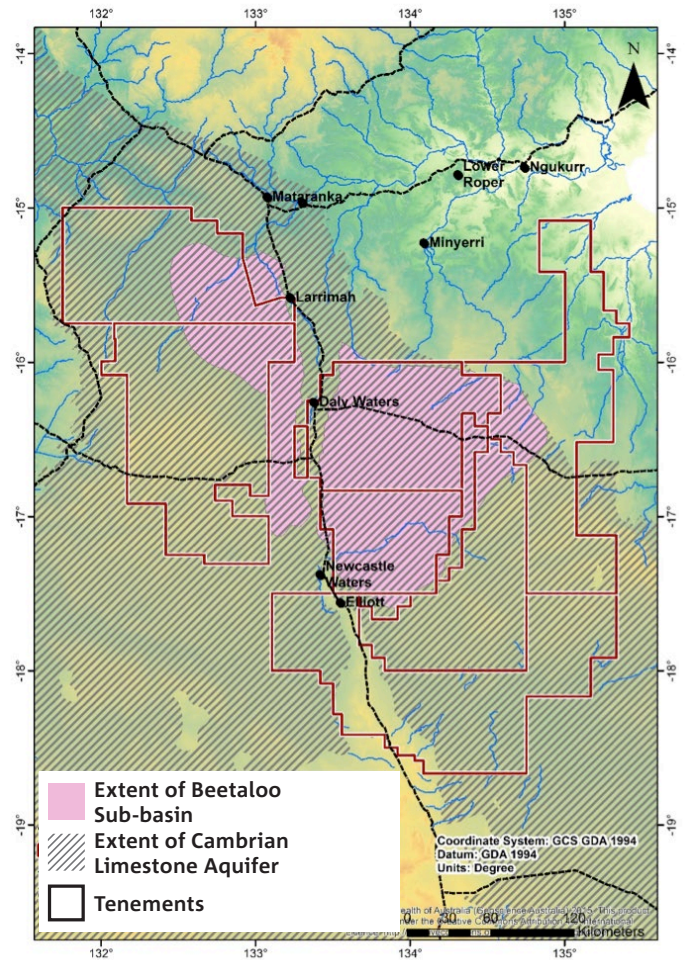
In aquifer microcosms experiments, microbes were able to degrade all chemicals to some extent, however, this degradation was not complete during the time period examined (3 months) for any chemical/aquifer combination.

The study demonstrates that at the concentrations of chemicals tested, microbes are likely able to readily degrade all the chemicals in soils. Similarly, in aquifers microbes are able to degrade the chemicals at a slower rate.

Identifying indicator microbes

The field of biomonitoring is increasingly being used for assessing ecosystem health. In addition to measuring changes in microbial communities, these methods allow the identification of organisms that are sensitive to particular chemicals; the more sensitive organisms may then be a focus for ongoing monitoring.

For example, abundance of *Ignavibacteria* species in aquifers was significantly reduced in the presence of most chemicals. While the reasons for this decline are not clear, population changes in this taxon may be a useful marker for any contamination in these aquifers.



Map showing the Cambrian Limestone Aquifer and the Beetaloo Sub-basin in the Northern Territory.

Chemicals

In consultation with industry and the NT Government, a list of chemical compounds associated with onshore gas activities were identified and used in testing. A full list of chemicals selected for testing is available in the [project final report](#).

More information

[More about the project](#)

[Read the final report](#)

[About the Beetaloo Sub-basin](#)

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GISERA is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, greenhouse gas emissions, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research.