

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

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

Community concerns

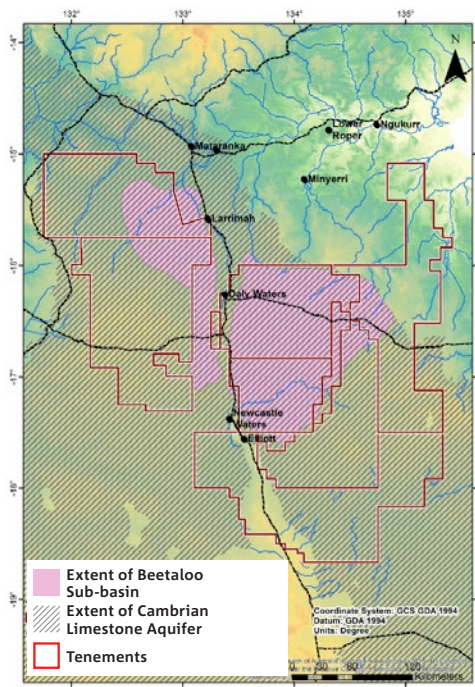
The final report from the [Scientific Inquiry into Hydraulic Fracturing in the Northern Territory](#) acknowledged public concerns about hydraulic fracturing, and made recommendations that could reduce the potential environmental, social, health, cultural and economic risks associated with unconventional gas development in the Northern Territory.

This project forms part of the efforts to reduce these potential risks in relation to groundwater quality. The project will establish an environmental baseline from which to monitor the environment as the industry expands 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. One of the most prospective areas for shale gas in Australia, it contains an estimated resource of 178,200 petajoules (PJ) of gas.

The Cambrian Limestone Aquifer system is the major aquifer in the Wiso, Georgina and Daly basins, within which the Beetaloo Sub-basin is situated.



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

KEY POINTS

- The Scientific Inquiry into Hydraulic Fracturing in the Northern Territory identified the need for baseline data for groundwater ecosystems to address community concerns about the effects of hydraulic fracturing on groundwater in the region.
- This study will determine baseline microbial profiles for aquifers examined in a related groundwater study, and in the five major soil types identified in the Beetaloo Sub-basin region.
- The study will also identify any microbes in the soil and aquifer samples that can affect the break down of chemicals associated with the onshore shale gas industry.
- There has been no prior biomonitoring research in this region and the capacity for microbes to degrade chemical compounds used by the gas industry in the Northern Territory is unknown.

MORE INFORMATION

- More about [the project](#)
- Scientific Inquiry [final report](#)
- About the [Beetaloo Sub-basin](#)

Objectives of the project

This project has two main objectives:

1. Establish baseline data of microbial communities in subsurface aquifer waters and soil samples of sites located near prospective unconventional gas activities in the Beetaloo Sub-basin.
2. Understand the microbial degradation of a range of chemicals likely to be used in unconventional gas activities, in both the five major soil types of the region and in relevant aquifers.

What is unique about this project?

Biological baselining and biomonitoring has not yet been undertaken in the Beetaloo Sub-basin. Baseline data on microbial communities and the identification of microbial taxa in soils and aquifers can be used to measure any potential impacts on the environment as the shale gas industry grows in the region.

In addition, microbes have the potential to assimilate, degrade or detoxify a range of environmental contaminants, and their potential to degrade compounds used by the shale gas industry in the Beetaloo Sub-basin is unknown. This project will characterise the microbial communities within the soils and aquifers of the region, and identify their potential for degrading a range of chemicals used by industry.

Sampling sites

This project will develop microbial community profiles for five major soil types in the Beetaloo Sub-basin, and aquifers examined in the GISERA project 'Groundwater characteristics in the Beetaloo Sub-basin'. The baselining component will involve the profiling of the same 55 bores, which can then be correlated with the geochemical data collected in the groundwater project.

In consultation with industry and the NT Government, a list of chemical compounds associated with onshore gas activities will be devised and used in testing. These chemicals will also help inform the selection of sites for soil sampling.

Field collection and analysis

Researchers will collect microbially-preserved water samples from the 55 bores, and 10 soil samples from each of the five major soil types (tenosols, rudosols, kandosols, vertosols and chromosols). On return to the laboratory, the samples will be subjected to DNA extraction and sequencing.

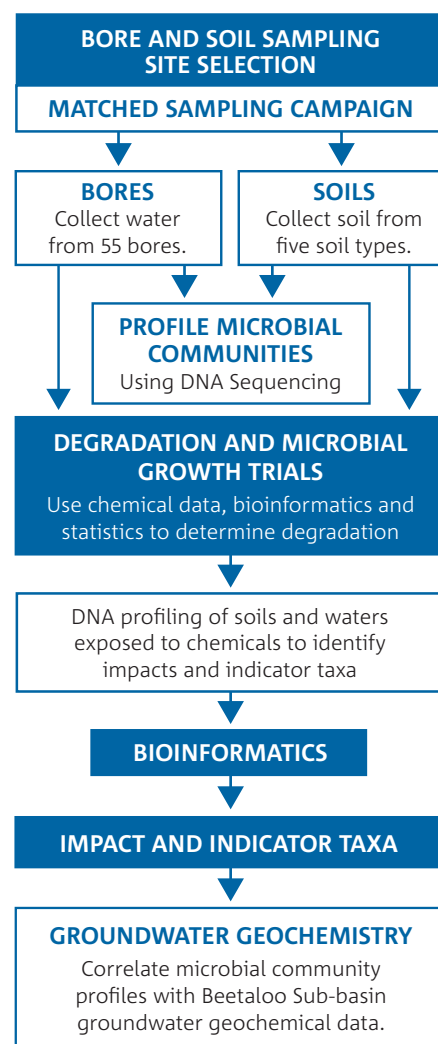
The samples will be incubated under field-like conditions, and the ability of microbes to degrade selected chemicals will be measured. Chemical degradation will be determined either through direct measurement of the chemical using analytical chemistry techniques or microbial growth assays.

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.

The research will involve: DNA sequencing that targets genes in bacteria and fungi; describing the effects of chemicals on the microbial community; and identifying those microbes that impact the degradation of the selected chemical compounds.



Schedule and brief description of project tasks.

FAQs

What is the timeline for this project?

May 2019 to May 2020

When will the results be available?

Reporting will take place in mid-2020

Who is funding this project?

The project is co-funded by the Australian Government and the Northern Territory Government (45%); CSIRO (25%); and by Origin Energy, Santos and Pangaea (30%).

ABOUT GISERA

The Gas Industry Social and Environmental Research Alliance (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, 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. Visit gisera.csiro.au for more information about GISERA's governance structure, projects and research findings.

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