



Australian Government



# Geological and Bioregional Assessment Program

## Fact sheet 18

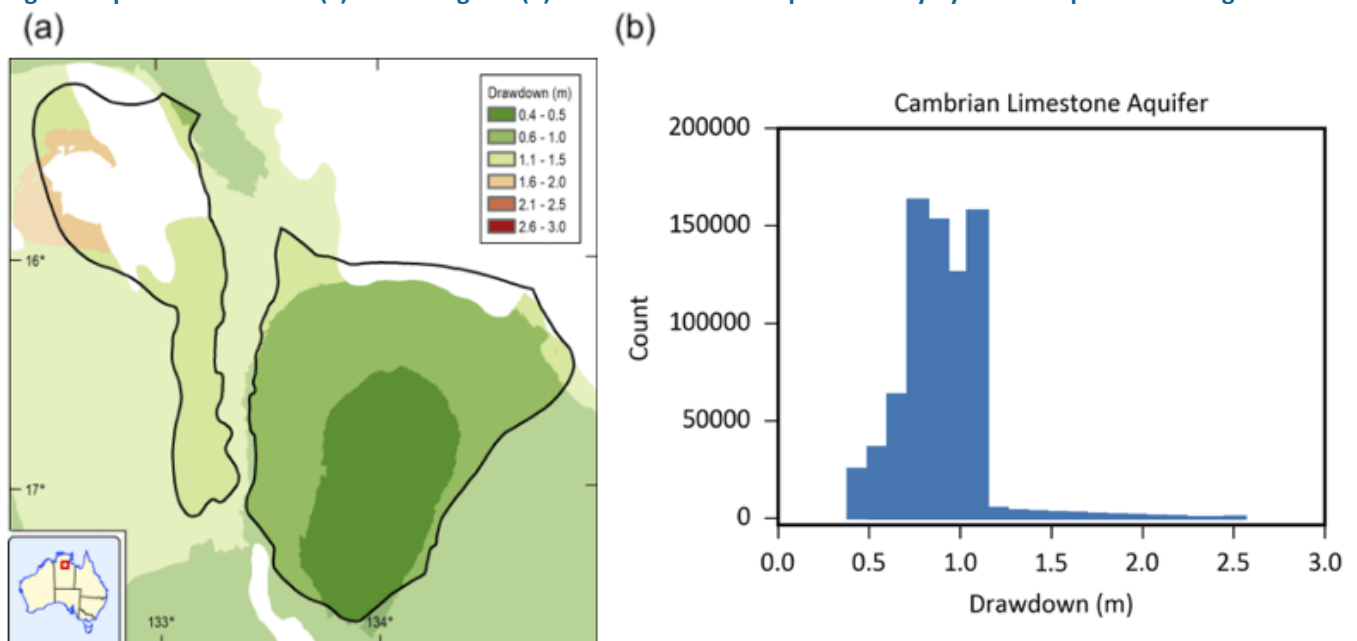
### Hydraulic impact pathways in the Beetaloo GBA region

Five key potential groundwater impact pathways were identified in the geological and environmental baseline assessment for the Beetaloo GBA region (Huddleston-Holmes et al., 2020). These included hydraulic impacts, which involve the propagation of reductions in groundwater pressure, known as drawdown. In an unconventional gas resource development context, drawdown can result from the extraction of groundwater needed for the construction of shale gas production wells. Drawdown can propagate directly, which occurs when an aquifer or gas reservoir is in contact with another aquifer. Alternatively, drawdown can propagate indirectly, either diffusely through an intervening aquitard or preferentially via fractures present in a geological fault zone. Analytical groundwater flow models were used to estimate potential hydraulic impacts in terms of changes in pressures and flows resulting from likely groundwater and shale gas extraction activities in the Beetaloo GBA region.

### Modelling of potential hydraulic impact pathways

Three workflows based on local-scale impact models provided predictions of potential hydraulic impacts. For the simulation of drawdown impacts that propagated upward via an intervening aquitard, the effects of fault zones as preferential flow paths were assessed. The assumptions required by each model were stated explicitly, and conservative parameter values were able to be chosen in most instances. Modelling results indicated that hydraulic impacts are likely to be negligible, as aquitard sequences in the Beetaloo GBA region are generally thick (in the order of hundreds of metres). Conversely, predicted drawdowns were larger in areas where aquifers or aquitards were thin, and/or where fault zones were present. For example, the horizontal propagation of drawdown resulting from extraction in the Cambrian Limestone Aquifer (CLA) was simulated. Predicted drawdown ranged from 0.4 m to 2.6 m in areas of the CLA overlying the Beetaloo Sub-basin (Figure 1). Drawdown predictions did not exceed 1.2 m in most locations.

Figure 1 Spatial distribution (a) and histogram (b) of drawdown values predicted by hydraulic impact modelling



## The GBA Program

The \$35.4 million Geological and Bioregional Assessment (GBA) Program is assessing the potential impacts of shale and tight gas development on water and the environment to inform regulatory frameworks and appropriate management approaches. The geological and environmental knowledge, data and tools produced by the GBA Program will assist governments, industry, land users and the community by informing decision-making and enabling the coordinated management of potential impacts.

## How to cite

Geological and Bioregional Assessment Program (2021) Fact sheet 18: Modelling of potential hydraulic impact pathways in the Beetaloo GBA region [online document]. Fact sheet for the Geological and Bioregional Assessment Program.

## Find out more

- Journal paper: Turnadge C, Crosbie RS, Evans T, Frery E, Raiber M and Martinez JL (in prep.) Prediction-specific methods of simulating potential hydraulic impacts of shale and tight gas development on groundwater resources in the presence of faults.
- Huddleston-Holmes CR, Frery E, Wilkes P, Bailey AHE, Bernadel G, Brandon C, Buchanan S, Cook SB, Crosbie RS, Evans T, Golding L, Gonzalez D, Gunning ME, Hall LS, Henderson B, Herr A, Holland KL, Jarrett A, Kear J, Kirby J, Lech ME, Lewis S, Macfarlane C, Martinez J, Murray J, Northover S, O'Grady A, Orr ML, Owens R, Pavey C, Post D, Sundaram B, Rachakonda P, Raiber M, Ransley TR, Tetreault-Campbell S and Wang L (2020) Geological and environmental baseline assessment for the Beetaloo GBA region. Geological and Bioregional Assessment Program: Stage 2. Department of the Environment and Energy, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia. Viewed 12 February 2021, <https://www.bioregionalassessments.gov.au/assessments/geological-and-bioregional-assessment-program/beetaloo-sub-basin/beetaloo-gba-region-stagetwo-report>.

Datasets that support this work are available at [data.gov.au](https://data.gov.au):

- Geological and Bioregional Assessment Program (2020) [Predictive modelling of potential groundwater impact pathways from shale gas development](#) [text].

More information is available at [bioregionalassessments.gov.au/gba](https://www.bioregionalassessments.gov.au/gba).