C&R CONSULTING
Geochemical & Hydrobiological Solutions Pty Ltd
ABN 72 077 518 784

Underground Coal Gasification / Coal Seam Gas Investigations
Mineralogical, Geological, Petrographic and Soils Services
Hydrogeomorphic and Palaeogeomorphic Evaluations
Terrestrial and Aquatic Fauna and Flora Surveys
Climate History and Extreme Events Analysis
Contaminated Site and Mine Water Analysis
Environmental Compliance and Monitoring
Estuarine and Marine Water Assessments
Surface and Groundwater Investigations

PO Box 1777
Thuringowa, Qld, 4817, AUSTRALIA
Tel: +61 (0) 7 4725 3751
Mob: +61 (0) 417 635 032
info@candrconsulting.com.au
www.candrconsulting.com.au

Geomechanical and Petrophysical Properties of Mudrocks
The Geological Society
16-17 November, 2015, London

ABSTRACT

Mineralogical characterisation of coal samples relevant to CSG, porosity and permeability concerns

Cuff, CC; Rasmussen, CE; Corkeron, M; Bush, A

Formation (skin) damage, which may be irreversible, may be defined as the reduction in production arising from the lowering of permeability caused by various well bore fluids. This damage has long been recognised in sandstone, mud–rock, and carbonate reservoir rocks in the hydrocarbon extraction industries. The investigation presented here documents similar phenomena arising in coal beds during the drilling, fracking, and production phases of CSG operations in Queensland, Australia.

In this investigation a range of petrological techniques have been employed including Hand Specimen Evaluation, Polarising and Reflectance Light Microscopy, Scanning Electron Microscopy, Field Emission Microscopy, and Electron Microprobe Analysis. Where appropriate these techniques were supplemented by conventional chemical analysis of groundwater and drilling fluids.

These investigations indicated:

- The potential for the precipitation (modelled using GeoChemists WorkBench Professional) of a range of clay minerals from reactions between the ambient groundwater and the drilling fluids used.
- The potential for the precipitation (modelled using GeoChemists WorkBench Professional) of carbonate minerals, principally siderite / ankerite, and sulphate minerals (gypsum) from reactions between the ambient groundwater and drilling fluids.
- The presence of sodic smectites, possibly formed by precipitation from groundwater / drilling fluid interaction, or by diagenetic processes.
- Expansion and dispersion of the sodic smectites if inappropriate drilling fluids were used.

All of these processes have been confirmed by observation and have profound influences upon gas flow through the coal porosity system potentially leading to large reductions in permeability. Indications are that these processes can be significantly reduced by suitable matching of groundwater with drilling fluids to ensure chemical compatibility.