



Chris Boreham, Barry Freifeld,
Dirk Kirste, Linda Stalker

12. MONITORING THE GEOCHEMISTRY OF RESERVOIR FLUIDS

12.1 Introduction

Geochemistry was a critical component of the overall monitoring and verification (M&V) strategy implemented for the CO₂CRC Otway Project Stage 1.

Reservoir fluids (gases and formation waters) were sampled and analysed from the Buttress-1 well both pre- and post-injection of the CO₂-rich fluid (injected CO₂) and during the drilling of the CRC-1 injection well. However, the main geochemical focus of the Otway investigations was on sampling of the Naylor-1 monitoring well at the wellhead, and especially the reservoir fluids (pre- and post-CO₂-injection) via U-tubes (Figure 12.1) placed in the bottom hole assembly (BHA). The U-tubes were able to sample the change in fluids at a series of levels (Figures 12.1 and 12.2) where initially formation water was present but displaced over time by the injected CO₂. Tracers were added at CRC-1 and these compounds were

also recovered at Naylor-1, quantified and compared with the evolution of CO₂ and CH₄ contents of the gas. Sampling by U-tubes at Naylor-1 first commenced soon after the BHA installation on October 2007 and continues now (2014).

During the course of Otway Stage 1, various operational issues relating to the system design and reservoir fluids were encountered and some delays were experienced until novel solutions were developed. Particular difficulties were encountered during the deployment of the BHA containing the reservoir level tools, due to the utilisation of a production well that was both narrow (3½" completion) and contained a casing patch at a critical depth close to the injection formation (Figure 12.2).

12.2 Sampling the Buttress-1 well

Throughout the course of the gas injection period, Buttress-1 gases were collected both before the separator at the Buttress production plant and at the CRC-1 injection well before the gases were deployed subsurface. Buttress gas was sampled at the wellhead during a pre-injection flow test in June 2006 and again during the CO₂ injection phase of the Otway Stage 1 test in 2008–09 (see Chapter 4). Between