



Project Update – AGL Groundwater Investigations at Broke

AGL Energy (AGL) is currently exploring for gas from deep coal seams in the vicinity of Broke and Bulga. Impacts on water catchments and groundwater resources have been raised as a possible consequence of the activity and hence substantial investigations have been completed by AGL since March 2009.

Background

Parsons Brinckerhoff (PB) is conducting the groundwater investigation and monitoring program in the Broke area. The objectives of the program are to:

- provide more information on groundwater in the area by determining whether water can travel and be lost between shallow and deep groundwater, and
- help the community understand what impacts, if any, there might be on local water supplies and groundwater as a result of gas exploration.

There are six main tasks associated with the groundwater program:

1. Drilling and installation of water monitoring bores around gas wells at Broke
2. Routine (baseline) groundwater sampling and laboratory analysis (wet, intermediate and dry events across a 6 month period in 2009)
3. Continuous monitoring of water levels
4. Testing the rate at which water can flow through the different sediment and rock layers
5. Extraction testing of a gas exploration well (and associated water level and water quality monitoring – water level monitoring and sampling during the pumping and recovery periods)
6. Reporting, peer review and communication of the results

The works program has been developed in consultation with members of the Bulga Community Consultative Committee (BCCC) and endorsed by the peer reviewer for the program, Professor Garry Willgoose from the University of Newcastle. Professor Willgoose regularly reports to the BCCC and is independent of AGL and PB. This brief update summarises the program and results to late November 2009.

Program

The program has investigated the main water supply aquifer located near surface through to the deeper coal seams and provided baseline data on water levels and water chemistry under both natural (non pumping) and operational (gas test well extraction) conditions. The intent of the investigation was to prove through water level and water quality studies - the natural variability, origin, age and connectivity of the shallow aquifers in the sandy sediments (to 15m depth) and deeper aquifers in fractured rock and coal seams (to 350m depth).

Natural conditions were studied first to identify whether there were any substantial seasonal variations from wetter Autumn to drier Spring periods. The deeper coal seams were then depressurised by extracting more than 160,000 litres of groundwater to determine whether shallow aquifers were likely to drain to the deeper coal seams.

Results

The investigation has involved:

- the construction of nine monitoring bores in and around the main gas test well HB02, identified for testing (on the northern outskirts of Broke)

- continuous monitoring of water levels at these monitoring sites (some since May and most since July 2009)
- analysis of rainfall and pumping test water level trends at all sites
- five water quality sampling events at these monitoring sites (a wet event in April, an intermediate event in July, a dry event in September, several samples during the extraction test event in October, and a recovery event in November)
- some water level monitoring of Xstrata bore sites and water quality monitoring of private water supply bores
- using special techniques and analyses to determine the origin and age of groundwater in the different aquifers
- analysis of salinity, pH, temperature and other chemical trends

A summary of the natural baseline conditions is as follows:

- water levels are less than 5m below surface for all aquifers (except for the deep coal seams where water levels are much deeper)
- water levels have been mostly static with only slight rises in water levels over Winter, with slight declines coming into the drier Spring period
- water quality in the shallow sediments is mostly slightly brackish (this groundwater is a useful resource for stock, limited domestic and occasional garden and irrigation use) –
 - fresher water quality occurs at the water table in the alluvium
 - more saline water quality occurs at depth closer to the bedrock
 - fresher water quality occurs closer to Wollombi Brook and around the edges of the floodplain (ie. In the areas where rainfall recharges the aquifer)
- water quality in the deeper rocks and coal seams is brackish to slightly salty (water has limited beneficial uses but it is NOT toxic and is typical of water from coal seams)
- all water in all aquifers originates from rainfall recharge
- water in the shallow aquifers (less than 15m below ground) is decades to centuries old; groundwater in the upper rock aquifers (less than 200m below ground) much older at 10000 to 20000 years old; groundwater within the coal seams (more than 300m below ground) is much older again at more than 50000 years old

Results for the 12-day pump test indicated:

- no pumping induced changes in water levels in the adjacent monitoring bores
- no substantial changes in the quality of the pumped groundwater that might suggest leakage

To conclude:

- there is nothing in the monitoring water level data to suggest that there is any drainage or connectivity with deep (coal seam) aquifers during the pump test
- there is nothing in the water quality data from the gas test well or monitoring bores to suggest that there is water draining from upper aquifers

Analysis of all the pump test data and all the water quality data is still under way but preliminary analysis indicates that the shallow and deep aquifers are disconnected.



The groundwater data collected and progress reports have been made available to members of the BCCC and the independent peer reviewer.

Report Content and Project Timeline

A detailed report on the groundwater investigations is being prepared and discussions are continuing with the peer reviewer, Professor Garry Willgoose. The PB technical report will cover the following:

- Scope of Works
- Background information
- Investigation methodology
- Approvals licences and permits
- Hydrogeology
- Groundwater chemistry
- Discussion
- Conclusions

The timeline of the major tasks required to conclude the project are shown below:

Week Commencing	30 Nov	7 Dec	14 Dec	21 Dec	28 Dec	4 Jan	11 Jan	18 Jan	25 Jan	1 Feb	8 Feb
	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11
Data compilation and analysis											
First Draft of Report											
Report review											
Final laboratory results											
Final Draft of Report											
Formal Peer Review											
BCCC Meeting and tabling of final conclusions											
Final Reports											

AGL Hunter Gas Project Links

For further information on the AGL Hunter Gas Project and the current groundwater investigations and for information on the regular BCCC meetings visit:

<http://www.agl.com.au/huntergasproject>

Other Useful Groundwater Links

USGS Groundwater Information <http://water.usgs.gov/ogw/>

University of NSW – Connected Waters Initiative <http://www.connectedwaters.unsw.edu.au/>

Sydney Coastal Councils – Groundwater Management Handbook

<http://www.sydneycoastalcouncils.com.au/groundwater.htm>

Selection of Groundwater Guidelines <http://www.iah.org.au/publications.html>

National Centre for Groundwater Research and Training <http://www.groundwater.com.au/>

IAH Australia <http://www.iah.org.au/index.html>