Department of Natural Resources, Mines and Energy Office of Groundwater Impact Assessment

Groundwater management modelling and science – an example from the Surat Basin

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Sanjeev Pandey







- The modelling drivers some background and context
- Surat impact model for assessing coal seam gas impacts
- How the model is used for resource management purposes

Background



- Cumulative impact assessment and management
- 3 years reporting cycle









Surat Cumulative Management Area

• Brisbane

Why model?

Context

- Complex multilayered aquifer system
- Multiple stresses (20,000 CSG wells)

Explicit objective

- Assess impacts from depressurisation time and space
- Underpin proactive management arrangements for:
 - Impacted water bores
 - Irrigation bores Environmental values (springs, watercourses, etc) General groundwate

Implicit objective

- Stakeholder communication and engagement
- Information for regulators for compliance



▲ CSG wells

* S&D bores

2019 OGIA GW Model

- 3D geological model
- MODFLOW-USG
- 34 layers, 22 faults
- ~1,3 million cells
- 1.5 km x 1.5 km cells



Regional CSG modelling challenges



- 1. Dual-phase flow
- 2. Local data assimilation
- 3. CSG well operations
- 4. Faults
- 5. Model calibration

Geophysical logs, Pumping Tests, Core Tests, DST's

Stochastic Lithology Permeability Models





K_h and K_v for 2019 Model

Uncertainty analysis

- Null Space Monte Carlo (Tonkin & Doherty, 2008)
- 450 sets of parameters +
 predictions



Key outputs for GW impact management

- Impacts on water bores and springs
- Loss in fluxes to alluvial aquifers



95th Percentile

10 - 20

20 - 50

50 - 100

100 - 200

200 - 300

300 - 500

> 500

Cracow

Drawdown (m)

2 - 5

5-10



- Proactive 'make good' of water supply bores
- Monitoring network
- Spring impact mitigation and monitoring

Make-good bores

- **100** bores impacted in the short-term (next 3 years)
- Responsible tenure holders are assigned
- Proactive bore assessment and makegood will follow





Groundwater monitoring



Spring impact management

- 8 spring groups impacted
- 6 require mitigation actions



So what did we learn in the process?

- Every model has its purpose a specific purpose
- Stakeholder buy-in is essential

A sound model with academic seal of approval

VS

An appropriate model trusted by stakeholders

- Trust in model depends on:
 - Trust in **data**
 - Trust in conceptualisation and science
- Ongoing improvement cycle
- **Simple** is beautiful...but...complex might do the trick



Thank you

Sanjeev Pandey Executive Director, Office of Groundwater Impact Assessment sanjeev.pandey@dnrme.qld.gov.au