

WATTLE RANGE MODEL 2010

Purpose

The purpose of the project, as described in Aquaterra (2010), is to estimate the effects of forestry plantations on the water balance and groundwater levels of the Wattle Range region, and to undertake selected scenario modelling using the upgraded groundwater model, originally developed by DWLBC and informally referred to as Barker's Range or Shorts and Coles model.

The outcome is the Wattle Range 2010 (WR2010) model that is fit for the purpose of investigating a range of hydrogeological conditions, and particularly to produce outputs that will inform future management of the forestry areas in the South East to achieve the DWLBC water management objectives.

Background

From Aquaterra (2010), this work supported the initiative of the Department of Water, Land and Biodiversity Conservation (DWLBC) to quantify the effects of existing forestry plantations in the Hundreds of Coles and Shorts of the South East of South Australia. The DWLBC, in collaboration with other organisations, has undertaken several studies and monitoring initiatives to investigate the effects of plantations on groundwater systems. Among them, in 2006, the DWLBC developed a groundwater numerical model that covers the area of interest and simulates the responses of the groundwater system to some of hydrological processes. That model, referred to as the Barkers Range model, was deemed to not be fit in its current form for this particular study purpose.

In 2010, the groundwater model was upgraded by Aquaterra, mainly by expanding the boundaries to deal with potential boundary effects, and also including revised information on groundwater abstraction, revised layer elevations and other improvements to the conceptual understanding.

After the model was upgraded, the Wattle Range 2010 model was used to run 14 management scenarios to examine options related to:

- forestry long term management modelling consistent with WAP settings
- the effect of climate change being manifest through changes to groundwater recharge
- changes to forestry extraction rates
- changes to land-use management
- management options to manipulate the cone of depression attributed to the forestry plantation
- importing of additional water to be available to groundwater recharge.

Location

The location of the model domain is shown in Figure 1.

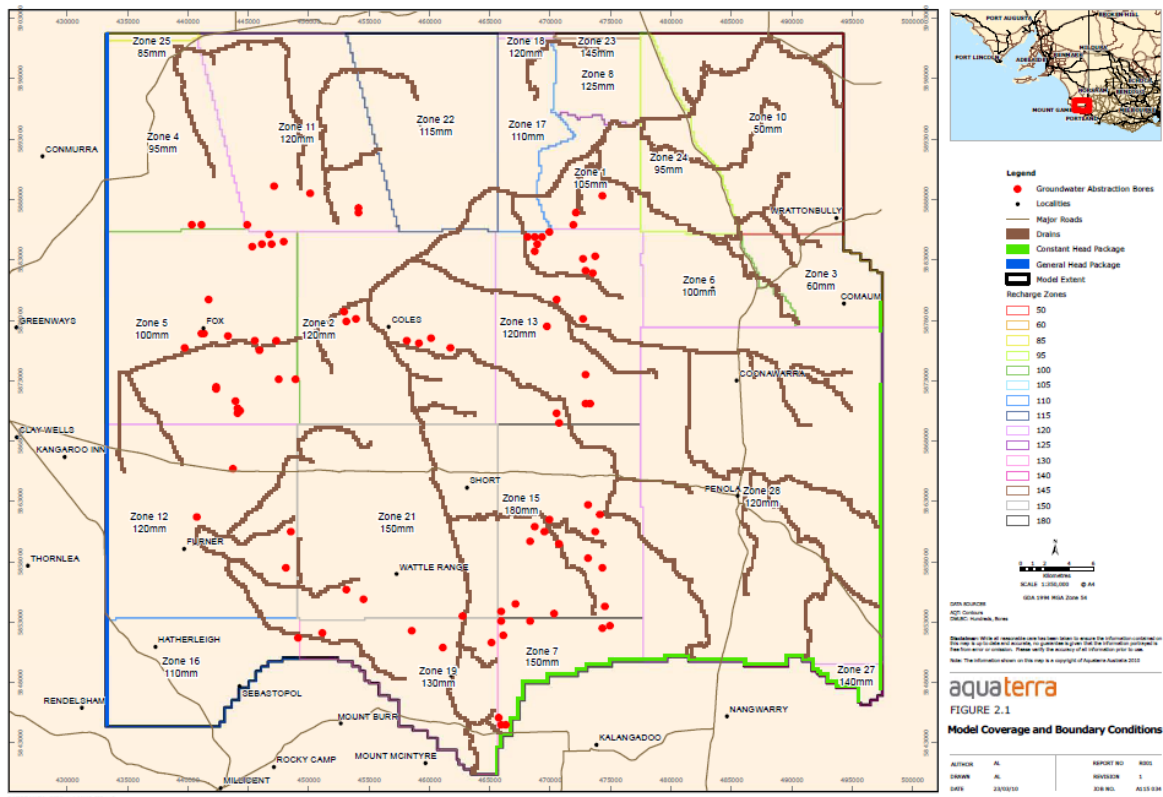


Figure 1. Wattle Range model domain

Model structure

The model was built with Groundwater Vistas version 5 MODFLOW 2000.

Model domain and grid size

The model domain simulates an area of 64.2 km (east to west) by 69.0 km (north to south). The bounding coordinates of the model domain are 433250E, 5832800N (south-west) and 497450E, 5901800N (north-east) (GDA 1994, MGA Zone 54).

The rectangular model grid was divided into 321 columns and 308 rows. The model grid was applied to the one model layer resulting in 98 868 finite difference cells. The minimum grid size is 200 m x 200 m in the central of model area. The maximum grid size is 200 m x 7600 m in the remaining model area.

Model layer

The model is a one layer model. The site was represented as two hydrostratigraphic units — the Bridgewater Formation and upper Gambier Limestone. The two units were combined as one model layer due to these two units is directly connected hydraulically.

Reports

Aquaterra, 2010, *Modelling Forestry Effects on Groundwater Resources in the SouthEast of SA*. Final report to DWLBC, South Australia. June 2010 (A115\R001c)

Aquaterra, 2010, *Modelled Hydrological Impacts by Plantation Forest on Groundwater Resources in the Lower South East. A Scenario Report*. Final report to DFW, South Australia. August 2010 (A115B\R002b)

Harvey, D, 2010, *Assumptions and parameters applied in the numeric modelling of plantation forest impacts on the unconfined groundwater resource in the Wattle Range region of the South East of South Australia*, DFW Technical Note TN2011/01, Department for Water, Adelaide