CHOWILLA MODEL 2012

Purpose

The objective of this model, as described in RPS Aquaterra (2012), is to estimate potential local 'real time' impacts and the (long term) Basin Salinity Management Strategy (BSMS) salinity accountability position.

In addition, as part of salinity accountability obligations under the BSMS, the operation of the environmental regulator on Chowilla Creek must be assessed for its long term salinity impacts.

Background

A steady-state model was initially used to model pre-locking (Lock 6) conditions, after which a transient model (Chowilla 2004 model) was developed and applied to the historic period (1930–2004) to investigate the historic salt load being delivered to the river. The Chowilla 2004 model was then applied to the prediction scenarios for a period of 100 years to determine the salt load being delivered to the river, and the EC impact at Morgan. The calibration and all scenarios tested in 2004 were under low flow condition. Historical flood events were not simulated in 2004 modelling.

Between 2005 and 2010, the existing Chowilla 2004 model was used to simulate the aquifer hydraulic response to historic flood events and flooding induced by a regulator, using a simplified version (30 days interval) of the River Murray flow hydrograph of the past 30 years (Howe et al., 2007). The fundamental parameters and conditions of the model (Chowilla 2007 model) were not changed since the development in 2004, other than to apply the conditions necessary to simulate flooding. The Chowilla 2007 model was also summarised in a conference paper (Yan et al. 2008).

Between 2011 and 2012, based on reviewer comments and a request from MDBA, DFW undertook a future investigation of the potential local and 'real time' (or short term) salinity impacts of the operation of the regulator to inform downstream users of the potential impacts. The Chowilla 2007 model has been upgraded (Chowilla 2012 model) specifically to examine the potential impacts of the environmental regulator. The key uncertainties from previous reviews (Salient Solutions, 2008) have been addressed in the Chowilla 2012 model.

Visual MODFLOW was used to develop the model and scenario modelling.

Location

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

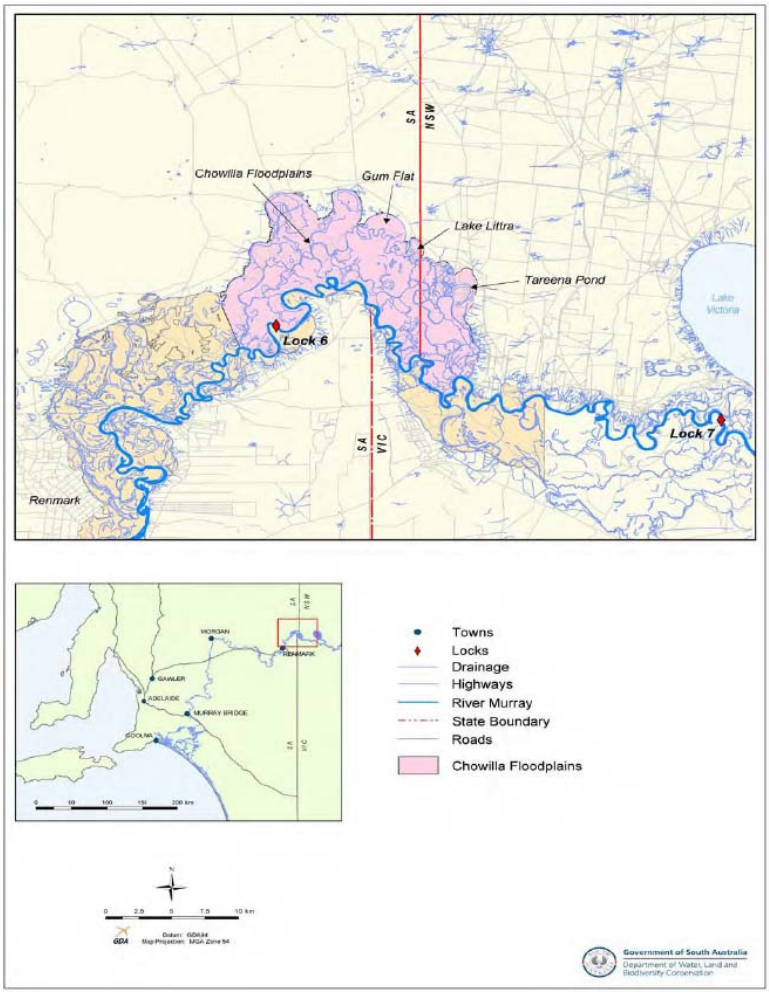

Figure 1. Chowilla model domain

Model structure

Model domain and grid size

The model domain simulates an area 55 km (east to west) by 45 km (north to south) and includes the western part of Lake Victoria and the entire Chowilla floodplain (Figure 1). The bounding coordinates are 470000E, 6220000N (south-west) and 525000E, 6265000N (north-east) (GDA 1994, MGA Zone 54).

The rectangular model grid is divided into 393 rows and 390 columns. The minimum grid size is 76.5 m x 62.5 m in the Chowilla floodplain. The maximum grid size is 305 m x 250 m in the remaining model area. The model grid was applied to five layers resulting in 312 500 finite difference cells.

Model layers

The regional aquifer system underlying the Chowilla floodplain was conceptualised as five layers, including four aquifer layers and one aquitard layer (Table 1 and Figure 2) and hydrogeological conceptual model in Figure 3.

Table 1. Model layers

Layer	Hydrogeological unit	Aquifer/Aquitard	MODFLOW layer
1	Upper Monoman Formation and highland Upper Pliocene Sands (upper part)	Aquifer	Type-3
2	Lower Monoman Formation and highland Upper Pliocene Sands (lower part)	Aquifer	Type-3
3	Lower Pliocene Sands	Aquifer	Type-3
4	Bookpurnong Formation	Aquitard	Type-0
5	Murray Group Limestone	Aquifer	Type-0

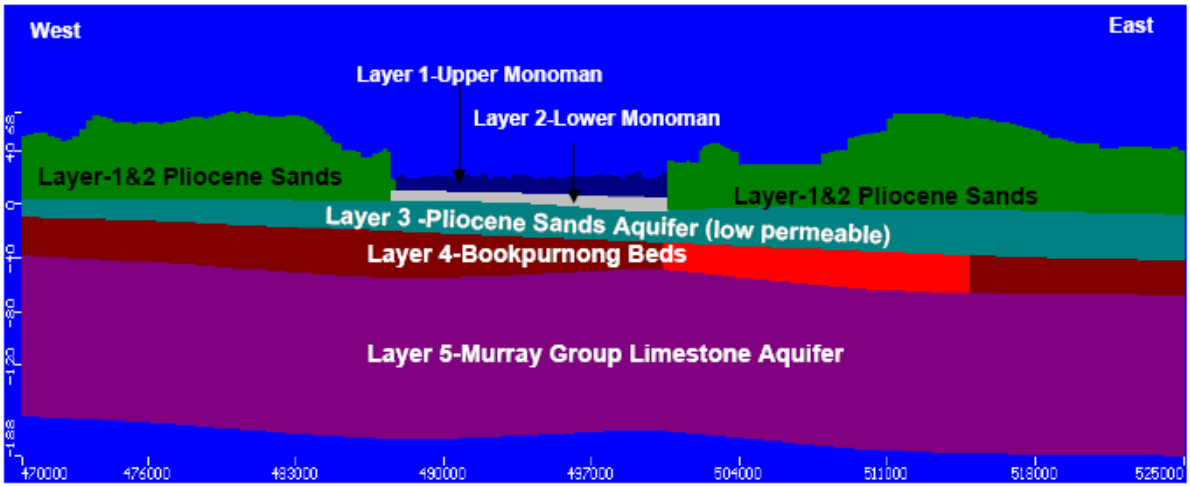

Figure 2. Cross-section

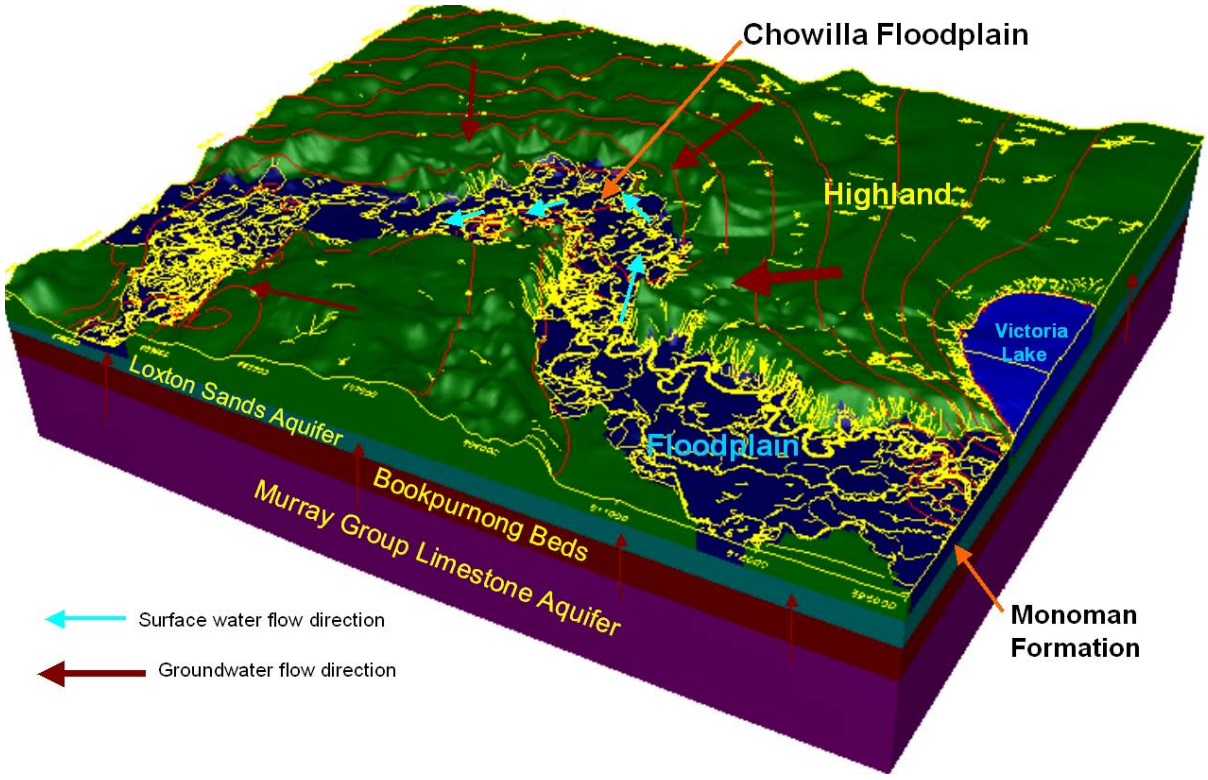

Figure 3. **Hydrogeological conceptual model**

Reports

Yan W, Howles S and Marsden Z, 2004, *Chowilla Floodplain Numerical Groundwater*, Report DWLBC 2004/65, Department of Water, Land and Biodiversity Conservation, Adelaide

Howe B, Yan W and Stadter M, 2007, *groundwater Impact Assessment of the Proposed Chowilla Regulator using the Chowilla Numerical Groundwater Model: Report 1*, Report DWLBC 2007/28, Department of Water, Land and Biodiversity Conservation, Adelaide

Yan, W and Howe, B (2008), *Chowilla Floodplain Groundwater Model*, Water Down Under Conference Paper 2008

RPS Aquaterra 2012, Chowilla Model 2012, Prepare for Department For Water. A191B/R002d