

ENPOINT

Contaminated Land Solutions

Pit Lake Model Validation Understanding Impact of Mine Dewatering

The issue

Enpoint was engaged to validate modelled predictions on the dewatering radius of influence, pit lake recovery and pit lake salinity.

The key outcomes of the models were as follows:

- Pit inflow was estimated to be < 1kL/day (10-5 m/day) to 100 kL/day (10-3 m/day) during pit dewatering.
- Pit water levels would recover to an elevation of between ~310 mAHD to ~320 mAHD within a period of 7 to 11 years. The pit lake was therefore predicted to become a groundwater 'sink'.
- Salinity of pit water was predicted to increase over a 100-year period to 55,000 mg/l (low K scenario) and 8,600 mg/l (high K scenario).

The objective of the assessment was to review measured groundwater elevations, pit water elevations and salinity to validate the model predictions of for the pit lake.

The Enpoint solution

To validate the modelled predictions, Enpoint completed the following:

- A comparison of the observed to predicted head data to estimate the actual radius of influence from dewatering;
- An assessment of the changes in pit lake water levels, with inference to groundwater level, during recovery; and

- An assessment of salinity concentration estimates following pit lake recovery.

Hydrographs for observation wells surrounding the pit lake are presented in Figure 2.

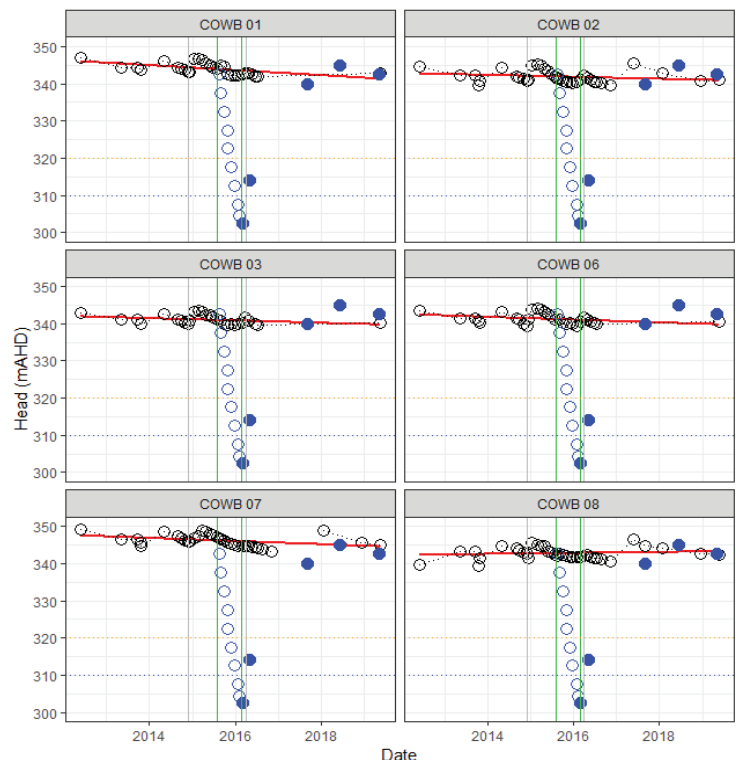


Fig 2. Hydrographs From Figure 2, the pit lake water level appeared to have reached a quasi-steady state condition within approximately 2 years. The groundwater elevation ranged from ~341 to ~344 mAHD, with groundwater flow to the northwest and hydraulic gradient of approximately 0.007 (0.7 m/100 m). The pit lake water level was comparable with the surrounding water table elevation. Groundwater contours comparing the current pit lake levels with the surrounding water table elevations are provided in Figure 3.

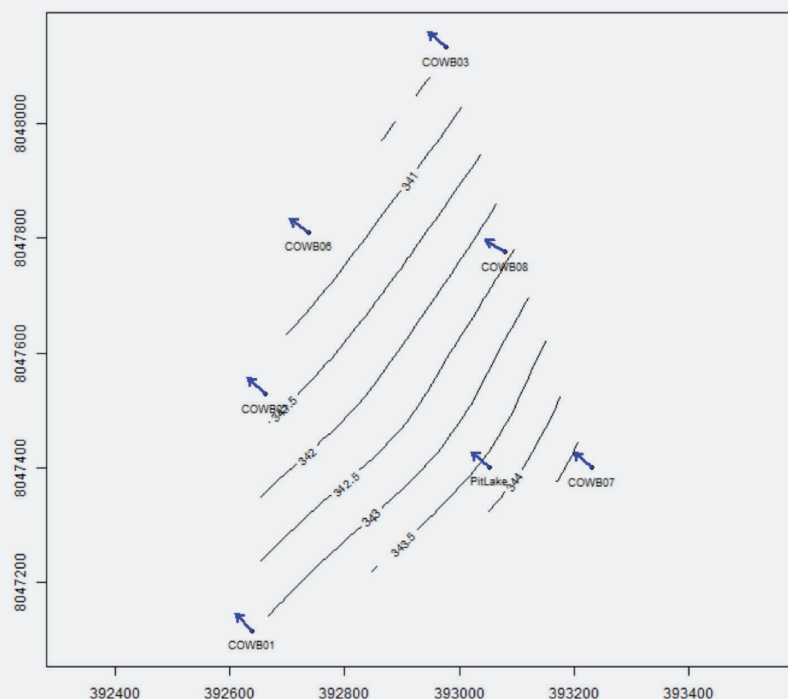


Fig 3. Water Table Elevation Contours and Flow Direction

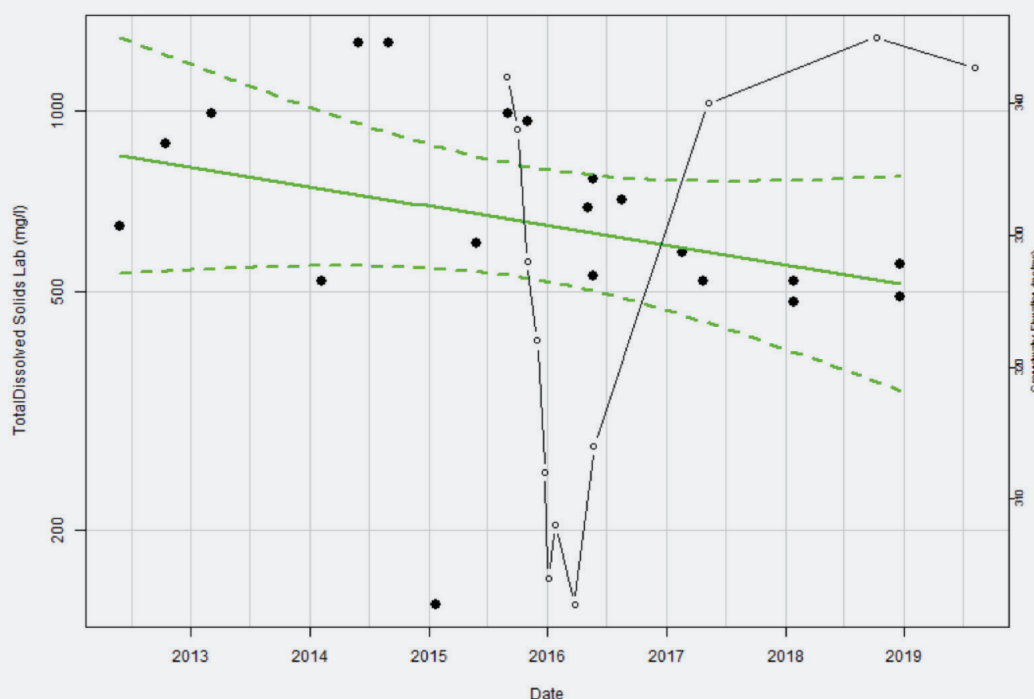


Fig 4. Temporal Trend in the TDS Concentration of the Pit Lake

From Fig. 4, pit water salinity appears to have decreased as the pit lake water levels have recovered.

An assessment of the temporal trend in TDS concentrations of the pit lake water is provided as Figure 4

The outcomes

In summary, the validation of the initial model indicated the following:

- The pit lake recovered to a level comparable to the local water table elevation within approximately 2 years of mine completion. The pit lake was therefore deemed to be a surface expression of the water table, which is in direct hydraulic connection with the superficial aquifer and considered a flow through system rather than a sink.
- The pit lake salinity is freshening with time rather than becoming more saline as predicted by the model.

Meet the consultants

The Enpoint team of environmental scientists and support staff have been in operation since 2009. Enpoint maintains an Integrated Management System (IMS), which is certified to ISO 9001:2015, ISO 14001:2015 and AS/NZS 4801:2001.

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