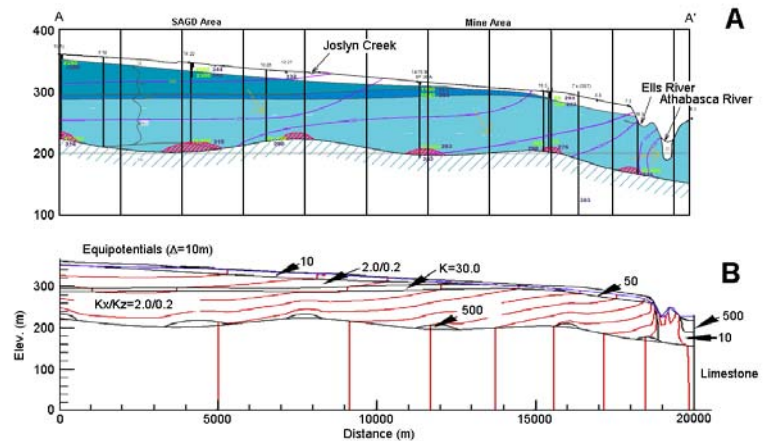


## Review of neighbouring SAGD and Oil Sands mining prospects

|                          |                           |
|--------------------------|---------------------------|
| <b>Project Location:</b> | Athabasca Oil Sands       |
| <b>Client(s):</b>        | Mikisew Cree First Nation |
| <b>Date Completed:</b>   | 2005, 2006                |
| <b>Project Budget:</b>   | \$ 45,000                 |



**Cross-section through the lease showing lateral equipotential lines within the Cretaceous oil sands. Profile A: Field measurements by the applicant. Profile B: Vertical 2D numerical model by WDA.**

### Project Summary

A number of development applications for SAGD (Steam Assisted Gravity Drainage) and mining development precipitated several reviews dealing, amongst other matters, with groundwater flow and chemistry patterns in the area under investigation. The lease is located close to the Athabasca River and in the vicinity of another application for mining. Both applicants made use of the same mathematical model for calculating groundwater flow and the effect and propagation of pressure changes due to mine dewatering and injection of fluids into the Basal Sands. The applicants' model is essentially a horizontal 2D model confined to the Basal Sands as the assumed regional aquifer. The model has restricted groundwater flow to the Quaternary and Cretaceous layers, considering the karstic Devonian limestone layers to be impermeable. The above cross-section A by the Applicant shows downward directed groundwater flow by means of lateral equipotential lines. The karst in the Devonian limestone was ignored during field investigation and in the applicants' mathematical model.

The review showed the widespread existence of limestone karst under the oil sands in the area of the lease by borehole records provided by the Applicant and by an evaluation of the surface of the Devonian rocks. The presence of karst immediately below the Cretaceous layers provides for effective pathways for pressure changes between injection and depressurization wells and for flow towards the Athabasca River. In addition the presence of permeable karst also affects the SAGD operation as pressure losses will occur into the Devonian karst. Therefore higher pressures likely need to be applied and the danger of surface escapes of steam is thus increased. Operating costs will increase as well.

### Services Provided

- \* Creation of a hydrogeological database.
- \* Evaluation of the hydrogeological database by means of the proprietary program system HD.

### Deliverables or Results

- \* Several reports were prepared for the Mikisew Cree First Nation; the client then delivered these reports to Deer Creek Ltd., to Alberta Environment (AENV), and to the Alberta Energy and Utilities Board (EUB).