

An Integrated Approach to Oil Sands Exploration and Delineation: The Deer Creek Example

By J. Henderson* and M. Bowman
Associated Mining Consultants
Suite 200, #708 - 11th Avenue S.W. Calgary, AB T2R 0E4
hendersonj@calgary.amcl.ca

F. Lobkowicz and E. Visser
Deer Creek Energy, Calgary, AB

ABSTRACT

The geology of the Athabasca Basin can be complex on a local scale. In order to address this complexity, it is important to develop an integrated approach to exploration and development. This paper outlines the approach undertaken by Deer Creek Energy for exploration of their oil sands lease north of Fort McKay, Alberta.

The Deer Creek Energy oil sands lease incorporates both surface mineable and in-situ deposits which by itself adds a degree of complexity in planning exploration and development programs. The depths of investigation vary from 0 to 100 metres in the surface mineable and from 0 to 200 metres in the in-situ area. Objectives of exploration programs include:

- Delineation of rich oil sands of McMurray Formation
- Presence and thickness of Clearwater Formation
- Mapping Paleozoic surface
- Groundwater sources
- Delineation of surficial deposits
- Siting of facilities
- Presence of basal water sands

At present, the drill hole density on the lease varies from 16 wells per section to only 1 well per section. In order to provide additional information between wells, Deer Creek have conducted a number of complementary geophysical surveys as summarized in the following table:

Geophysical Survey	Area	Objective
Airborne electromagnetic:	surface mineable area	Presence of Clearwater Formation Delineation of rich oil sands Siting of facilities Delineation of surficial deposits
Airborne magnetic:	surface mineable area	Basement structure
Seismic reflection:	surface mineable and in-situ areas	Mapping Paleozoic surface
Seismic refraction:	in-situ area	Mapping Paleozoic surface
Transient electromagnetic soundings:	in-situ area	Thickness of Clearwater Formation Groundwater sources Delineation of rich oil sands Presence of basal water sands

In order for the geophysical surveys to provide complementary information to the drill data, there is a necessity for a mappable contrast in physical properties at the geological horizons of interest. Borehole geophysical logs provide the detailed information required to determine the effectiveness of both the airborne and surface geophysical techniques.

This approach has allowed Deer Creek to cost effectively integrate diverse data sets in the exploration of their lease. This paper provides an overview of that unique approach which relies upon the integration of geology with borehole, surface and airborne geophysical methods. There is also a discussion of the advantages as well as pitfalls learned from this approach.