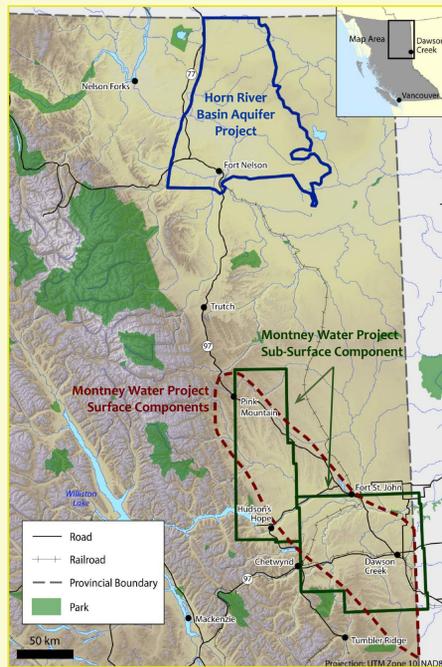


## Background

In 2009, Geoscience BC secured \$5 million in funding from the Provincial Government, dedicated to geoscience studies supporting timely and efficient appraisal and development of the enormous gas resource in Northeast BC.

Water is an essential component of unconventional gas development, and is used for drilling and hydraulic fracturing. Hydraulic fracturing or fracking is a process where a mixture of water and sand is injected into the deep shale at a high pressure to create small cracks in the rock which allows gas to flow.

In 2008, members of the Horn River Basin Producers Group asked Geoscience BC to investigate deep subsurface aquifers as sources of frac water and subsequent disposal sites for the produced water, to support the emerging Devonian shale gas play in the Horn River Basin. In 2009, a group of producing companies approached Geoscience BC to undertake a similar assessment of potential water sources and sinks in the Montney play area.



## Horn River Basin Aquifer Characterization Project - Phase 1



Photo courtesy of Shell

In consultation with the Horn River Basin Producers Group, Geoscience BC determined a key geoscience challenge in identifying aquifers capable of producing high volumes of water to support completions (fracking) operations, and also capable of accepting disposal of large volumes of spent frac fluids. The Horn River Basin Aquifer Characterization Project, a cooperative effort between Geoscience BC and the Horn River Basin Producers Group was conceived as a result.

Phase 1 results (released in April 2010) include:

1. A Horn River Basin stratigraphic framework for hydrogeological and deep aquifer analysis.
2. Aquifer and fluid data from deep water wells that may be used for water source and fluid disposal.
3. Systematic hydrogeological investigation of potential aquifers in the Horn River Basin to quantify and map reservoir capacity and productivity / injectivity potential.

## Horn River Basin Aquifer Characterization Project - Phase 2

Phase 2 of the Horn River Basin Project is now in development. Project plans will be released shortly through Geoscience BC's website.

The Horn River Basin producers group consists of the major industry players, which are Apache, ConocoPhillips, Devon, Encana EOG Resources, Imperial Oil, Nexen, Pengrowth, Quicksilver and Stone Mountain Resources. The purpose of the group is to facilitate cooperation and communication between major industry players, key stakeholders and First Nations in the area.

## Montney Water Project

The Montney Gas Play in northeast British Columbia is a world-class unconventional natural gas resource. Operations in the Montney are moving into development drilling, which will increase the demand for water and deep sites for the disposal of fluids. Provincial, First Nations and local governments, industry, communities, and environmental groups all want to ensure that water sources are carefully managed during natural gas development.

In response to this challenge, Geoscience BC met with industry and government in early 2010 and began planning for a collaborative project to undertake water studies in the Montney area.

The Montney Water Project is designed to provide a comprehensive inventory of water sources and potential for deep geological disposal sites in the Montney Gas Play area.

Phase I of the project focuses on collecting, analyzing and interpreting available water information in the Montney region. This phase includes three components:

### 1. Surface Water

This component will assess the surface water resource through the collection of a variety of publicly available data, including climate and precipitation data, stream flow, lake volume and related hydrometric information at the watershed level. This will aid in determining surface water availability, seasonal changes in these volumes and recharge rates on a drainage sub-basin and basin (watershed) level.

### 2. Near-surface Water

Most of the Montney area is covered by unconsolidated sediments that vary greatly in thickness. Since much of the unconsolidated material is of glacial origin, the first priority of this component is to compile existing mapping and data in the Montney area. A summary report describing which deposits hold the best potential for sourcing water in unconsolidated sediments will be produced.

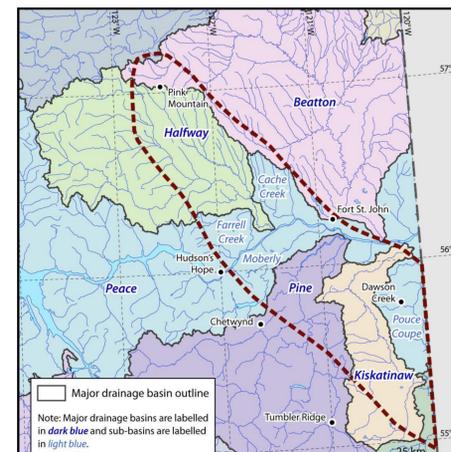
### 3. Sub-surface Water

This component is designed to assess the availability of non-potable deep saline aquifers for natural gas development (this is a water source that is not suitable for other uses such as drinking water or agriculture), and the usefulness of these aquifers for disposal of fluids.

Data and results from this project will be made publicly available in 2011.



Photo courtesy of A. Hickin



Main drainage basins of the Montney Water Project, northeastern British Columbia: Beatton, Halfway, Peace, Pine and Kiskatinaw. The boundary of the Montney Water Project is represented by the red dashed line.

## Montney Water Project Partners

The Montney Water Project is a collaborative effort by Geoscience BC in partnership with seven companies active in the Montney Play, with support from the B.C. Oil & Gas Commission's SCEK Fund, B.C. Ministry of Energy, Ministry of Environment, Ministry of Health Services and the Northern Health Authority and contributions from the Kiskatinaw River Watershed Project being undertaken at the University of Northern British Columbia in partnership with the City of Dawson Creek.



## Kiskatinaw River Watershed Research Project

part of the Montney Water Project

The Kiskatinaw River Watershed Research Project is a collaborative research project developed jointly between the City of Dawson Creek, University of Northern British Columbia and Ministry of Environment. The project is also receiving some financial support from Geoscience BC and industry, and forms an important partner-project within the MWP area.



Photo courtesy of Shell

The goal is to obtain sufficient scientific information necessary to successfully manage the watershed and thereby reduce conflict and uncertainty between water users.

The Kiskatinaw River watershed (drainage basin) provides community water supply and supports various other values such as timber harvesting, agriculture, oil and gas, wildlife and recreation. The Kiskatinaw watershed's hydrology is currently poorly understood and has proven to be intermittent in terms of water supply.

Two Ph.D. candidates, F. Hirshfield and G. Saha, are conducting the project as part of their Ph.D. dissertations. The project includes six main tasks:

1. investigating the contribution of discharge and sediment levels (sediment yield) from each tributary to the main stem of the Kiskatinaw River;
2. selecting a hydrological model for watershed modelling;
3. examining the impacts of future climate changes on the snowmelt processes and discharge;
4. identifying the impacts of oil and gas activities on discharge in each tributary and main stem;
5. investigating the surface water-groundwater (SW-GW) interaction and quantification of groundwater contribution to river flow; and
6. modelling of water quality in the Kiskatinaw River and its tributaries.



Photo courtesy of A. Hickin



Geoscience BC is an industry-led, not-for-profit society with a mandate to collect, interpret and market geoscience data and expertise to promote investment in resource exploration and development in British Columbia. Geoscience BC is funded by the Provincial Government and works in partnership with industry, academia, government, First Nations and communities to attract mineral and oil & gas investment to BC.

For more information on this project, please contact:

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