

FOREWORD

Geoscience Reports is the annual publication of the Geoscience Section of the Geoscience and Strategic Initiatives Branch (GSIB) in the Oil and Gas Division, BC Ministry of Energy and Mines. This publication highlights petroleum related geosciences activities carried out in British Columbia by ministry staff and affiliated partners. The Geoscience Section of the Strategic Initiatives Branch provides public geoscience information to reduce exploration and development risk and promote investment in British Columbia's natural gas and other petroleum resources. The studies produced by staff and partners encourage responsible development and provide technical expertise to better aid policy development. Public Geoscience is identified as an important component of the British Columbia Natural Gas Strategy, announced in February 2012 (www.gov.bc.ca/ener/natural_gas_strategy.html).

Geoscience Reports 2012 includes six articles that focus on two themes; geological studies in the Liard region of northeast British Columbia and water studies related to oil and gas development. The first two articles describe mapping and thematic studies in the Liard Basin. These studies investigate rocks that are currently being targeted for shale gas development in the Liard and Horn River basins. The subsequent four articles focus on water, an important resource in northeast British Columbia, where it is critical for the petroleum industry, agriculture and domestic activities.

The first article in this year's volume is by Filippo Ferri and Adrian Hickin of the GSIB and Julito Reyes of the Geological Survey of Canada (GSC). They present results from the 2011 summer field program that is part of a multi-year project evaluating the shale and siliceous siltstone of the Besa River Formation from measured sections of outcrop. The evaluation includes lithological description, a gamma-ray spectrometry (U, Th and K) survey and Rock-Eval™ and litho-geochemical analysis of samples. The second study, by Margaret McMechan (GSC), Filippo Ferri (GSIB) and Larry MacDonald (GSC), is a regional mapping project. This article reports on summer fieldwork in 2011 within the Toad River map area (NTS 094N) and incorporates published and unpublished geological studies in the Liard River area. Rocks in this map sheet span the Mesoproterozoic to Upper Cretaceous, which have been affected by tectonic activity during the Middle Cambrian, Ordovician to Silurian, Mississippian to Permian, and Jurassic to Early Cretaceous (pre-Albian). Hydrocarbon resources occur within Middle Devonian carbonates involved in large, structural culminations (e.g. Beaver River and Crow River gas fields). In addition, the Paleozoic and Mesozoic successions contain several organic-rich horizons (Besa River Formation, Toad/Grayling formations and Garbutt Formation) that are stratigraphically equivalent to sequences being developed for shale gas resources elsewhere within the Western Canada Sedimentary Basin.

The first of the series of papers related to water resources is by Elizabeth Johnson of GSIB and Laura Johnson, an independent consultant. Their contribution investigates industry water consumption during hydraulic fracturing operations in northeast British Columbia. The paper looks at the relationships around fracture type, stimulation volume, well location and the number of fractures per well. Another contribution is a compilation of potential freshwater aquifers hosted in shallow bedrock formations by Janet Riddell, formerly with the GSIB, but now with the British Columbia Geological Survey. She notes that the most important prospective regional aquifer units are the coarse clastic Cenomanian Dunvegan and Campanian Wapiti formations. Some of these aquifers are well known in the Peace River valley, but outside that region hydrogeological data are sparse and many aquifers are not formally identified or delineated. This work indicates that new data will significantly improve our knowledge about the hydrostratigraphy of Cretaceous clastic units across northeast British Columbia.

The final two papers introduce a multi-year, inter-agency program initiated in September of 2011. This program is directed at gaining an understanding of the groundwater resources in the rural area around Dawson Creek. The principle objective of this ongoing work is to provide

science based information (characterization of groundwater aquifers and water) that will benefit water resource management. The paper by Wilford et al. includes 15 authors from 10 agencies that are participating in this multi-year program. This paper describes two projects; the first is the Northeast British Columbia Aquifer Project with components that include: 1) a private water well sampling survey; 2) expansion of the British Columbia Observation Well Network; 3) an evaluation of the geological framework for the Groundbirch Paleovalley; and 4) an update to the Groundwater Level Interface database. The second project involves surface water hydrology modelling and the development of a decision-support tool for water allocation in northeast British Columbia. The final paper in the volume, by Adrian Hickin (GSIB) and Melvyn Best (Bemex Consulting International), describes the geophysical techniques that were employed to construct the geological framework of the Groundbirch Paleovalley, a feature known to host an unconsolidated groundwater aquifer. In their paper, they provide some preliminary results from the Coldstream River, where incision by the river has allowed direct observation of the paleovalley-fill secession.

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