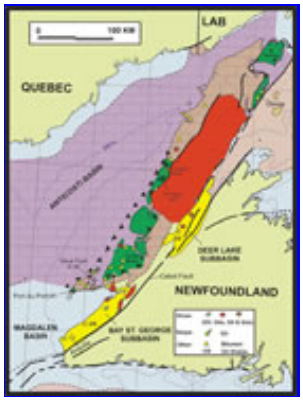
Looking for New Found Oil in Newfoundland

Structure, Dolomites Look Good

By SUSAN EATON
EXPLORER Correspondent

Editor's note: This is the second report on a three-part series that examines Canadian activity in the prolific Trenton-Black River Trend.



A geological map showing sub-basins and leading edge of Taconic Orogeny, plus indications of drilling activity in the Canadian portion of the Trenton-Black River trend.

Map, data courtesy of the Department of Mines and Energy, Government of Newfoundland and Labrador

(Click to enlarge)

Some geologists refer to it as "HTD" or hydrothermal dolomite.

AAPG member Graham Davies uses the term "thermobaric" dolomite to acknowledge that high pressures are as important for dolomitization as the existence of hot, saline fluids.

(Davies also uses the term "implosion" dolomite to explain the processes that created rocks with breccia clasts "floating" in saddle dolomite crystals. He describes some hydrothermal dolomite fabrics as "ladder zebras" and "chevron zebras," adding a level of sophistication that includes a structural descriptor.)

"These are dramatic fabrics," explained Davies, president of Calgary-based Graham Davies Geological Consultants. "We're dealing with an extremely dynamic system that is not only temperature driven, but pressure driven."

Whatever the descriptor, this rock is characterized by coarsely crystalline, high temperature saddle dolomite, and forms the prolific reservoir trends of the Trenton-Black River that stretch across continental North America.

The Trenton-Black River fairway -- containing the world class Albion-Scipio and Lima-Indiana oil fields -- crosses into Canada where it is virtually unexplored to date.

An exploration renaissance, however, is under way in Canada's eastern provinces. Fueled by a new understanding of the mechanisms that create hydrothermal dolomites -- and the critical role that wrench faults play as conduits for high pressure, high temperature dolomitizing fluids -- Canadian oil and gas companies too are re-evaluating geological and geophysical data bases for Trenton-Black River potential.

Papers published by the mining industry indicate the very processes that generated Mississippi Valley Deposits have, in fact, created the HTD reservoirs that host commercial accumulations of oil and gas across North America.

Using a tool kit developed to explore for HTD plays in the Devonian and Mississippian strata of Western Canada the Northwest Territories, Canadian E&P firms are tackling Appalachia with new exploration analogs. Canadian firms familiar with the Rocky Mountain front have identified both thin-skinned and thick-skinned tectonics in Appalachia -- analogous to leading edge or Triangle Zone geometries observed in the Rockies -- that set up large thrust plays involving the Trenton-Black River formations.

Western Newfoundland

Western Newfoundland is a field geologist's paradise when it comes to teaching

Black River Yields New Discovery

Since February's EXPLORER article on Canadian Trenton-Black River activity, Calgary-based Talisman Energy announced yet another discovery in the play in northern New York state.

Fortuna Energy, Talisman's wholly owned subsidiary, completed the Andrews Hz #1 gas well in the Corning area. The well, which tested a new structure, was drilled to 10,100 feet and then steered horizontally through the upper Black River formation.

Fortuna reported that the well flowed at rates of greater than 18 mmcf per day; flow rates were limited by surface equipment, according to the company.

Based on initial flow results, the company said that the Andrews well has an unconstrained potential of greater than 30 mmcf per day.

-- SUSAN EATON

On a more personal note ...

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During the summer of 1979 I worked as a summer student for Chevron Canada Minerals in western Newfoundland. A young, aspiring mining

the theories of orogenesis and plate tectonics -- very few places in the world can boast outcrops of oceanic basalts and pillow lavas juxtaposed against Cambro-Ordovician platform carbonates that have been thrusted during more than one orogeny.

Add hydrothermal dolomite reservoirs to the tectonic mix, and geologists get pretty ... excited.

"This really was one of the proving grounds for plate tectonics, where Appalachia came together," said Steven Millan, chief executive officer and chairman of Newfoundland-based Canadian Imperial Venture Corporation (CIVC).

In 1974, Millan, an AAPG member, walked the coast of western Newfoundland, studying its geology.

"My conclusion at the time was that these structures were quite complex," he said, "and the geophysics didn't have the capability of imaging these structures."

Thirty years later, seismic data acquisition and processing techniques have evolved to image thrust belts and, occasionally, to predict reservoir characteristics (see Seismic Targets and Gulf Targets). CIVC wants to acquire a multi-component, 3-D seismic survey over the company's 33,000-acre lease on the Port au Port Peninsula. In addition to the onshore lease, CIVC holds two adjacent offshore permits.

A seismic section (Norcen Line 92-067) near Portland Creek Pond that shows thick-skinned tectonics involving the competent, authochthonous platform strata.

Seismic data courtesy of Glen S. Stockmal, Geological Survey of Canada

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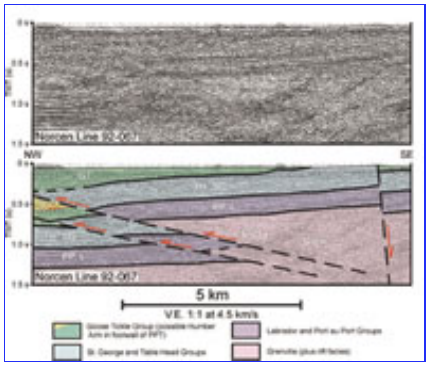


Glen Stockmal, a Calgary-based research scientist with the Geological Survey of Canada, specializes in the structural geology of the Rocky Mountains and in the leading edge of deformation, often termed "the Triangle Zone."

Stockmal first looked at seismic data from offshore Newfoundland in 1987 -- and what he saw surprised him.

"Holy smokes," he said, describing his epiphany on that first day, "that's the Triangle Zone."

Nearly 20 years later, Stockmal still gets excited by the thin-skinned and thick-skinned tectonics that he has studied in the Cambro-Ordovician succession of western Newfoundland. He is currently working on apatite fission track studies to generate a "thermo-chronology" of the various orogenies that have affected the geology of western Newfoundland.

"The times of thermal peaks or maxima," he said, "have helped us to constrain the structures and the time of their emplacement."

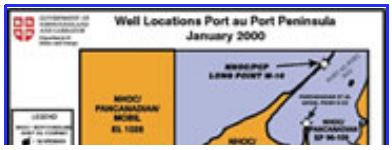
CIVC's Port au Port acreage was configured parallel to the strike of the Round Head Thrust Fault -- Millan believes the fault acts as both a conduit for hydrothermal fluids and for oil moving out of the oil kitchen. In fact, the Round Head Thrust carries the carbonate platform and underlying basement to surface. The entire stratigraphic section is repeated, under the thrust sheet.

In 1995, Hunt Oil and PanCanadian Energy (now EnCana) tested this deeper, underlying carbonate platform -- situated at approximately 3,400 meters -- with the Port au Port #1 well.

The well encountered several reservoirs.

On an extended production test, the zone flowed a total of 5,012 barrels of oil and 9.2 mmcf of natural gas over a nine-day period. The reservoir showed no signs of pressure depletion.

Port au Port #1 is not on production; to date, the well has produced a disappointing 22,000 barrels of oil -- it's been plagued by many problems, including casing integrity issues, calcium carbonate fines introduced into the reservoir while drilling through a lost circulation zone (Millan



young, aspiring mining geologist, my job involved prospecting for lead-zinc mineralization characteristic of the Mississippi Valley Type Deposits found in Appalachia.

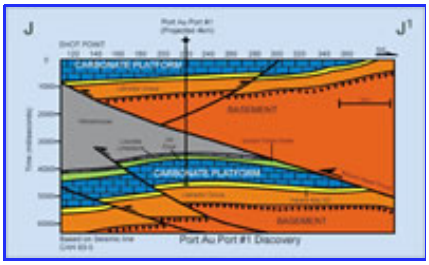
With my spray bottle of zinc oxide in hand, I zapped virtually every Ordovician carbonate outcrop I came across, looking for the telltale signs of mineralization.

That summer, I was lucky enough to go underground at the Daniel's Harbour lead-zinc mine. The dolomitized host rock at the mine was heavily karsted and brecciated -- a recipe for enhanced mineralization.

Given the extreme karsting, the mine would have flooded had the water pumps failed. In the dark -- save the narrow corridor illuminated by my headlamp -- I reflected on this as the underground river of swirling waters approached the tops of my rubber boots.

The samples I collected from the mine formed the basis of my bachelor's dissertation -- a fluid inclusion study designed to pinpoint the temperatures of the hydrothermal brines as they entered the host limestone rock, creating zebra dolomites and collapse breccias, and precipitating economic deposits of galena and sphalerite. During my dissertation, I noted the presence of globs of bitumen in the rocks and thin sections, and pondered their meaning.

Imagine my surprise, two decades later, when my geology



describes this as an underground "cave" or karst) and reservoir plugging due to very saline, produced water.

In 1999, CIVC farmed into the Port au Port acreage by virtue of drilling two sidetrack wells to Port au Port #1. The first sidetrack encountered non-commercial quantities of hydrocarbons; the second sidetrack flowed at 195 barrels of oil per day and 1.2 mmcf per day of natural gas, with no water.

Hunt and EnCana have exited the play; CIVC is now the operator.

"Hunt Oil poked a hole to prove a geological concept," Millan said. "They were surprised to get oil."

According to Millan, Hunt and its partner intended to prove the geological concept prior to testing a large Ordovician structure situated offshore.

Millan also is optimistic about the chance of success at his next location in the Port au Port Peninsula. At an estimated drilling depth of 3,400 meters and a cost of $C 5 million, the well will be located on 3-D seismic data and situated close to the Round Head Thrust Fault, increasing the chances of finding a HTD reservoir.

According to Phonse Fagan, a geophysical consultant with Newfoundland's Department of Mines and Energy, Port au Port #1 was the first well in western Newfoundland ever drilled on seismic data, albeit a regional grid.

"Now, we're moving into the next exploration cycle with small companies taking all of the seismic and well data that are released (by the government)," Fagan said.

The reservoir target at the Parson's Pond #1 well in Newfoundland's Arches Provincial Park. Note its porous, pervasively dolomitized carbonate strong petroliferous odor and staining. For at least 150 years, area residents have gathered oil from these surface seeps for local usage. Right, George Langdon takes a closer view of the reservoir target.

Photos courtesy of Tim Bird

The December 2002 licensing round in the Great Northern Peninsula of western Newfoundland was propelled by the release of 300 kilometers of 2-D seismic data to industry. Two seismic programs were acquired during the 1990s in Daniel's Harbour-Parson's Pond area, situated some 150 kilometers to the north of the Port au Port Peninsula. Interpretation of the seismic data illustrates both thin-skinned and thick-skinned tectonic features extending over a 100-kilometer-long fairway.

George Langdon, the vice president of exploration of Calgary-based Contact Exploration, is animated when he talks about the petroleum potential of western Newfoundland.

Contact is a publicly traded junior E&P company that focuses on "front-end" exploration in Eastern Canada and internationally. The company's strengths, according to Langdon, lie in identifying geological opportunities, picking up large land spreads, acquiring and interpreting seismic and attracting larger companies to drill the prospects.

In December 2002, Contact Exploration acquired three exploration licenses from the government of Newfoundland, totaling 160,000 acres onshore western

later, when my geology professor at Dalhousie University mentioned that my mining thesis had been copied by several oil companies as part of their initial hydrocarbon assessments of western Newfoundland.

Newfoundland. Two of the permits are located in the Middle Ordovician St. George Group fairway at Daniel's Harbour-Parson's Pond. This "inversion" fairway is equivalent to the Appalachian fold-and-thrust belt of western Newfoundland.

As far back as 150 years ago, the residents of Parson's Pond gathered oil from surface seeps for local usage. Mining test holes and 27 shallow wells have produced a total of 6,000 barrels of oil from this area. The deepest well, located on the north shore of Parson's Pond, was drilled to 1,302 meters before it collapsed and was abandoned. The well contained 44 degree API oil, but didn't test any of the structures delineated by modern seismic acquired in the mid- to late-1990s.

Contact spudded Parson's Pond #1 in late January, using a water rig to drill the surface hole. Once the surface casing is set, Contact will switch to a continuous coring rig. With a price tag of $C 1 million, the company intends to drill the slim hole test to about 1,200 meters, targeting the leading edge of a shallowest thrust in the allochthon. The reservoir is a deep-water carbonate facies, believed to be dolomitized, with high amplitude seismic reflectors.

A second allochthonous carbonate sheet sits at 2,000 meters drilling depth, and the underlying autochthonous carbonate platform at about 2,500 meters.

Situated at the leading edge of an imbricate sheet in a partially eroded Triangle Zone, Langdon hopes that this 1,200 meter-target may have enhanced porosity due to thrust-induced fracturing. Seismic data to the west and offshore, Langdon says, illustrate a well-preserved Triangle Zone wedging into the foreland basin.

Ordovician carbonate targets in the allochthon and autochthon lie within the oil window, he added. The source rock is a deep-water carbonate that also acts as a vertical and lateral seal.

The Parson's Pond #1 well will test a 30-square-kilometer feature that is seismically mapped. Contact estimates that the structure could contain about 100 million barrels of recoverable oil.

Originally from Newfoundland, Langdon completed his doctoral thesis on the geology of western Newfoundland. "I would love to be involved in the first great discovery in western Newfoundland," Langdon said. "That's my dream."

A third permit at Daniel's Harbour-Parson's Pond was picked up in December 2002 by a consortium of Canadian and American E&P firms: Canadian firms Deer Lake Oil and Gas and 554568 Alberta Ltd., and American partners East Resources and Ammonite Corporation. The consortium paid the equivalent of $C 10 per acre -- which represents a work commitment to the Newfoundland government -- to hold the 35,000-acre block for five years.

AAPG member Skip Hobbs, president of Ammonite, has been involved in this particular play in western Newfoundland for more than 20 years. He's conducted geological field work in the Great Northern Peninsula and has studied the lead-zinc mine at Daniel's Harbor, where hydrothermal brines altered the Ordovician host rock, creating zebra dolomites and collapse breccias and precipitating economic deposits of galena and sphalerite.

"This play is a sleeper," he said. "We realized that we had light gravity oil with trap sizes that could approach the Albion-Scipio Field and, with the thrusting, could be repeated. We know the petroleum system is there -- it's just a matter of putting enough holes in the ground to find it."

"And, it takes guts," he added. "The industry just doesn't have the guts to do onshore frontier exploration."