NORTHERN BLOCKS FIELD STUDY AND
GEOCHEMICAL ANALYSIS OF CORE SAMPLES
(Total Organic Carbon and Rock-Eval
Pyrolysis Evaluation of Seven Core Samples)

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GEOCHEMICAL SAMPLING, BIG SPRING BLOCK

These samples were collected as part of field work done on the Big Spring property in November of 1994. The accompanying map is based upon the map produced by Peter Cawood in his report to Vinland of February, 1993. Two types of sampling were carried out: (1) shale samples from the Goose Tickle Group were collected for Rock-Eval analysis, and (2) surface overburden samples were collected for the identification of hydrocarbon microseeps.

Collection sites for the first group (Goose Tickle shales) are highlighted on the accompanying map in yellow. These samples were analyzed for source rock potential by pyrolysis at CoreLabs in Calgary. All these sample sites are on the block or within 10 km of the western boundary of the block. These were ideal sample sites because rocks exposed to the west of the main (Brent Island) thrust are interpreted to be present in the core of the Big Spring anticline, which forms the dominant structure on the block, as shown.

The surface geochemical samples were collected approximately every 200 m along the 7 km stretch of the Croque road which traverses the crest of the Big Spring anticline. These are highlighted in green on the map. These samples were not analyzed further; it was found, after consultation with the labs that carry out this work in the United States, that such studies entail much more rigorous sampling, storage and rapid transit than could be carried out on this particular trip. This method, however, may still have some application on this property, and Vinland is considering contracting one of a number of consulting groups in the States to do this work at some point in the future.

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TABLE 1.
Total Organic Carbon and Rock-Eval Pyrolysis
Vinland Petroleum Inc.
Core Chip Samples

Sample Depth	Sample Type	TOC (wt%)	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	Tmax (deg C)	Hydrogen Index	Oxygen Index	Trans. Ratio
BS-6	Core Chip	1.16	0.01	0.02	0.00	389	2	0	0.33
GT-2	Core Chip	0.15	0.00	0.00	0.00	***	***	***	***

18-2	Core Chip	0.20	0.00	0.00	0.00	***	***	***	***
MB-6	Core Chip	0.36	0.00	0.00	0.00	***	***	***	***
DC-1	Core Chip	0.38	0.00	0.00	0.00	***	***	***	***
AT-1	Core Chip	0.21	0.20	0.06	0.00	***	29	0	0.77
MI-1	Core Chip	0.11	0.02	0.00	0.00	***	***	***	***

TOC = Total Organic Carbon (wt%); TC = Total Carbon (wt%); S1 = Free Hydrocarbons (mg/g); S2 = Pyrolyzable Hydrocarbons (mg/g); S3 = CO_2 released during pyrolysis (mg/g). Hydrogen Index (HI) = [(S2/%TOC)x100]; Oxygen Index (OI) = [(S3/%TOC)x100]; Transformation Ratio = S1/(S1 + S2)

*** = Unable to provide an accurate calculation based on available data.

NOTE: Due to insufficient levels and/or poor quality of organic matter, the S1, S2, and S3 values were below detection limits recognized by Rock-Eval pyrolysis.

REPORT ON TRIP TO VINLAND'S NORTHERN BLOCKS, OCTOBER 31 - NOVEMBER 7, 1994

A trip was made to Parcels 8 ("Big Spring block") and 9 ("Castor River block") in early November 1994, so that I could see firsthand and further evaluate these parcels. The following is a description of the activities undertaken on this trip.

Big Spring Block (Parcel 8)

Map: Big Spring Block (pdf - 627kb)

During this part of the trip I stayed at Con and Karen Coates' house in main Brook. Their hospitality and assistance was highly appreciated.

Day 1 (Nov 1/94): I drove to Conche to look at the Carboniferous Crouse Harbour Formation, which is equivalent to the upper part of the Tournaisian Anguille Group in the Deer Lake Basin. This is 6 km SSW of where the Pilier Bay oil seep is found. I spent half a day looking at the Carboniferous-rocks near their fault zone boundary with the Cambrian Maiden Point Formation, by the roadside and along the inside of Conche Harbour (Photo 1 and Photo 3 (pdf - 781kb)). No live hydrocarbons or bitumen shows were seen. In the fault zone down at the shorelines I spent some time photographing the cataclastic structures associated with the fault-movement. I would like to show these to a structural geologist such as Jamie Jamison (CERR). This is a northern continuation of the Taylor's Brook splay of the Cabot Fault that we see in the northwestern Deer Lake Basin, and probably provides one of the best exposed-views of the Cabot Fault. A structural study to work out the timing and kinematics of the fault zone here would make an excellent Bachelor's or Master's thesis (Photo 2 (Pdf - 328kb)).

In the afternoon I drove out to-look at the Goose Tickle Formation near Croque and noticed bituminous or organic-rich streaks in Goose Tickle along the side of the road 1.1 km west of Croque. These were quite soft and could be dug out of the solid shale with a pocketknife (see Photo 6). I took several samples of these for basic hydrocarbon analysis (Photo 4, Photo 5 and Photo 6 (pdf - 954kb)).

Day 2 (Nov. 2/94): In the morning I drove around on the woods roads on the block south of Main Brook, to check on the boundaries between the overcooked and possibly less cooked areas that Cawood identified. Ed Pilgrim of Main Brook accompanied me as a guide on this trip. There is little exposure in this area but I collected some samples from the Table Head Group along the side of the road. Here we are presumably in relatively undeformed "Slice 31, of Cawood, and these rocks do not appear to be highly deformed, cleaved or altered. Most of the Table Head along here has a petroliferous odour on a freshly-broken

surface. Samples MB-1-4 were collected from this area. In the afternoon we drove along the highway under construction which will link Main Brook with the St. Anthony airport. Here we were presumably in the upper, relatively "cooked" slices of the platform, here within the St. George and Port au Port Groups, and there was evidence of much structural disruption along this road, with beds standing on end and west-directed thrust faulting (Photo 7 (pdf - 348kb)).

Somewhere between the 3 and 4 km mark the thrust contact is crossed, and large exposures of Goose Tickle Formation have been cut out by the road-building. These are black organic-looking shales that do not appear to have undergone much low-grade metamorphism. Several samples of these were collected for Rock-Eval/TOC studies (MB-6.1, 6.2, 6.3, 6.4).

Day 3 (Nov 3/94): in the morning Ed Pilgrim and I went up to Spring Inlet in a small open boat. Here I collected from the Goose Tickle Formation, which is exposed on the east side of Spring Inlet. Several samples were collected from here (BS-1 to -7). On the way back we stopped on the east side of McGray Island, collected several more samples of the Goose Tickle (MI-1 to -5), and took shelter from the heavy rain in a camp. Next we came back to American Tickle where samples AT-1 to -3 were collected from the Goose Tickle Formation. In the afternoon we steamed across to Goose Tickle and I collected samples GT-1 to -3 from there; on the way back to main Brook in the late afternoon we stopped in at the core east of Jack Patey's Point and I collected Samples DC-1 and -2 from the Goose Tickle Formation there. These last localities are just north of and presumably along strike from the new exposures seen up on the new highway on the previous day (in fact the Brent island thrust emerges on the shoreline there). This group of samples should provide us with some good reconnaisance scale coverage of maturation/TOC variations in the area.

Day 4 (Nov 4/94): With the aid of the Stouge detailed 1:50000 map sheets faxed by Cabot, I returned to "18-road" and connected roads on the southwestern edge of the block. Stouge's map shows small narrow exposures of Goose Tickle under the west-directed thrust slices (Slices 4-6 of Cawood) in this area. I went back to these roads to look for some of these exposures. I did traverses on a couple of woods roads where these were marked on the map; the most I could see was fracturing in the Table Head limestones that probably comes from proximity to the thrust faults. I expect that the thin slivers of Goose Tickle shown on the map have only very limited exposure, and are acting as a lubricant at the base of thE upper thrust package - in fact this may be part of the reason Cawood made a distinction between the upper (4-6) and lower (1-3) groups of slices.

However, I believe I found a new outcrop of Goose Tickle that is fairly well exposed but doesn't appear to be mapped properly. It occurs in a little clearing on the south side of the road, about 0.5 km west of the bridge crossing Salmon River. It looks like the base of the thrust shown on the map just north of the road comes across to the south side of the road here. Samples 18-2 and -3 come from grey-black splintery shales here. This may provide us with another Goose Tickle data point.

In the afternoon I drove back on the Croque road to collect samples for the Kalhoun surface aromatic method. I took samples from the upper 6" of the soil, and sampling conditions varied because of the variation of the soil from black loamy to reddish sandy material. Samples were collected by scooping with a small garden trowel. Because of the boggy or heavily vegetated terrain the samples were taken mainly from the side of the road. Samples were taken at approx. 200m intervals along the 7 km stretch back to the Main Brook road (Route 74, see location on accompanying Map).
in the evening I drove to Port aux Choix and stayed at the Sea Breeze motel.

Castor River Block (Parcel 9)

Day 5 (Nov 5/94): I took a boat with Randell Hawkins (fisherman) and Rex Boyd to St. John Island to look at the reported oil/bitumen seep at Photography Point and on the shoreline inside Square Rock, as reported by Ian Knight in his map report on this area. The hydrocarbon show at Photography Point is quite spectacular in my opinion. It occurs as a thin seam, generally 0.5-2.0 cm thick, in association with a zone

of epigenetic sphalerite mineralization (Photo 11 & 12 (pdf - 811kb)). In fact, small yellow-weathering crystals of sphalerite are imbedded in the bitumen. The bitumen is black in colour, and forms a recessive unit that is very difficult to sample except by digging out small chunks with a pocket-knife. The bed is exposed for some 10m along a small protruding ledge which dips gently eastward (see photos); this area is situated inside a tall bluff that is in the process of being cut off by erosion to form a sea stack. The fact that the bitumen is soft and forms a discrete layer suggests that it may be undergoing recharge today - in other words it may be an active bitumen seep from stratigraphically equivalent strata buried more deeply to the east beneath the Labrador Group riding on the Ten Mile Lake thrust. (Strategic note: it is interesting that Ian Knight does not mention this bitumen seam in his report; perhaps he did not know about it at that time).

Tar blobs up to several inches in diameter are present on the rocks around the shoreline (Photo 16 & 17 (pdf - 614kb)) - could they have "flown" or oozed on hot summer days from the bitumen seep?

The showing at Square Rock is of a different nature. Here no discrete bitumen layer was identified. The low cliffs here contain a stockwork of mineralized dolomite veins which cut the Table Point limestone (Photo 18 (pdf - 330kb)). The vertical veins have a dyke-like appearance; areas around the fracture network show local gradations from yellowish brown to black (Photo 19 & 20 (pdf - 707kb)). The fresh surface is light to medium brown fine-grained dolomite which appears to derive much of its colour from impregnation by oil, as these rocks also give off a highly petroliferous odour. Of these dolostones in general, Knight notes that "bitumen residues fill open spaces throughout the dolostones". The hydrothermal fluids which produced the mineralizing stockwork here must have had an associated hydrocarbon phase. This has exciting implications, for there is some data to suggest that the mineralizating fluids at Daniel's Harbour migrated from carbonate platform rocks now buried deep under the Long Range (see Tom Lane's Ph. D. thesis, MUN, 1990). This might mean that hydrocarbons have moved in the same hydrodynamic system as the mineralizing fluids, and provides further support for the idea that extensive areas of carbonate platform and/or source rocks (Green Point in this case?) may be buried eastward beneath the Long Range Inlier. In the area of the Castor River block this indirectly supports the idea that the Labrador Group exposed in the Highlands of St. John is allochthonous above a fully preserved carbonate platform sequence (Photo 21 & Photo 22 (pdf - 336kb)).

Day 6 (Nov. 6/94): I took a float plane from Hawke's Bay and flew north to the Castor River Block with pilot Andy Caines. We flew north along the coast to Mount St. Margaret/Three mile Lake Provincial Park (northern boundary of the land) and then swung eastward and inland as far as East Castor Pond, which marks the northeastern corner of the land. We then turned south to cross the Long Range Thrust onto the Precambrian, and then turned westward to fly out over the southern boundary of the property. The accompanying photographs show this general flight path (Photo 22 (pdf - 336kb), Photo 23 and Photo 24 (pdf - 633kb); also see accompanying miscellaneous photographs in Appendix (pdf - 535kb)).

Such an overflight is a good way to assess the surface conditions of the property, and is most effective when combined with recent air photos and examination of roads an the ground. In this case, because I was trying to see the whole property within the limited time, I didn't get as good photos of the new woods roads (see ground photos in Appendix (pdf - 535kb)) on the northern side of Castor River (i.e., in the centre of the permit) as I would have liked. (I didn't know about some of the newest ones until I drove them on the next day). Part of the problem with flying on this particular day was that, although it was mostly sunny, there was a low thin cloud cover at about 2000', which meant that we had to fly at about 1600, most of the time. Higher altitude would have afforded a better overall view of the terrain. In future it might be better to try and drive the roads first and then fly over them.

in the afternoon I drove the new woods road that goes in from Squid Cove, south of Castor River along the southern side of the permit. This road appears from its approximate projection on the map to go in about 13 km. The road branches a few kilometres in; one branch heads south and climbs up toward the Highlands of St. John, while the other branch heads east more or less parallel to the-Castor River. The road appears to end near the eastern end of Leg Pond, but I was only able to go in on this fork a short distance due to slippery conditions. As the photos show, these roads are in very good shape and would be excellent for seismic acquisition (see photos in Appendix (pdf - 535kb)).

In the late afternoon I took a quick look at the rocks at the New Ferolle lighthouse. Here the St. George Group is exposed; these massive limestones and dolostones have a petroliferous odour.

Day 7 (Nov. 7/94): In the morning I drove the woods roads inside Three Mile Pond Provincial Park. Here this is a network of new woods roads that head in a grossly southwestern direction toward Leg Pond. I drove for about 9.3 km and by my rough dead reckoning I reached the end of the road somewhere within a kilometre or two of the north side of Leg Pond. A quick and easy way to find out exactly where this road goes would be o send somebody in with a GPS (satellite positioning) system; maybe Rex Boyd or some other local person could do this. Again, these roads are in pretty good shape and would be excellent for seismic work (see ground photos in Appendix (pdf - 535kb)).

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Dec 5/94

**** Extra Photos:**

Photo 8 (pdf - 326kb)

Photo 9 (pdf - 322kb)

Photo 10 (pdf - 359kb)

Photo 13 & 14 (pdf - 649kb)

Photo 15 (pdf - 318kb)