

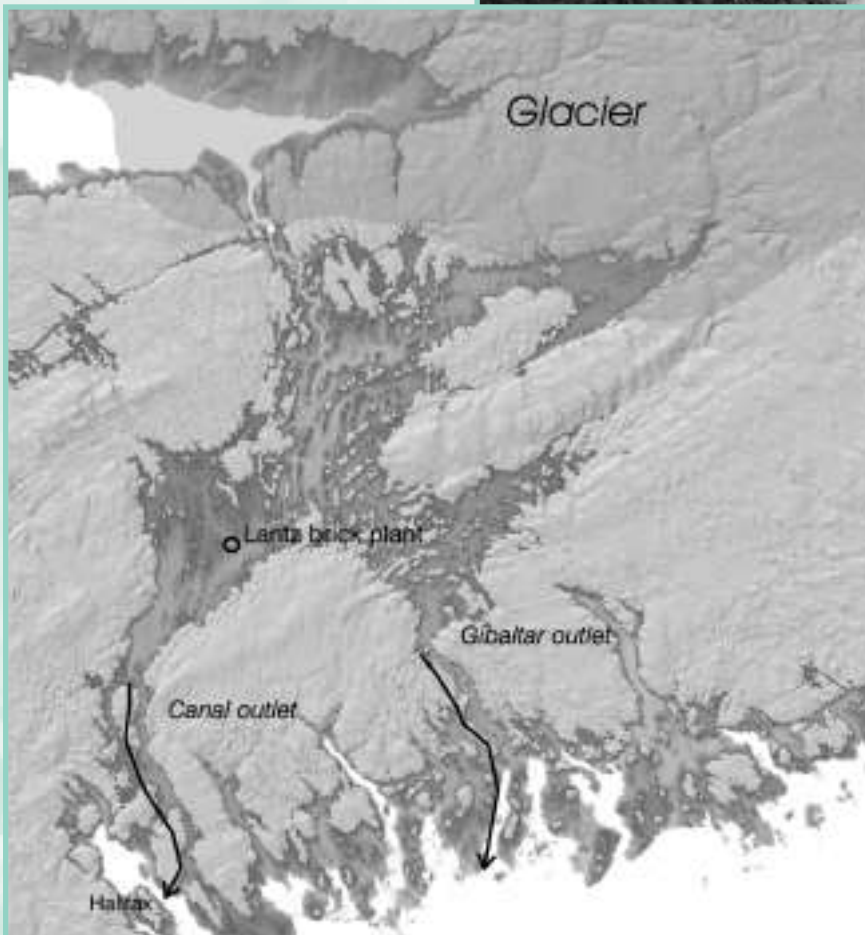
# Glacial Lakes in Nova Scotia and their Economic Legacy of Clay!

By Ralph Stea, Garth Demont,  
and Craig Lake

Shubenacadie-Grand Lake is an impressive lake today, but it is a mere shadow of its former self. At the end of the last ice age the remnants of kilometre-thick glaciers retreated out of the Bay of Fundy and Laurentian Channel leaving isolated ice caps over northern Nova Scotia. The melting glaciers acted as huge dams covering northern and western river outlets and forcing glacier meltwater to find alternative routes to the ocean.



Lantz brickyard and clay quarry.

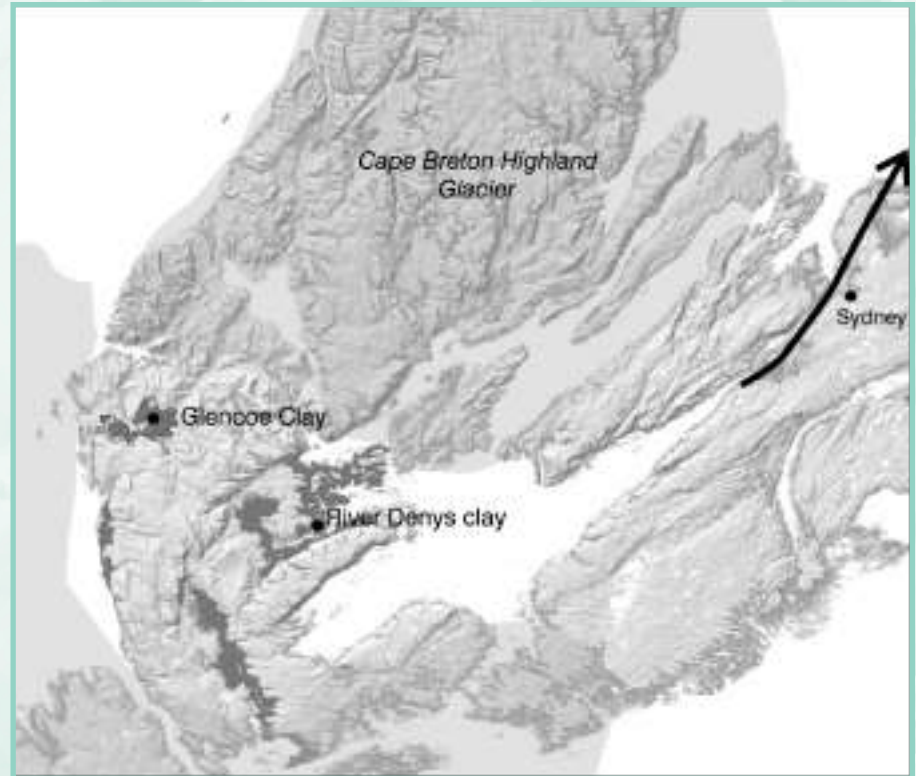


These new meltwater routes were at a higher elevation, thereby creating vast glacial lakes in lowlands such as the Shubenacadie Valley in central Nova Scotia and River Denys Lowlands in Cape Breton. In the Shubenacadie Valley, for instance, Glacial Lake Shubenacadie covered more than 200 square kilometres at depths of 30 m or more. The meltwater from this vast lake was routed through two gorges, one represented today by the chain of lakes (Fletcher's Lake, Lake Williams, Lake Charles and Micmac Lake) leading into Halifax Harbour,

The extent of Glacial Lake Shubenacadie. The glacier dam over the mouth of the Shubenacadie River prevents normal drainage into the Bay of Fundy, hence the back up of water into the Shubenacadie Valley. The arrows indicate meltwater spillways.



Glacial Lakes in Cape Breton.  
The arrow indicates the  
meltwater spillway through  
East Bay and Sydney.



and the other by Gibraltar Rock down the Musquodoboit River. The depth of Glacial Lake Shubenacadie was defined by the elevation of rock sills in the channels at both these outlets. Using a bathtub analogy, the rock sill can be likened to the edge of a overflowing bathtub, and the glacier to a drain plug.

The River Denys Lowlands are bounded by the Creignish Hills and the North Mountain. This low-lying area was periodically inundated by glacial lakes during the last ice age when highland glaciers advanced and retreated. The glacial lakes were higher extensions of the present-day Bras d'Or lakes, whose outlet at the Great Bras d'Or was dammed by Cape Breton Highland glaciers. Meltwater had to find an alternate route to escape to the ocean, and the path of least resistance was around the remnant ice caps on the highlands through the East Bay-Sydney River corridor.

Where can we find the geological evidence of these former lakes? Lantz, Hants County is one place to go. The Shaw Resources plant here derives much of its brick-making materials from a pure brown clay quarried just behind the railway tracks at the plant. These clay deposits were created by glacier meltwater streams flowing into Glacial Lake Shubenacadie. The heavier sand and gravel materials

were immediately dumped out near the shoreline, while lighter clay-sized materials spread throughout the lake, settling out into thick deposits when the lake surface conditions were calm or ice-covered during winter.

While conducting regional geological mapping, DNR has discovered economically significant clay deposits. Deposits found near Glencoe Station in western Cape Breton, have economic potential for use in ceramic applications such as pottery and brickmaking. In the River Denys Lowlands, similar glacial lake clays were used for brick making at the end of the 1800s. James Miller opened a brick plant in the 1890's at Eden, in large part due to the proximity of pure clay to the intercolonial railway line. Some of those bricks still survive today in walls of the Sydney Steel Plant, and the St Columba Catholic Church in Iona.

In association with Dalhousie University, DNR has been evaluating a clay deposit near River Denys for its potential use as a landfill seal and liner. Evaluation began with detailed geological mapping of the extent and thickness of the deposits. Using an excavator, pits were dug throughout the deposit to observe variations in the thickness and grain-size that might affect the economic potential of the clays. Samples were obtained for further laboratory analyses at Dalhousie University.

Clays, because of their fine-grained, plastic nature, have significant application as natural impermeable seals for projects such as landfill liners and cover seals. Environmental standards demand high impermeability and long term stability for liner material. The purpose of compacted clay in a landfill liner is to minimize contaminant transport to underlying groundwater.





Excavating a clay deposit near River Denys (Eden). The CNR rail line to Sydney can be seen in the background.

Contaminant transport through a bottom liner can occur via “leakage”, diffusion, and dispersion. When the “leakage” is relatively slow (i.e. the clay is relatively impermeable), dispersion becomes negligible, and diffusion tends to dominate the contaminant transport process. This diffusive transport tends to be a very slow process compared to “leakage”, and hence the reason that relatively impermeable clay (i.e. a clay with low hydraulic conductivity) is used as a liner in many landfills.

The hydraulic conductivity of a soil depends on its grain-size, structure, mineralogy and chemical properties. Clays with lower hydraulic conductivities are preferred since this promotes less “leakage” and potentially slower diffusion. Preliminary data from the River Denys clay indicates that these deposits have excellent potential due to low hydraulic conductivities and relatively high plasticity.

The Sydney Tar Ponds and Coke Oven cleanup will require several hundred thousand tons of clay fill sealant to prevent containment diffusion. The River Denys area contains clay deposits of exceptional purity with thickness and extent still to be determined. DNR, in conjunction with the Tar Ponds Agency, Enterprise Cape Breton, Office of Economic Development, and Strait Highlands RDA, are looking at the feasibility of using the River Denys clay deposits

for this application. The proximity of these deposits to the railway may also provide renewed economic interest in this important infrastructure asset.

Industrial clays are only one of the many legacies of the former great lakes in Nova Scotia at the end of the last ice age. Agriculture, forestry and human settlement patterns can all be linked to the glacial lake landscapes and deposits. For further information on glacial lakes and Nova Scotia landscapes take the Virtual Tour of Nova Scotia! :

<http://www.gov.ns.ca/natr/meb/field/start.htm>

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Close-up of massive, pure, plastic clay that characterizes these deposits.