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NOVA SCOTIA Natural Resources

Stratigraphy and Structure of the Orangedale Salt Deposit, Windsor Group, Central Cape Breton Island, Nova Scotia

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The Orangedale salt deposit is defined by three wells in the Orangedale area, 10 km northwest of Malagawatch, in central Cape Breton Island. The host strata are part of the regionally extensive Viséan Windsor Group.

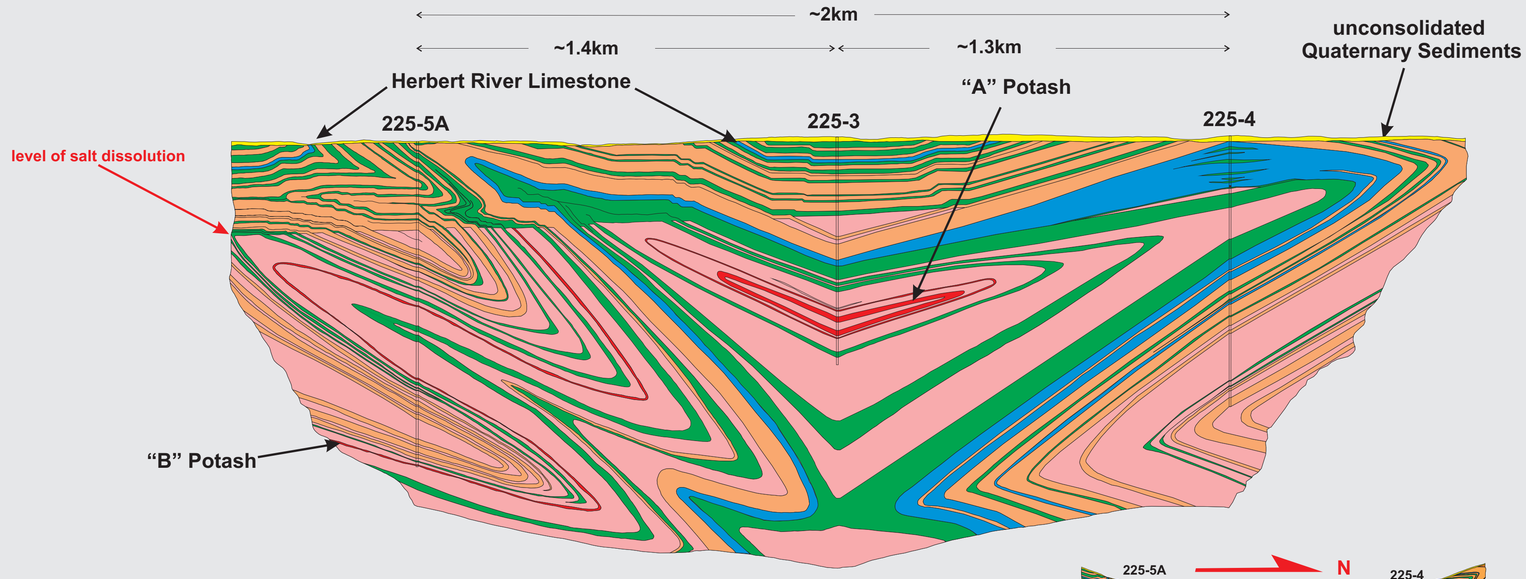
Well Noranda-225-3 drilled into a moderate to steeply dipping succession of interbedded siltstone, gypsum and minor limestone. At 75m, the well intersected the Herbert River Limestone, the base of which marks the defined base of the Upper Windsor Group. At 260m, the well penetrated the first salt horizon. This salt interval contains thin interbeds of anhydrite with minor limestone as the well passes into the lower part of the Middle Windsor Group. At 355m, anhydrite with interbedded dolostone becomes the dominant lithology. At 430m, the thicker dolostone units disappear, indicating the changeover to Lower Windsor Group rocks and the second major zone of salt. The 'A' potash was encountered at 575m and intersected again at approximately 650m in overturned Lower Windsor strata. The well did not encounter the Middle Windsor Group 'B' potash which was possibly removed by salt dissolution. Total depth of the well is 754m.

Noranda-225-4 drilled into 171m of leached caprock consisting of lower Middle Windsor Group gypsiferous siltstone and carbonate before intersecting the first salt with interbedded siltstone of the upper parts of the Lower Windsor Group at 160m. At 268m, the drill penetrated overturned Lower Windsor salt and proceeded downhole but up-section into Middle Windsor dolomite and anhydritic dolomite before intersecting 240m of overturned Middle Windsor salt. Noranda 225-4 did not encounter the 'A' or 'B' potash zones. Overall, the well records an overturned asymmetrical fold containing Middle and Lower Windsor Group rocks.

Well Noranda-225-5A contains 1078m of Middle Windsor Group strata. The hole first drilled into overturned leached caprock of gypsum, and siltstone. It penetrated five fold axes repeating the distinctive 'Triplet Marker' horizon six times, and the Middle Windsor 'B' potash zone three times. The thickest intersected salt zone was encountered between 450m and 800m in a folded section of strata.

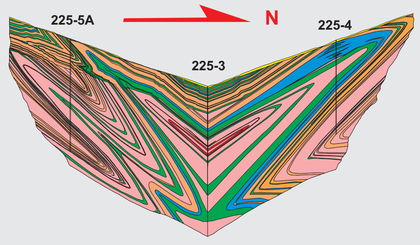
The Orangedale salt deposit displays a complex post-depositional tectonic history in which Windsor Group rocks are folded and overturned to form northeast-southwest to north-south trending inclined horizontal folds. The area has relatively good economic potential for salt resources. However, the potash may be of lesser economic potential due to the structural complexity of the deposit.

Orangedale salt deposit

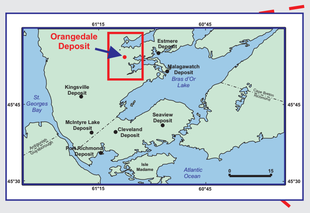


Fold repetition within the Middle Windsor Group is a striking feature of the Orangedale deposit. The scale of folding is best illustrated by 225-3 which collared in an upright limb and proceeded down-section for ~600m before intersecting a major fold axis.

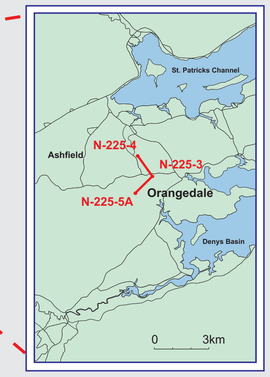
In general terms, the structural setting for the Orangedale deposit is a series of west verging tight to isoclinal folds. The plunge of the folds is not well constrained, but is thought to be moderate.



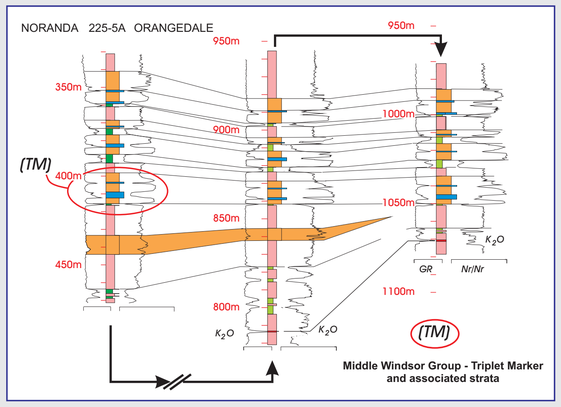
Oblique view of panel diagram looking ~ westerly from above



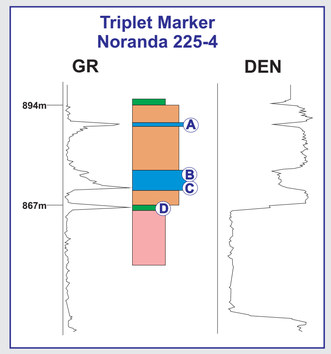
Location of the Orangedale salt deposit showing its relationship to other major salt deposits in south central Cape Breton Island



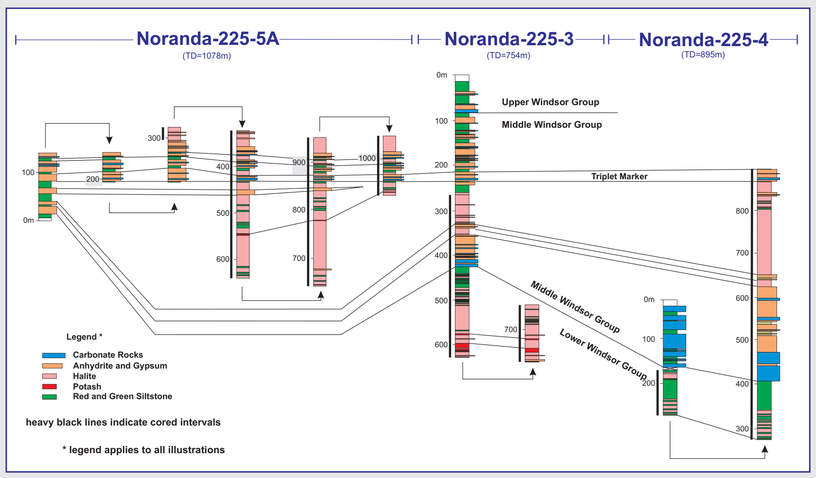
The "Triplet Marker" - a key stratigraphic marker in the Middle Windsor Group



Mechanical logs provide a very useful stratigraphic tool in Windsor Group study. In hole 225-5A, the typical expression of the so-called "Triplet Marker" and overlying strata illustrate fold repetition on a large scale. Structures of comparable scale have been documented at most central and southern Cape Breton Island salt deposits.



Photograph locations within the "Triplet Marker" at the base of Noranda 225-4. Note the typical three-part Gamma Ray response for the marker suite. This distinctive signature provides a valuable correlation tool within the Middle Windsor Group. The drilled section (overturned) has been corrected to its normal stratigraphic orientation.



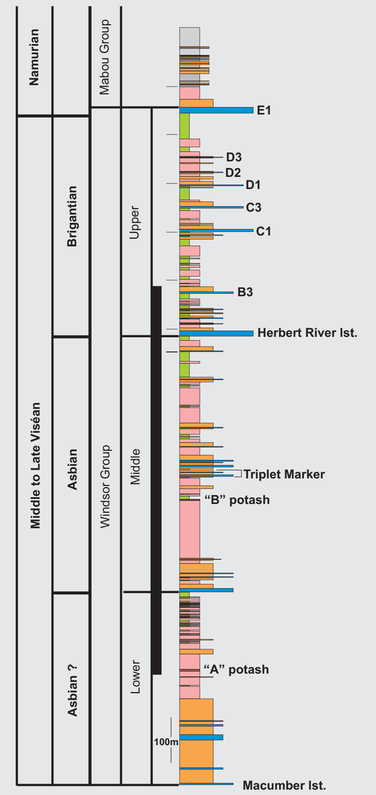
Stratigraphic summary for the three wells which define the Orangedale salt deposit. Arrows indicate the position of fold axes and downhole direction. Overturned sections have been returned to normal stratigraphic orientation to show correlation across fold axes and between wells.

Pale to dark grey-brown oncolitic to sub-oncolitic, bioclastic limestone marking the middle strong GR peak in the "Triplet Marker". The argillaceous content of the limestone is presumed to cause the GR "spike". Photograph in B taken at ~ 874m; C taken at ~ 871m.

Stromatolitic dolostone marking the highest GR peak of the "Triplet Marker". Photograph taken at ~ 885m. The strong GR peak is not yet explained, and is quite atypical for dolostone.

Mottled pale grey-green and grey-brown siltstone which marks the strong GR peak at the base of the "Triplet Marker". Photograph taken at a depth of ~866m.

Composite Stratigraphy Windsor Group of central Cape Breton Island



A composite Windsor Group succession, shown above, can be constructed using data from the Malagawatch and McIntyre Lake deposits. The record provided by Orangedale deposit wells is shown by the heavy black line. Important marker beds intersected include the "A" and "B" potash horizons and the regionally diagnostic "Triplet Marker" horizon. Mechanical log interpretation permits identification of the Herbert River limestone member at the base of the Upper Windsor Group, and the B3 limestone above the Herbert River. The record at Orangedale does not include the lowest part of the Windsor Group, or the upper parts of the Upper Windsor Group.

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