4. Chemo-stratigraphic database

Future discoveries of new deposits of many of the above commodities; and of other types of economic mineralization (including sedimentary exhalative (SEDEX) base- or precious metal occurrences; diamonds; and shallow gas resources) within the Mesozoic will likely rely, to a great extent, on geochemical data tied to the stratigraphy. The development of a chemo-stratigraphic database was described by Bamburak (2008a, b). This work was recently enhanced by the analyses of samples (collected in August 2008) as part of the Shallow Unconventional Shale Gas Prospects Project (See: **Poster T24**), described by Nicolas (2008) and by Nicolas and Bamburak (2009). The results of Fedikow et al. (2009), who conducted soil geochemistry transects in the vicinity of shallow gas wells in the Manitou area, in 2009 show some interesting correlations to the bedrock geochemistry.

The results of geochemical analyses of the Upper Cretaceous beds in southwest Manitoba, stored in the chemo-stratigraphic database, show that there is a relative enrichment of a number of rare earth elements (REE) and of thorium (Th) and uranium (U), as shown in **Figure 16**, within the *Gammon Ferruginous Member of the Pierre Shale*.

Recently collected samples (Boyne Member-UB, BB and LB, shown in **Table 3**), under the Shallow Unconventional Shale Gas Prospects Project (Nicolas and Bamburak, 2009), also show similar increases in REE, Th and U within the Babcock beds of the *Boyne Member of the Carlile Formation*. However, these increases are also accompanied by a corresponding increase in petroleum potential (S1+S2) and TOC (**Figure 16**).

The thorium increase within the Babcock beds shown in Figure 16 shows a close correspondance to an increase in thorium in soil in the immediate vicinity of a gas well in the Manitou area (**Figure 17a**) sampled by Fedikow et al. (2009). **Figure 17b** shows the thorium anomaly from their study.

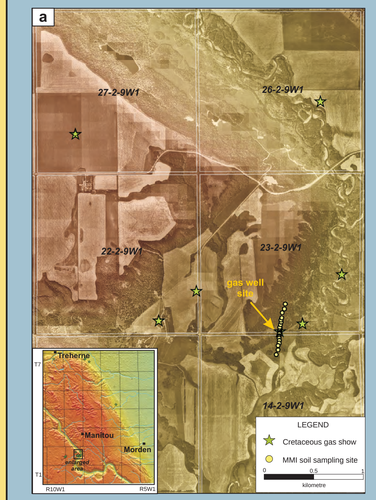
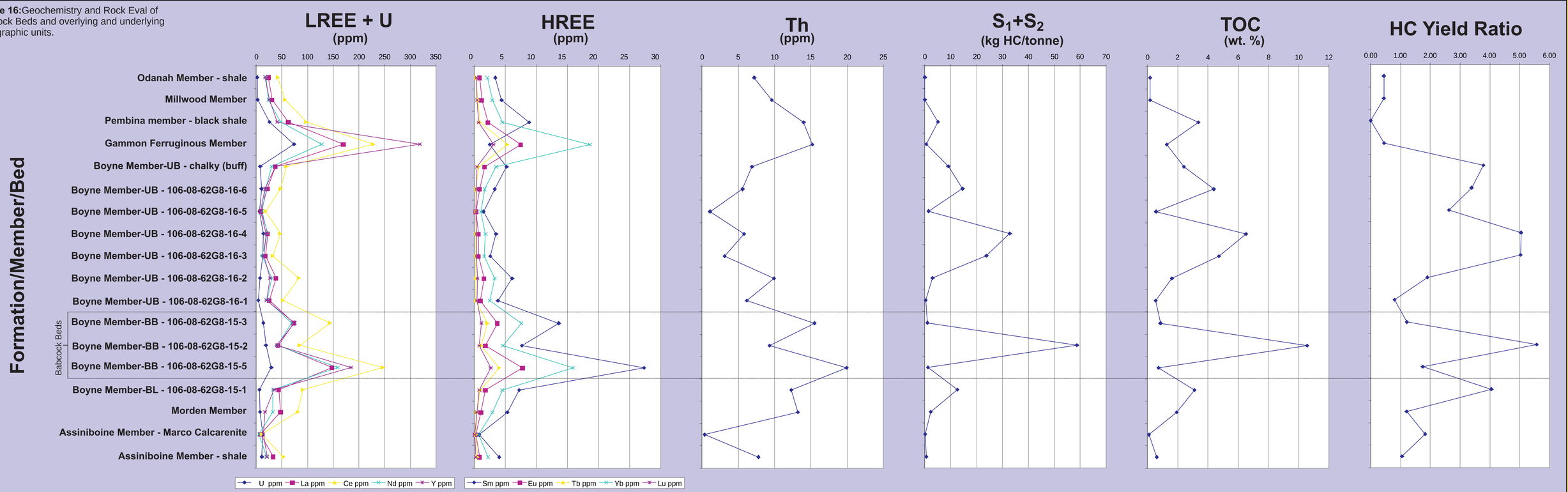


Figure 17: (a) MMI sampling transect south of Manitou; **(b)** Plot of thorium MMI values along transect, red arrow indicates gas wellhead location along transect (from Fedikow et al. 2009) .

Table 3: Samples used for inorganic chemical analyses and rock eval depicted in Figure 16.

Sample Interval	Analysis Conducted
Odanah Member-shale	IC-average 16 outcrop samples, RE-average 9 outcrop samples
Millwood Member	IC-average 6 outcrop samples, RE-average 2 outcrop samples
Pembina Member-black shale	IC-average 67 outcrop samples, RE-average 9 outcrop samples
Gammon Ferruginous Member	IC-average 11 outcrop samples, RE-average 3 outcrop samples
Boyne Member-UB-chalky (buff)	IC-average 38 outcrop samples, RE-average 28 outcrop samples
Boyne Member-UB-106-08-62G8-16-6	medium brown shale-just above highest coquina bed
Boyne Member-UB-106-08-62G8-16-5	coquina beds-abundant clam shells
Boyne Member-UB-106-08-62G8-16-4	zebra beds-light grey to beige stripe-chalky
Boyne Member-UB-106-08-62G8-16-3	zebra beds-buff coloured stripe
Boyne Member-UB-106-08-62G8-16-2	zebra beds-banded beige buff
Boyne Member-UB-106-08-62G8-16-1	greenish medium grey shale
Boyne Member-BB-106-08-62G8-15-3	Upper Babcock beds-siltstone to fine sandstone, resistant, at top of unit
Boyne Member-BB-106-08-62G8-15-2	Middle Babcock beds-brown to buff to grey silty shale to shaly siltstone
Boyne Member-BB-106-08-62G8-15-5	Lower Babcock beds-siltstone beds interbedded black shale laminae
Boyne Member-LB-106-08-62G8-15-1	lower black speckled shale-lowest exposed unit on outcrop
Morden Member	IC-average 23 outcrop samples, RE-average 6 outcrop samples
Assiniboine Member-Marco Calcarenite	IC-average 5 outcrop samples, RE-average 2 outcrop sampes
Assiniboine Member-shale	IC-average 13 outcrop samples, RE-1 outcrop sample
UB-Boyne Member Upper Beds, BB-Boyne Member Babcock Beds, LB-Boyne Member Lower Beds IC-inorganic chemical analyses, RE-Rock Eval 6	

Figure 16: Geochemistry and Rock Eval of Babcock Beds and overlying and underlying stratigraphic units.



Mineral potential of Mesozoic rocks in southwest Manitoba

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