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Upper Cretaceous and Paleocene Stratigraphy, Gas Shale and Industrial Minerals of the Pembina Mountain and Turtle Mountain Areas

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GAC–MAC 2013: Field Guide Summary

Upper Cretaceous and Paleocene Stratigraphy, Gas Shale and Industrial Minerals of the Pembina Mountain and Turtle Mountain Areas

GAC–MAC Winnipeg 2013, pre-meeting field trip

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FIELD TRIP OBJECTIVES

The Manitoba Escarpment (Fig. 1) provides a breathtaking view of the prairies in southwestern Manitoba. The escarpment and its many incised valleys offer a glimpse into the eastern extent of the Upper Cretaceous and Paleocene stratigraphy of the Western Canadian Sedimentary Basin. Consisting of shale and siltstone strata interbedded with numerous bentonite seams, the Pembina Hills in the southern end of the escarpment is the best place to see the Upper Cretaceous formations in detail. Further to the west, the Turtle Mountain area provides rare access to uppermost Upper Cretaceous and Paleocene sedimentary rocks.

This three-day field excursion will include stops at outcrops from the Favel (Second White Specks equivalent), Carlile (Niobrara equivalent; Fig. 2), Pierre Shale (Bearpaw equivalent; Fig. 3), Boissevain (Fox Hills, Eastend and Whitemud equivalent) and Turtle Mountain (Ravenscrag and Fort Union equivalent) formations. The Pembina Hills area has a long history of oil and gas exploration; the field trip will include visiting a few historic, rudimentary, shallow gas well sites, and visits to outcrops of potential shale gas reservoirs.

Mineral resource exploitation in southwestern Manitoba has a long and rich history, and has helped build the communities in this area. Field trip stops will include sites and discussions on natural cement, brick making (including the Leary Brick Plant; Fig. 4), aggregate (including the exotic gravel of the Souris Agate Pit; Fig. 5), and bentonite mining. Examples of rehabilitated surface mining sites will also be visited.

One of Manitoba's top travel destinations, The Canadian Fossil Discovery Centre (CFDC), is located in the beautiful city of Morden. The CFDC is active in excavating Cretaceous marine reptiles, birds and fish, such as mosasaurs and *Xiphactinus*. Their museum displays fossils that are found along the Manitoba Escarpment, including the 13 m long mosasaur named 'Bruce' (Fig. 6), along with pleisiosaur, hesperornis (birds) and fish exhibits. The field trip will include an evening dinner event with exclusive access to the museum and its collections, and a visit to one of their active dig sites.

Figure 1. Mount Nebo at the edge of the Manitoba Escarpment, with a picturesque view of the 1st Prairie Level in the distance.

Figure 2. Outcrop of the Boyne Member of the Carlile Formation (First Speckled Shale in Manitoba) in Snow Valley along Roseisle Creek, southwest of Roseisle, Manitoba.

Figure 3. Bentonite seams and black shale interlayers within the Pembina Member of the Pierre Shale in the Pembina Hills, southwestern Manitoba.

Figure 4. Historical site of the Leary brick plant near the community of Roseisle. This kiln was operational from 1900 to 1950, utilizing shale from Morden Member of the Carlile Formation.

Figure 5. Pleistocene – Recent gravel deposits with redeposited Tertiary-aged gravels that contain 'exotic' agate, jasper and petrified wood pebbles and cobbles; Souris Agate Pit, Souris, Manitoba.

Figure 6. Exhibit of 'Bruce', a Cretaceous-aged mosasaur (marine reptile), discovered within the Pembina Member of the Pierre Shale in 1974, at The Canadian Fossil Discovery Center in the city of Morden, Manitoba.

The field trip stops will include discussions on stratigraphy, industrial minerals (non-swelling calcium bentonite, natural cement rock and lignite) and shale gas. There will be opportunities to collect selenite crystals, agate, jasper, petrified wood and fossils, as well as a visit to the Souris Rock Shop. This field trip complements the GAC–MAC 2013 *Special Session entitled Williston Basin and Other Intracratonic Basins – Sedimentology, Stratigraphy, Paleontology and Resources.*

OTHER INFORMATION

The Pembina Hills and Turtle Mountain areas are approximately 1.5 hours and 3.5 hours, respectively, west of Winnipeg. The field trip will include one night in the city of Morden and one in the town of Boissevain. Most of the stops are roadside or accessible by short paths; one stop includes a 4.5 km hike (round trip) along trails and a stream bed, which can be wet and slippery.