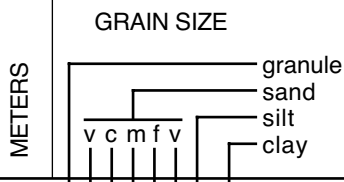


Released as part of Appendix 6 in
AER/AGS Open File Report 2017-08

Logged by: F. J. Hein

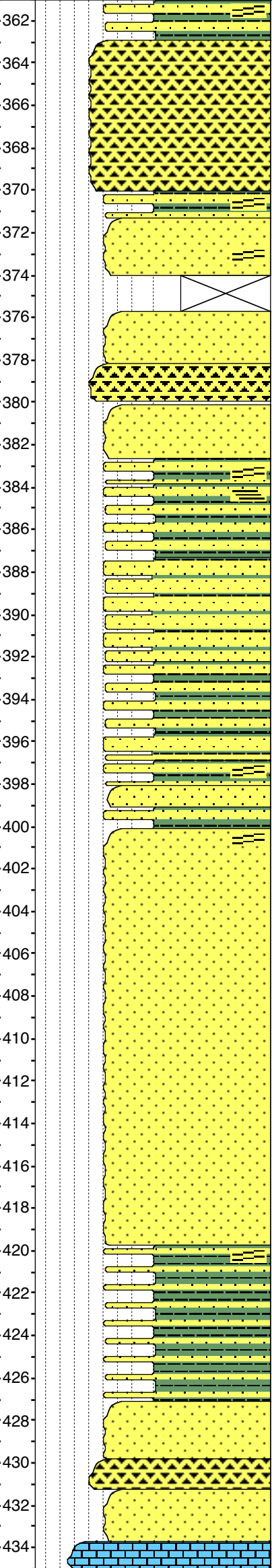
Remarks: General log done for the Surmont Hearing, as part of Staff Assisting the Panel



Picks: Top Wabiskaw (T21) = 339.5 m; Top Wabiskaw C (T11) = 348.5 m; Top McMurray A1 Sequence (E10) = 350.5 m; Top McMurray A2 Sequence = 353 m; Top McMurray Channel Sequence (E10) = 361 m; sub-Cretaceous unconformity/ Top Paleozoic (Pz) = 433.8 m

Core starts about 1.5 m below top of McMurray Channel Seq.

REMARKS



Top of core at 361 m
starts in the McM
Chnl sequence

Devonian 433.9 m

AppleCore colour legend

LITHOLOGY

	SAND/SANDSTONE		SHALE/MUDSTONE		organic shale		LIMESTONE
	silty sand		silty shale		coal		Calcareous shale
	shaly sand		sandy shale		breccia		Lost Core
	sandy silt		clay/claystone				

CONTACTS

	Sharp		Erosional
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PHYSICAL STRUCTURES

	Current Ripples		Trough Cross-strat.		Oscillatory Ripples		Planar Tabular Bedding
	High Angle Tabular Bedding		Low Angle Tabular Bedding		Wavy Parallel Bedding		Synaeresis Cracks

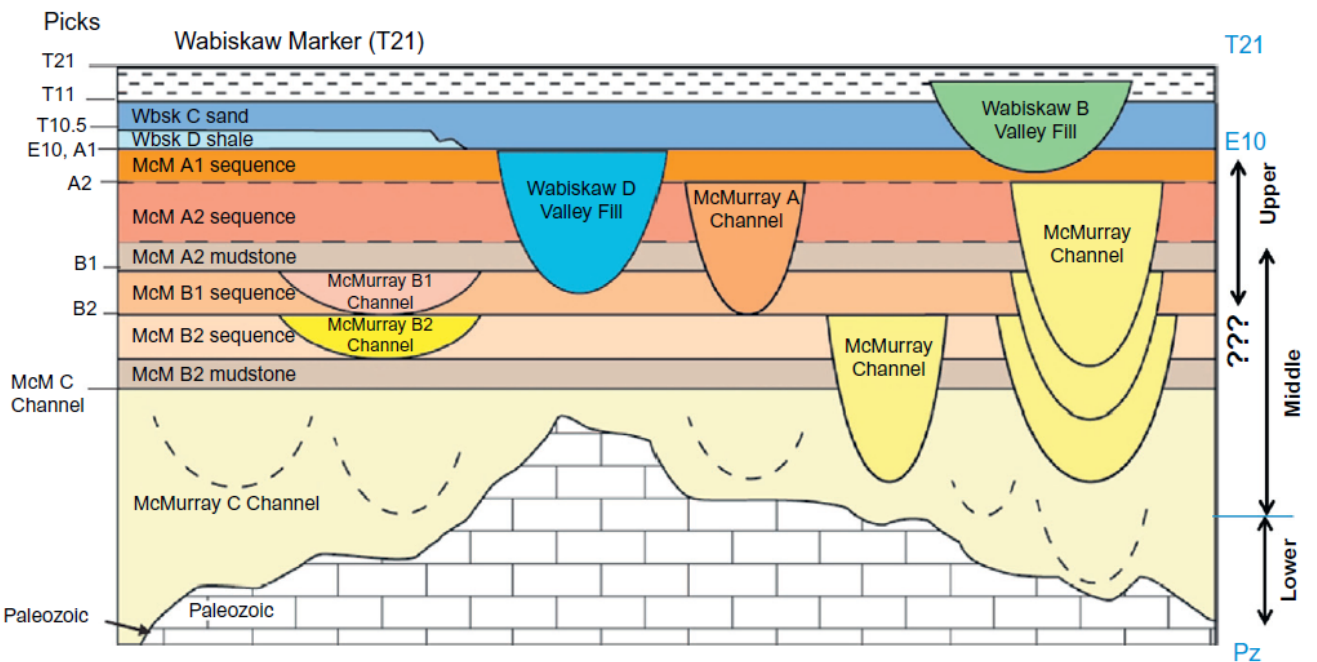
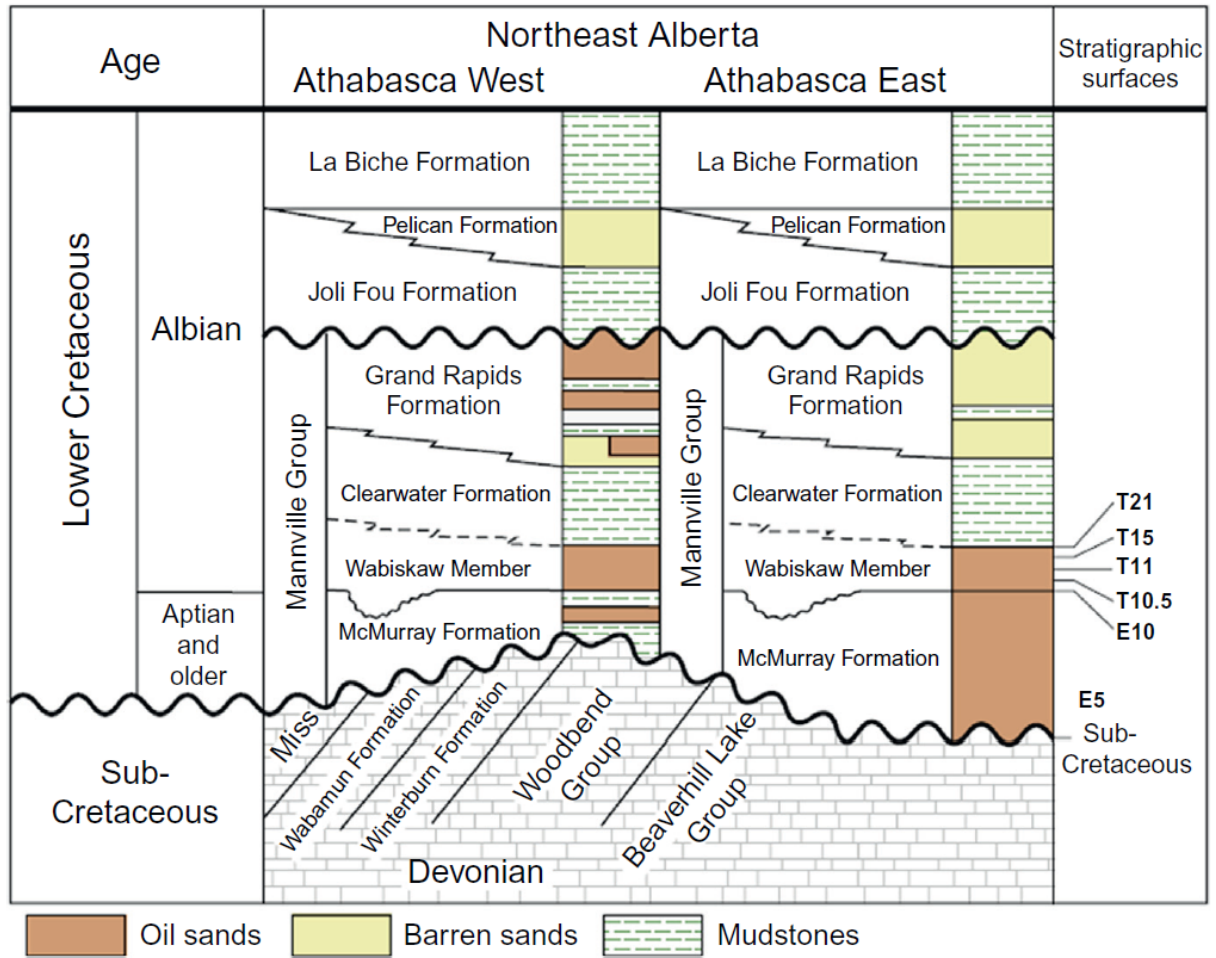
LITHOLOGIC ACCESSORIES

	Silt Lamina		Shale Lamina		Pebbles/Granules		Glauconitic
	Feldspathic		Lithic		Rip Up Clasts		Coal Fragments
	Wood Fragments		S P Salt & Pepper				

ICHTNOFOSSILS

	Rootlets		Skolithos		Planolites		Gyrolithes
	Diplocraterion		Arenicolites		Escape Trace		Cylindrichnus
	Bergaueria		Asterosoma		Thalassinoides		Chondrites
	Teichichnus		Anconichnus				

Stratigraphic Nomenclature for Picks



References Posted on Alberta Energy Regulator and Alberta Geological Survey websites

- Alberta Energy and Utilities Board (2003): Athabasca Wabiskaw-McMurray Regional Geological Study, Alberta Energy and Utilities Board Report, 187 p., URL < <https://www.aer.ca/documents/reports/r2003-a.pdf>. > [January 2017].
- Hein, F. J. (2000): Historical overview of the Fort McMurray area and oil sands industry in northeast Alberta (with expanded bibliographies on oil sands, surficial geology, hydrogeology, minerals and bedrock in northeast Alberta); Alberta Energy and Utilities Board, Alberta Geological Survey, Earth Sciences Report 2000-05, 26 p with appendices, URL < http://www.ags.gov.ab.ca/publications/ESR_2000_05.html > [May 2017]
- Hein, F. J., Berhane, H., and Weiss, J. A. (2007): Cold Lake oil sands area: Formation picks and correlation of associated stratigraphy; Alberta Energy and Utilities Board, Alberta Geological Survey, Geo-Note 2006-03, 17 p., URL < http://www.ags.gov.ab.ca/publications/GEO_2006_03.html > [May 2017]
- Hein, F.J. and Cotterill, D.K. (2007): Field guide: Regional sedimentology and processes of deposition of the Athabasca oil sands, northeast Alberta; Alberta Energy and Utilities Board/Alberta Geological Survey, Geo-Note 2006-04, 157 p., URL < http://www.ags.gov.ab.ca/publications/GEO_2006_04.html > [May 2017]
- Hein, F.J., Cotterill, D.K., and Berhane, H. (2000): An atlas of lithofacies of the McMurray Formation, Athabasca oil sands deposit, northeastern Alberta: Surface and subsurface; Alberta Energy and Utilities Board, Alberta Geological Survey, Earth Sciences Report 2000-07, 216 p., URL < http://www.ags.gov.ab.ca/publications/ESR_2000_07.html > [May 2017]
- Hein, F.J., Cotterill, D.K., and Rice, R. (2006a): Subsurface geology of the Athabasca Wabiskaw-McMurray succession: Lewis – Fort McMurray area, northeastern Alberta (NTS 74D/14); Alberta Energy and Utilities Board/Alberta Geological Survey, Earth Sciences Report 2006-06, 67 p., URL < http://www.ags.gov.ab.ca/publications/ESR_2006_06.html > [May 2017].
- Hein, F.J., Cotterill, D.K., Weiss, J., and Berhane, H. (2006b): Subsurface geology and facies characterization of the Athabasca Wabiskaw-McMurray succession Firebag-Sunrise area, northeastern Alberta (NTS 74D/74E); Alberta Energy and Utilities Board/Alberta Geological Survey, Earth Sciences Report 2006-08, 73 p., URL < http://www.ags.gov.ab.ca/publications/ESR_2006_08.html > [May 2017].
- Hein, F. J. and Dolby, G. (2017): Palynology, lithostratigraphy, and biostratigraphy of the Athabasca oil-sands deposit, northeastern Alberta; Alberta Energy Regulator, Alberta Geological Survey, Open File Report (2017, under review), 56 p. with digital appendices.
- Hein, F.J., Langenberg, C.W., Kidston, C., Cotterill, D.K., Berhane, H., and Berezniuk T. (2001): Comprehensive field guide for facies characterization of the Athabasca oil sands, Fort

McMurray area, northeast Alberta; Energy and Utilities Board, EUB/AGS Special Report 13, 335 p., URL <
http://www.ags.gov.ab.ca/publications/SPE_013.html > [May 2017]

Wynne, D. A., Attalla, M., Berhane, H., Brulotte, M., Cotterill, D. K., Strobl, R., and Wightman, D. M. (1994): Athabasca oil sands database: McMurray/Wabiskaw deposit; Alberta Energy and Utilities Board, Alberta Geological Survey, Open File Report, 1994-14, 44 pp., URL <
http://www.ags.gov.ab.ca/publications/OFR_1994_14.html > [May 2017]

Langenberg, C. W., Hein, F. J., and Berhane, H. (2001): Three-dimensional geometry of fluvial-estuarine oil sand deposits of the Clarke Creek area (NTS 74D), northeastern Alberta; Energy and Utilities Board, EUB/AGS Earth Sciences Report 2006-1, 35 p., URL <
http://ags.aer.ca/publications/ESR_2001_06.html > [May 2017]

Definition of stratigraphic markers ('picks') with quality codes
(modified from Wynne et al., 1994 and Hein et al., 2000).*

Pick	Type of Surface	Description	Quality Code**
T21	Transgressive	Wabiskaw Marker Top Wabiskaw Mbr. 'A'	Good - Very Good
T15	Transgressive	Top Wabiskaw Mbr. 'B'	Good - Very Good
E14	Major Erosion	Wabiskaw Internal Incision	Good - Very Good
T11	Transgressive	Base First Regional Marine Shale in the Clearwater Fm. Top Wabiskaw Mbr. 'C'	Very Good-Excellent
T10.5	Transgressive	Top Wabiskaw Mbr. 'D' Incised Valley-Fill Deposit	Excellent-Very Good
E10	Disconformity/ Unconformity	Top Upper McMurray Fm Major Erosion Surface	Excellent -Very Good
E5	Disconformity/ Unconformity	Top Lower McMurray Fm. Major Erosion Surface	Variable Very Poor -Fair
Sub-Cret. (Pal.)	Unconformity	Base of McMurray Fm Major Erosion Surface	Variable Very Good-Excellent (However this is sometimes difficult to pick in areas of significant clastic karst-infill, or where marl is above the sub- Cretaceous unconformity)

* Abbreviations: Group, Grp.; Formation, Fm.; Member, Mbr.

** Quality Codes are relative: Excellent to Very Good, can be picked on all wire-line logs and seismic; Poor to Very Poor, need to be confirmed by outcrops or core, difficult to pick on wire-line logs, somewhat easier to pick on seismic.

References cited

Hein, F. J. Cotterill, D. K., and Berhane, H., 2000, An atlas of lithofacies of the McMurray Formation, Athabasca oil sands deposit, northeastern Alberta: Surface and Subsurface: Alberta Energy and Utilities Board/Alberta Geological Survey, Alberta Geological Survey, Edmonton, AB, Earth Sciences Report 2000-07, 216 p.

Wynne, D. A., Attalla, M., Berhane, H., Brulotte, M., Cotterill, D. K., Strobl, R., and Wightman, D. M., 1994, Athabasca oil sands database: McMurray/Wabiskaw deposit, Alberta Energy and Utilities Board, Alberta Geological Survey, Edmonton, AB, Open File Report, 1994-14, 44 p.