

Done as part of regional facies mapping and picks for Athabasca oil sands.

GRAIN SIZE		BIOTURBATION INTENSITY	ICHOFOSSILS	ACCESSORIES	STAIN	COLOR	DEPOSITIONAL ENVIRON	REMARKS
METERS	<div><div><div>v</div><div>c</div><div>m</div><div>f</div><div>v</div></div><div><div>granule</div><div>sand</div><div>silt</div><div>clay</div></div></div>							
14				GI Sid		..		Wabiskaw Member-Regional Marine Shale
16				Py Py		dk GY		
18				GI		mdk GY		
20				GI		vdk GY		Top Wab C (T11) = 19.75 m
22				GI		mdk gn GY	trans.	Transgressive Wabiskaw C sand
24								-similar to other wells where the C sand typically thins over an underlying Wabiskaw D valley fill sand body
26								TSE
28						mdk BR dk GY		Wabiskaw C/D contact
30								Wabiskaw D valley fill
32								-current to wave ripple sand interbedded with wavy, often bifurcating mudstone laminae (to very thin beds), flaser bedding
34								Wabiskaw D/McMurray contact
36						med BR lt br GY		--tidal channel abandonment interpretation may be changed to channel margin similar to interpretation below (very similar facies)
38						med gy BR		
40						dk BR		
42						mdk BR	tidal ch. margin	Gyrolithes ??
44						mdk BR		-some primary stratification preserved
46						dk BR med br GY	upper point bar	core disturbed, difficult to discern bioturbation intensity and burrow types
48								-rare preserved mudstone interbeds
50						dk BR med br GY	tidal ch. ..	
52								reworked Cyllindrichnus
54								
56								
58								
60								
62								
64								
66								
68						vdk BR med br GY	point bar	
70								Gyrolithes with burrowed point bar muds (??)
72								
74								
76								
78								
80								
82								
84						vdk BR	fluvial channel	
86								

AppleCore colour legend









LITHOLOGY

	SAND/SANDSTONE		SHALEMUDSTONE		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		Salt & Pepper				

ICHTNOFOSSILS

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

Appendix 1. 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)

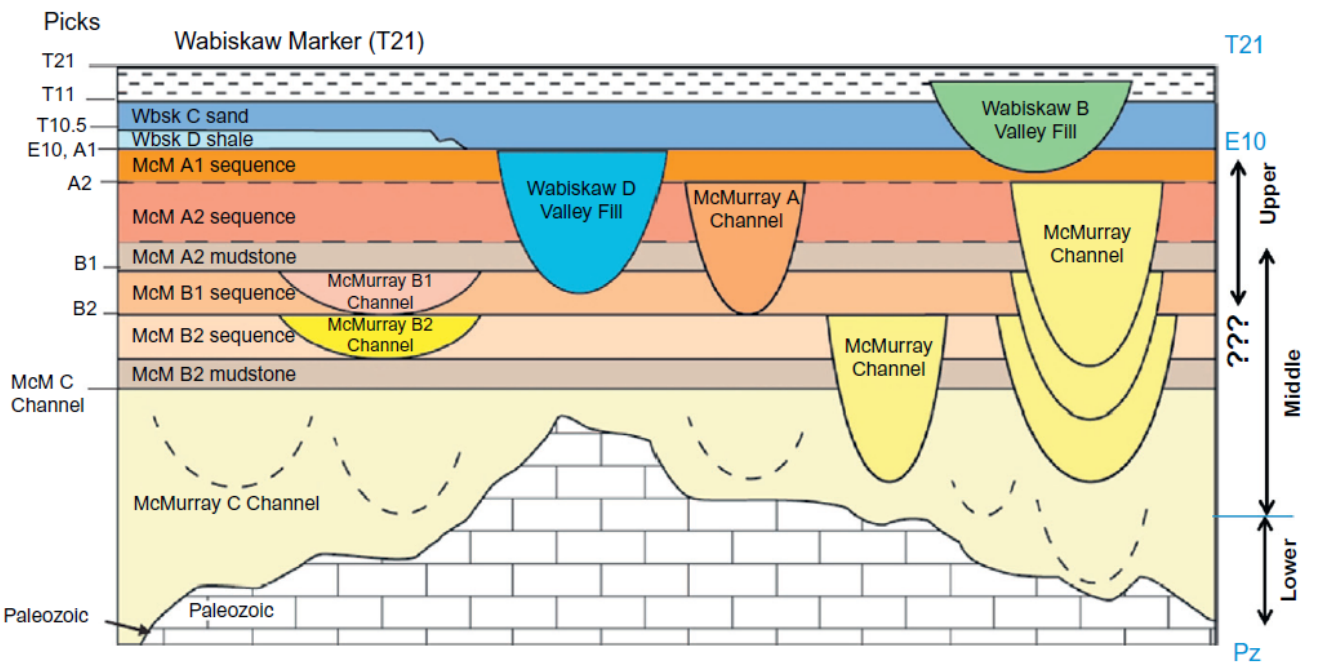
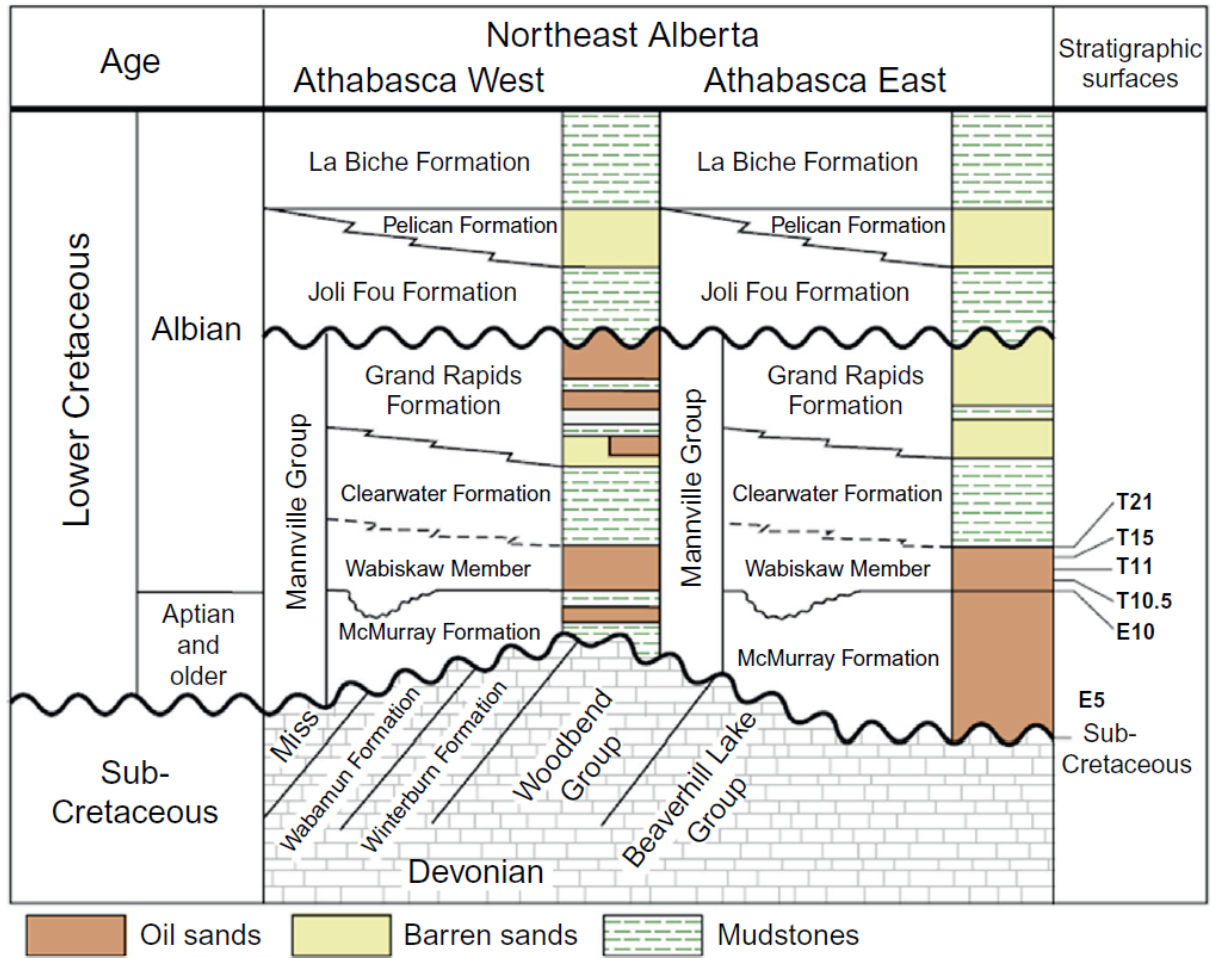
* Abbreviations: Group, Grp.; Formation, Fm.; Member, Mbr.

** 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.

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 Special Report 13, 35 p., URL <
http://ags.aer.ca/publications/ESR_2001_06.html > [May 2017]