DEVLAN EXPLORATION INC.

DEVLAN ET AL THUNDER RIVER N-73

300\N73673013115\00
SECTION 73 N N67 deg. 22' 52" W 131 deg. 29' 16"
TSIIGEHTCHIC. N.W.T.

Décollement Consulting Ltd.
CALGARY - ALBERTA - CANADA

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SECTION 73 N N67 deg. 22' 52" W 131 deg. 29' 16"
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GEOLOGICAL REPORT

ON

DEVLAN ET AL TREE RIVER
300\B10672013145\00
SECTION 10 N67 19' 14" W 131 45' 30"
TSIIGEHTCHIC, N.W.T

FOR

DEVLAN EXPLORATION INC.

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February/March, 2001

Keith Robertson, B. Sc.,
Wellsite Geologist

DECOLLEMENT CONSULTING LTD.

WELL DATA SUMMARY

WELL NAME	DEVLAN et al THUNDER RIVER N-73
LEGAL LOCATION	SECTION 73 N67° 22' 52" W 131° 29' 16"
UNIQUE WELL I.D.	300\N73673013115\00
SURFACE LOCATION	N67° 22' 52" W 131° 29' 16"
FIELD/REGION	TSIIGEHTCHIC NWT
OPERATOR	DEVLAN EXPLORATION INC.

SITE DATA

BOTTOMHOLE COORDINATES	N67° 22' 52" W 131° 29' 16"	
SURFACE COORDINATES	N67° 22' 52" W 131° 29' 16"	
SEISMIC LOCATION	N67° 22' 52" W 131° 29' 16"	
WELL CLASSIFICATION	WILDCAT	WELL LICENSE # 9211-D28-1-3
AFE NUMBER	NONE	
DRILLING CONTRACTOR	AKITA 14	

ELEVATIONS

GROUND LEVEL	120.1 (m)
KELLY BUSHING	124.2 (m)

DRILLING DATES

SPUD DATE	24 Feb, 2001	**TIME**	0730 HRS
T.D. DATE	March 11, 2001	**TIME**	1215 HRS

HOLE SIZE & MUD TYPE

SURFACE	311 mm. GEL CHEM
MAIN	200 mm. GEL CHEM

CASING DATA

SURFACE	SET AT 310 m. ran 22 jts of 219.1 mm. 35.7 kg\m. ST&C casing, cement with 30 tonne Polar Set Reg, +.2% R-15; plug down 0500 hrs.
PRODUCTION	ran 83 jts of 139.7 mm 20.8 kg\m production casing

GEOLOGICAL DATA

SAMPLE INTERVAL	0 to 1146 metres
GAS DETECTION INTERVAL	0 to 1146 metres
CORES	NONE
LOGGING SUITE	DIL-SP-CNL-PE-GR-CAL-SONIC
DRILL STEM TESTS	NONE

Décollement Consulting Ltd.

WELL STATUS **POTENTIAL BEAR ROCK GAS WELL**

FORMATION TOPS

DEVLAN et al THUNDER RIVER N-73
SECTION 73 N67° 22' 52" W 131° 29' 16"

K.B.(m): 124.20 **G.L.(m):** 120.10

	PROGNOSIS		SAMPLE		LOG	
FORMATION	MD(m)	SS(m)	MD(m)	SS(m)	MD(m)	SS(m)
FLUVIAL	124.0	0.2	3.0	121.2	3.0	121.2
FORT CREEK	74.2	50.0	70.5	53.7	70.0	54.2
RAMPARTS (HUME)	474.2	-350.0	498.0	-373.8	501.0	-376.8
GOSSAGE	554.0	-429.8	586.0	-461.8	585.0	-460.8
LONE MOUNTAIN	714.2	-590.0	784.0	-659.8	788.0	-663.8
BEAR ROCK	789.2	-665.0	949.0	-824.8	952.0	-827.8
LOWER LONE MTN			1041.0	-916.8	1041.0	-916.8
ORDOVICIAN	874.2	-750.0	1065.0	-940.8	1061.0	-936.8
TOTAL DEPTH	1239.2	-1115.0	1146.0	-1021.8	1145.8	-1021.6

DEVIATION SURVEYS

DEVLAN et al THUNDER RIVER N-73
SECTION 73 N67° 22' 52" W 131° 29' 16"

Depth	*Inclination*
60.0	0.750°
95.0	0.250°
133.0	2.000°
161.0	2.250°
190.0	2.250°
218.0	2.125°
247.0	2.000°
276.0	2.250°
305.0	2.000°
199.0	2.500°
247.0	2.250°
305.0	2.250°
346.0	0.250°
452.0	2.000°
598.0	1.250°
704.0	1.000°
849.0	1.750°
1100.0	2.250°

WELLSITE BIT RECORD #1

DEVLAN et al THUNDER RIVER N-73
SECTION 73 N67° 22' 52" W 131° 29' 16"

SPUD DATE: 24 Feb, 2001
T.D. DATE: March 11, 2001

SURFACE CASING: SET AT 310 m. ran 22 jts of 219.1 mm. 35.7 kg\m. ST&C

BIT #	*1ARR*	*2A*	*3ARR*	*4A*	*5*	*6*
SIZE (mm)	311	200	311	311	200	200
MAKE	VAREL	VAREL	VAREL	VAREL	VAREL	VAREL
TYPE	L127	L127	L127	L127	L127	ETD09XG
SERIAL #	140640	158870	140640	137231	158872	164838
JETS	4X12.7	3X12.7	4X12.7	4X12.7	3X11.1	3X11.1
DEPTH IN	0.00	173.00	173.00	240.00	310.00	435.00
DEPTH OUT	173.00	310.00	240.00	310.00	435.00	793.00
METRES	173.00	137.00	67.00	70.00	125.00	358.00
HOURS	13.00	22.00	7.75	8.75	19.25	80.00
ACC. HRS.	13.00	35.00	42.75	51.50	70.75	150.75
ROP (m/hr)	13.31	6.23	8.65	8.00	6.49	4.48
FOB	5\13000	5\6000	5\6000	5\6000	11\12000	11\12000
RPM	90\180	160\180	160\180	160\180	130\150	80\90
PP	3700	4460	4460	4460	5090	7610
DEN	1180	1240	1235	1280	1280	1050
VISCOSITY	55	56	68	101	42	43
MAX DEV.°	2.250°	2.000°	2.500°	2.250°	0.250°	1.000°
Condition:	*T/B/G*	*T/B/G*	*T/B/G*	*T/B/G*	*T/B/G*	*T/B/G*
	1\1\I	3\1\I	3\1\I	2\1\I	4\1\I	2\1\I
Condition:	*IR/OR/D/L*	*IR/OR/D/L*	*IR/OR/D/L*	*IR/OR/D/L*	*IR/OR/D/L*	*IR/OR/D/L*
	B/G/O/RP	*B/G/O/RP*	*B/G/O/RP*	*B/G/O/RP*	*B/G/O/RP*	*B/G/O/RP*
REMARKS	drill surface hole	drill pilot hole	ream pilot hole	ream pilot hole		

WELLSITE BIT RECORD #2

DEVLAN et al THUNDER RIVER N-73
SECTION 73 N67° 22' 52" W 131° 29' 16"

SPUD DATE: 24 Feb, 2001
T.D. DATE: March 11, 2001

SURFACE CASING: SET AT 310 m. ran 22 jts of 219.1 mm. 35.7 kg\m. ST&C

BIT #	*7*	*8*	*9*	*10*	*11*	*12*
SIZE (mm)	200	200				
MAKE	VAREL	VAREL				
TYPE	ETD17XG	ETD17XG				
SERIAL #	163953	164008				
JETS	3X11.1	3X11.1				
DEPTH IN	793.00	944.00				
DEPTH OUT	944.00	1146.00				
METRES	151.00	202.00				
HOURS	44.25	68.00				
ACC. HRS.	195.00	263.00				
ROP (m/hr)	3.41	2.97				
FOB	11\12000	11\12000				
RPM	80\100	80\100				
PP	5500	5500				
DEN	1050	1050				
VISCOSITY	44	42				
MAX DEV.°	1.750°	2.250°				
Condition:	*T/B/G*	*T/B/G*	*T/B/G*	*T/B/G*	*T/B/G*	*T/B/G*
	3\2\I	2\2\I				
Condition:	*IR/OR/D/L*	*IR/OR/D/L*	*IR/OR/D/L*	*IR/OR/D/L*	*IR/OR/D/L*	*IR/OR/D/L*
	B/G/O/RP	*B/G/O/RP*	*B/G/O/RP*	*B/G/O/RP*	*B/G/O/RP*	*B/G/O/RP*
REMARKS						

DAILY DRILLING SUMMARY

DEVLAN et al THUNDER RIVER N-73

SECTION 73 N67° 22' 52" W 131° 29' 16"

Date	Depth	Progress	Drilling Hours	ROP (m/hr)	Mud Properties				Operations Summary
					Density	Vis	WL	pH	
21-Feb-01	0	0	0.00	0.00	N\A	N\A	N\A	N\A	MOVING TO LOCATION
22-Feb-01	0	0	0.00	0.00	N\A	N\A	N\A	N\A	SET UP RIG, WOC TO ARRIVE
23-Feb-01	0	0	0.00	0.00	N\A	N\A	N\A	N\A	CEMENT CONDUCTER BARREL,
24-Feb-01	0	0	0.00	0.00	1035	60	28	12	RIG TO SPUD, SPUD AT 0730; DRILL; TRIP
25-Feb-01	173	173	13.00	13.31	1260	42	16.8	9.0	DRILL PILOT SURFACE HOLE
26-Feb-01	310	137	22.00	6.23	1240	56	12.8	9.0	REAM PILOT HOLE
27-Feb-01	270	97	10.50	9.24	1235	68	N\A	9.0	REAM PILOT HOLE; COND MUD, RUN CASING
28-Feb-01	310	40	6.75	5.93	1280	101	N\A	9.0	CEMENT; WOC; PRESSURE TEST
1-Mar-01	319	9	1.00	9.00	1025	38.0	14.0	9.5	LEAK OFF TEST; DRILL MAIN HOLE; TRIP FOR BIT
2-Mar-01	435	116	18.25	6.36	1080	42	8.0	9.5	DRILL AHEAD
3-Mar-01	568	133	23.00	5.78	1060	43	8.0	9.5	DRILL AHEAD
4-Mar-01	665	97	23.00	4.22	1050	45	7.5	9.5	DRILL AHEAD
5-Mar-01	752	87	23.00	3.78	1050	42	7.0	9.5	DRILL AHEAD; TRIP FOR BIT
6-Mar-01	816	64	16.75	3.82	1050	43	8.0	9.5	DRILL AHEAD
7-Mar-01	900	84	23.00	3.65	1050	52	8.4	9.0	DRILL AHEAD; TRIP FOR BIT
8-Mar-01	951	51	18.00	2.83	1040	44	8.4	9.5	DRILL AHEAD
9-Mar-01	1016	65	22.25	2.92	1040	42	8.4	9.5	MIX LCM, FIGHT LOST CIRCULATE; DRILL;
10-Mar-01	1057	41	13.00	3.15	1045	51	8.8	9.5	DRILL AHEAD
11-Mar-01	1131	74	23.00	3.22	1050	47	8.0	9.5	DRILL AHEAD to TD; POOH TO LOG
12-Mar-01	1146	15	6.25	2.40	1060	72	7.6	9.5	LOG; RUN CASING
13-Mar-01	1146	0	0.00	0.00	N\A	N\A	N\A	N\A	RUN CASING

WELLSITE LOGGING REPORT

DEVLAN et al THUNDER RIVER N-73
SECTION 73 N67° 22' 52" W 131° 29' 16"

HOLE DATA		*MUD DATA*		*LOGGING COMPANY*	
Hole Size:	200			**Logging Co.:**	TUCKER
TD Driller:	1146	**Type:**	GEL CHEM	**Engineer:**	Randy Nitz
Strap:	N\A	**Density:**	1060	**Truck No.:**	117
TD Logger:	1145.8	**Viscosity:**	72	**Start Date:**	12 Mar 2001
Casing Driller:	310	**W.L.:**	7.6	**Start Time:**	0100
Casing Logger:	310	**pH:**	9.5	**End Date:**	12 Mar 2001
Hole Condition:	GOOD			**End Time:**	0530

LOGGING SEQUENCE

Run Number	Logged Interval From	To	Hours	Logs	Remarks
1	1146	1	4.50	DIL-SP-CNL-LDT-PE-GR.	
				XY-CAL.	
	Total Hours:		4.50		

LOGGING OPERATIONS SUMMARY

Date	From	To	Description of Operation
11 Mar 01	1145.8	1	Logs ran to and through surface casing but only presented to
			surface casing. All ran in combo.

REMARKS & COMMENTS

WELL SUMMARY

DEVLAN et al THUNDER RIVER N-73
SECTION 73 N67° 22' 52" W 131° 29' 16"

The Devlan et al Thunder River well was spudded on the 24th of February at 0730 hours. Drilling commenced below the conductor barrel. At a depth of 133 m. the survey jumped out to 2 degrees and continued to climb to 2.25 degrees at 166 m. even though measures had been installed to counteract the swing. Consequently a bit trip was made at 173 m. and a pilot hole was drilled to surface casing depth of 310 m. while trying to control the deviation problem. Although the inclination did not increase more it also did not diminish, and casing was set with a deviation of 2 degrees. Main hole was drilled to a Total Depth of 1146 metres. Lost circulation was encountered at 815 and again at 1019 due to open fractures. The shaker was bypassed from 1019 to 1074, therefore sample quality was poor over this section, and no gas readings were recorded. The well was logged successfully.

Samples were caught in 5 metre intervals from surface to Total Depth as per instructions from the NEB. One set of bagged samples and 3 sets of vialed samples were required. The bagged samples and 2 sets of vials were shipped to the NEB, while the operator of the well retained the final set.

This well was drilled to evaluate the potential of the Gossage, Bear Rock and Ordovician formations. The play was constructed around old wells drilled in the 60's and 70's along with new seismic data run over the area. The Devlan et al Thunder River well was drilled on top of the seismic high that appeared to be developed over a fairly large land area.

Since it is somewhat unclear as to the exact composition of the Bear Rock and Lone Mountain, the formation tops in this well may not coincide with other wells. A classic section consisted of pelletoidal Gossage limestone overlying dolomite and brecciated limestone of the Bear Rock. The Bear Rock breccias are predominantly limestone rather than dolostones, according to papers published in the 60's through the 80's by a large group of geologists studying this formation in the Fort Norman and Mackenzie Mountains area. No mention was made of the Lone Mountain formation. However, in the Grandview Hills area, the Bear Rock has been described as brecciated dolomites by long time experts. In the 2 wells drilled to date (Devlan et al Tree River and Devlan et al Thunder River) no brecciated dolomites were encountered, only homogeneous, well cemented dolomites with minor to large, and sometimes open, fractures. Therefore these dolomites were labeled as Bear Rock in the 2 previously mentioned wells. A possible explanation for the presence of non-brecciated dolomites as such, is no near-surface removal of evaporites by dissolution to cause the brecciation. The limestone section, (at the base of the Lone Mountain in this well) may actually be the Landry Member of the Bear Rock. The **Landry Formation** (Douglas and Norris, 1961) is the bedded limestones overlying the Bear Rock and has been assigned to the **Landry Member** of the Bear Rock. Recognition of a Landry Member as part of the Bear Rock indicates that the Landry Formation continues recognizably in the Bear Rock. These studies from the Fort Norman and Mackenzie Mountain areas show that a pelletal lime mudstone is consistently recognizable in unbrecciated subsurface well sections. There have been no previous reports of this in the Grandview Hills area.

The Gossage formation comprised well-cemented pelletoidal limestone; cryptocrystalline, clean, calcilutites as well as clean packstones with black bituminous infills in pore spaces in the top 20 metres but was rare in the remainder of the section. Only two dolomite lenses were recorded and no shows or gas peaks were noted through out the section. The Lone Mountain included interbedded limestones and dolomites with a middle tight dolomite section. Clean, dolomitic, microcrystalline to very fine crystalline packstones were sandwiched between the limestone beds. The basal Lone Mountain (Landry Member\Bear Rock?) consisted of tight dolomitic limestone with micro fractures and rare fossil fragments. The Bear Rock comprised light to medium brown clean calcilutite and packstone with open fractures between 1019 and 1025 metres. The Lower Lone Mountain consisted of; medium brown clean dolomitic calcilutites; pyritic dolomitic grey green shale laminae; grey green argillaceous dolomitic calcilutites; and pink microcrystalline clean dolomitic packstones. **The Ordovician consisted of clean white dolomitic calcilutite with stringers of fine to medium crystalline dolomites containing varying amounts of porosity.**

No shows or hydrocarbon of reservoir quality were noted in this well. However two zones are of particular interest; the fracture zone between 1019 and 1025 metres along with the dolomites directly underneath, 1025 to 1030 metres, and the top of the Ordovician from 1068 to 1082 metres. Connection gases were noted after the gas detector was re-installed from bypassing the shaker due to lost circulation. Also, when tripping out, the hole was swabbed and finally started to flow slightly, enough that the mud required weighting up for logging. Trip gas was recorded at a peak of 130 units. If possible, more intensive information should be gathered over the fracture zone. From the resistivity logs it appears that the fracture zone at 1019 contained gas over water. The well was cased as a **potential Bear Rock gas well**.

FORMATION EVALUATIONS

DEVLAN et al THUNDER RIVER N-73
SECTION 73 N67° 22' 52" W 131° 29' 16"

GLACIAL GRAVEL surface to 70.5m.

These gravels consisted of clear, vitreous, pink, light brown to ochre; vari-coloured sands ranging in size from very fine grained to coarse grained, with common small pebbles. They were unconsolidated in samples but were cemented with argillaceous clay matrix. Although generally angular and sub angular they also contained well rounded quartz grains. It was obvious that the source rock was the igneous granite shield of the north since samples contained common feldspars often with imbedded micas and quartz crystals.

CONCLUSION: A zone of no interest.

FORT CREEK 70.5 m. to 498 m.

The Fort Creek formation can be divided into 3 sections; an upper shale, a middle sandier section and a lower shale. The upper shale was medium grey, micromicaceous, slightly silty containing occasional carbonaceous fragments, and non-calcareous. The middle section comprised a predominantly micromicaceous shale section but with increased components of silt and sand. Shales were carbonaceous, moderately firm to hard and non calcareous. Sandstones were poorly developed; silty to very fine and fine grained, poorly sorted, well consolidated, siliceous argillaceous, and dirty. The siltstones were predominantly a degraded sandstone, but often contained siderite grains or laminae and disseminated pyrite. **All were tight. One exception was found at 314m. where 3 metres of earthy brown, very fine to fine grained sandstone showed light blooming cut fluorescence and a trace of residual oil stain.** Gas readings only tripled over this section to a peak of 150 units. The lower shales were purer with little to no sand or silt components. **From a depth of 385m. to 498m. these shale were petroliferous and exhibited light blue blooming fluorescence after 1 minute on all samples.** A bed of light grey, mottled, banded, kaolinitic claystone was logged at the base of the Fort Creek.

Gas readings ranged between 100 to 200 units over the total formation with 2 exceptions. The petroliferous shales from 325 to 342 metres and from 385 to 498 metres logged between 200 to 400 units decreasing slightly towards the base of the Fort Creek. No shows were noted anyway through out this formation.

CONCLUSION: No hydrocarbon shows or gas increase of endemic proportions indicates a zone of no interest.

HUME 498 m. to 586 m.

The Hume is an interbedded shale-limestone sequence. In this well the shales were predominantly grey green, devoid of sand or silt grains, calcareous with common disseminated pyrite and moderately firm. Limestones were predominantly medium brown to grey brown, mottled with small amounts of white and buff. These argillaceous calcilutites were cryptocrystalline, often contained small amounts of calcite and pyritic infill in minor fractures and pore spaces, and were well indurated and **tight.** No gas peaks were encountered with gas readings ranging from 40 to 50 units.

CONCLUSION: This zone was devoid of hydrocarbons and is of no interest.

GOSSAGE 586 m. to 784 m.

The Gossage formation comprised well-cemented pelloidal limestone in this well. It encompassed cryptocrystalline, clean, calcilutites as well as clean packstones, well cemented with calcareous cement. Black bituminous infills in pore spaces were noted in the top 20 metres but were rare in the remainder of the section. Micro fractures were common through out and usually infilled with calcite crystals, bituminous shale material or pyritic cubes. Only 2 dolomite lenses were recorded; **one at 650 metres with 5% porosity and questionable light blue blooming cut fluorescence, and the second at 750 metres with patchy micro vuggy porosity at 8%.** Below this dolomite lens was another 30 metres of clean pelloidal packstones. Stringers and laminae of black bituminous shales in the upper half and apple green shales in the lower half were also logged. Gas readings were very low ranging from 30 to 70 units over the whole interval with no peaks.

CONCLUSION: No hydrocarbon shows or gas increase indicates a zone of no interest. The only interesting area was the dolomite lens at 650 metres, but no hydrocarbon shows or gas increases were found

LONE MOUNTAIN 784 m. to 952 m.

The Upper Lone Mountain can be divided into an upper and lower section. The upper section encompassed limestone interbedded with stringers and lenses of dolomite. The pelletoidal, calcisiltite limestones were well cemented with calcareous cement and rare dolomite rhombs. Clean, dolomitic, microcrystalline to very fine crystalline packstones were sandwiched between the limestone beds. Large open fractures containing abundant calcite crystals were drilled between 814 and 818 metres where lost circulation was encountered. The lower section comprised clean calcilutites and packstones with occasional stringers of grainstones. Another open fracture at 828 metres also contained abundant calcite crystals but no lost circulation. **Common micro vuggy porosity of 3 to 8% in lenses of very fine to fine crystalline grainstones were interbedded with tight cryptocrystalline dolomite beds in the top 30 metres of this section.** The remaining 40 metres were predominantly tight with only minor porosity stringers.

An interesting development was the penetration of dolomitic limestone with abundant micro fractures (that was not logged or mentioned in previous wells). Mixes of light grey and buff cryptocrystalline calcilutites with medium to dark brown organic rich (of non-calcareous origin) calcilutites were logged through out the section. Rare fossil fragments of brachiopod, ostracod, crinoid and possible algae mats were present. It was well cemented with calcareous and dolomitic cement. Gas ranged from 30 to 50 units with no peaks. Gas readings were low over the whole formation, ranging from 20 to 50 units. The exception was recorded at 828 metres with a peak of 88 units. No hydrocarbon shows were seen in any of the porosity streaks and permeability was low.

CONCLUSION: The absence of gas increases and hydrocarbon shows indicates this is non-reservoir quality rock.

BEAR ROCK 952 m. to 1041 m.

The Bear Rock comprised homogeneous dolomite with occasional limestone stringers. Dolomites consisted of light to medium brown, clean, cryptocrystalline, calcilutites interbedded with clean, very fine crystalline packstone stringers, generally well cemented with dolomitic and occasional calcareous cement. **Some of the packstone stringers contained low intercrystalline porosity but at times coupled with micro vuggy porosity reached 12%.** No hydrocarbon or gas shows were noted. At 1019 metres to a depth of 1025 metres a series of open fractures were encountered, with lost circulation of a total 32 cubic metres before the opening was healed. Due to the large amounts of lost circulation material in the system the shaker was bypassed for a length of time. No gas readings were logged from 1019 to 1074 metres and samples over this area were poor. More minor fractures were encountered from 1035 to 1040 metres. Gas readings over the whole section ranged between 30 and 50 units with no peaks.

CONCLUSION: There were no hydrocarbon or gas shows. It appeared that the open fracture was not reservoir quality but contained gas over salt water. **Any stringers with porosity appeared wet.** The fracture continued to give problems through out the remainder of the hole, alternately taking and giving fluids.

LOWER LONE MOUNTAIN 1041 m. to 1065 m.

The Lower Lone Mountain consisted of dolomites; medium brown clean calcilutites; pyritic dolomitic grey green shale laminae; grey green argillaceous dolomitic calcilutites; and pink microcrystalline clean dolomitic packstones. No gas readings were collected over this section.

CONCLUSION: A zone of no interest.

ORDOVICIAN 1065 m. to 1164 m. TD

In this well the Ordovician was a cryptocrystalline to microcrystalline, pyritic, very clean calcilutite interbedded with stringers of fine to medium crystalline dolomite rhombs with calcareous and dolomitic cement. **These well-developed crystalline stringers contained varying amounts of intercrystalline and micro vuggy porosity of 3 to 10%.** Near the top black, dead, bituminous infill was commonly associated with these large crystals and pore spaces. At 1100 a 20-metre, cryptocrystalline, calcilutite limestone bed of was encountered. Under lying this were more argillaceous, pyritic, dolomitic packstones, and calcareous dark grey brown shales. Gas readings ranged from 5 to 10 units with increases to 30 units at times.

CONCLUSION: There were no hydrocarbon shows or gas increases in this zone, however connection gases appeared after the gas detector was replaced from bypassing the shaker due to lost circulation. The top of the Ordovician was wet.

LITHOLOGICAL DESCRIPTIONS

DEVLAN et al THUNDER RIVER N-73
SECTION 73 N67° 22' 52" W 131° 29' 16"

0 to 15 — NO SAMPLES

15 to 30 — SANDSTONE; GLACIAL GRAVEL; white, cream, off white, translucent, pink, medium to very coarse grained to small pebbles, angular to sub angular, poorly sorted, loose and unconsolidated, common pink feldspar, **20% intergranular porosity, no shows,** trace black shale stringers at base, blocky, non calcareous. Possibly interbedded with clay beds or laminae (interpreted?) very poor samples.

30 to 40 — SANDSTONE: GLACIAL GRAVEL; variable colour, transparent, yellow, brown, pink, black, medium to very coarse grained to small pebbles, sub angular to sub rounded, poorly sorted, unconsolidated, loose in samples, occasional pink feldspar, argillaceous and silty matrix and cement, frosted quartz grains, common pyrite blebs, rare shale partings, **20% intergranular porosity, no shows.**

40 to 50 — SANDSTONE; GLACIAL GRAVEL; variable colour, transparent, yellow, brown, pink, black, medium to very coarse grained to small pebbles, sub angular to sub rounded, poorly sorted, unconsolidated, loose in samples, occasional pink feldspar, argillaceous and silty matrix and cement, trace glauconite grains, occasional chert fragments from chert pebbles, frosted quartz grains, common pyrite blebs, rare shale partings, **20% intergranular porosity, no shows.**

50 to 60 — SANDSTONE: GLACIAL GRAVEL; transparent, translucent, yellow, brown, pink, red, variable colour, medium to very coarse grained to small pebbles, angular to sub rounded, poorly sorted, unconsolidated, loose in samples, quartzose, occasional feldspar, occasional chert pebbles, pyrite blebs, **20% intergranular porosity, no shows,** argillaceous and silty matrix inferred.

60 to 65 — SANDSTONE: GLACIAL GRAVEL; transparent, translucent, yellow, brown, pink, red, variable colour, predominantly small pebbles, angular to sub rounded, poorly sorted, unconsolidated, loose in samples, quartzose, occasional feldspar, common chert pebbles, pyrite blebs, **20% intergranular porosity, no shows,** argillaceous and silty matrix inferred.

65 to 70.5 — SANDSTONE: GLACIAL GRAVEL; transparent, translucent, yellow, brown, pink, red, variable colour, predominantly small pebbles, angular to sub rounded, poorly sorted, unconsolidated, loose in samples, quartzose, occasional feldspar, common to abundant chert pebbles, pyrite blebs, **20% intergranular porosity, no shows,** argillaceous and silty matrix inferred.

TOP OF FORT CREEK 70.5 m.

70.5 to 80 **SHALE**; medium grey, blocky, silty with scattered sand grains, micromicaceous, very hard, non calcareous.

80 to 90 **SHALE**; medium grey, blocky, silty in part, scattered micro carbonaceous fragments and occasional carbonaceous smear grading to minor carbonaceous laminae, micromicaceous, rare siderite grains and micro laminae, hard, non calcareous.

90 to 100 **SHALE**; medium grey, blocky, slightly silty in part, common micro carbonaceous fragments and micro laminae, micromicaceous, firm to hard, non calcareous.

100 to 110 **SHALE**; medium grey, blocky, sub platy, silty in part, micromicaceous, common carbonaceous fragments and micro laminae, firm to hard, non calcareous.

110 to 120 **SHALE**; medium grey, blocky to sub platy, silty with increase in silt components, occasional carbonaceous micro fragments, decreasing from above, micromicaceous, firm, non calcareous.

120 to 130 **SHALE**; as above, medium grey, blocky to sub platy, silty with increase in silt components, occasional carbonaceous micro fragments, decreasing from above, micromicaceous, firm, non calcareous.

130 to 140 **SHALE**; medium grey, blocky to sub platy, micromicaceous, slightly silty, common micro carbonaceous fragments, occasional pyrite blebs, firm, non calcareous.

140 to 150 **SHALE**, as above, medium grey, blocky to sub platy, micromicaceous, slightly silty, common micro carbonaceous fragments, occasional pyrite blebs, firm, non calcareous.

150 to 157 **SHALE**; medium grey, blocky, sub platy, micromicaceous, silty and sandy, occasional coal micro fragments, disseminated pyrite, moderately firm to firm, non calcareous.

157 to 161 **SANDSTONE**; medium grey, salt and pepper, very fine to fine grained to silty, sub angular, poorly sorted, well consolidated, very argillaceous and dirty matrix, micro coal fragments, occasional clear chert grains, hard, **tight.**

161 to 170 **SHALE**; medium grey, blocky, sub platy, silty and sandy, minor coal micro fragments, moderately firm, non calcareous.

170 to 175 **SHALE**; medium grey, blocky to sub platy, micromicaceous in part, very sandy laminae in part, silty, occasional coal micro fragments, moderately firm, non calcareous.

175 to 185 **SHALE**; as above, medium grey, blocky to sub platy, micromicaceous in part, very sandy laminae in part, silty, occasional coal micro fragments, moderately firm, non calcareous, sandstone stringers, medium grey, salt and pepper, very fine to fine grained, very argillaceous and dirty, hard, dense, **tight.**

185 to 195 **SHALE**; medium grey, blocky, sub platy, sandy laminae throughout, occasional coal micro fragments, trace pyrite blebs, moderately firm, non calcareous.

195 to 205 **SHALE**; as above, medium grey, blocky, sub platy, sandy laminae throughout, occasional common coal micro fragments and micro laminae, moderately firm, non calcareous.

205 to 208 **SANDSTONE**; light grey, salt and pepper, predominantly fine grained, sub angular, moderately sorted, quartzose, clay matrix, siliceous cement, occasional coal partings, dense, **tight,** rare siderite cement and grains.

208 to 215 **SHALE**; medium grey, blocky, sub platy, sandy, occasional coal micro fragments, common disseminated pyrite, moderately firm, non calcareous.

215 to 221 **SILTSTONE**; light to medium grey, slightly salt and pepper, grading to very fine and fine grained sandstone in part, very argillaceous and dirty, common coal micro laminae and fragments, rare disseminated pyrite and chert grains, moderately indurated, dense, **tight.**

221 to 224 **SANDSTONE**; light grey, salt and pepper, very fine grained grading to silt and fine grained sandstone in part, sub angular, poorly sorted, well consolidated, quartzose with abundant (30%) clay and argillaceous matrix and cement, very slightly calcareous in part, common coal laminae and micro fragments, rare siderite grains, dense, **tight.**

224 to 230 **SILTSTONE**; light to medium grey, slightly salt and pepper, occasional very fine and fine sand grain inclusions, common coal partings and laminae, very argillaceous and dirty, dense, **tight,** grading to very silty shale in part.

230 to 235 **SILTSTONE**; as above, light to medium grey, slightly salt and pepper, occasional very fine and fine sand grain inclusions, rare coal partings and laminae, very argillaceous and dirty, dense, **tight.**

235 to 238 **SANDSTONE**: medium to light grey, salt and pepper, very fine to fine grained, silty in part, sub angular, poorly sorted, well consolidated, quartzose, siliceous cement in part, very argillaceous and dirty in part, argillaceous cement and matrix, common coal micro laminae and fragments, dense, **tight.**

238 to 245 **INTERBEDDED SILTSTONE AND SHALE**;

SILTSTONE; (50%) medium grey to light grey, slightly salt and pepper, occasional sand grains, common coal micro laminae and fragments, trace glauconite, very argillaceous and dirty, dense, occasional pyrite blebs, **tight;**

SHALE; (50%) medium grey, blocky, very silty, occasionally sandy, occasional coal micro fragments, moderately firm, non calcareous.

245 to 250 **SHALE**; as above, medium grey, blocky, very silty, occasionally sandy, occasional coal micro fragments, moderately firm, non calcareous, with siltstone stringers, as above, medium grey to light grey, slightly salt and pepper, occasional sand grains, common coal micro laminae and fragments, trace glauconite, very argillaceous and dirty, dense, occasional pyrite blebs, **tight.**

250 to 252 **SANDSTONE**; light grey, very fine to fine grained to silty, poorly sorted, well consolidated, quartzose, siliceous in part with argillaceous cement and matrix, dirty, coal partings, hard, dense, **tight.**

252 to 260 **SHALE**; medium grey, blocky, sub platy in part, silty and sandy, occasional coal partings, moderately firm, non calcareous.

260 to 268 **SHALE**; medium grey, blocky, sub platy, silty and sandy in part, occasional coal micro fragments, moderately firm, non calcareous, minor **SANDSTONE**; stringers, very fine grained, very argillaceous and dirty, hard, **tight.**

268 to 272 **SILTSTONE**; medium grey, slightly salt and pepper, very argillaceous and dirty, grading to very fine grained sandstone in part, fine grained sand inclusions, argillaceous cement, trace glauconite and siderite grains, hard, dense, trace pyrite, **tight.**

272 to 276 **SHALE**; as above, medium grey, blocky, sub platy, silty and sandy in part, occasional coal micro fragments, moderately firm, non calcareous.

276 to 278 **SILTSTONE**; as above, medium grey, slightly salt and pepper, very argillaceous and dirty, grading to very fine grained sandstone in part, fine grained sand inclusions, argillaceous cement, trace glauconite and siderite grains, hard, dense, trace pyrite, **tight.**

278 to 288 **SHALE**; medium grey, blocky, sub platy in part, slightly silty, rare coal micro fragments, trace disseminated pyrite, moderately firm, non calcareous.

SANDSTONE; stringers, light to medium grey, salt and pepper, silty to very fine grained to fine grained, poorly sorted, well consolidated, very argillaceous and dirty, siliceous in part, hard, dense, **tight.**

288 to 289 **SILTSTONE**; light to medium grey, sandy with common very fine and fine grained sand inclusions, argillaceous, dirty, siliceous, common micro coal fragments, hard, dense, **tight.**

289 to 295 **SHALE**; medium grey with brown cast, blocky, sub platy, slightly silty, rare coal micro fragments, trace disseminated pyrite, moderately firm, non calcareous, with minor siltstone, stringers, as above.

295 to 301 **SHALE**; as above, medium grey with brown cast, blocky, sub platy, slightly silty, rare coal micro fragments, trace disseminated pyrite, moderately firm, non calcareous, with minor siltstone, stringers, as above.

301 to 303 **SANDSTONE**; light grey, light brown, salt and pepper, silty to very fine grained, poor to moderately sorted, well consolidated, sub angular, quartzose, off white kaolin matrix in part, sideritic matrix in part, slightly siliceous cement, hard, occasional carbonaceous micro fragments, **tight.**

303 to 306 **SHALE**; medium grey, blocky, sub platy, common micro fragments of coal, moderately firm, non calcareous, minor brown siderite stringers, trace Inoceramous crystals.

306 to 310 **SANDSTONE**; as above, light grey, light brown, salt and pepper, silty to very fine grained, poor to moderately sorted, well consolidated, sub angular, quartzose, off white kaolin matrix in part, sideritic matrix in part, slightly siliceous cement, hard, occasional carbonaceous micro fragments, **tight,** with shale stringers, as above.

SET SURFACE CASING 310m.

310 to 314 **SHALE**; medium to dark grey, blocky, slightly silty, moderately firm, non calcareous.

314 to 317 **SANDSTONE**; light brown and grey brown, mottled, earthy in part, very fine to fine grained, sub angular, moderately sorted and consolidated, quartzose, common chert grains, argillaceous cement and matrix, trace pyrite, common coal micro fragments, **12% intergranular porosity, trace of light blue blooming cut fluorescence, no visible dry fluorescence.**

317 to 325 **SHALE**; medium to dark grey, blocky to sub platy, silty, micromicaceous, minor coal micro fragments, moderately firm, non calcareous;

SANDSTONE; stringers, medium grey brown, very fine grained to silty, well consolidated, poorly sorted, sub angular, very argillaceous and dirty, minor coal micro fragments, dense, hard, **tight.**

325 to 339 **SHALE**; dark grey to black, blocky to platy, micromicaceous, very carbonaceous throughout, rarely silty, carbonaceous laminae and micro fragments, moderately firm, trace disseminated pyrite, non calcareous.

339 to 343 **SHALE**; medium to dark grey, black in part, blocky, sub platy, micromicaceous, carbonaceous in part, silty, carbonaceous partings grading to micro carbonaceous fragments, moderately firm, non calcareous.

343 to 348 **SHALE**; dark grey to medium grey, blocky, micromicaceous, silty and sandy, rare micro coal fragments, common brown siderite grains, firm to hard, non calcareous, siderite stringers, medium brown, secondary, silty and sandy, rare coal micro fragments, hard, **tight.**

348 to 354 **SHALE**; medium grey to grey brown, blocky, silty laminae, occasional scattered sand grains, rare coal micro fragments and rare disseminated pyrite, firm to hard, non calcareous.

354 to 361 **SILTSTONE**; medium brown and grey brown, scattered very fine sand grains, very argillaceous and dirty, varved texture in part, coal micro laminae and fragments, hard, dense, **tight,** occasional siderite stringers, light brown, silty, sandy.

361 to 370 **SHALE**; dark grey, blocky to sub platy, micromicaceous, slightly carbonaceous, hard, non calcareous, occasional siderite stringers associated with calcite crystals (fractures?).

370 to 380 **SHALE**; medium to dark grey and grey brown, blocky, sub platy, slightly silty, minor micro coal fragments, firm to hard, non calcareous, trace disseminated pyrite.

380 to 387 **SHALE**; as above, medium to dark grey and grey brown, blocky, sub platy, slightly silty, minor micro coal fragments, firm to hard, non calcareous, trace disseminated pyrite, minor fractures with calcite crystal infill, occasional white specks (precipitated secondary chert? or silica?).

387 to 400 **SHALE**; dark grey to black, blocky, sub platy, micromicaceous, very carbonaceous throughout, rare silt grains and brown siderite grains, common disseminated pyrite, moderately firm, non calcareous, occasional calcite crystal infill in micro fractures.

400 to 407 **SHALE**; dark grey to black, blocky, sub platy, micromicaceous, very carbonaceous, rare silt grains, common disseminated pyrite, moderately firm, non calcareous, trace secondary silica replacement.

407 to 411 **SHALE**; as above, dark grey to black, blocky, sub platy, micromicaceous, carbonaceous, rare silt grains, common disseminated pyrite, moderately firm, non calcareous, decrease in car material, occasional sandstone stringers, light brown, mottled, very fine grained to silty, poorly sorted, very argillaceous and dirty, pyrite blebs, siliceous cement, hard, **tight.**

411 to 415 **SHALE**; dark grey to black with brown cast, blocky, common disseminated pyrite, common micro fractures, carbonaceous, stringers of very siliceous shale with rounded secondary precipitated silica and chert grains, (radiolarian?) very very hard, non calcareous.

415 to 420 **SHALE**; as above, dark grey to black with brown cast, blocky, common disseminated pyrite, no micro fractures, carbonaceous, stringers of very siliceous shale with rounded secondary precipitated silica and chert grains, (radiolarian?) very very hard, non calcareous.

420 to 430 **SHALE**; dark grey to black to dark grey brown with earthy texture, blocky, common disseminated pyrite and occasional pyrite laminae, slightly carbonaceous, hard, non calcareous, trace of micro fractures.

430 to 435 **SHALE**; dark grey brown with earthy texture, dull lustre, blocky, common disseminated pyrite, slightly carbonaceous, hard, non calcareous.

435 to 440 **SHALE**; dark grey to black to dark grey brown, blocky, common to abundant disseminated pyrite, occasional micro fractures with calcite crystal infill, rare siliceous and chert specks (radiolarian? secondary silica replacement of fossil?) very hard, carbonaceous to petroliferous, non calcareous.

440 to 445 **SHALE**; dark grey to black, blocky, common disseminated pyrite, occasional siliceous and chert specks, (radiolarian? secondary silica replacement of fossil?) very hard, carbonaceous to petroliferous, non calcareous.

445 to 453 **SHALE**; dark grey, black, dark grey brown, earthy and dull texture, common disseminated pyrite, laminated due to pyrite, carbonaceous and petroliferous in part, rare micro fractures with calcite crystal infill, rare pyrite blebs, hard, non calcareous.

453 to 454 **SILTSTONE**; light grey, very argillaceous and clayey matrix and cement, sandy, siliceous, minor coal micro fragments, dense, hard, **tight.**

454 to 455 **SANDSTONE**; clear, translucent, medium grained, well sorted, moderately consolidated, quartzose, clean, siliceous cement in part to kaolinitic cement in part, **12% porosity, no shows,** associated with medium grey brown dolomite laminae, common pyrite blebs.

455 to 456 **CLAYSTONE**; off white to light grey, speck, kaolinitic, soft, common shale and sand partings, dense, **tight.**

456 to 460 **SHALE**; dark grey to black, blocky, carbonaceous in part, petroliferous, common disseminated pyrite, hard, non calcareous.

460 to 465 **SHALE**; dark grey and grey brown, earthy texture, petroliferous, common disseminated pyrite, hard, non calcareous, occasional pyrite nodules and large calcite crystals (fractures).

465 to 470 **SHALE**; as above, dark grey and grey brown, earthy texture, petroliferous, common disseminated pyrite, hard, non calcareous, common transparent and white calcite crystals and common pyrite nodules, (fractures).

470 to 475 **SHALE**; dark grey and grey brown, earthy texture, petroliferous, occasional disseminated pyrite, hard, non calcareous, decrease in pyrite and calcite.

475 to 486 **SHALE**; dark grey to black, blocky, carbonaceous, petroliferous, common disseminated pyrite, occasional horizontal bands of pyrite, hard, non calcareous, trace micro fractures with calcite infill.

486 to 494 **CLAYSTONE**; light to medium grey, mottled, argillaceous laminae, banded with light and dark clay, common disseminated pyrite, occasional black coal partings, soft, dense, **tight,** non calcareous, becoming darker with depth and grading to shale.

494 to 498 **SHALE**; dark grey to black, blocky, carbonaceous, petroliferous, moderately firm to hard, non calcareous.

TOP OF HUME 498 m

498 to 500 **SHALE**; as above, dark grey to black, blocky, carbonaceous, petroliferous, moderately firm to hard, non calcareous, with stringers of interbedded limestone; bioclastic in part, Gastropod, brachiopod, crinoid fragments, argillaceous, dirty, also fine crystalline, white and medium brown, crystalline texture, vitreous, clean, well indurated, **tight.**

500 to 502 **LIMESTONE**; white, clear, buff, medium brown, medium grey brown, mottled in part, massive texture, crystalline texture in part, vitreous in part, calcilutite, occasional sparry calcite, argillaceous laminae to very clean, common brachiopod fossil fragments, cryptocrystalline, well indurated, **tight.**

502 to 506 **SHALE**; medium grey green, platy, clayey, no silt or sand, calcareous, marly, moderately firm, disseminated pyrite.

506 to 510 **LIMESTONE**; occasional translucent, buff, medium brown, medium grey brown, chalky texture in part, crystalline in part, earthy to vitreous, cryptocrystalline to microcrystalline, calcilutite, clean to argillaceous, well indurated, dense, tight, brachiopod and crinoid fragments, trace slickensides, minor shale stringers, as above.

510 to 515 **LIMESTONE**; off white, buff, medium brown, vitreous in part to earthy, crystalline to chalky texture, clean calcilutite, cryptocrystalline to microcrystalline, occasional fossil fragments of brachiopod, minor bioclastic stringers, minor very fine crystalline grainy stringers, well indurated, **tight, no shows.**

515 to 520 **SHALE**; medium grey green, sub platy, sub blocky, calcareous, occasional crinoid fragments, disseminated pyrite, moderately firm.

520 to 527 **SHALE**; medium grey green with brown cast, sub platy, sub blocky in part, greasy texture, calcareous, disseminated pyrite, moderately firm.

527 to 530 **LIMESTONE**; buff, medium brown, crystalline texture, mottled in part, trace of brachiopod fossil fragments, slightly argillaceous calcilutite, cryptocrystalline, well indurated, **tight.**

530 to 535 **LIMESTONE**; medium brown, medium grey brown, mottled, massive texture, cryptocrystalline, argillaceous calcilutite, minor micro fossil fragments unidentifiable, well indurated, trace black bitumen in associated with calcite crystals (fractures) and scattered black bituminous spots (porosity infill?), **tight, no shows.**

535 to 540 **LIMESTONE**; medium brown and grey brown, mottled in part, massive texture, cryptocrystalline, argillaceous calcilutite, occasional argillaceous and shale partings, minor unidentifiable fossil fragments, well indurated, dense, **tight, no shows.**

540 to 548 **LIMESTONE**; medium to dark brown, mottled in part, massive texture, crystalline texture in part, argillaceous calcilutite, well indurated, increase in secondary limestone and calcite infill in minor fractures with bitumen and bituminous shale coating along with disseminated pyrite, **tight, no shows.**

548 to 555 **SHALE**; medium grey, medium grey green, sub platy, marly, calcareous, disseminated pyrite and pyrite cubes, moderately firm.

555 to 560 **LIMESTONE**; medium brown, dark brown, mottled in part, occasionally vitreous, massive and crystalline texture, cryptocrystalline, clean to argillaceous calcilutite, occasional carbonaceous and bitumen shale stringers, minor fractures with white sparry calcite infill and bituminous shale coatings, rare pyritic fracture infill, well indurated, **tight.**

560 to 565 **LIMESTONE**; predominantly as above, medium brown, dark brown, mottled in part, occasionally vitreous, massive and crystalline texture, cryptocrystalline, clean to argillaceous calcilutite, common bitumen shale infill in minor fractures with white sparry calcite, rare Ostracods and brachiopod fossil fragments, well indurated, **tight.**

565 to 569 **LIMESTONE**; 60% medium grey brown and medium brown, mottled, cryptocrystalline, massive texture, bioclastic stringers with argillaceous secondary limestone and calcite infill in fractures and porosity spaces, clean in part grading to argillaceous calcilutite, disseminated pyrite, well indurated, **tight,** marly;

SHALE; 40% medium grey green, sub platy, calcareous, unidentifiable fossil fragments, disseminated pyrite, grading to marlstone in part, moderately firm.

569 to 575 **SHALE WITH LIMESTONE STRINGERS:**

SHALE; medium grey green, sub platy, sub blocky in part, disseminated pyrite, rare unidentifiable fossil fragments, calcareous, moderately firm;

LIMESTONE; stringers, buff, off white, medium brown, mottled, cryptocrystalline, massive to crystalline texture in part, clean calcilutite, disseminated pyrite and pyrite replacement of fossil fragments, trace crinoid fragments, well indurated, **tight.**

575 to 586 **SHALE**; as above, medium grey green, sub platy, sub blocky in part, disseminated pyrite, calcareous, moderately firm;

LIMESTONE stringers, off white, medium to light grey and grey brown, crystalline texture, common calcite crystal and pyrite infill in fractures and pore spaces, chalky texture in part and soft, cryptocrystalline, calcilutite, wind, **tight.**

TOP OF GOSSAGE 586 m

586 to 590 **LIMESTONE**; medium brown to medium grey brown, dark brown, crystalline texture, cryptocrystalline, calcilutite, dense, well indurated, tight, stringers of off white to buff limestone, pelletoidal with secondary limestone cement, well indurated, **tight.**

590 to 595 **LIMESTONE**; medium brown to grey brown, mottled, pelloidal, texture, secondary calcareous cement, clean grainstone to packstone, microcrystalline to very fine crystalline, occasional black shale coating on pellets, well indurated, dense, **tight.**

595 to 600 **LIMESTONE**; off white, medium brown and grey brown, mottled in part, occasional pelletoidal texture grading to crystalline texture in part, secondary calcareous cement, massive texture in part, clean calcilutite with stringers of packstone, rare ghost fossil fragments, well indurated, **tight.**

600 to 605 **LIMESTONE**; off white, medium brown, massive texture, crystalline texture, cryptocrystalline, clean calcilutite, occasional micro fractures infilled with limestone breccia calcite crystals and black dead bitumen, 3% fracture porosity, no permeability, well indurated, very hard, **tight.**

605 to 610 **LIMESTONE**; off white, medium brown to dark brown, massive texture, crystalline texture, cryptocrystalline, clean calcilutite, common micro fractures pore spaces and fossil fragments replacement with calcite crystals and black bitumen, **3% porosity,** no permeability well indurated, very hard, **tight.**

610 to 615 **LIMESTONE**; light to medium brown and grey brown, massive and crystalline texture, cryptocrystalline to microcrystalline in part, clean calcilutite grading to clean calcisiltite, occasional white sparry calcite crystals, very well indurated, very hard, **tight.**

615 to 620 **LIMESTONE**; medium brown to grey brown, massive and crystalline texture, cryptocrystalline, clean calcilutite, well indurated, trace of white secondary limestone in minor pore space and rare micro fractures, **tight,** occasional shale stringers, dark grey to black, very carbonaceous, calcareous.

620 to 625 **LIMESTONE**; light to medium brown and grey brown, dull, massive and crystalline texture, cryptocrystalline, clean calcilutite, trace styolite, trace micro fractures infilled with calcite and carbonaceous shale mix, well indurated, stringers of micro sucrosic texture limestone, microcrystalline, slightly argillaceous calcisiltite, calcareous cement, well indurated, **tight.**

625 to 630 **LIMESTONE**; off white, light to medium brown and grey brown, dull, massive to crystalline to micro sucrosic texture, cryptocrystalline to microcrystalline, clean calcilutite to clean packstone, occasionally mottled, translucent secondary calcite crystal infill in pore spaces, predominantly well indurated, **tight,** trace shale stringers, grey green, calcareous, disseminated pyrite.

630 to 635 **LIMESTONE**; off white, light to medium brown and grey brown, dull, massive and crystalline texture, cryptocrystalline, clean calcilutite, rare stringers of pelloidal limestone, calcareous cement, well indurated, **tight.**

635 to 640 **LIMESTONE**; light to medium brown and grey brown, dull, massive and crystalline texture, cryptocrystalline, clean calcilutite, increase in pelloidal limestone, mottled, cryptocrystalline to microcrystalline, clean calcisiltite to clean packstone, well cemented with calcareous cement, dense, **tight,** rare micro fractures infilled with carbonaceous shale, shale, stringers, dark grey to black, carbonaceous, bituminous, calcareous.

640 to 645 **LIMESTONE**; off white, light to medium brown, mottled, light grey, massive and crystalline texture, cryptocrystalline, clean calcilutite, stringers of pelloidal limestone as above, but not common, trace disseminated pyrite and minor micro fractures infilled with carbonaceous shale, well indurated, **tight.**

645 to 650 **LIMESTONE**; light to medium brown and grey brown, dark brown in part, pelloidal texture, occasionally crystalline and massive texture, clean calcilutite to slightly argillaceous calcisiltite, calcareous cement, increase in micro fractures infilled with carbonaceous shale and carbonaceous shale grain coating, very well indurated, **tight,** trace shale stringers, black, carbonaceous, calcareous.

650 to 653 **DOLOMITE**; medium brown, vitreous, micro sucrosic texture, clean grainstone, moderately indurated, **5% intercrystalline porosity, low permeability, trace of light blue blooming cut fluorescence (gas?) no visible dry fluorescence.**

653 to 660 **LIMESTONE**; light to medium brown and grey brown, mottled, pelloidal texture in part, massive and crystalline texture in part, calcilutite, calcareous cement, increase in micro fractures with translucent sparry calcite infill, well indurated, **tight.**

660 to 665 **LIMESTONE**; medium brown to grey brown, mottled, pelloidal texture, cryptocrystalline, clean calcilutite to clean packstone, calcareous cement, slightly argillaceous in part, well indurated, dense, **tight.**

665 to 670 **LIMESTONE**; light to medium brown and grey brown, mottled, microcrystalline to cryptocrystalline, clean packstone, calcareous cement, slightly argillaceous in part, trace black carbonaceous shale coating in micro fractures, well indurated, **tight,** rare dolomite stringers, medium grey, micro sucrosic texture, dolomitic cement, clean packstone, **tight.**

670 to 675 **LIMESTONE**; medium brown, cryptocrystalline, clean packstone, pelloidal texture, occasional massive and crystalline texture, rare carbonaceous shale infill in minor pore spaces and stylolite, trace calcite crystals and secondary limestone cement in pore space, well indurated, **tight.**

675 to 680 **LIMESTONE**; off white, light to medium brown, dark brown in part, mottled, massive and crystalline texture, rare pelloidal texture, clean calcilutite, well indurated, **tight,** trace dolomite; stringers, light brown, micro sucrosic texture, clean calcisiltite, dolomitic cement, rare secondary calcareous cement and infill in minor pores, **3% porosity, no permeability, no shows.**

680 to 685 **LIMESTONE**; off white, medium brown and grey brown, massive and crystalline texture, occasionally pelletoidal texture with minor pelloidal stringers, clean calcilutite, well indurated, common carbonaceous shale infill in minor fractures, dense, **tight.**

685 to 690 **LIMESTONE**; off white, medium to dark brown and grey brown, mottled, pelletoidal texture, rare massive texture, calcareous cement with occasional microcrystalline dolomite rhombs, clean to argillaceous calcisiltite, large white to transparent sparry calcite crystal infill in fractures with carbonaceous shale coating, trace of limestone, very argillaceous, grading to calcareous shale.

690 to 696 **LIMESTONE**; off white, medium brown to grey brown, mottled, predominantly pelletoidal texture, calcareous cement, occasional scattered dolomite rhombs and minor dolomite laminae, clean to argillaceous calcisiltite, common carbonaceous shale coating, well indurated, **tight,** shale stringers, dark grey, carbonaceous, calcareous, grading to argillaceous limestone in part.

696 to 700 **LIMESTONE**; off white, chalky, cryptocrystalline, soft, also medium brown to grey brown, mottled, pelletoidal in part to massive and crystalline texture, clean calcilutite, occasional dolomite rhombs, becoming argillaceous in part, well indurated, dense, **tight.**

700 to 710 **LIMESTONE**: off white, light to medium brown and grey brown, light grey, mottled, predominantly pelletoidal texture, clean calcilutite, occasional dolomite rhombs, very fine pellets with calcareous cement, occasional carbonaceous shale coating, moderately indurated, **tight.**

710 to 715 **LIMESTONE**; off white, semi pelloidal texture, chalky and occasionally crystalline texture, medium brown and grey brown, predominantly pelloidal texture, cryptocrystalline, clean calcisiltite, well indurated in part to moderately indurated and soft in part, **predominantly tight.**

715 to 720 **LIMESTONE**; off white, cream, very light grey, pelletoidal texture throughout, calcareous cement, very clean calcisiltite, occasional calcite crystal infill in minor fractures, rare carbonaceous shale infill in minor fractures, rare carbonaceous shale infill, moderately indurated to soft, **tight.**

720 to 725 **LIMESTONE**; off white, light brown, light grey, pelletoidal texture in part, massive texture in part, cryptocrystalline, clean calcilutite to clean calcisiltite, occasional chalky texture, calcareous cement, moderately indurated and soft to well indurated, dense, **tight;**

SHALE: stringers, light grey to grey green, pyritic, calcareous, grading to light grey argillaceous limestone in part.

725 to 740 **LIMESTONE**; light to medium brown and grey brown, mottled, predominantly pelletoidal texture with interbeds of massive texture, cryptocrystalline, clean calcilutite to clean calcisiltite, rare Ostracods, rare calcite crystals and rare bituminous shale infill in minor fractures, moderately to well indurated, **tight.**

740 to 745 **LIMESTONE**; medium grey brown to medium grey, massive texture, cryptocrystalline, slightly argillaceous calcilutite, not as clean as above, moderately indurated, rare calcite crystals, **tight;**

SHALE: stringers, medium grey to medium grey green, pyritic, calcareous.

745 to 750 **LIMESTONE**; off white, light brown to grey brown, pelloidal texture in part, massive texture in part, cryptocrystalline, clean calcilutite to clean calcisiltite, scattered dolomite rhombs throughout, occasional dolomite rhomb crystals in minor fractures, calcite crystal infill and bituminous shale coating in minor fractures, well indurated, **tight.**

750 to 755 **DOLOMITE**; white, buff to medium brown, vitreous, cryptocrystalline to fine crystalline in part, sucrosic to grainy texture, clean grainstone, well developed dolomite rhombs in part with black bituminous shale coating rhombs, well cemented with dolomite cement, **patchy micro vuggy porosity 3 to 7%, no shows, low to moderate permeability.**

755 to 765 **LIMESTONE**; cream, light grey, light brown to dark brown, predominantly pelloidal texture, cryptocrystalline to microcrystalline, clean calcilutite to clean calcisiltite, well cemented with calcareous cement, no visible dolomite rhombs, moderately to well indurated, **tight,** trace shale stringers, light green, pyritic, calcareous.

765 to 770 **LIMESTONE**; cream, light grey and grey brown to medium brown, predominantly pelletoidal texture to sub pelloidal (breccia in part), cryptocrystalline, clean calcilutite to clean calcisiltite, well cemented with calcareous cement, no visible dolomite rhombs, moderately to well indurated, **tight.**

770 to 775 **LIMESTONE**; cream to off white, chalky texture, massive, clean calcilutite, soft, also light grey to grey brown, pelletoidal to crystalline texture, cryptocrystalline, clean calcilutite, well cemented with calcareous cement, no visible dolomite rhombs, moderately to well indurated, **tight,** trace shale; stringers, dark green, pyritic, calcareous.

775 to 780 **LIMESTONE**; cream, light to medium brown and grey brown, predominantly pelletoidal and sub pelletoidal texture grading to crystalline texture in part, clean calcilutite to clean calcisiltite, trace carbonaceous shale and calcite crystals in minor micro fractures, moderately to well indurated, **tight,** trace shale stringers, apple green, pyritic, calcareous, also black, carbonaceous to bituminous, calcareous.

780 to 784 **LIMESTONE**; off white to cream, light buff, predominantly massive and crystalline texture, rare pelletoidal texture, very clean calcilutite, well cemented with calcareous cement, **tight,** dolomite stringers, dark brown and dark grey brown, vitreous, cryptocrystalline, clean calcilutite, predominantly dolomitic cement with rare patchy calcareous cement, well indurated, hard, **tight.**

TOP OF LONE MOUNTAIN 784 m

784 to 790 **DOLOMITE**; medium brown to grey brown, vitreous, microcrystalline, clean packstone, well cemented with dolomite cement and rare calcareous cement, well indurated, **tight,** 20% white to translucent calcite crystals, large fracture.

790 to 792 **LIMESTONE**; cream to light buff, light to medium brown, massive and crystalline texture, rare pelletoidal texture, clean calcilutite, well cemented with calcareous cement and rare dolomite rhombs, well indurated, **tight.**

792 to 793 **DOLOMITE**; as above, medium brown to grey brown, vitreous, microcrystalline, clean packstone, well cemented with dolomite cement and rare calcareous cement, well indurated, **tight.**

793 to 798 **LIMESTONE**; cream to light buff, cryptocrystalline, massive and crystalline texture, clean calcilutite, well cemented with calcareous cement, very rare dolomite rhombs, common white to translucent sparry calcite crystals in large fracture, well indurated, **tight.**

798 to 799 **DOLOMITE**; white, very light buff, cryptocrystalline to microcrystalline, micro sucrosic, clean packstone, well indurated, **tight.**

799 to 807 **LIMESTONE**; cream, light buff, pearly, massive to crystalline texture, occasional pelloidal texture, very clean calcilutite to clean calcisiltite, well cemented with calcareous cement, no visible dolomite, well indurated to moderately indurated, **tight.**

807 to 808 **DOLOMITE**; light brown to grey brown, vitreous to dull, very fine to fine crystalline, sucrosic to grainy texture, clean packstone, dolomitic and calcareous cement, well cemented, **3 to 5% intercrystalline porosity, no shows.**

808 to 811 **LIMESTONE**; cream, light brown to medium brown, pearly in part, massive to crystalline texture, common pelletoidal texture, well cemented with calcareous cement, very clean, well indurated, **tight,** trace of apple green shale.

811 to 818 **DOLOMITE**; medium brown and grey brown, dull to vitreous in part, microcrystalline, occasionally macro crystalline, micro sucrosic texture in part, predominantly crystalline texture, clean packstone, well cemented with dolomitic cement, rare calcareous cement, common to abundant (30%) white and translucent sparry calcite crystals, large fracture, **occasional micro vuggy porosity, 10% fracture porosity, no shows,** trace apple green shale.

818 to 826 **LIMESTONE**; cream, light buff to medium brown, cryptocrystalline and massive texture, crystalline texture, clean calcilutite, well cemented with calcareous cement, well indurated, dense, **tight,** dolomite stringers, white to light buff, very fine to fine crystalline with well developed dolomite rhombs, well cemented in part with dolomitic and calcareous cement, **5% intercrystalline porosity, clean packstone, no shows.**

826 to 831 **DOLOMITE**; off white, light grey and grey brown, vitreous, sucrosic and grainy texture, clean grainstone and packstone, well cemented in part with dolomitic cement, very rare calcareous cement, trace of micro vuggy porosity but not common, rare bituminous shale infill in some pore space, abundant (20%) white and translucent sparry calcite crystals, **10% fracture porosity,** large open fracture.

831 to 835 **DOLOMITE**; medium to dark brown to black, vitreous, cryptocrystalline in dark brown and black with very fine to fine crystalline in medium brown, grainstone to packstone, common (10%) bituminous shale infill in pore space, common white calcite crystals in micro fractures, common secondary white dolomite rhombs in pore space, **stringers of 10% micro vuggy and fracture porosity but also tight, no shows.**

835 to 840 **DOLOMITE**; light buff to medium brown, vitreous, cryptocrystalline with stringers of very fine crystalline, crystalline texture to micro sucrosic and grainy, clean packstone to grainstone, well cemented in part with dolomitic cement and rare calcareous cement, well indurated and tight, very fine crystalline stringers with **trace of micro vuggy porosity 5% but low permeability,** also dark brown stringers with very fine crystalline and grainy texture, argillaceous grainstone with common bituminous shale infill and crystal coating, dolomitic cement with rare calcareous cement and pyritic cubes, **5 to 7% intercrystalline and micro vuggy porosity,** common white to translucent calcite crystals in micro fractures.

840 to 845 **DOLOMITE**; buff to light to medium brown with stringers of dark brown, predominantly microcrystalline with rare macro crystalline to very fine crystalline, clean packstone to clean calcisiltite, well cemented with dolomitic cement, occasional argillaceous streaky and rare bituminous shale infill, occasional white sparry calcite crystal infill in micro fractures, **scattered 3 to 5% intercrystalline and rare micro vuggy porosity, no shows.**

845 to 850 **DOLOMITE**; medium brown, vitreous, predominantly sucrosic and grainy texture with stringers of crystalline texture, very fine to fine crystalline with microcrystalline and macro crystalline stringers, clean grainstone to clean packstone, rare argillaceous streaky, rare sparry calcite crystals, **stringers of 8% micro vuggy and pinpoint porosity with good permeability** interbedded with well cemented tight stringers, **no shows.**

850 to 855 **DOLOMITE**; buff to light brown, vitreous, microcrystalline with rare macro crystalline, clean packstone to argillaceous packstone stringers, crystalline texture, common stringers of dark brown dolomite well cemented with dolomitic cement and rare calcareous cement, moderately indurated throughout, **3 to 5% intercrystalline porosity to tight, no shows.**

855 to 860 **DOLOMITE**; medium brown and dark brown, vitreous, microcrystalline to macro crystalline, micro sucrosic and crystalline texture, clean packstone, well cemented with dolomitic cement, common argillaceous stringers, common white calcite crystal infill in micro fractures, well indurated, dense, **tight.**

860 to 868 **DOLOMITE**; medium brown with dark brown stringers, vitreous, cryptocrystalline to microcrystalline to macro crystalline, clean packstone, well cemented with dolomitic cement, occasional bituminous shale infill in pore spaces, white calcareous and pyritic infill in micro fractures, well indurated, **tight "ghost" pelletoidal texture.**

868 to 874 **DOLOMITE**; medium to dark brown, vitreous, mottled in part, cryptocrystalline to microcrystalline, crystalline texture, clean calcilutite, well cemented with dolomitic cement, **scattered micro vuggy and pinpoint porosity of 3%, no permeability,** common white calcite crystals dolomitic in part infill in micro fractures.

874 to 880 **DOLOMITE**; medium to dark brown to black, vitreous, mottled in part, cryptocrystalline to microcrystalline, crystalline texture and massive texture, clean calcilutite, well cemented with dolomitic cement, common white calcite crystal dolomitic in part infill in minor fractures and stress fractures, well indurated, dense, **tight,** shale stringers, black, dolomitic, calcareous, very hard, grading to shaly limestone.

880 to 885 **LIMESTONE**: dark brown to black, pearly to dull, cryptocrystalline, argillaceous calcilutite, crystalline and massive texture, light brown dolomitic stringers in part, well cemented with calcareous cement, very well indurated, trace crinoid fragments, **tight.**

885 to 890 **LIMESTONE**; light brown, predominantly dark brown to black, massive and crystalline texture, rare pelletoidal texture, argillaceous calcilutite, well cemented with calcareous cement, stringers of cryptocrystalline dark brown dolomite, well indurated, dense, **tight,** shale stringers black, bituminous in part, calcareous.

890 to 895 **LIMESTONE**; cream and buff to medium and dark brown, dull to pearly, cryptocrystalline, clean calcilutite to wackestone?, nodular and lumpy texture in part, trace lineation of limestone pellets, rare dolomitic stringers grading to limy dolomite, trace unidentifiable fossil fragments, common white calcite crystal infill in micro fractures, well indurated, hard, **tight.**

895 to 900 **LIMESTONE**; cream to buff and light brown, dull to pearly, cryptocrystalline, massive and crystalline texture, clean calcilutite, well indurated, occasional white calcite crystal infill, hard, **tight,** dolomite stringers, dark brown to black, vitreous in part, microcrystalline to macro crystalline, micro sucrosic texture and grainy texture in part, well cemented with dolomitic cement and common calcareous cement in part, irregular calcite crystals, hard, **tight.**

900 to 905 **LIMESTONE**; cream, medium to dark brown, dull, pearly, cryptocrystalline to microcrystalline, massive texture, rare pelloidal texture, calcilutite to packstone, well cemented with calcareous cement and abundant macro to very fine crystalline dolomite rhombs, well dolomitize, well indurated, crinoid fragments, fossil casts, abundant particulate material, **tight,** dolomite stringers, dark brown to black, vitreous, microcrystalline, micro sucrosic and grainy texture, packstone, well cemented with minor calcareous and dolomitic cement, very well indurated, **tight.**

905 to 910 **LIMESTONE**; cream, medium brown to dark brown, dull, pearly, cryptocrystalline, massive texture, calcilutite, well cemented with calcareous cement, rare dolomite rhombs and laminae, trace brachiopod and crinoid fragments, well indurated, common stress fractures, **tight,** dolomite stringers, as above.

910 to 915 **LIMESTONE**; light chalky grey brown, predominantly dark brown to black, lithographic in part, cryptocrystalline, crystalline and massive texture, clean calcilutite, trace gastropod and crinoid fragments, rare dolomite rhombs, argillaceous in part, well indurated, **tight,** trace shale stringers, black, carbonaceous, calcareous.

915 to 920 **LIMESTONE**; light grey brown to dark brown and black, occasionally lithographic, cryptocrystalline in part, mottled, clean calcilutite with stringers of bioclastic crinoid packstone, common crinoid fragments, well cemented with calcareous cement, rare dolomitic rhombs, occasional dolomite laminae with calcareous cement, well indurated, **tight,** common shale stringers, black, carbonaceous, calcareous.

920 to 925 **LIMESTONE**; light buff to medium brown, dull to pearly, cryptocrystalline, nodular and lumpy texture in part cemented with microcrystalline dolomite, mottled, lithographic in part, clean packstone to clean calcilutite, calcareous cement, stringers of dolomitic cement, silicified calcite laminae, well indurated, **tight.**

925 to 930 **LIMESTONE**; light buff to cream and light grey, chalky texture, dull, cryptocrystalline, soft calcilutite, also dark brown, crystalline texture, cryptocrystalline, clean calcilutite, well cemented with calcareous cement, minor stringers of macro crystalline dolomite with calcareous cement, common bituminous shale infill in micro fractures, algae?, well indurated, **tight,** minor shale stringers black, calcareous.

930 to 935 **LIMESTONE**; light buff and cream, chalky, cryptocrystalline, soft calcilutite grading to medium brown, mottled, crystalline texture, clean calcilutite, well cemented with calcareous cement and occasional scattered dolomite rhombs and laminae, black carbonaceous shale infill with calcite crystals and dolomite rhombs, well indurated, **tight.**

935 to 940 **LIMESTONE:** light buff to medium brown, dull to vitreous in part, cryptocrystalline, crystalline texture in part, clean calcilutite, well cemented with calcareous cement, increase in white calcite crystals due to micro fractures, well indurated, **tight,** dolomite stringers (10%) dark brown to black, shaly and carbonaceous, vitreous, macro crystalline to very fine crystalline, calcareous and dolomitic cement, well indurated, **tight.**

940 to 945 **LIMESTONE**; light buff to cream chalky, dull, cryptocrystalline clean calcilutite, well cemented with calcareous cement, rare stringers of macro to very fine crystalline dolomite with dolomitic and calcareous cement, moderately indurated, **tight.**

945 to 949 **LIMESTONE**; cream to light buff to light to medium brown, pearly, dull in part, chalky to crystalline texture, clean calcilutite, mottled in part, well cemented with calcareous cement and scattered macro to very fine dolomite rhombs, rare stringers of dolomite with bituminous shale matrix and calcareous cement infill in minor fractures, well indurated, trace algae?, **tight.**

TOP OF BEAR ROCK 949 m

949 to 959 **DOLOMITE**; medium brown, vitreous, cryptocrystalline to microcrystalline, very rare very fine crystalline, crystalline texture to micro sucrosic in part, well cemented with dolomitic cement and rare calcareous cement, clean calcisiltite to packstone, stringers of argillaceous dolomite grading to shale, well indurated, **tight to 3 to 5% intercrystalline porosity.**

959 to 962 **LIMESTONE**; white, cream, mottled brown, dull to pearly, cryptocrystalline, very clean calcilutite, rare pelletoidal texture, massive texture throughout, well cemented with calcareous cement, no visible dolomite rhombs, trace Ostracods, well indurated, **tight.**

962 to 964 **DOLOMITE**; buff, off white, vitreous, microcrystalline to very fine crystalline, very clean packstone, dolomitic cement, no visible calcareous cement, sucrosic to crystalline texture, **5 to 7% micro vuggy and intercrystalline porosity, no shows or permeability.**

964 to 966 **LIMESTONE**; white, cream, mottled brown, dull to pearly, cryptocrystalline, very clean calcilutite, rare pelletoidal texture, massive texture throughout, well cemented with calcareous cement, no visible dolomite rhombs, **tight.**

966 to 971 **DOLOMITE**; predominantly medium brown, vitreous, microcrystalline to macro crystalline, crystalline to micro sucrosic texture, well cemented with dolomitic cement, occasional calcareous cement grading to minor stringers of limestone with dolomitic cement, rare bituminous shale infill in micro fractures, rare calcite crystal infill in fractures, moderately to well indurated, **tight.**

971 to 973 **LIMESTONE**; light buff to light to medium brown, mottled, pearly to dull, crystalline texture, rare chalky texture, clean calcilutite, well cemented with calcareous cement and common dolomite rhombs, well indurated, **tight.**

973 to 980 **DOLOMITE**; medium to dark brown, vitreous, cryptocrystalline to microcrystalline to rare macro crystalline, crystalline texture to micro sucrosic texture in part, clean packstone, well cemented with dolomitic cement and common calcareous cement blebs, occasional bituminous infill, well indurated, **tight.**

980 to 985 **DOLOMITE**; medium to light brown, vitreous, microcrystalline to stringers of very fine and fine crystalline, micro sucrosic to grainy texture, very clean packstone, predominantly well indurated and **tight, stringers of micro vuggy porosity** moderately to poorly cemented with dolomitic and calcareous cement, **12% porosity, no shows.**

985 to 991 **DOLOMITE**; light to medium brown and grey brown, vitreous, microcrystalline to macro crystalline, micro sucrosic texture to crystalline texture, clean packstone, well cemented with dolomitic cement and occasional calcareous cement grading to rare limestone stringers with dolomitic cement, occasional white calcite crystal infill in micro fractures, well indurated, **tight.**

991 to 992 **LIMESTONE**; white to very light grey, dull, chalky, clean calcilutite, massive with rare crystalline texture, moderately indurated, soft, **tight.**

992 to 994 **DOLOMITE**; as above, light to medium brown and grey brown, vitreous, microcrystalline to macro crystalline, micro sucrosic texture to crystalline texture, clean packstone, well cemented with dolomitic cement and occasional calcareous cement grading to rare limestone stringers with dolomitic cement, occasional white calcite crystal infill in micro fractures, well indurated, **tight.**

994 to 995 **LIMESTONE**; as above, white to very light grey, dull, chalky, clean calcilutite, massive with rare crystalline texture, moderately indurated, soft, **tight.**

995 to 1000 **DOLOMITE**; light to medium brown, vitreous, predominantly microcrystalline and cryptocrystalline with rare very fine crystalline, crystalline texture, clean packstone, well cemented with dolomitic cement and common (20%) calcareous cement, rare white calcite crystal infill in minor fractures, well indurated, **tight.**

1000 to 1005 **DOLOMITE**; as above light to medium brown, vitreous, predominantly microcrystalline and cryptocrystalline with rare very fine crystalline, crystalline texture, clean packstone, well cemented with dolomitic cement and common (20%) calcareous cement, rare white calcite crystal infill in minor fractures, well indurated, **tight**, limestone stringers light grey brown, mottled, dull to pearly, cryptocrystalline, clean calcilutite, well cemented with calcareous cement but common to abundant dolomite rhombs, well indurated, **tight.**

1005 to 1010 **DOLOMITE**; buff to light to medium brown, vitreous, cryptocrystalline to microcrystalline, clean packstone, well cemented with dolomitic cement, occasional to common calcareous cement, occasional stringers becoming slightly argillaceous, stringers of white cryptocrystalline dolomite, well indurated, **tight,** trace shale laminae, grey green, pyritic.

1010 to 1016 **DOLOMITE**; light to medium brown, mottled with white, occasional cryptocrystalline, predominantly microcrystalline to very fine crystalline, micro sucrosic texture to grainy texture, well cemented with dolomitic cement, rare calcareous cement, clean packstone to grainstone, common white calcite crystals, **8 to 10% micro vuggy pinpoint and intercrystalline porosity, no shows.**

NOTE; Due to lost circulate the samples from 1015 to 1060 were caught from the mud tanks and are of very poor quality.

1016 to 1019 **DOLOMITE**; light to medium brown, mottled with white, vitreous, occasionally cryptocrystalline, predominantly microcrystalline to very fine crystalline, micro sucrosic to grainy texture, well cemented with dolomite cement and occasional calcareous cement, clean packstone, well indurated, **tight.**

1019 to 1023 **DOLOMITE**; dark brown, vitreous, very fine to fine crystalline dolomite rhombs, packstone, grainy texture, grain supported with dolomite cement in part, common black dead bituminous infill, abundant white calcite crystal infill, 20% porosity in micro vuggy dolomite, open fracture, **no shows,** no gas.

1023 to 1024 **DOLOMITE**; medium brown, vitreous, cryptocrystalline, clean calcilutite, well cemented, crystalline texture, very well indurated, hard, dense, **tight.**

1024 to 1025 **DOLOMITE**; as above, with fractures as above.

1025 to 1031 **DOLOMITE**; light to medium brown with stringers of dark brown to black, vitreous, cryptocrystalline to microcrystalline with occasional stringers of very fine crystal, clean packstone with stringers of argillaceous packstone, crystalline texture, well cemented with dolomite cement including very fine crystalline dolomite rhombs, well indurated, very hard, **tight.**

1031 to 1035 **DOLOMITE**; medium brown to dark brown, vitreous, cryptocrystalline to microcrystalline, crystalline texture, well cemented with dolomite cement, clean calcilutite becoming argillaceous in occasional stringers, wind, very hard, **tight.**

1035 to 1041 **DOLOMITE**; medium to dark brown, vitreous, cryptocrystalline to microcrystalline, crystalline texture, clean packstone, well cemented with dolomitic cement, well indurated, hard, **tight,** stringers of light brown cryptocrystalline dolomite with large calcite crystal fracture infill, occasional calcite crystals with well developed very fine crystalline dolomite rhombs growing on crystal face, also frost with dolomite rhombs, stringers of white cryptocrystalline to microcrystalline dolomite with argillaceous bituminous matrix, **occasional fracture porosity, also occasional micro vuggy and pinpoint porosity 6%.**

LOWER LONE MOUNTAIN 1041 m

1041 to 1045 **DOLOMITE**; medium brown, rare dark brown, cryptocrystalline to microcrystalline with rare very fine crystal, crystalline texture, clean packstone, well cemented with dolomitic cement, occasional white calcite crystals in fractures decreasing from above, well indurated, **tight.**

1045 to 1050 **DOLOMITE**; as above, medium brown, rare dark brown, cryptocrystalline to microcrystalline with rare very fine crystal, crystalline texture, clean packstone, well cemented with dolomitic cement, occasional white calcite crystals in fractures decreasing from above, well indurated, **tight,** shale stringers, medium grey to grey green, pyritic, dolomitic.

1050 to 1056 **DOLOMITE**; medium brown, occasional light to dark brown, cryptocrystalline to microcrystalline, vitreous, crystalline texture, clean packstone grading to argillaceous calcilutite, very well indurated, well cemented with dolomitic cement, hard, tight, occasional micro fractures with calcite\dolomite crystal infill, shale stringers, light grey to light grey green, pyritic, dolomitic, fractures.

1056 to 1058 **DOLOMITE**; light grey to grey green, cryptocrystalline to microcrystalline, crystalline texture, well cemented, argillaceous calcilutite, very well indurated, **tight.**

1058 to 1062 **DOLOMITE**; pink, microcrystalline to very fine crystalline in part, vitreous, grainy texture to crystalline texture in part, clean packstone, well cemented, occasional pyrite blebs, dense, **tight.**

1062 to 1065 **DOLOMITE**; predominantly medium grey, white to medium brown in part, cryptocrystalline, vitreous, crystalline texture, clean packstone to argillaceous calcilutite, well cemented, well indurated, dense, **tight**, abundant **LCM,** poor sample.

TOP OF ORDOVICIAN 1065 m

1065 to 1068 **DOLOMITE**; white, translucent, cream in part, vitreous, cryptocrystalline to microcrystalline, crystalline texture, very clean packstone grading to clean calcilutite, well indurated, **tight.**

1068 to 1072 **DOLOMITE**; as above, white, translucent, cream in part, vitreous, cryptocrystalline to microcrystalline, crystalline texture, very clean packstone grading to clean calcilutite, well indurated, **tight** with stringers of dolomite, white, medium crystalline, vitreous, grainstone stringers, well developed dolomite rhombs cemented with dolomitic cement and black dead bitumen matrix, **10% micro vuggy and pinpoint porosity in streaky, no shows.**

1072 to 1075 **DOLOMITE**; white, light grey, vitreous, cryptocrystalline to microcrystalline in part, clean calcilutite, well cemented, very clean, common pyrite cubes, well indurated, **tight.**

1075 to 1080 **DOLOMITE**; white to cream, vitreous, cryptocrystalline, occasionally microcrystalline, crystalline texture, clean calcilutite, massive, occasional pyrite cubes and blebs, well cemented, **very hard and tight, no shows,** occasional dolomite stringers, light brown, microcrystalline to very fine crystalline, packstone, argillaceous and bituminous infill in pore space, **6% intercrystalline and micro vuggy porosity, no shows.**

1080 to 1082 **DOLOMITE**; buff, light brown, vitreous, very fine crystalline to medium crystalline, well developed dolomite rhombs grading to deformed rhombs in part, clean packstone to grainstone cemented with dolomite cement and occasional calcareous cement and occasional bituminous infill, **8% micro vuggy porosity but in streaky, low permeability, no shows.**

1082 to 1085 **DOLOMITE**; white, light grey, vitreous, cryptocrystalline, crystalline texture to massive, well cemented, clean calcilutite, disseminated pyrite and pyrite blebs, well indurated, **tight,** shale stringers, grey green, pyritic, dolomitic.

1085 to 1087 **DOLOMITE**; buff, light brown, vitreous, very fine crystalline to medium crystalline, well developed dolomite rhombs grading to deformed rhombs in part, clean packstone to grainstone cemented with dolomite cement and occasional calcareous cement and occasional bituminous infill, **8% micro vuggy porosity but in streaky, low permeability, no shows.**

1087 to 1090 **DOLOMITE**; white, light grey, vitreous, cryptocrystalline, crystalline texture to massive, well cemented, clean calcilutite, disseminated pyrite and pyrite blebs, well indurated, **tight.**

1090 to 1095 **DOLOMITE**; white, vitreous, very fine crystalline to medium crystalline, clean packstone to grainstone, predominantly deformed dolomite rhombs, well cemented with dolomitic cement and rare calcareous cement, stringers of well developed dolomite rhombs with increased calcareous cement and dolomitic cement in part, **scattered micro vuggy and intercrystalline porosity 5%, no permeability,** well indurated, very clean.

1095 to 1100 **DOLOMITE**; white, vitreous, predominantly as above with increase in calcareous cement grading to stringers of limestone, buff, pearly, cryptocrystalline, clean calcilutite, common dolomitic cement and dolomite rhombs, **tight.**

1100 to 1105 **LIMESTONE**; white, buff, light grey, pearly, cryptocrystalline, crystalline to massive texture, clean calcilutite, well cemented with calcareous cement and common stringers of dolomite rhombs with calcareous cement, microcrystalline to medium crystalline dolomite rhombs scattered throughout, moderately indurated, very clean, **predominantly tight with scattered intercrystalline porosity due to dolomitize,** shale stringers, grey green, pyritic, dolomitic.

1105 to 1110 **LIMESTONE**; white, buff, light grey brown, stringers of medium brown, pearly, cryptocrystalline, crystalline texture to massive in part, rare chalky texture, well cemented, calcareous cement, rare dolomitize to nil, moderately well indurated, very clean calcilutite, **tight,** shale stringers, grey green, pyritic, dolomitic.

1110 to 1115 **LIMESTONE**; predominantly light grey to light grey green, rare buff and white, cryptocrystalline, crystalline and massive texture, well cemented with calcareous cement, well indurated, argillaceous calcilutite, **tight.**

1115 to 1121 **LIMESTONE** white to cream to buff, pearly, cryptocrystalline, massive texture, crystalline in part, well cemented well calcareous cement, scattered microcrystalline to fine crystalline dolomite rhombs, clean calcilutite, stringers of light grey green pyritic argillaceous calcilutite, stringers of dolomite, white to light brown, microcrystalline to fine crystal well cemented with dolomitic cement, **very rare micro vugs but no permeability, 3% porosity in dolomite stringers, otherwise tight.**

1121 to 1123 **SHALE**; grey green, pyritic, dolomitic.

1123 to 1125 **DOLOMITE**; white grading to light grey green, vitreous, cryptocrystalline to microcrystalline, well cemented with dolomitic cement, argillaceous packstone to argillaceous calcilutite, well indurated, **tight grading to shale.**

1125 to 1130 **DOLOMITE**; white, light grey green, light buff, vitreous, cryptocrystalline to microcrystalline, well cemented with dolomitic cement, crystalline to micro sucrosic texture, no calcareous cement, argillaceous packstone to clean calcilutite, well indurated, tight.

1130 to 1134 **DOLOMITE**; white to light grey green, vitreous, cryptocrystalline to microcrystalline, massive and crystalline texture, well cemented with dolomitic cement and minor calcareous cement, common disseminated pyrite, minor stringers of microcrystalline to very fine crystalline dolomite with dolomitic cemented indurated, tight.

1134 to 1136 **DOLOMITE**; light grey to grey green, vitreous, cryptocrystalline, argillaceous calcilutite, massive texture, dolomitic and occasional calcareous cement, well indurated, hard, **tight.**

1136 to 1146 **SHALE**; dark grey brown, blocky, predominantly calcareous, occasionally dolomitic, occasionally pyritic in part, moderately firm grading to very argillaceous limestone in occasional stringers.

TD 1146 m

Décollement

Scale 1:240 (5"=100') Metric

Well Name: DEVLAN ET AL THUNDER RIVER N-73
Location: N 67° 22' 50" W 131° 29' 16"
Licence Number: 8011-G05-1-3
Region: GRANDVIEW HILLS
Spud Date: 24 FEB 2001
Drilling Completed: 11 MAR 2001
Surface Coordinates: N 67° 22' 50" W 131° 29' 16"
Bottom Hole Coordinates: N 67° 22' 50" W 131° 29' 16"
Ground Elevation (m): 120.1m
K.B. Elevation (m): 124.2 m
Logged Interval (m): To: 1148
Total Depth (m): 1148 m
Formation: GOSSAGE, BEAR ROCK, LONE MOUNTAIN
Type of Drilling Fluid: GEL CHEM

Printed by WellSight Log Viewer from WellSight Systems Inc. 1-800-447-1534 www.wellsight.com

OPERATOR

Company: DEVLAN EXPLORATION INC.
Address: 500 635 8TH AVE S.W.
CALGARY ALTA

GEOLOGIST

Name: KEITH ROBERTSON
Company: DECOLLEMENT CONSULTING LTD.
Address: 200-1109 7th Ave S.W.
CALGARY, ALTA
T2P 1A9

Comments

lost circulation at 1020-1075m; by passed shaker, no gas readings for this interval

ROCK TYPES

Anhy, Bent, Brec, Clyst, Coal, Congl, Dol, Ls, Igne, Lmst, Meta, Mrlst, Salt, Shale, Shcol, Shgy, Sltst, Ss, Till, Blank

ACCESSORIES

MINERAL: Anhy, Arggrn, Arg, Bent, Bit, Brecfrag, Calc, Carb, Chtdk, Chtlt, Dol, Feldspar, Ferrpel, Ferr, Glau, Gyp, Hvymin, Kaol, Marl, Minxl, Nodule, Phos, Pyr, Salt, Sandy, Silt, Sil, Sulphur, Tuff
FOSSIL: Algae, Amph, Belm, Bioclst, Brach, Bryozoa, Ceph, Coral, Crin, Echin, Fish, Foram, Fossil, Gastro, Oolite, Ostra, Pelec, Pellet, Pisolite, Plant, Strom
STRINGER: Anhy, Arg, Bent, Coal, Dol, Gyp, Ls, Mrst, Sltstrg, Ss
TEXTURE: Boundst, Chalky, Cryxln, Earthy, Finexln, Grainst, Lithogr, Microxln, Mudst, Packst, Wackest

OTHER SYMBOLS

POROSITY TYPE: Earthy, Fenest, Fracture, Inter, Moldic, Organic, Pinpoint, Vuggy
SORTING: Well, Moderate, Poor
ROUNDING: Rounded, Subrnd, Subang, Angular
SHOWS: Even, Spotted, Ques, Dead
EVENTS: Rft, Sidewall, Casing
INTERVALS: Core, Dst

TOP OF FORT CREEK 73.5 m

TOP OF HUME 487

TOP OF GOSSAGE 666 m

TOP OF LONE MOUNTAIN 784 m

TOP OF BEAR ROCK 849

LOWER LONE MOUNTAIN 1041 m

TOP OF ORDOVICIAN 1069