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PRESSURE ANALYSES, BRISTOL BAY, ALASKA PENINSULA**

by

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# OUTCROP SAMPLE RESULTS FROM MERCURY INJECTION CAPILLARY PRESSURE ANALYSES, BRISTOL BAY, ALASKA PENINSULA

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## Introduction

This non-interpretive report summarizes the results of mercury injection capillary pressure (MICP) analyses performed on 21 outcrop samples collected from 17 locations during the 2005 and 2006 field seasons from the Port Moller and Herendeen Bay areas of the Alaska Peninsula Bristol Bay basin region, Alaska (fig. 1). Helicopter-supported fieldwork conducted in 2006 by geologists from the Alaska Division of Geological & Geophysical Surveys (ADGGS) and the Alaska Division of Oil & Gas (ADOG) marked the end of a three-year geological research project that was funded by the U.S. Department of Energy through the Arctic Energy Technology Development Laboratory at the University of Alaska Fairbanks, the Bristol Bay Native Corporation, ADGGS, and ADOG. The overall goal of the project was to better understand the hydrocarbon potential of the Bristol Bay basin.

Preliminary mercury injection capillary pressures from five samples were reported previously in Loveland-Strauch *et al.* (2006), as those were the only results available at the time of publication. Results for those samples are also included in this report. It is important to note that the table showing gas/water and oil/water seal capacity and the associated charts for three samples in that report, contained an error. The error is corrected in this report.

### Mercury Injection Capillary Pressure

The results of mercury injection capillary pressure (MICP) analyses for 21 outcrop samples from 17 locations in the Staniukovich, Tolstoi, Stepovak, and Bear Lake Formations (fig. 2) are presented in this report. Analyses were performed by PetroTech Associates, Houston, Texas.

Potential seal capacity data for the gas/water and oil/water systems are summarized in Figures 3 and 4, respectively. Figures 5 and 6 illustrate the seal capacity potential at 7.5% saturation in the seal. The pore system and capillary properties are shown in Table 1. Tables 2 and 3 summarize composite height data.

Figures 3–6 and tables 1–3 are modified from their report to DGGs.

The geographic coordinates and metadata for sample locations in this report are recorded in Loveland-Strauch *et al.* (2006), but are not included here.

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### References

- Burk, C.A., 1965, Geology of the Alaska Peninsula–Island Arc and Continental Margin: The Geological Society of America Memoir 99, 250 p., 3 sheets.
- Decker, P.L., Finzel, E.S., Ridgway, K.D., Reifenhohl, R.R., and Blodgett, R.B., 2005, Preliminary summary of the 2005 field season: Port Moller, Herendeen Bay, and Dillingham areas, Bristol Bay Basin, Alaska Peninsula: Alaska Division of Geological & Geophysical Surveys Preliminary Interpretive Report 2005-7, 55 p.
- Finzel, E.S., Reifenhohl, R.R., Decker, P.L., and Ridgway, K.D., 2005, Sedimentology, stratigraphy, and hydrocarbon reservoir-source rock potential, using surface and subsurface data, of Tertiary and Mesozoic strata, Bristol Bay Basin and Alaska Peninsula: Alaska Division of Geological & Geophysical Surveys Preliminary Interpretive Report 2005-4, 67 p.
- Loveland-Strauch, A., Gillis, R., Reifenhohl, R.R., and Decker, P.L., 2006, 2006 Bristol Bay, Alaska Peninsula field summary and outcrop sample results from porosity and permeability and mercury capillary pressure analyses: Alaska Division of Geological & Geophysical Surveys Raw-Data File 2006-1, 67 p.

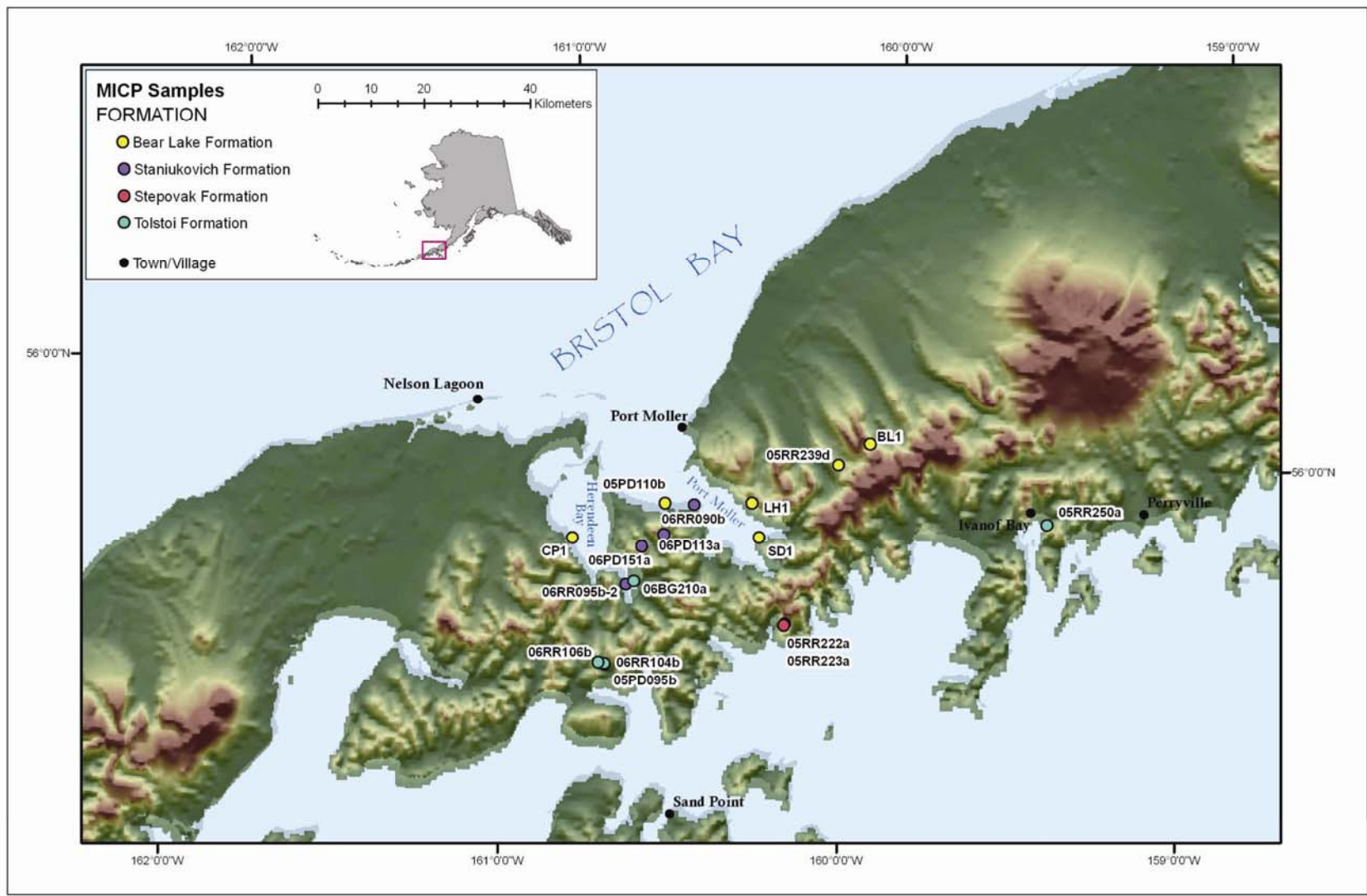


Figure 1. Map of the Bristol Bay study area showing the locations of MICP samples.

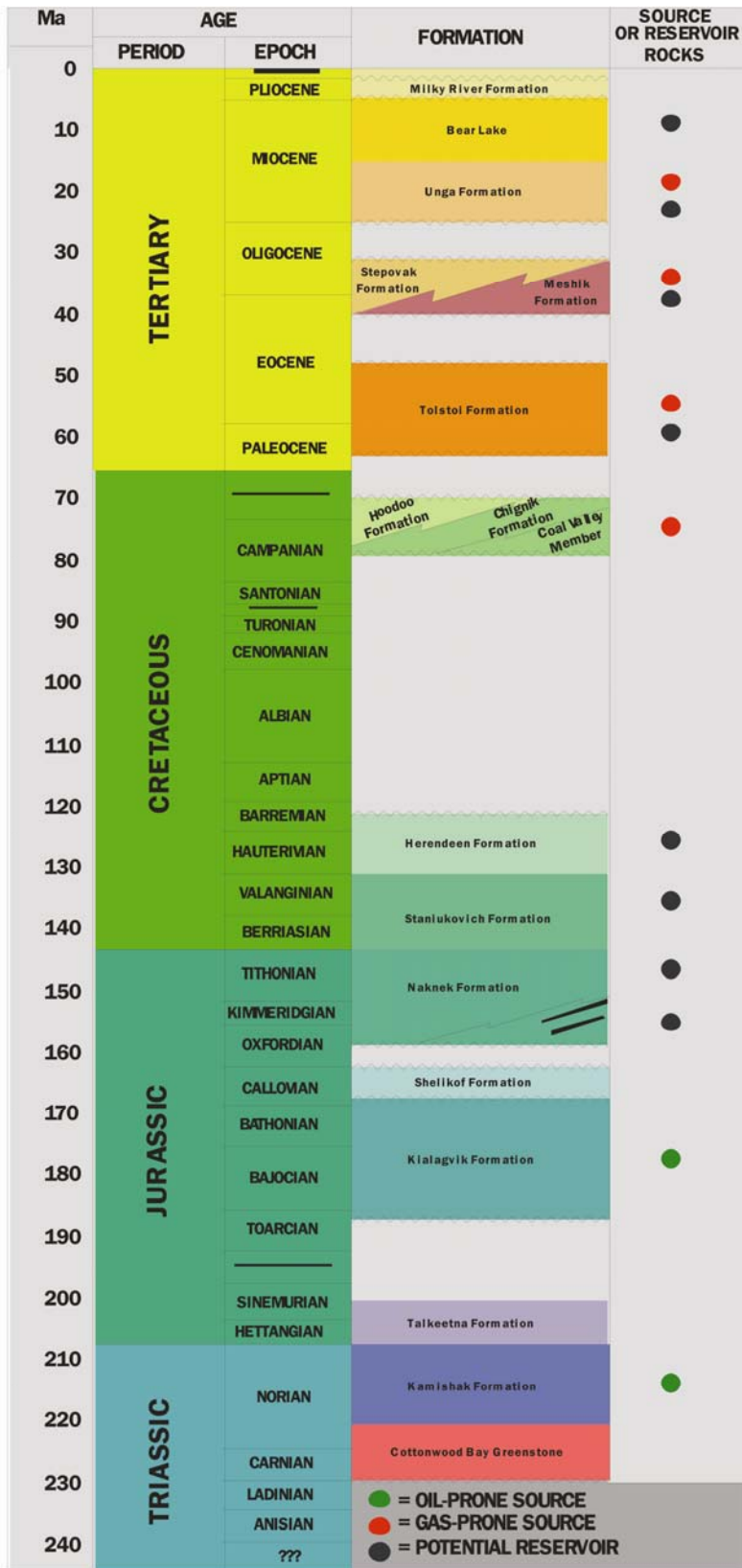


Figure 2. Stratigraphic column of the Bristol Bay area indicating potential source and reservoir units (modified from Burk, 1965).

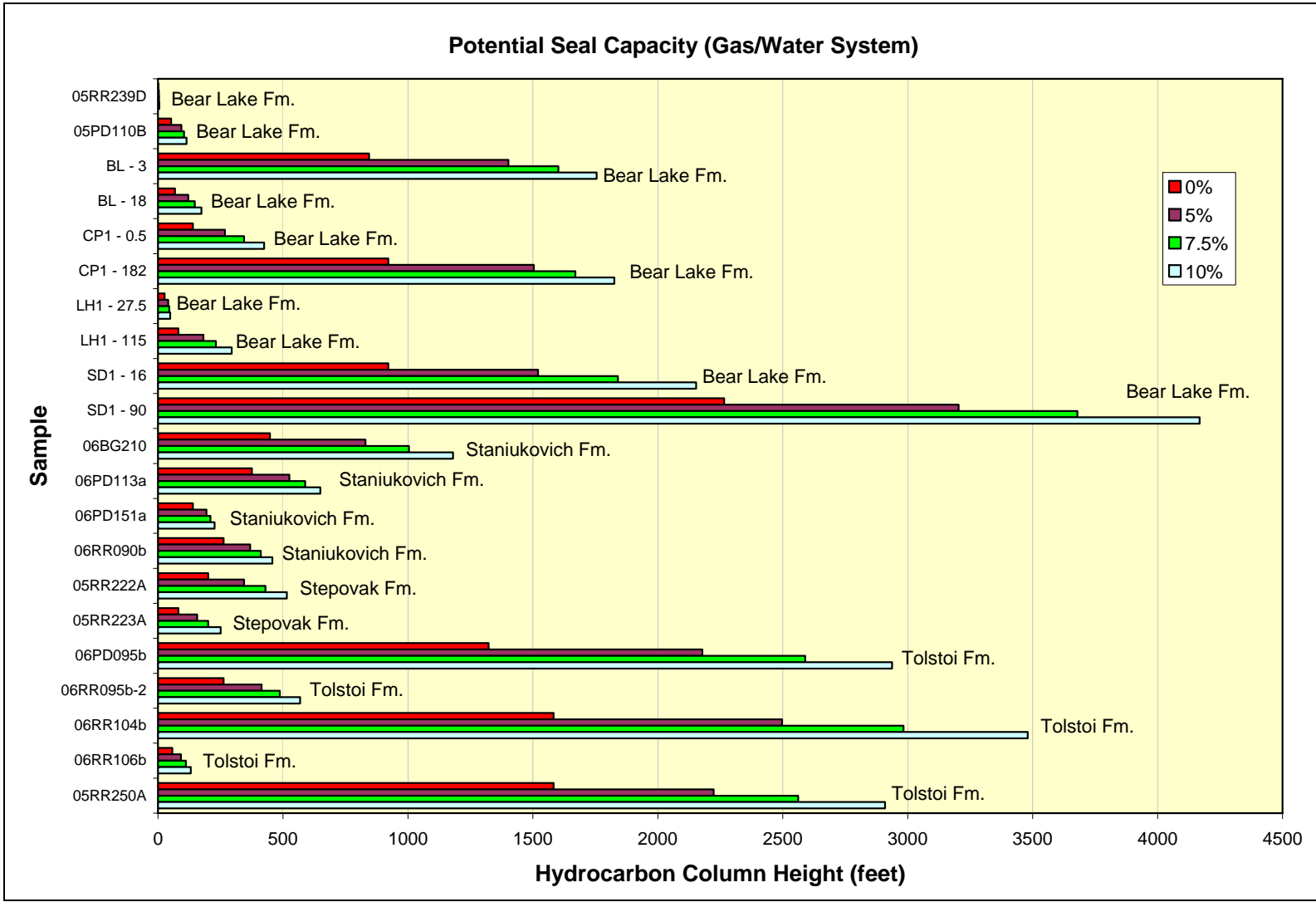


Figure 3. Summary bar graph of potential seal capacity in a gas/water system.

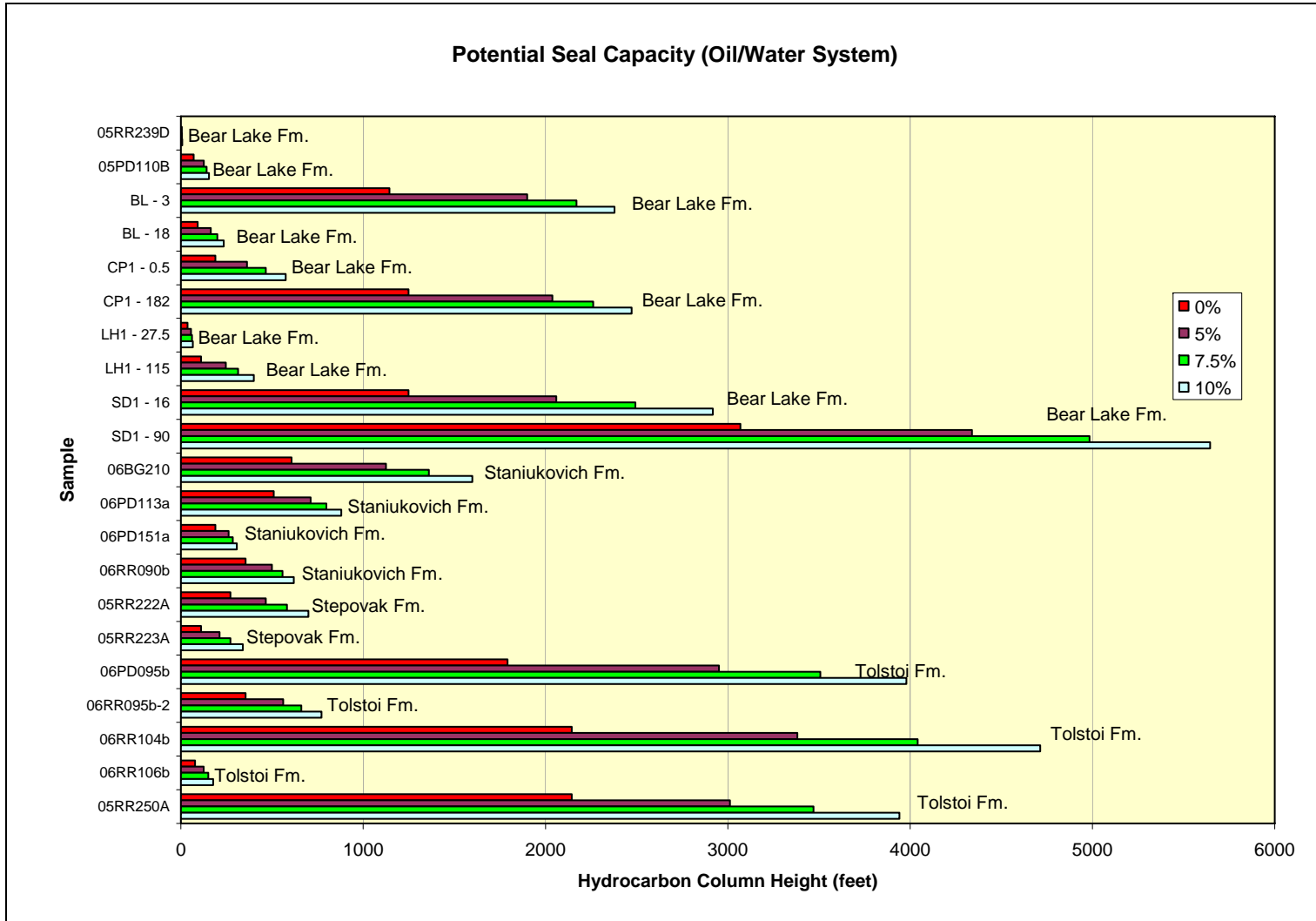


Figure 4. Summary graph of the potential seal capacity in an oil/water system.

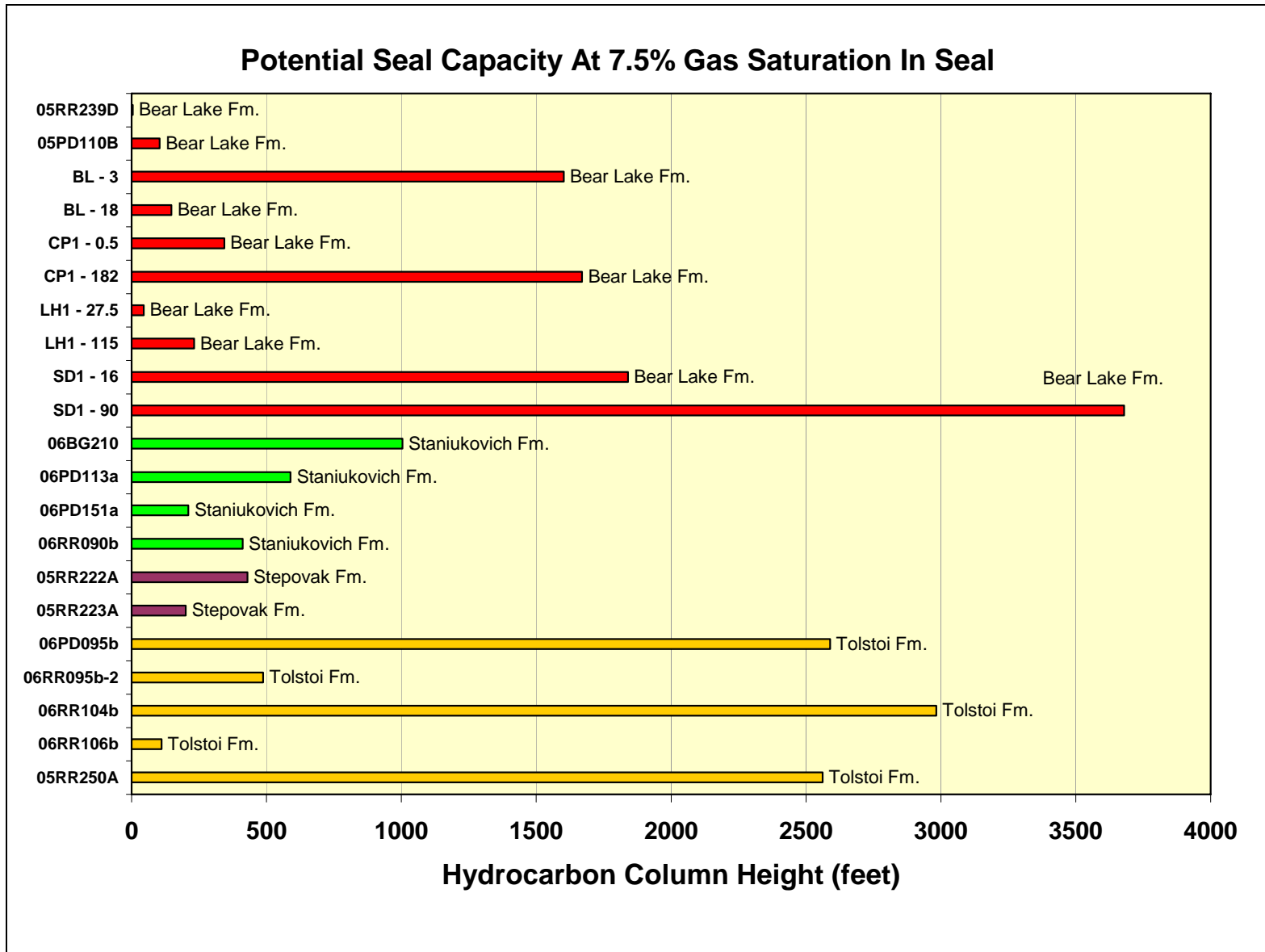


Figure 5. Graph of the potential seal capacity at 7.5% gas saturation.



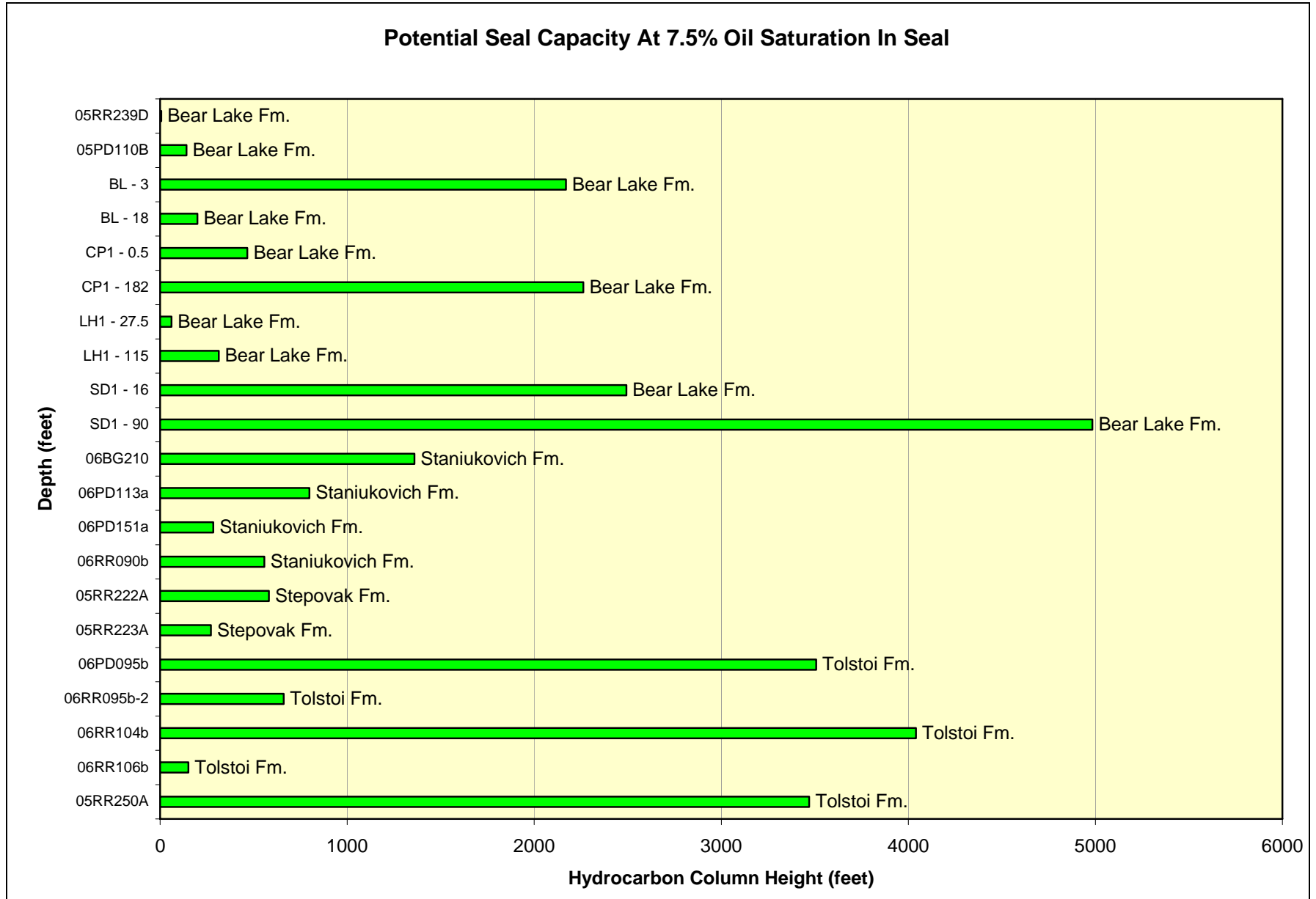


Figure 6. Bar graph summarizing the potential seal capacity at 7.5% oil saturation.

Table 1. Pore system and capillary properties summary.

Sample Depth (ft.)	Formation	Porosity (%)	Kair (md)	Median Aperture	Capillary Pressure at Various Mercury Saturations				
					entry	5%	7.5%	10%	
05RR239D	Bear Lake	19.4	20.9	0.3320	*	3	8	10	12
05PD110B	Bear Lake	22.1	0.285	0.1135	*	122	219	244	267
BL - 3	Bear Lake	20.2	0.0068	0.0279		1980	3286	3754	4114
BL - 16	Bear Lake	18.2	0.112	0.0738	*	160	284	345	406
CP1 - 0.5	Bear Lake	10.3	0.0006	0.0192		328	628	806	995
CP1 - 182	Bear Lake	7.49	0.0007	0.0156	*	2160	3525	3914	4279
LH1 - 27.5	Bear Lake	17.3	1.30	0.5331		62	96	105	114
LH1 - 115	Bear Lake	7.77	0.0005	0.0184	*	191	426	543	692
SD1 - 16	Bear Lake	4.06	0.0001	0.0117		2160	3564	4313	5047
SD1 - 90	Bear Lake	3.64	0.0001	0.0078		5310	7508	8623	9769
06BG210	Staniukovich	4.98	0.0002	0.0146		1050	1946	2353	2766
06PD113a	Staniukovich	8.30	0.0064	0.0251	*	881	1232	1380	1522
06PD151a	Staniukovich	12.6	0.048	0.0724	*	328	454	492	531
06RR090b	Staniukovich	9.33	0.0088	0.0193	*	615	864	964	1072
05RR222A	Stepovak	4.82	0.0002	0.0187		470	806	1007	1209
05RR223A	Stepovak	7.02	0.0005	0.0238		191	367	470	587
06PD095b	Tolstoi	3.69	0.0001	0.0100		3100	5106	6069	6884
06RR095b-2	Tolstoi	5.65	0.0061	0.0194	*	615	971	1143	1333
06RR104b	Tolstoi	2.88	0.00003	0.0087		3710	5852	6991	8156
06RR106b	Tolstoi	19.2	0.026	0.1156		134	215	261	307
05RR250A	Tolstoi	6.65	0.0004	0.0102		3710	5211	6004	6819

Value picked at peak intrusion

Median aperture size is diameter in microns

\* bimodal pore structure

Table 2. Outcrop sample MICP data from the Bristol Bay area.

Outcrop Samples - Composite Height Data												
Data Used In Height Plots												
Changing any values in green cells will recalculate and replot seal capacity												
				Gas				Oil				
Assumed water density (g/cc) - 1.016				Surface Tension 50 dynes/cm Density 0.28 g/cc 0.1360				Surface Tension 30 dynes/cm Density 0.69 g/cc 0.0816				
				h(ft)= 0.4267 *Pc				h(ft)= 0.5780 *Pc				
	Capillary pressure (psia)				Height in feet				Height in feet			
	0%	5%	7.5%	10%	0%	5%	7.5%	10%	0%	5%	7.5%	10%
05RR239D	3	8	10	12	1	3	4	5	2	5	6	7
05PD110B	122	219	244	267	52	93	104	114	71	127	141	154
BL - 3	1980	3286	3754	4114	845	1402	1602	1755	1144	1899	2170	2378
BL - 18	160	284	345	406	68	121	147	173	92	164	199	235
CP1 - 0.5	328	628	806	995	140	268	344	425	190	363	466	575
CP1 - 182	2160	3525	3914	4279	922	1504	1670	1826	1248	2037	2262	2473
LH1 - 27.5	62	96	105	114	26	41	45	49	36	55	61	66
LH1 - 115	191	426	543	692	81	182	232	295	110	246	314	400
SD1 - 16	2160	3564	4313	5047	922	1521	1840	2153	1248	2060	2493	2917
SD1 - 90	5310	7508	8623	9769	2266	3204	3679	4168	3069	4340	4984	5646
06BG210	1050	1946	2353	2766	448	830	1004	1180	607	1125	1360	1599
06PD113a	881	1232	1380	1522	376	526	589	649	509	712	798	880
06PD151a	328	454	492	531	140	194	210	227	190	262	284	307
06RR090b	615	864	964	1072	262	369	411	457	355	499	557	620
05RR222A	470	806	1007	1209	201	344	430	516	272	466	582	699
05RR223A	191	367	470	587	81	157	201	250	110	212	272	339
06PD095b	3100	5106	6069	6884	1323	2179	2590	2937	1792	2951	3508	3979
06RR095b-2	615	971	1143	1333	262	414	488	569	355	561	661	770
06RR104b	3710	5852	6991	8156	1583	2497	2983	3480	2144	3382	4041	4714
06RR106b	134	215	261	307	57	92	111	131	77	124	151	177
05RR250A	3710	5211	6004	6819	1583	2223	2562	2910	2144	3012	3470	3941
Average	1201	1894	2199	2499	512	808	938	1066	694	1094	1271	1444

Table 3. Summary of height at 7.5% saturation.

Height @ 7.5% Saturation			
	Capillary Pressure	Gas	Oil
05RR239D	10	4	6
05PD110B	244	104	141
BL - 3	3754	1602	2170
BL - 18	345	147	199
CP1 - 0.5	806	344	466
CP1 - 182	3914	1670	2262
LH1 - 27.5	105	45	61
LH1 - 115	543	232	314
SD1 - 16	4313	1840	2493
SD1 - 90	8623	3679	4984
06BG210	2353	1004	1360
06PD113a	1380	589	798
06PD151a	492	210	284
06RR090b	964	411	557
05RR222A	1007	430	582
05RR223A	470	201	272
06PD095b	6069	2590	3508
06RR095b-2	1143	488	661
06RR104b	6991	2983	4041
06RR106b	261	111	151
05RR250A	6004	2562	3470