

Cook Inlet Play 2: Mesozoic Stratigraphic Play

Geological Assessment

GRASP UAI: AAAAAACAC

Play Area: 3,775 square miles

Play Water Depth Range: 100-500 feet

Play Depth Range: 4,000-10,000 feet

Play Exploration Chance: 0.2

Play 2, Mesozoic-Stratigraphic, Cook Inlet (Federal) OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	377	1,203
Total Gas (Tcfg)	0.000	0.157	0.508
Total Liquids (Mmbo)	0	349	1,113
Free Gas** (Tcfg)	0.000	0.028	0.099
Solution Gas (Tcfg)	0.000	0.130	0.409
Oil (Mmbo)	0	348	1,107
Condensate (Mmbc)	0	1	5
* Risked, Technically-Recoverable			
** Free Gas Includes Gas Cap and Non-Associated Gas			
F95 = 95% chance that resources will equal or exceed the given quantity			
F05 = 5% chance that resources will equal or exceed the given quantity			
BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas			
Mmb = millions of barrels			
Tcf = trillions of cubic feet			

Table 1

Play 2, the “Mesozoic Stratigraphic” play, is the most important play (of four plays) in the Cook Inlet OCS Planning Area, with 31% (377 Mmboe) of the Planning Area energy endowment (1,225 Mmboe). The overall assessment results for play 2 are shown in [table 1](#). Oil forms 92% of the hydrocarbon energy endowment of play 2.

[Table 5](#) reports the detailed assessment results by commodity for play 2.

[Table 3](#) summarizes the volumetric input data developed for the *GRASP* computer model of Cook Inlet play 2. [Table 4](#) reports the risk model used for play 2. The location of play 2 is shown in [figure 1](#).

This play is probably best developed along the western margin of lower Cook Inlet and Shelikof Strait. Sandstone provenance would have been the Mesozoic plutonic terrane to the west. Detritus from the accretionary complex to the east in the Chugach terrane would be less conducive to good reservoir-rock quality. Play 2 includes stratigraphic traps in turbidite sandstones within marine mudstone sections. The turbidites may have developed in submarine fan complexes in the Upper Cretaceous Kaguyak Formation, similar to the type locality onshore on the Alaska Peninsula (Detterman and others, 1996).

Play 2 also includes stratigraphic traps in Upper Cretaceous non-marine sandstones in fan-delta deposits. Four wells encountered Upper Cretaceous non-marine sandstone: the COST well, the Arco Y-0113 (Ibis) well, the Arco Y-0097 (Raven) well, and the Chevron Y-0243 (Falcon) well. This unit occurs beneath the Lower Tertiary Unconformity at the top of the Mesozoic stratigraphic section. The non-marine sandstone is equivalent to Upper Cretaceous deposits located near Saddle Mountain onshore (Magoon and others, 1980). The fan-delta sandstones prograded eastward from that area and they are areally restricted to the western margin of lower Cook Inlet in the vicinity of the wells listed above. Those

sandstones are characterized by higher quartz content and better porosities than in sandstones in the underlying marine Kaguyak Formation.

Potential source rocks are Upper Triassic carbonates or Middle Jurassic marine siltstones. According to Magoon and Anders (1992), oil in the lower Cook Inlet-Alaska Peninsula area migrated from both Upper Triassic and Middle Jurassic sources during Late Cretaceous to early Tertiary time.

All of the wells drilled in lower Cook Inlet were on structural prospects, so play 2 remains unexplored. The Mesozoic stratigraphic play ranked highest in technically recoverable potential in the Planning Area because it covers a much more extensive area than the two Tertiary plays, it has better reservoir-rock potential than the Mesozoic structural play, and it has untested potential throughout the basin. However, the economically recoverable potential is not as high as play 1, the Tertiary oil play, which is closer to existing infrastructure.

A maximum of 33 hypothetical pools is forecast by the aggregation of the risk model and the prospect numbers model for play 2. These 33 pools range in mean conditional (un-risked) recoverable volumes from 6 Mmboe (pool rank 33) to 225 Mmboe (pool rank 1). Pool rank 1 ranges in possible conditional recoverable volumes from 60 Mmboe (F95) to 593 Mmboe (F05). [Table 2](#) shows the conditional sizes of the 10 largest pools in play 2.

Play 2, Mesozoic-Stratigraphic, Cook Inlet (Federal) OCS Planning Area, 2006 Assessment, Conditional BOE Sizes of Ten Largest Pools			
Assessment Results as of November 2005			
Pool Rank	BOE Resources *		
	F95	Mean	F05
1	60	225	593
2	34	120	253
3	22	82	176
4	15	62	131
5	11	49	105
6	9	41	88
7	8.0	35	76
8	7.2	31	67
9	6.5	28	60
10	6.0	25	55
* Conditional, Technically-Recoverable, Millions of Barrels Energy-Equivalent (Mmboe), from "PSRK.out" file F95 = 95% chance that resources will equal or exceed the given quantity F05 = 5% chance that resources will equal or exceed the given quantity BOE = total hydrocarbon energy, expressed in barrels-of-oil- equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas			

Table 2

In the computer simulation for play 2 a total of 52,526 “simulation pools” were sampled for size. These simulation pools can be grouped according to the USGS size class system in which sizes double with each successive class. Pool size class 11 contains the largest share (14,511, or 27.6%) of simulation pools (conditional, technically recoverable BOE resources) for play 2. Pool size class 11 ranges from 32 to 64 Mmboe. The largest simulation pool for play 2 falls within pool size class 16, which ranges in size from 1,024 to 2,048 Mmboe. [Table 6](#) reports statistics for the simulation pools developed in the *GRASP* computer model for play 2.

GRASP Play Data Form (Minerals Management Service - Alaska Regional Office)

Basin: Lower Cook Inlet
 Play Number: 2
 Play UAI Number: AAAAACAC

Assessor: Comer / Larson
 Play Name: Mesozoic Stratigraphic Play

Date: March, 2005

Play Area (mi²; millions of acres): 3,775 (2.416)
 Reservoir Thermal Maturity, % Ro:

Play Depth Range, feet: 4,000 - 6,000 - 10,000
 Expected Oil Gravity, ° API: 30
 Play Water Depth Range, feet: 100 - 230 - 500
 Prospect Distance from shore, miles: 50

POOLS Module (Volumes of Pools, Acre-Feet)

Fractile	F100	F95	F90	F75	F50	Mean / Std. Dev.	F25	F15	F10	F05	F02	F01	F00
Prospect Area (acres)-Model Input	0				4500	---				14623			~
Prospect Area (acres)-Model Output	313	1385	1797	2775	4500	5816.8 / 4764.4	7296	9456	11272	14623	19601	23828	24000
Fill Fraction (Fraction of Area Filled)	0.2	0.21	0.25	0.31	0.4	0.4303 / 0.17064	0.52	0.59	0.65	0.75	0.88	0.97	1
Productive Area of Pool (acres)	81	474	646	1082	1920	2727.32 / 2568.05	3407	4635	5709	7776	11010	13882	17064
Pay Thickness (feet)	18	47	55	73	94	111.719 / 56.038	137	162	182	215	260	295	564

MPRO Module (Numbers of Pools)

Play Level Chance	0.6	Prospect Level Chance	0.4	Exploration Chance	0.24
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Risk Model	Play Chance	Petroleum System Factors	Prospect Chance
		[See Risking Sheet]	

Fractile	F100	F95	F90	F75	F50	Mean / Std. Dev.	F25	F15	F10	F05	F02	F01	F00
Numbers of Prospects in Play	8	10	12	15	20	21.89 / 8.60	26	30	33	38	45	49	50
Numbers of Pools in Play	~	~	F59.96 = 0	F55 = 4	5	5.25 / 5.35	9	11	13	15	18	20	33

Minimum Number of Pools	0	Mean Number of Pools	5.25	Maximum Number of Pools	33
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POOLS/PSRK/PSUM Module (Play Resources)

Fractile	F100	F95	F90	F75	F50	Mean / Std. Dev.	F25	F15	F10	F05	F02	F01	F00
Oil Recovery Factor (bbl/acre-foot)	131	174	184	201	222	224.381 / 33.515	245	258	268	283	300	312	377
Gas Recovery Factor (Mcft/acre-foot)	287	417	445	496	559	568.010 / 103.764	631	673	703	750	807	847	1088
Gas Oil Ratio (Sol'n Gas)(cf/bbl)	143	193	220	274	350	374.603 / 142.092	447	510	558	637	739	815	1110
Condensate Yield ((bbl/Mmcftg)	20	40	42	47	51	52.692 / 8.796	58	62	64	68	73	76	100

Pool Size Distribution Statistics from POOLS (1,000 BOE): μ (mu) = 10.7070994 σ^2 (sigma squared) = 0.975488683 Random Number Generator Seed = 799503

BOE Conversion Factor (cf/bbl)	5620	Probability Any Pool Contains Both Oil and Free Gas (Gas Cap)	0.1
Probability Any Pool is 100% Oil	0.9	Fraction of Pool Volume Gas-Bearing in Oil Pools with Gas Cap	0.3
Probability Any Pool is 100% Gas	0		

Table 3. Input data for Cook Inlet play 2, 2006 assessment.

GRASP - Geologic and Economic Resource Assessment Model - PSUM Module Results

Minerals Management Service - Alaska OCS Region

GRASP Model Version: 8.29.2005)

Computes the Geologic Resource Potential of the Play

Play UAI: AAAAACAC	Play No. 2
World Level -	World Level Resources
Country Level -	UNITED STATES OF AMERICA
Region Level -	MMS - ALASKA REGION
Basin Level -	COOK INLET
Play Level -	2 Mesozoic - Stratigraphic
Geologist Larson /	Comer
Remarks 2005 Assessment	
Run Date & Time: Date	19-Sep-05 Time 13:59:24

Summary of Play Potential

Product	MEAN	Standard Deviation
BOE (Mboe)	377,090	428,160
Oil (Mbo)	347,620	395,190
Condensate (Mbc)	1,470	3,451
Free (Gas Cap & Nonassociated) Gas (Mmcfg)	27,547	63,681
Solution Gas (Mmcfg)	129,820	150,690

10000 (Number of Trials in Sample)
0.5993 (MPhc [Probability] of First Occurrence of Non-Zero Resource)
Windowing Feature: used

Empirical Probability Distributions of the Products

Greater Than Percentage	BOE (Mboe)	Oil (Mbo)	Condensate (Mbc)	Free (Gas Cap & Nonassociated) Gas (Mmcfg)	Solution Gas (Mmcfg)
100	0	0	0	0	0
99.99	0	0	0	0	0
99	0	0	0	0	0
95	0	0	0	0	0
90	0	0	0	0	0
85	0	0	0	0	0
80	0	0	0	0	0
75	0	0	0	0	0
70	0	0	0	0	0
65	0	0	0	0	0
60	16,109	14,701	99	1,730	5,625
55	188,280	173,380	789	14,356	64,959
50	272,830	250,490	1,292	23,162	95,167
45	345,460	318,810	1,306	24,991	117,440
40	410,460	378,640	1,538	28,046	142,150
35	479,960	441,630	1,993	37,387	166,830
30	552,160	511,080	1,738	33,274	187,790
25	636,100	586,120	2,437	45,701	221,510
20	726,930	668,330	3,149	56,373	255,240
15	845,030	781,950	2,781	53,057	285,860
10	986,380	909,080	3,917	74,486	337,930
8	1,055,000	970,980	4,105	76,405	372,910
6	1,140,500	1,052,700	3,913	74,657	397,010
5	1,203,000	1,107,300	5,249	98,592	409,490
4	1,263,700	1,166,300	4,340	80,694	441,950
2	1,467,900	1,351,900	5,781	107,470	512,090
1	1,652,700	1,527,300	5,856	110,790	561,310
0.1	2,355,000	2,205,200	5,863	114,210	694,840
0.01	2,932,400	2,733,300	7,017	134,600	944,560
0.001	3,030,800	2,845,600	3,815	73,259	946,240

Table 5. Assessment results by commodity for Cook Inlet play 2, 2006 assessment.

Basin: COOK INLET Play 02 - Mesozoic - Stratigraphic UAI Key: AAAAACAC				Model Simulation "Pools" Reported by "Fieldsize.out" GRASP Module																					
Classification and Size				Pool Count Statistics				Pool Types Count			Mixed Pool Range		Oil Pool Range		Gas Pool Range		Total Pool Range			Pool Resource Statistics (MMBOE)					
Class	Min (MMBOE)	Max (MMBOE)	Pool Count	Percentage	Trial Average	Trials w/Pool Avg		Mixed Pool	Oil Pool	Gas Pool	Min	Max	Min	Max	Min	Max	Min	Max		Min	Max	Total Resource	Average Resource		
1	0.0312	0.0625	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
2	0.0625	0.125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
3	0.125	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
4	0.25	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
5	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
6	1	2	54	0.102806	0.0054	0.009009	14	40	0	1	1	1	1	0	0	1	1	1	1	1.043508	1.993605				
7	2	4	366	0.696798	0.0366	0.061061	48	318	0	1	2	1	2	0	0	1	2	2	2	2.006784	3.998413				
8	4	8	1868	3.556334	0.1868	0.311645	244	1624	0	1	2	1	4	0	0	1	4	4	4	4.008502	7.997763				
9	8	16	5624	10.707078	0.5624	0.938272	668	4956	0	1	4	1	6	0	0	1	7	7	8	8.007251	15.999640				
10	16	32	11395	21.694017	1.1395	1.901068	1184	10211	0	1	3	1	9	0	0	1	10	10	16	16.004859	31.999393				
11	32	64	14511	27.626318	1.4511	2.420921	1490	13021	0	1	4	1	11	0	0	1	11	11	32	32.000446	63.992072				
12	64	128	11072	21.079084	1.1072	1.84718	995	10077	0	1	3	1	10	0	0	0	1	10	64	64.009326	127.971123				
13	128	256	5633	10.724213	0.5633	0.939773	484	5149	0	1	2	1	7	0	0	1	7	7	128	128.004214	255.968435				
14	256	512	1705	3.246011	0.1705	0.284451	126	1579	0	1	2	1	4	0	0	1	4	4	256	256.140947	511.888221				
15	512	1024	290	0.552108	0.029	0.048382	23	267	0	1	1	1	2	0	0	1	2	2	513	513.183046	982.573860				
16	1024	2048	8	0.015231	0.0008	0.001335	2	6	0	1	1	1	1	0	0	1	1	1	1073	1073.305000	1627.432000				
17	2048	4096	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
18	4096	8192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
19	8192	16384	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
20	16384	32768	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
21	32768	65536	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
22	65536	131072	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
23	131072	262144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
24	262144	524288	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
25	524288	1048576	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000				
Not Classified			0	0	0	0	Below Class	0	0	0									Below Class	0.000000	0.000000				
Totals			52526	100	5.2526	8.763097	Above Class	0	0	0									Above Class	0.000000	0.000000				
Number of Pools not Classified: 0				Min and Max refer to numbers of pools of the relevant size class that occur within any single trial in the simulation.																		Min and Max refer to aggregate resources of the relevant size class that occur within any single trial in the simulation.			
Number of Pools below Class 1: 0																									
Number of Trials with Pools: 5994																									

Table 6. Statistics for simulation pools created in computer sampling run for Cook Inlet play 2, 2006 assessment.

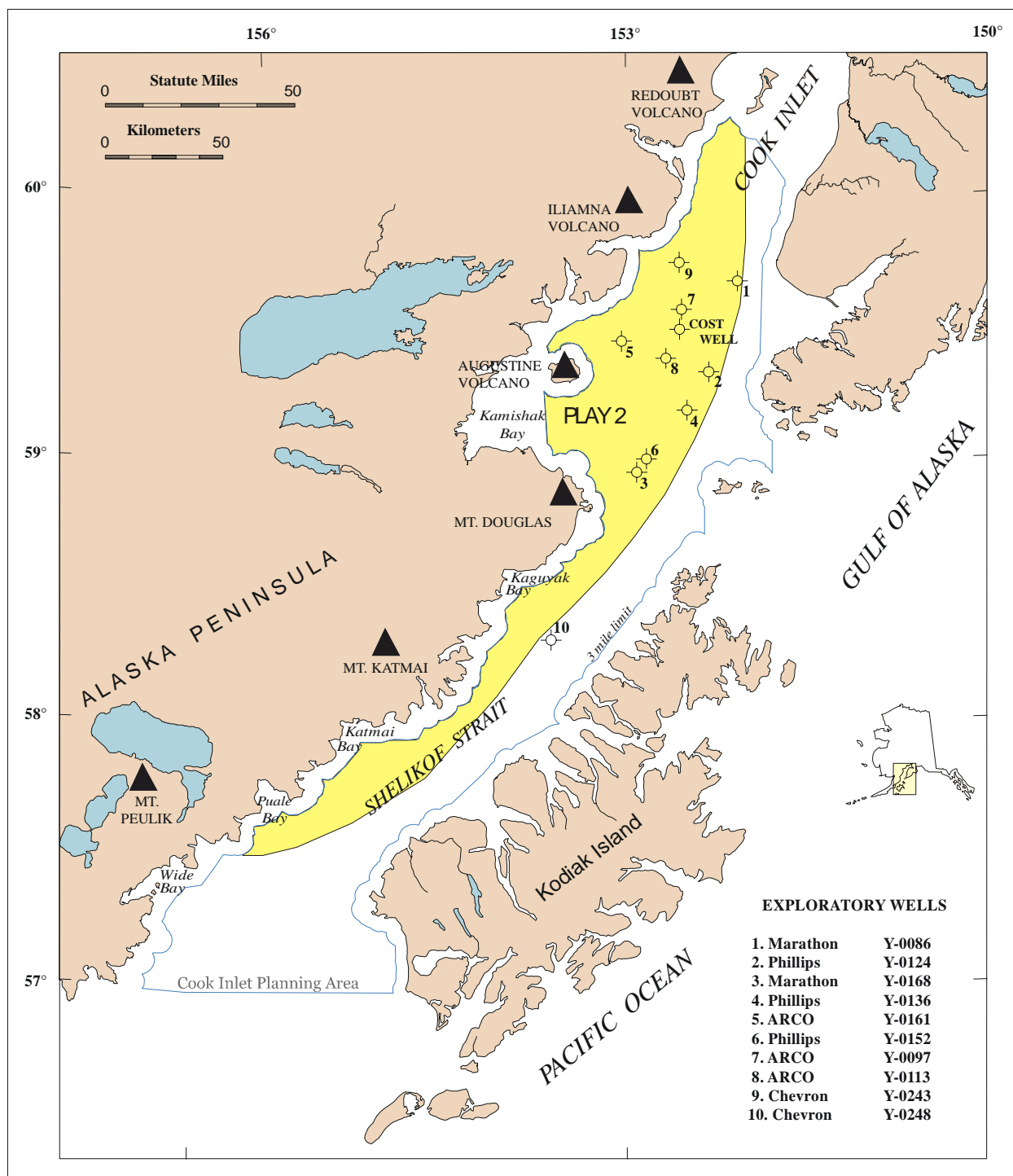


Figure 1. Map location of Cook Inlet play 2, 2006 assessment.