PNGE 241
Oil and Gas Property Evaluation

Oil Well Proposal
SHAHAB OIL COMPANY
(Texas & Louisiana Project)

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Petroleum and Natural Gas Engineering
West Virginia University

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Executive Summary

SHAHAB OIL COMPANY has been offered to invest in two newly drilled oil wells. While only having enough resources to invest in one well, we the engineering department highly recommend investing in the Texas oil well as it brings $1,671,547 American dollars more than the Louisiana well at a 15.5 percent discount rate over the next three years. Using decline curve analysis and a net present value profile, it can be seen that the NPV for the Texas oil well at a time value of money of 15.5% is $1,698,759 American dollars. This is significantly greater than the NPV of the Louisiana oil well at a 15.5 % discount rate, which is $27,212 American dollars. These amounts represent the net present value of each well for the next three years. The present value profile graph, located in Appendix E, shows that the Texas well would be a more economical choice as long as the time value of money is above 400%.

Introduction

Objective

SHAHAB OIL COMPANY has been offered to invest in two newly drilled oil wells. The first oil well is located in Texas and the second is in Louisiana. Management informed the operations department that the company only has enough resources to invest in one of the two wells. Our assessment team was asked to analyze the situation and choose the most profitable well to invest in. The production data for the first four months was provided for both wells. Appendix A contains this data, and all the other information that was provided to us.

Background

To solve this problem the “Decline Curve Analysis” method was used. Decline curves are the most common means of predicting production. When the logarithm of production is potted versus time, the graph will usually display a straight line, or it will curve upward. A straight line shows the presence of “exponential decline” whereas a line curved upward shows “hyperbolic decline”. When the production data for the first four months was plotted, the line curved upward indicating hyperbolic decline. This was true for both wells.

To incorporate a monetary value to our calculations the yardstick Net Present Value Profile was used. This method is useful in comparing projects, in our case two oil wells. The present value profile is generated by calculating the net present value (NPV) for each project at several discount rates. A plot of NPV versus discount rate is then made. When the projects are plotted on the same graph it can easily be seen which project is the most profitable at a certain discount rate.

Methodology

Using decline curve analysis, the production data for the first four months was plotted on a semi-log graph for each well. From this plot, located in Appendix B and C, it was discovered that both oil wells had hyperbolic decline. The next step was to perform type curve matching. The flowrate versus time was plotted on tracing paper over the type curve. The type curve and the trace can be seen in Appendix D. The plot showed a match for the Empirical Region. A good match was made for a b value of 0.5 for the Texas well, and a b of 0.2 for the Louisiana well. Two match points were then found and the qi and Di values were found using the following equations.

$$qi = qDd / q(t)$$

$$Di = tDd / t$$

The match points from the tracing paper are q(t) and t, whereas the match points from the type curve are qDd and tDd.

The analysis was for the next three years, so the flowrate was calculated at each day for three years. The following equation was used.

$$q = qi(1+bDit)^(-1/b)$$

The flow rate was found in barrels of oil per day (BOPD). The cumulative production (Np) was then found for each month using the following equation.

$$Np = ((qi^b)/(Di(1-b))[(qi^(1-b))-(q^(1-b))]$$

The cumulative production was found in stb. The revenue in dollars per month was then found by multiplying the change in Np with the price of oil. Since the price of oil increased 5% each year, that had to be taken into account when the revenue was calculated. The monthly cost was then calculated by multiplying the production cost with the change in monthly cumulative production. Net cash flow per month was then calculated subtracting cost from revenues.

The net present value at an interest rate of 10, 15.5, 17, 100, 200, 300, 400, and 600 percent was calculated using the following equation.

$$NPV = NCF / ((1+(i/12)) ^ month)$$

The NPV was given per month in dollars. Then at each discount rate the NPV values at each month were summed up for the net present value profile graph. For the graph the NPV versus the discount rate was plotted for each well. This graph can be seen in Appendix E.

From the graph and the calculations it can be seen that the NPV for the Texas well at a time value of money of 15.5% is $1,698,759 American dollars. This is significantly greater than the NPV of the Louisiana well at a

15.5 % discount rate, which is $27212 American dollars. The Present value profile graph shows that the Texas well would be a more economical choice as long as the time value of money was above 400%.

Results & Discussion

Decline curve analysis combined with a net present value profile is a very effective way to analyze future production and cost. Calculating the future production rate for the oil wells is sometimes referred to being an art rather than a science. This can clearly be seen when performing type curve matching. To find the future production rate the b values play a big role. To show how good of a method type curve matching is to find future production the actual production at 120 days, and the calculated production only differed by 20 BOPD for both the Louisiana and Texas well. That's accurate!

Conclusion / Recommendations

We highly recommend investing in the Texas oil well as it gives $1,671,547 American dollars more than the Louisiana well at a 15.5 % discount rate. From the graph and the calculation it can be seen that the NPV for the Texas well at a time value of money of 15.5% is $1,698,759 American dollars. This is significantly greater than the NPV of the Louisiana well at a 15.5 % discount rate, which is $27,212 American dollars. The present value profile graph shows that the Texas well would be a more economical choice as long as the time value of money was above 400%.

References

1. Mohaghegh, Shahab, Ph.D., personal communication.

2. Thompson, Robert S., and Wright, John D., “Oil Property Evaluation” Second Edition. Thompson-Wright Associates, 1984.

Appendix A
Given Data

GIVEN DATA FOR THE WELL IN TEXAS

The following is the production data from the well in Texas

first 4 months of production

Time (Day)	Rate (BOPD)
1	92800
2	81390
4	69980
6	58800
8	50100
10	41800
20	25000
30	15000
40	10500
50	8000
70	4800
100	2600
120	2000

4 months * 30(days/month)=120 days

Texas oil is sold for 17 dollars per barrel

Production cost is 5.51 dollars fixed

need 1,000,000 investment

The price of oil will increase 5% each year.

Texas operation requires $1,000,000

time value of money is 15.5 %

year	Oil Price ($/bbL)
1	17
2	17.85
3	18.7425

GIVEN DATA FOR THE WELL IN LOUISIANA
The following is the production data from the well in Louisiana.

first 4 months of production

Time (Day)	Rate (BOPD)
1	93000
2	81500
4	70000
6	53000
8	43000
10	38500
20	18000
30	9000
40	5000
50	2900
70	1100
100	370
120	200

4 months * 30(days/month)=120 days

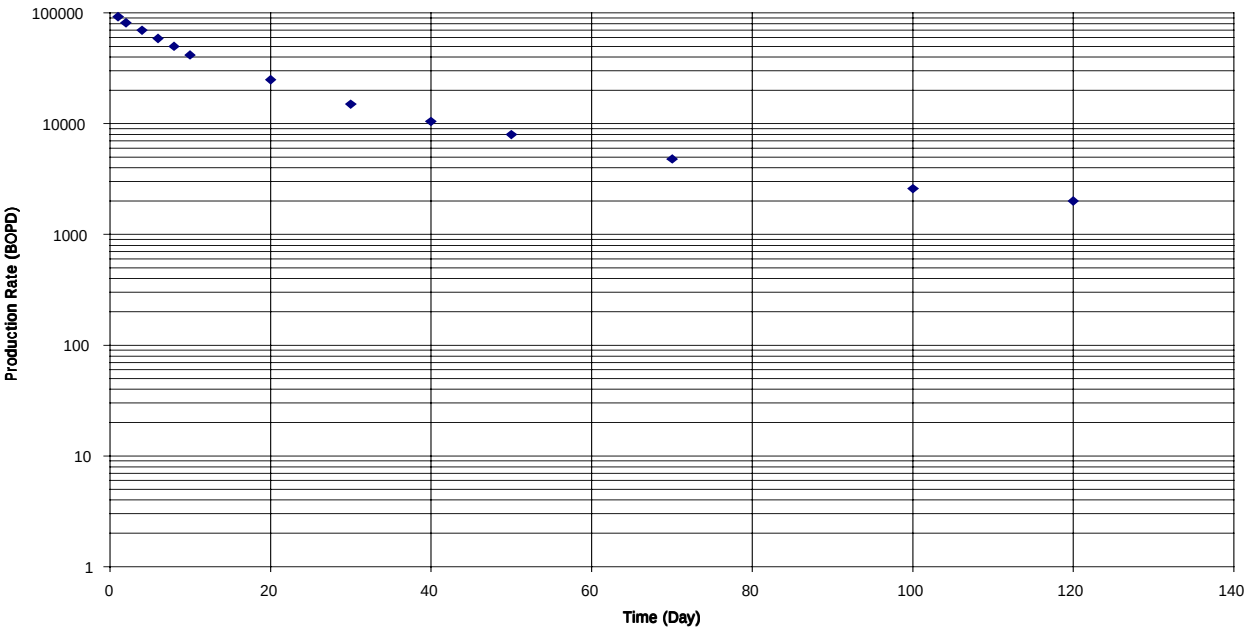
year	Oil Price ($/bbL)
1	18.95
2	19.8975
3	20.892375

Louisiana oil is sold for 18.95 dollars per barrel
Production cost is 4.93 dollars fixed
need 100,000 investment
The price of oil will increase 5% each year.
Louisiana operation requires $100,000
time value of money is 15.5 %

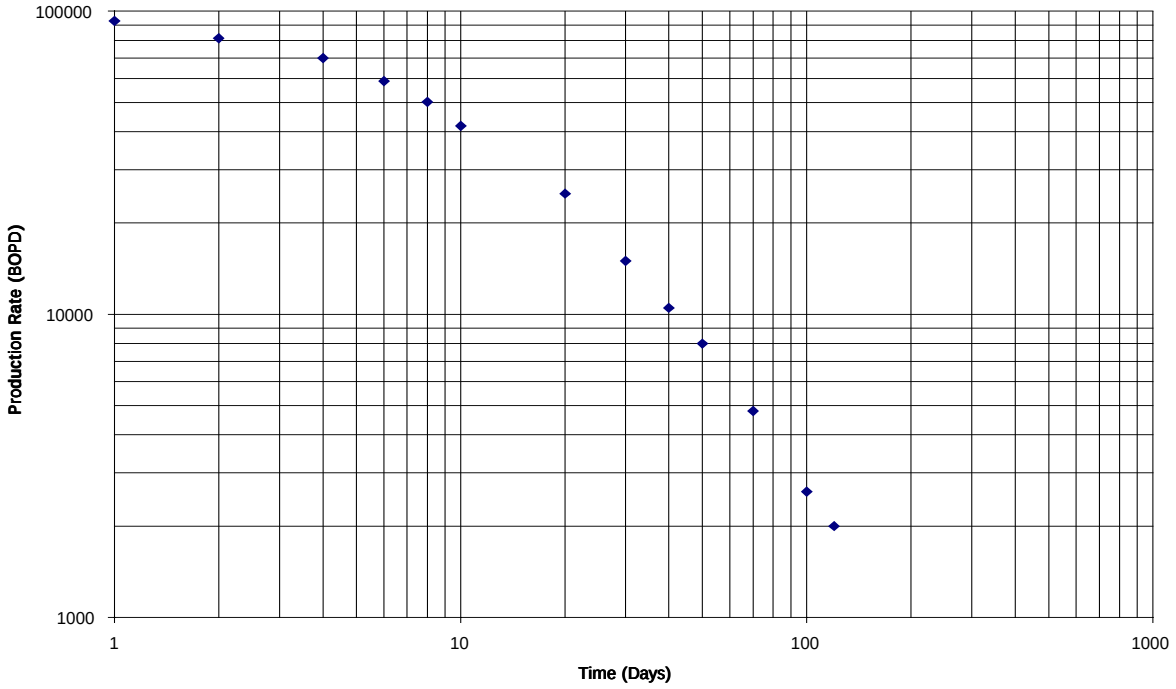
Appendix B

Decline Curve Analysis
(Texas Well)

TEXAS WELL (Semi-Log Plot)



TEXAS WELL (Log-Log Plot)



Analysis for next three years

	Month	Days	Q (BOPD)	Np (STB)	delta Np (STB/month)	Investment
	0	120	2040.816327	1714285.714	----------	-1000000
	1	150	1384.083045	1764705.882	50420.16807	0
	2	180	1000	1800000	35294.11765	0
	3	210	756.1436673	1826086.957	26086.95652	0
	4	240	591.7159763	1846153.846	20066.88963	0
	5	270	475.6242568	1862068.966	15915.11936	0
	6	300	390.625	1875000	12931.03448	0
	7	330	326.5306122	1885714.286	10714.28571	0
	8	360	277.0083102	1894736.842	9022.556391	0
	9	390	237.953599	1902439.024	7702.182285	0
	10	420	206.6115702	1909090.909	6651.884701	0
	11	450	181.0774106	1914893.617	5802.70793	0
year 1	12	480	160	1920000	5106.382979	0
	13	510	142.3994304	1924528.302	4528.301887	0
	14	540	127.5510204	1928571.429	4043.126685	0
	15	570	114.9095088	1932203.39	3631.961259	0
	16	600	104.0582726	1935483.871	3280.481137	0
	17	630	94.67455621	1938461.538	2977.667494	0
	18	660	86.50519031	1941176.471	2714.932127	0
	19	690	79.34933545	1943661.972	2485.501243	0
	20	720	73.04601899	1945945.946	2283.974115	0
	21	750	67.46500253	1948051.948	2106.002106	0
	22	780	62.5	1950000	1948.051948	0
	23	810	58.06357962	1951807.229	1807.228916	0
year 2	24	840	54.08328826	1953488.372	1681.143177	0
	25	870	50.49867441	1955056.18	1567.807682	0
	26	900	47.25897921	1956521.739	1465.559355	0
	27	930	44.32132964	1957894.737	1372.997712	0
	28	960	41.64931279	1959183.673	1288.936627	0
	29	990	39.21184198	1960396.04	1212.366135	0
	30	1020	36.98224852	1961538.462	1142.421935	0
	31	1050	34.93754913	1962616.822	1078.360891	0
	32	1080	33.05785124	1963636.364	1019.541206	0
	33	1110	31.32586733	1964601.77	965.4062751	0
	34	1140	29.72651605	1965517.241	915.4714678	0
	35	1170	28.24659275	1966386.555	869.3132425	0
year 3	36	1200	26.8744961	1967213.115	826.5601322	0

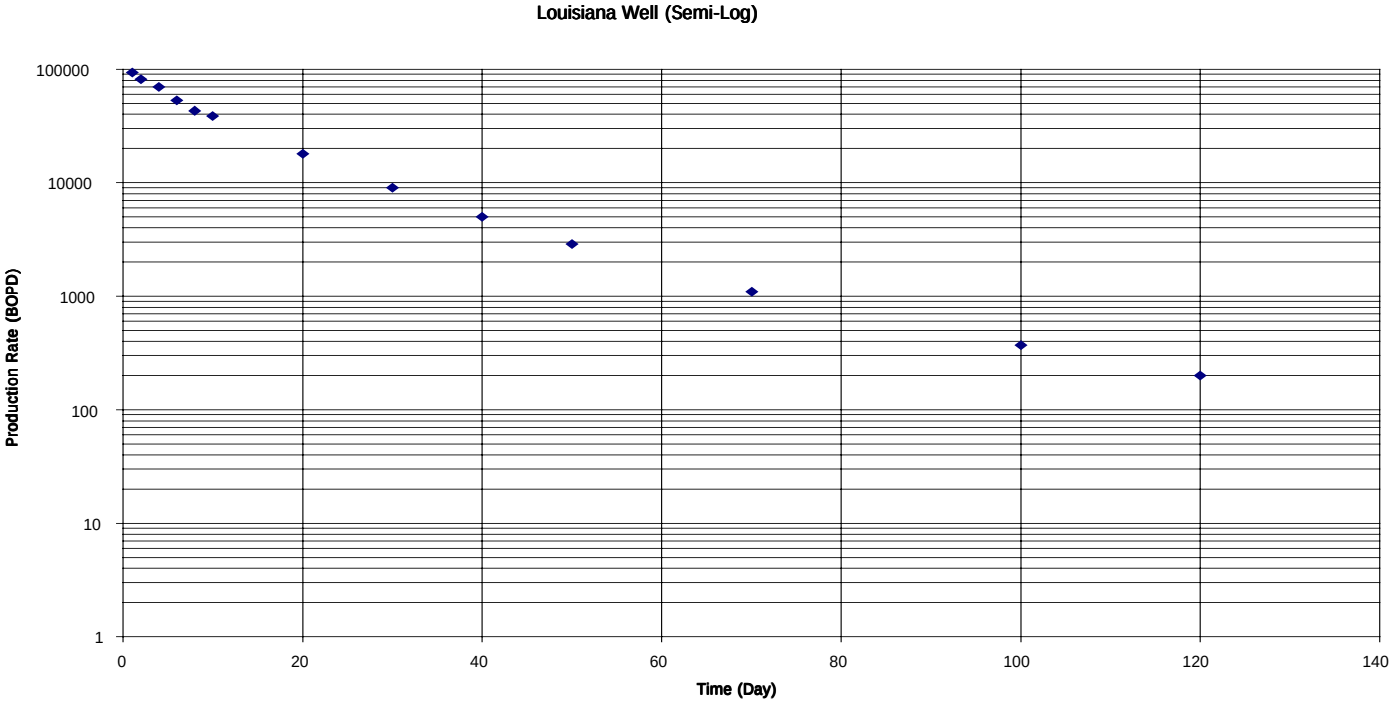
Interest = 0%	*Interest = 10%*

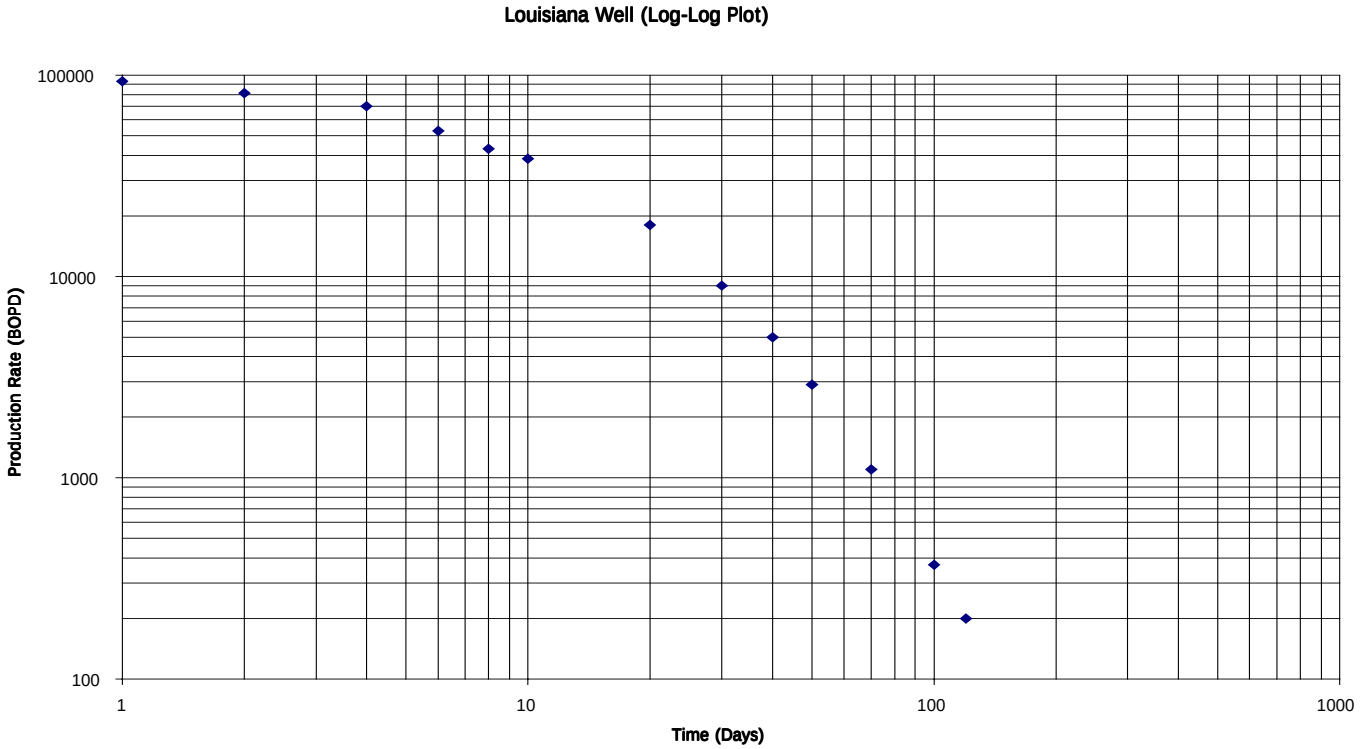
Revenues			
(dollars/month)	**Cost ($/month)**	**NCF ($/month)**	**NPV ($)**
0	0	-1000000	-1000000
857142.8571	277815.1261	579327.7311	574539.8986
600000	194470.5882	405529.4118	398854.1445
443478.2609	143739.1304	299739.1304	292368.8303
341137.1237	110568.5619	230568.5619	223040.43
270557.0292	87692.30769	182864.7215	175432.1991
219827.5862	71250	148577.5862	141360.6563
182142.8571	59035.71429	123107.1429	116159.4059
153383.4586	49714.28571	103669.1729	97010.03016
130937.0988	42439.02439	88498.07445	82129.03178
113082.0399	36651.8847	76430.15521	70343.42317
98646.03482	31972.9207	66673.11412	60856.27606
86808.51064	28136.17021	58672.34043	53110.93184
80830.18868	24950.9434	55879.24528	50164.54949
72169.81132	22277.62803	49892.18329	44419.61289
64830.50847	20012.10654	44818.40194	39572.59251
58556.5883	18075.45107	40481.13723	35447.5902
53151.36476	16406.94789	36744.41687	31909.59169
48461.53846	14959.27602	33502.26244	28853.59287
44366.19718	13695.11185	30671.08534	26196.95314
40768.93795	12584.69737	28184.24058	23873.92647
37592.13759	11604.0716	25988.06599	21831.68976
34772.72727	10733.76623	24038.96104	20027.41788
32259.03614	9957.831325	22301.20482	18426.10188
30008.40572	9263.098907	20745.30681	16998.90237
29384.63548	8638.620329	20746.01516	16858.99121
27468.24621	8075.232047	19393.01417	15629.24805
25733.40961	7565.217391	18168.19222	14521.12824
24157.89474	7102.040816	17055.85392	13519.41776
22722.77228	6680.137401	16042.63488	12611.19077
21411.84311	6294.744859	15117.09825	11785.41032
20211.17901	5941.768512	14269.4105	11032.60779
19108.75106	5617.672048	13491.07901	10344.62399
18094.12711	5319.388576	12774.73854	9714.398595
17158.22399	5044.247788	12113.9762	9135.798052
16293.10345	4789.915966	11503.18748	8603.473962
15491.80328	4554.346329	10937.45695	8112.746075
	SUM NPV=	***1958516.312***	***1784796.814***

NPV (dollars per month) These calculations are on a per month basis

Interest = 15.5%	*Interest = 17%*	*Interest = 100%*	*Interest = 200%*	*Interest = 300%*	*Interest = 400%*	*Interest = 600%*
NPV ($)	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**
-1000000	-1000000	-1000000	-1000000	-1000000	-1000000	-1000000
571940.1706	571235.232	534764.0595	496566.627	463462.1849	434495.7983	386218.4874
395252.7711	394279.043	345539.8538	297939.976	259538.8235	228110.2941	180235.2941
288417.954	287352.809	235752.9437	188757.003	153466.4348	126452.4457	88811.5942
219030.8166	217952.955	167398.5399	124455.167	94440.88294	72953.33403	45544.40728
171498.9017	170444.608	122551.7162	84604.9904	59921.11194	43394.65559	24080.95098
137565.964	136551.761	91913.78718	58921.3326	38948.72276	26443.61825	13043.84845
112529.7184	111562.42	70298.89657	41846.1709	25817.43909	16432.81991	7205.173427
93553.46917	92634.9724	54645.29612	30204.755	17392.80107	10378.6231	4045.009643
78844.31188	77974.0032	43060.08324	22101.0402	11878.01049	6644.850157	2302.038008
67224.49837	66400.5107	34327.61881	16360.5103	8206.625426	4304.05067	1325.415823
57894.83918	57114.7245	27641.87963	12233.0867	5727.176893	2815.948045	770.8092021
50297.77883	49558.8735	22453.71145	9227.24255	4031.932533	1858.525709	452.2080652
47292.49309	46540.3038	19739.81828	7532.55422	3071.993997	1327.537983	287.1204752
41686.98339	40973.3863	16269.081	5764.70986	2194.281426	888.9763281	170.9050448
36970.09871	36292.4581	13490.39833	4438.68701	1576.90733	598.9289668	102.3499138
32966.52955	32322.3843	11247.57776	3436.40285	1139.442716	405.7260743	61.63005563
29541.88263	28928.9528	9424.005984	2673.59694	827.4107107	276.2058275	37.29408494
26591.76891	26007.9521	7931.516348	2089.44971	603.5231066	188.8760438	22.66895359
24034.13625	23477.4991	6702.689872	1639.60843	442.0169232	129.686016	13.83551158
21803.79021	21272.5569	5685.441721	1291.42903	324.9421705	89.37820021	8.475808897
19848.41817	19340.9581	4839.157189	1020.68417	239.6976011	61.81024885	5.210237504
18125.66365	17640.4795	4131.895754	809.256734	177.3762248	42.88086014	3.212979794
16600.94583	16136.6614	3538.34261	643.505354	131.6430777	29.83577919	1.98714413
15245.81519	14801.1646	3038.290613	513.09397	97.96694155	20.8156599	1.232337445
15051.91519	14594.9088	2804.671713	439.809848	78.3762293	15.61227799	0.821586349
13890.84513	13452.49	2420.084622	352.394226	58.61178887	10.94556446	0.512003087
12847.58068	12426.8125	2092.834313	282.975213	43.92799334	7.690699238	0.319777366
11907.19286	11503.0277	1813.570707	227.700172	32.99081949	5.414880076	0.200132774
11057.01509	10668.5419	1574.615846	183.577225	24.82477506	3.819903024	0.125495799
10286.24636	9912.62028	1369.636269	148.273912	18.7140612	2.699643002	0.078837104
9585.633072	9226.06976	1193.385448	119.965275	14.13173967	1.911195864	0.049610888
8947.212202	8600.98234	1041.500027	97.2186123	10.68873401	1.355211613	0.031269893
8364.102661	8030.52721	910.3376683	78.9056247	8.096952486	0.962440105	0.019739697
7830.334837	7508.78072	796.8472959	64.1351136	6.142515679	0.68449404	0.012479118
7340.710527	7030.58676	698.4647273	52.2012089	4.666247205	0.487486302	0.007899946
6890.687266	6591.44144	613.0283105	42.543374	3.54940771	0.347633674	0.005007616
1698759.195	***1676343.46***	***873715.579***	***417160.58***	***153964.0698***	***-21602.447***	***-245246.657***

Appendix C
Decline Curve Analysis
(Louisiana Well)


Louisiana Well (Semi-Log)
Production Rate (BOPD)
100000
10000
1000
100
10
1
0
20
40
60
80
100
120
140
Time (Day)


Louisiana Well (Log-Log Plot)
Production Rate (BOPD)
100000
10000
1000
100
1
10
100
1000
Time (Days)

Analysis for next three years

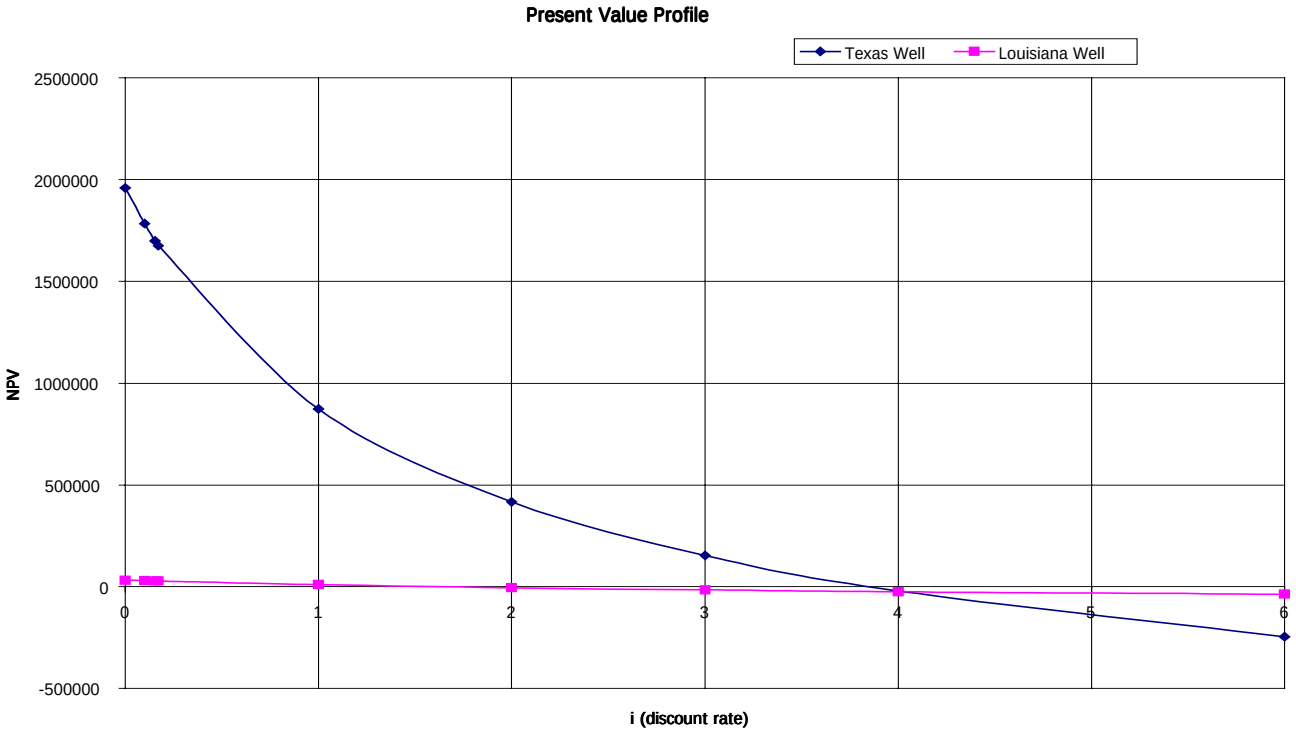
	Month	Days	Q (BOPD)	Np (STB)	delta Np (STB/month)	Investment
	0	120	220.0925868	1240646.1	----------	-100000
	1	150	97.65625	1245117.2	4471.122439	0
	2	180	48.55241556	1247208.2	2091.048606	0
	3	210	26.30166742	1248290.4	1082.155512	0
	4	240	15.23561649	1248895.4	605.0261863	0
	5	270	9.313225746	1249254.9	359.5241361	0
	6	300	5.949901827	1249479.4	224.4416499	0
	7	330	3.943955795	1249625.3	145.9406093	0
	8	360	2.697309227	1249723.5	98.20160472	0
	9	390	1.894901499	1249791.6	68.03503096	0
	10	420	1.36257599	1249839.9	48.336486	0
	11	450	1	1249875	35.10267884	0
year 1	12	480	0.747258173	1249901	25.9882921	0
	13	510	0.567426856	1249920.6	19.5719481	0
	14	540	0.437109216	1249935.5	14.96615041	0
	15	570	0.34110774	1249947.1	11.60190967	0
	16	600	0.269329074	1249956.2	9.105725142	0
	17	630	0.214934167	1249963.5	7.227166227	0
	18	660	0.173204144	1249969.3	5.795072825	0
	19	690	0.140828782	1249973.9	4.690410868	0
	20	720	0.115450654	1249977.8	3.829073849	0
	21	750	0.095367432	1249980.9	3.150764484	0
	22	780	0.079334038	1249983.5	2.611673446	0
	23	810	0.066429008	1249985.7	2.179576215	0
year 2	24	840	0.055962871	1249987.5	1.830497814	0
	25	870	0.047414468	1249989.1	1.54641114	0
	26	900	0.040386107	1249990.4	1.313627219	0
	27	930	0.034571613	1249991.5	1.1216553	0
	28	960	0.029733303	1249992.5	0.962386252	0
	29	990	0.025685222	1249993.3	0.829501199	0
	30	1020	0.022280818	1249994	0.718038898	0
	31	1050	0.019403791	1249994.7	0.624076224	0
	32	1080	0.016961248	1249995.2	0.54449006	0
	33	1110	0.014878532	1249995.7	0.476778358	0
	34	1140	0.013095293	1249996.1	0.418924582	0
	35	1170	0.011562477	1249996.5	0.369294245	0
year 3	36	1200	0.01024	1249996.8	0.326555375	0

Revenues		Interest 0%	Interest = 10%	Interest = 15.5%
(dollars/month)	Cost ($/month)	NCF ($/month)	NPV ($)	NPV ($)
0	0	-100000	-100000	-100000
84727.77021	22042.63362	62685.13659	62167.07761	61885.77861
39625.37107	10308.86963	29316.50145	28833.93353	28573.58332
20506.84696	5335.026676	15171.82028	14798.75965	14598.77914
11465.24623	2982.779098	8482.467132	8205.512066	8058.001001
6812.982378	1772.453991	5040.528388	4835.656504	4727.238122
4253.169265	1106.497334	3146.671931	2993.827136	2913.460694
2765.574546	719.4872039	2046.087342	1930.613323	1870.286542
1860.920409	484.1339113	1376.786498	1288.349236	1242.444109
1289.263837	335.4127026	953.851134	885.2042328	849.8008207
915.9764097	238.298876	677.6775337	623.7087625	596.0544256
665.1957641	173.0562067	492.1395574	449.2032682	427.3437787
492.4781352	128.12228	364.3558552	329.819449	312.349739
389.4328374	96.48970415	292.9431332	262.9842302	247.9276704
297.7889777	73.7831215	224.0058562	199.4351171	187.166161
230.8489977	57.19741468	173.651583	153.3263802	143.242862
181.181166	44.89122495	136.2899411	119.3432376	110.9901222
143.80254	35.6299295	108.1726105	93.93927368	86.96892849
115.3074615	28.56970903	86.73775251	74.70229217	68.84640327
93.32745024	23.12372558	70.20372466	59.96278465	55.0122653
76.1889969	18.87733407	57.31166283	48.54679055	44.33724121
62.69233632	15.53326891	47.15906742	39.61672753	36.0177972
51.96577239	12.87555009	39.0902223	32.56697392	29.47449435
43.36811774	10.74531074	32.622807	26.95420137	24.28431361
36.42233026	9.024354224	27.39797603	22.45016302	20.13489041
32.30820145	7.623806922	24.68439453	20.05946622	17.90933874
27.44479248	6.476182191	20.96861028	16.89905491	15.01941449
23.43404315	5.52976063	17.90428252	14.3101955	12.66095775
20.10653447	4.744564223	15.36197025	12.17675142	10.72464289
17.3302501	4.089440909	13.2408092	10.40866242	9.125921537
15.00153793	3.539931769	11.46160616	8.935559546	7.798911056
13.0384345	3.076695785	9.961738719	7.702067037	6.69190729
11.37569052	2.684335996	8.691354523	6.664314572	5.764060321
9.961032242	2.350517304	7.610514938	5.787325934	4.982890888
8.752329458	2.065298188	6.68703127	5.043048315	4.322420075
7.715433862	1.82062063	5.894813232	4.408853827	3.761750177
6.822517348	1.609917998	5.21259935	3.866391896	3.283980191
	SUM NPV=	***31197.28975***	***28591.75464***	***27211.56965***

Interest = 17%	Interest = 100%	Interest = 200%	Interest = 300%	Interest = 400%	Interest = 600%
NPV ($)	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**
-100000	-100000	-100000	-100000	-100000	-100000
61809.502	57863.203	53730.11708	50148.10927	47013.85244	41790.09106
28503.1906	24979.74088	21538.65413	18762.56093	16490.53207	13029.5562
14544.8649	11933.04754	9554.265835	7767.971986	6400.611682	4495.354158
8018.34719	6158.483192	4578.624491	3474.418537	2683.905616	1675.549063
4698.17732	3378.045801	2332.072871	1651.680342	1196.141014	663.7732856
2891.98125	1946.609456	1247.873978	824.8811667	560.0399995	276.2510337
1854.20968	1168.394287	695.4992105	429.0956162	273.119691	119.7527114
1230.24594	725.7210968	401.1365927	230.9864447	137.8341097	53.72006455
840.420448	464.1107672	238.2097283	128.0237321	71.61961315	24.81185696
588.748436	304.3701271	145.0625114	72.76507112	38.16240376	11.75196522
421.585456	204.0352035	90.29705545	42.27446608	20.78558115	5.689635238
307.761129	139.4377858	57.30127394	25.03834371	11.54146433	2.808216872
243.984369	103.4846514	39.4889019	16.10471906	6.959527359	1.505209514
183.962254	73.04489761	25.88238646	9.851881744	3.991324701	0.767329236
140.617303	52.26935642	17.19795872	6.10982191	2.320586159	0.396560872
108.821445	37.86780252	11.56951543	3.836220799	1.365978985	0.2074931
85.1645122	27.74351631	7.870854549	2.435830642	0.81312776	0.109790789
67.3348947	20.53478935	5.40960994	1.562528439	0.489002305	0.058690188
53.7381663	15.34193489	3.752935939	1.011742298	0.296841186	0.031668408
43.2569969	11.56114595	2.626075552	0.660758485	0.181747429	0.01723526
35.0969383	8.781343722	1.852177593	0.434965624	0.112163548	0.009454722
28.6855269	6.718956084	1.315948121	0.288434931	0.069729401	0.005224689
23.6051458	5.175983495	0.941337078	0.192571063	0.043644587	0.002906848
19.547648	4.012619055	0.677634533	0.129383284	0.02749089	0.001627527
17.3655753	3.337104623	0.523302414	0.093255006	0.01857608	0.000977555
14.545445	2.61670573	0.381024689	0.063373736	0.011834843	0.000553601
12.2463017	2.06243397	0.278864738	0.043289899	0.007578985	0.000315132
10.360617	1.633457896	0.205086376	0.029714372	0.004877107	0.000180257
8.80529466	1.299611201	0.151515697	0.02048916	0.003152762	0.000103578
7.51563216	1.038442116	0.112419537	0.014188781	0.002046838	5.97734E-05
6.44088951	0.833124397	0.083749972	0.009865628	0.001334241	3.46343E-05
5.54100874	0.670965307	0.062631123	0.006886	0.000873068	2.0145E-05
4.78416424	0.542331133	0.047007806	0.004823737	0.000573371	1.17599E-05
4.14491911	0.439867365	0.035403199	0.003390728	0.000377847	6.88859E-06
3.60282712	0.357928541	0.026750531	0.00239122	0.000249813	4.04833E-06
3.1413649	0.292158496	0.020275423	0.001691585	0.000165676	2.38654E-06
26841.3436	***9646.860271***	***-5270.371884***	***-16399.28188***	***-25085.13151***	***-37847.77529***

Appendix D
Type Curve Match

Appendix E
Net Present Value Profile



Present Value Profile Data

(for Graphical Analysis)

Texas

Interest rate	NPV
0	1958516.312
0.1	1784796.814
0.155	1698759.195
0.17	1676343.459
1	873715.5786
2	417160.58
3	153964.0698
4	-21602.44703
6	-245246.657

Louisiana

Interest rate	NPV
0	31197.28975
0.1	28591.75464
0.155	27211.56965
0.17	26841.34363
1	9646.860271
2	-5270.371884
3	-16399.28188
4	-25085.13151
6	-37847.77529