Schlumberger GeoQuest

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COMPANY:	PETROTECH
WELL	LOBITOS 16-14
PRODUCT:	MODELLING
REFERENCE:	
DATE:	May, 1995

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BOGOTA , 30 MAY 1995

CLIENT : PETROTECH
WELL : LOBITOS 16-14
PRODUCT: MODEL BASED TRANSIT TIME ANALYSIS

SUMMARY

The well is highly deviated down dip. A check shot survey was carried out and conventional true vertical depth and transit time correction was carried out. This simple processing assumes that velocity layers are horizontal, and that there is no refraction. This study used a flat layer model, and then a dipping layer model in which the interval velocities were constrained to give modelled source to receiver transit times to within 1.0% of those observed, taking into account refraction. Vertical raypath transit times were then computed by placing a source vertically above each geophone position, at the same elevation as the real source near the rig. Again refraction is taken into acount in the dipping layer model.

ANALYSIS

Figures 1 to 4 show the two models and the raypaths from the real source position, and from the modelled sources above each geophone position. The ray paths from the real source position to the three deepest levels are critically refracted. The raypaths shown for these levels are the closest approach before critical refraction occurs. Table 1 summarises the transit times, alongside those obtained in the simple case (no refraction, flat layers).

For a flat model, there is a maximum of 6 milliseconds difference at the deepest levels between the Vertical transit times computed with and without refraction. This is probably due to slight differences in the interval velocities with depth, and is within the 1% constraint imposed between modelled and observed slant transit times.

For a dipping model (dips increasing from zero to 30 degrees), there is a steady increase in the difference between the simple case and the refracted case taking into account the dip. The Vertical transit times for the dipping case become longer for the deeper (more down dip) levels. This means that for "vertical" ray paths (that is, source vertically above receiver but still taking into account refraction), the shortening effect of refraction is much less than the effect of dip which lowers the average velocity for the deeper, more down dip levels.

CONCLUSION

For this case of a highly deviated, down dip well, the model based vertical transit times taking into account refraction and dip, are longer than those calculated ignoring refraction and dip. They should agree more with transit times based on surface seismic velocities.

TABLE 1 LOBITOS 16-14 DIRECT ARRIVAL TRANSIT TIME SUMMARY

	Measured Depth (KB)	Vertical Depth (Source)	Observed TT (Source)	Vertical TT (Simple case)	Vertical TT Flat Model	Vertical TT Dipping Model	Difference Dipping-Flat	V Int at well (TT's to 1ms)	V Int in Model after iteration	V Avg Flat (Vertical)	V Avg Dipping (Vertical)
								5915	5957		
1	650	596	101	103	100	100	0	9309	9254	5960	5960
2	1300	1229	169	171	168	168	0	8406	8436	7315	7315
3	2000	1809	244	240	237	237	0	8803	8713	7633	7633
4	2780	2390	326	306	304	303	-1	9554	9430	7862	7888
5	3750	3097	426	380	379	379	0	10656	10617	8172	8172
6	4200	3438	468	412	411	413	2	11238	10899	8365	8324
7	4500	3674	496	433	433	436	3	10778	10739	8485	8427
8	5000	4062	542	469	469	475	6	12000	11547	8661	8552
9	5630	4518	597	507	508	519	11	10617	10530	8894	8705
10	6310	5017	661	554	556	569	13	12406	12139	9023	8817
11	6850	5414	705	586	588	607	19	12600	12139	9207	8919
12	7020	5540	719	596	599	619	20	11500	12139	9249	8950
13	7080	5586	724	600	602	624	22	11400	11855	9279	8952
14	7230	5700	736	610	612	634	22	12190	11855	9314	8991
15	7888	6212	792	652	655	683	28	12939	12820	9484	9095
16	8420	6639	833	685	688	722	34	13341	13158	9650	9195
17	9100	7186	883	726	730	771	41	13500	12847	9844	9320
18	9450	7456	909	746	751	796	45	11571	11704	9928	9367
19	9670	7618	927	760	765	811	46	15333	14367	9958	9393
20	9800	7710	936	766	771	819	48	12143	13046	10000	9414
21	9920	7795	944	773	778	827	49	18667	14509	10019	9426
22	10000	7851	950	776	782	832	50	12250	13252	10040	9436
23	10070	7900	955	780	785	836	51	16167	15554	10064	9450
24	10210	7997	963	786	792	845	53			10097	9464