COLUMBIA BUSINESS SCHOOL

B6015: Decision Models
Spring 2000

Petromor: The Morombian State Oil Company

Mr. Weston Vaco (MBA '95) has just moved to South America. He found a job in a new division of the Morombian State Oil Company. Like many state-owned companies in South America, Petromor is gradually being privatized. As a first step, the government has decided to sell some unexploited land owned by Petromor, with high potential for oil extraction. For each piece of land (or zone, in the oil lingo), Petromor has projected the number of barrels that can potentially be extracted in this zone. For this sale, Petromor has organized a public bid, in which other oil companies present sealed offers for the zones that interest them. The bids are presented in $ per barrel. The companies present different bids for different zones. If a company wins a certain zone, the final price it pays is determined by multiplying the offer in the bid by the zone's potential oil volume, as estimated by the government. Because Petromor wants to avoid charges of corruption, it has decided to institute a policy where no oil company can be awarded more than one zone as a result of the public offering. Petromor would like to maximize the revenue resulting from these sales, and Mr. Vaco thinks that a spreadsheet-based decision model can do the trick.

The data for the bids (in $ per barrel) are given in Table 1. The government-estimated potential (in # of barrels) for each zone is contained in Table 2.

Table 1. Bids in $ per Barrel

	A	*B*	*C*	*D*	*E*	*F*
Zone 1	$8.75	$8.70	$8.80	$8.65	$8.60	$8.50
Zone 2	$6.80	$7.15	$7.25	$7.00	$7.20	$6.85
Zone 3	$8.30	$8.20	$8.70	$7.90	$8.50	$8.40
Zone 4	$7.60	$8.00	$8.10	$8.00	$8.05	$7.85

Table 2. Zone potential (in # of barrels)

	Potential
Zone 1	205,000
Zone 2	240,000
Zone 3	215,000
Zone 4	225,000

(a) Write a decision model for this problem. What are the decision variables in this model? Do you need to restrict them to be integer? Justify your answer.

You should answer the following questions by looking at the answer and sensitivity reports generated by the Solver.

(b) A private investigator hired by Petromor has just discovered (after the sales had been finalized) that Company D is a fake company created by the owners of Company A, so as to circumvent the restriction that no more than one zone can be assigned to a company. Had Mr. Vaco known this fact before finding the optimal way to assign the zones, he would have eliminated Company D from his spreadsheet (and not penalized company A). Had Mr. Vaco known this fact in advance, would the result of the optimization have been different? Explain your answer.

(c) (Disregard (b) to answer this part) After the envelopes with all the bids have been opened, all the bidding companies can find out what the other companies offered for the different zones. Mr. Vaco overheard the following statement from a senior analyst at company A: "Our offer was too high; we could have lowered our bid by almost $0.10 a barrel, and still have gotten Zone 1." Is it true that Company A could have lowered their bid for Zone 1 by almost $0.10 per barrel and still have won the bidding? Explain your answer.

(d) (Disregard (b) and (c) to answer this part) After running the model in his computer, Mr. Vaco learned that Company A, which would have been awarded Zone 1, had decided to withdraw from the bidding. What is the impact of this decision on Petromor's revenue from the sales?

(e) (Disregard (b), (c) and (d) to answer this part) What is the "hidden cost" of the policy that every company can be assigned at most one zone?