The interpretation of Region I, given a broad range of relative benefits, L, is that the relative unit cost of export, F, is low in relation to the relative unit cost, M, of providing the necessary surface water to be mixed with this mined water. In other words, if the relative benefits, L, are not high enough to warrant using for irrigation purposes, the entire 90 percent of the 2.9 maf/yr mined in the saline area, it will be more economical to export more than 10 percent of this source than to provide the necessary excess surface water, y, as required by constraint 3. If not enough land is available in the northernmost part of the Plain, some water should be exported from this region to the salty areas in the central parts of the Doab.

The interpretation of Region II, given a broad range of relative benefits, L, is that it is more economical to provide excess surface water, y, in the saline area to mix with the mined water than it is to export more than 10 percent of the 2.9 maf/yr that must be mined in the saline area.

(f) Effects of an Increase in the Salinity of Recharge Water in the Saline Area, A, on the Optimal Choice of Values for the Decision Variables y, z and w. As discussed in a subsequent section of this chapter, there are a number of operational difficulties and uncertainties associated with the skimming of a layer of recharge-water from a deep layer of saline ground water. The assumptions as to the quality of the ground water made in this analysis of the saline area problem are based on data presently available. Although we believe our assumptions are reasonable and conservative, it is possible we have been over-optimistic about ground water quality. In the following calculation we show that our design decision is robust - that the decision to use part of the mined water for agriculture after mixture with surface water would remain valid even though it turned out in practice that the quality of recharge-water pumped was considerably poorer than expected. The salinity of the applied irrigation water in the saline area, C, for optimal values of the decision variables y, z and w is shown in the preceeding table for Regions I and II on Figure 7.6, to be less than the maximum allowable values of (say) either 1500 or 2000 mg/liter. This would indicate that the salinity of the recharge water in the saline area, A, may be increased above the value of 1200 mg/liter allowed in the mathematical model, without altering the optimal choice of values for the decision variables y, z and w. The following table demonstrates just how large the value of A may become before it has any effect on the decision variables. The calculations have been based on A = 1200 mg/liter and maximum allowable salinities of the applied irrigation water, CMAX, of 1500 and 2000 mg/liter. This table clearly demonstrates that the salinity of pumped recharge-water can vary over a wide range without affecting the design decision. For example, in design based on Region I, which we have adopted in completing the water budget and estimating the over-all cost of tubewell water, the salinity of the recharge-water could be as high as 4,020 mg/liter without causing the salinity of the water applied to the crops to exceed 2000 mg/liter.