8.0 CONCLUSIONS

KGS Group was retained by Water Security Agency to analyze 26 options to mitigate flooding on the Quill Lakes. The options were simulated using numerical models and the resulting water levels were analyzed to determine the potential benefits of reducing water levels on the Quill Lakes associated with each option.

The results indicated that the trends in the data for both Big Quill Lake and Little Quill Lake were similar. For the base case, the average water level in the first year was calculated to be 520.60 m (1708.01 ft). The averages did not fluctuate notably within the first 10 years, but decreased to El. 519.59 m (1704.69 ft) within 50 years on Big Quill Lake. It was found that within the first 5 years, 87% of the simulated water levels did not exceed the natural spill elevation of El. 521.47 m (1710.86 ft), which would cause water to spill from Big Quill Lake to Saline Creek and Last Mountain Lake. This percentage was essentially the same (86%) after 50 years of simulations.

The model results indicated that the short term (5 year) average reduction in water level on Big Quill Lake between the base case and the various options ranged between 0 m and 0.42 m, with about half of the options only having a minor overall reduction of 0.06 m or less. The percentage of simulated water levels that did not exceed El. 521.47 m ranged between 86% and 96% within the first 5 years of simulations. The long term results (50 years) did not differ significantly from the short term results. Over the next 50 years, the percentage of simulated water levels that did not exceed El. 521.47 m ranged between 83% and 98%.

A high level cost estimate for each option was prepared. The estimated range in cost between options varied significantly from approximately $5-$15 million for the lowest cost option to $920 - $1200 million for the most costly option. The short term average flood mitigation cost savings were estimated to range between approximately $0 and $17 million for all options with the exception of the two Kutawagan Creek inflow diversion options which were estimated to range between approximately $40 and $80 million. These costs savings were typically about 10 times less than the estimated project costs, except for the two Kutawagan Creek inflow diversion options which were approximately half the estimated projects costs. Although mitigation costs only included damages to infrastructure (roads, railways, dikes) and farmyards, it is anticipated

that a detailed economic analysis of the options would most likely conclude that none of the flood mitigation options should be selected based solely on economic factors.

An evaluation matrix was developed to compare the flood mitigation options against various criteria, including the average reduction in water level, cost, environmental considerations, social acceptance, and implementation time. Environmental and social considerations varied between options and the implementation time was similar for most options. Overall, the reduction of water level on the lakes resulting from the flood mitigation options was small and the costs, particularly in comparison to the flood mitigation cost savings, were high.

The results of this study do not indicate a clear choice for the optimum flood mitigation option to proceed with. All options considered have significant cost associated with them, and provide a range of benefits including reductions to the overall water levels on the Quill Lakes. The selection of the preferred alternative by WSA should consider all of the categories outlined in the evaluation matrix.