

EXECUTIVE SUMMARY

Atkins Haswell were commissioned on 21 September 1995, by the Geotechnical Engineering Office (GEO), to undertake a Quantitative Risk Assessment (QRA) of landslides for the Lei Yue Mun squatter village area. The principal objective of this assignment was to assess the landslide risk to the squatters, the acceptability of the prevailing risk levels and the optimal risk mitigation option.

The study followed a formal QRA methodology, which comprises several key elements as described below:

- consideration of the potential for landslide hazards
- estimation of how often landslides will occur
- consideration of the likely failure consequences
- construction of event trees to delineate the range of credible scenarios
- risk assessment calculations
- evaluation of acceptability of current risk levels

Key tasks that have been carried out during the course of the study include the following:

- aerial photograph interpretation and field mapping
- review of past failure records
- review of rainfall records and correlation of rainfall pattern with past instability
- assessment of the frequency of occurrence for different failures
- appraisal of severity of impacts arising from landslides, with due regard to travel distance of debris, scale of failure and proximity of squatters
- survey and interview of selected squatter population
- estimation of casualty due to different failures

The individual risk levels within the zone recommended for clearance by the GEO generally vary between $1E-04$ and $5E-03$. This zone defines a region with unacceptable risk, as judged against the individual risk criteria. The individual risk for an area beyond the south-eastern boundary of GEO's recommended clearance zone, although about an order of magnitude less than that within the clearance zone, has also been assessed as being marginally unacceptable.

The societal risk determinations indicate that landslide events resulting in 1 to 30 or more fatalities are unacceptable according to the societal risk criteria. However, these results are of reduced importance due to the overriding unacceptability of the individual risk levels.

Due to difficulties with access and the large extent and extremely variable and degrading condition of the old quarry faces, the implementation of stabilisation measures to reduce risks to acceptable levels is not considered practicable. It is therefore considered that there is no alternative to clearing the squatters from the zone of unacceptable risk.

Cost benefit calculations have considered the dollar value of fatalities avoided by re-housing squatters located within the cost benefit 'As Low As Reasonably Practicable' (ALARP) region bounded by the $1E-06$ and $1E-04$ individual risk contours. The collective risk to the population (208 dwellings) in this region is $2.8E-02$. The cost benefit calculations indicate that the cost of re-housing the squatters in this region outweighs the value of the corresponding reduction in landslide risk.

The conclusions and recommendations of the study pertain to all of the four squatter villages in the Lei Yue Mun area, ie. Lei Yue Mun, Ma Wan, Ma Pui & Che Tang.

The conclusions of the study are that:

- (i) The area assessed to be of unacceptable risk by this study matches closely the clearance zone recommended by the GEO.
- (ii) An area beyond the southeastern boundary of GEO's recommended clearance zone has also been assessed as being of marginally unacceptable landslide risk. We are advised by the Geotechnical Engineering Office that arrangements to clear the squatters from this area had already been initiated by the Government in the early part of 1995 in accordance with the Non-Development Clearance Scheme.
- (iii) The cost of re-housing the residents in the cost-benefit 'ALARP' region grossly outweighs the value of the corresponding reduction in landslide risk.

Furthermore it is recommended that:

- (i) All the squatters located within the unacceptable risk zone are re-housed.
- (ii) If a phased approach to clearance is adopted, the highest risk zones ($\geq 1E-03$) should be cleared first.
- (iii) The squatters in the cost benefit (ALARP) region are not re-housed based on considerations of slope safety alone.