SLOPE SAFETY TECHNICAL REVIEW BOARD

REPORT NO. 34

to

Director of Civil Engineering and Development
The Government of the Hong Kong Special Administrative Region

Hong Kong
6 December 2024

EXECUTIVE SUMMARY

In 2024, GEO again made good progress in the management of slope safety in Hong Kong. SSTRB confirms that GEO discharges its responsibilities effectively. As in previous years, SSTRB wishes to highlight the continued success of GEO's efforts to manage and mitigate risks associated with slopes. GEO remains at the forefront of global efforts to manage slope hazards, and SSTRB notes that it remains the model for effective slope management globally. SSTRB finds that good progress has been made across a wide range of areas. GEO is ambitiously proposing to increase its work in the LPMitP by 30% in the coming years. SSTRB endorses this proposal, which will counter the rapidly developing threat from increasing rainfall intensity associated with climate change. GEO will need to be diligent to ensure that there are sufficient human and physical resources to permit this level of activity.

Key conclusions from the 2024 review include:

- GEO continues to execute its key responsibilities to great effect and remains world leading in slope safety.
- SSTRB supports GEO's proposal to increase the number of slopes and catchments to be addressed under the LPMitP. The threat of the increased occurrence of extreme rainfalls to slope safety needs to be addressed.
- GEO is admirably incorporating innovation and new technologies into its activities, yielding impressive results.
- SSTRB endorses the revised approach to the management of risk, most notably through the consideration of the societal implications of the blockage of sole access routes.
- The largest current unknown in slopes lies in groundwater dynamics. SSTRB welcomes the plans to undertake long term monitoring of groundwater at a range of sites across Hong Kong.

SSTRB reiterates that very intense rainfall events, with a magnitude even greater than that of September 2023, will undoubtedly occur in the future, with serious consequences. It is essential that Hong Kong retains its admirable focus on managing slope risk, and that GEO is prepared for such events.

SSTRB makes 43 recommendations. Key recommendations include (recommendation number in parenthesis):

- *SSTRB recommends that GEO evaluates whether there is sufficient information about landslides in metasedimentary rocks to support additional analysis of the rates of landslides in these materials. In the case of Sandy Ridge, the number of landslides was almost an order of magnitude higher than the number predicted using data collected from predominantly volcanic rocks (2).*
- *SSTRB recommends that GEO models the flow of debris through the rigid barriers under design capacity scenarios at the Pinehill Village site and considers the potential for this debris to cause damage downstream (4).*
- *SSTRB recommends that GEO continues its work to map new natural terrain landslides using high resolution satellite imagery, adopting a systematic approach that will allow long term trends to be determined (6).*

- *Given the unusual nature of the rockslide at Yiu Hing Road, occurring on slope parallel stress relief joints in granite, the SSTRB supports GEO's ongoing work to identify and assess potentially similar conditions on other slopes. SSTRB recommends that GEO also considers other locations where former granite quarry sites below natural hillslopes have been or are being developed for other uses, and where similar rock slope conditions may be present (10).*
- *SSTRB recommends that GEO evaluates the potential for deterioration leading to collapse of old technology man-made cut slopes to determine whether these slopes, as a group, should undergo more frequent inspection and maintenance, or be upgraded under the LPMitP (17).*
- *SSTRB recommends that GEO studies best practice in the management of low-frequency, large-magnitude landslides globally, most notably with respect to a) Managing landslide hazard for large potential failures in space constrained sites; and b) Emergency works after large-magnitude landslide events. GEO should consider the approaches taken in New Zealand, Mainland China, Taiwan and Japan for example after recent large earthquakes that triggered multiple landslides, and approaches taken in the US, New Zealand, Mainland China, Italy and Switzerland after major rainstorms that triggered large numbers of damaging landslides (18).*
- *SSTRB recommends that GEO considers methods to deploy precision georeferencing of images and 3D photogrammetric models from UAV inspections of landslides to permit fusion with the data sources already available on the DAPI system. This would supplement API landslide mapping with the more detailed information available from the higher resolution images captured by UAVs and permit the inclusion of mapping of tension cracks and other features of interest (22).*
- *SSTRB recommends that GEO continues to pay careful attention to the public concerns on slope safety and prioritises the new goals of the enhanced LPMitP to reduce the societal impact of landslides in Hong Kong in terms of reducing fatalities and transportation disruption and reducing the risk to population and important facilities in vulnerable hillside catchments (28).*
- *SSTRB recommends that GEO provides SSTRB with a progress update regarding experimental work using the large-scale flume at its meeting in 2025 (38).*
- *SSTRB recommends that GEO continues to strengthen its emergency preparedness and ability to respond to emergencies. This work is vital for enhanced slope safety in Hong Kong (42).*