FACTUAL REPORT ON HONG KONG RAINFALL AND LANDSLIDES IN 2007

GEO REPORT No. 254

J.W.C. Lau & C.H.W. Chan

GEOTECHNICAL ENGINEERING OFFICE
CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT
THE GOVERNMENT OF THE HONG KONG
SPECIAL ADMINISTRATIVE REGION

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This report is largely based on GEO Special Project Report No. SPR 4/2008 produced in July 2008

First published, August 2010

Prepared by:

Geotechnical Engineering Office,
Civil Engineering and Development Department,
Civil Engineering and Development Building,
101 Princess Margaret Road,
Homantin, Kowloon,
Hong Kong.

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PREFACE

In keeping with our policy of releasing information which may be of general interest to the geotechnical profession and the public, we make available selected internal reports in a series of publications termed the GEO Report series. The GEO Reports can be downloaded from the website of the Civil Engineering and Development Department (http://www.cedd.gov.hk) on the Internet. Printed copies are also available for some GEO Reports. For printed copies, a charge is made to cover the cost of printing.

The Geotechnical Engineering Office also produces documents specifically for publication. These include guidance documents and results of comprehensive reviews. These publications and the printed GEO Reports may be obtained from the Government's Information Services Department. Information on how to purchase these documents is given on the second last page of this report.

R.K.S. Chan
Head, Geotechnical Engineering Office
August 2010

FOREWORD

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2007. Details of most of the landslides were obtained from the records of landslide incidents reported to the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD). Supplementary information was collected from the Agriculture, Fisheries and Conservation Department, Architectural Services Department, Drainage Services Department, Fire Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department and the GEO's landslide investigation consultants. The Hong Kong Observatory provided weather and rainfall information. The Standards and Testing Division of the GEO carried out a review of the available rainfall records as well as rainfall analyses, and prepared Section 2 of this report. All contributions are gratefully acknowledged.

K.K.S. Ho
Chief Geotechnical Engineer/LPM Division 1

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ABSTRACT

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2007. Rainfall information was obtained from the Hong Kong Observatory (HKO) to supplement the information available in the Geotechnical Engineering Office (GEO). Details of the landslides were obtained from the records of landslide incidents reported to the GEO. Supplementary information was provided by the Agriculture, Fisheries and Conservation Department, Architectural Services Department, Drainage Services Department, Fire Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department, together with the GEO's landslide investigation consultants, namely Fugro (Hong Kong) Limited and Scott Wilson Limited Joint Venture, and Halcrow China Limited.

Rainfall at the HKO's Principal Raingauge at Tsim Sha Tsui in 2007 amounted to 1,706.9 mm, which was about 23% below the mean rainfall of 2,214.3 mm recorded between 1961 and 1990. Two Red Rainstorm Warnings were issued between 24 April 2007 and 10 June 2007, and 12 Amber Rainstorm Warnings were issued between 24 April 2007 and 22 August 2007.

A Landslip Warning was issued on 20 May 2007. A total of 86 incidents that occurred in 2007 were reported to the Government. Of these, 83 were classified as genuine landslides. Of the 83 genuine landslides, two were designated as major failures (i.e. with a failure volume of 50 m^3 or more, or where a fatality has occurred).

No injury or fatality was reported as a result of the landslides that occurred in 2007. Notable consequences of the landslides included the permanent evacuation of two registered squatter dwellings and the temporary evacuation of two registered squatter dwellings. Five landslides resulted in the temporary partial closure of sections of roads and another six landslides resulted in the temporary closure of sections of pedestrian pavements, footpaths or other forms of minor access paths.

CONTENTS

1. INTRODUCTION

This report presents a summary of the factual information on rainfall and landslides that occurred in Hong Kong throughout 2007. Rainfall information was obtained from the Hong Kong Observatory (HKO) to supplement the information available in the Geotechnical Engineering Office (GEO). Details of the landslides were obtained from the records of landslide incidents reported to the GEO. Supplementary information was provided by the Agriculture, Fisheries and Conservation Department (AFCD), Architectural Services Department (Arch SD), Drainage Services Department (DSD), Fire Services Department (FSD), Highways Department (HyD), Housing Department (HD), Lands Department (Lands D), Water Supplies Department (WSD), together with the GEO's landslide investigation consultants, namely Fugro (Hong Kong) Limited and Scott Wilson Limited Joint Venture, and Halcrow China Limited, under Agreements Nos. CE 49/2005 (GE) and CE 53/2006 (GE) respectively.

In this report, a landslide is defined as the detachment or excessive displacement of soil or rock mass, and includes failure of fill slope, cut slope, retaining wall, natural hillsides, disturbed terrain, together with rockfall and boulder fall. A "major" landslide is defined as a failure in which the estimated/recorded volume of the detached or displaced mass is ≥ 50 m^3, or where a fatality has occurred. A "very minor" landslide is defined as a failure that is small in scale (i.e. ≤ 5 m^3 for failures involving soil, or ≤ 0.1 m^3 for rockfalls/boulder falls) and does not give rise to any notable consequences (e.g. casualty, "near-miss", evacuation of buildings or squatter dwellings, road closure, nuisance to the public, etc.). Landslides that are not classified as "major" or "very minor" are taken as "minor".

2. RAINFALL

2.1 The Raingauge System

The GEO, in collaboration with the HKO, operates an automatic raingauge system that transmits rainfall data through either telephone lines or the General Packet Radio Service (GPRS) of the mobile network, viz. a wireless transmission technology, to the GEO and the HKO at 5-minute intervals. The system comprises 86 GEO raingauges and 24 HKO raingauges. The raingauges are of the tipping-bucket type, tipping for every 0.5 mm of rainfall. The locations of the automatic raingauges are shown in Figure 1.

2.2 Rainfall Records

The rainfall data from the raingauge system are checked, verified and stored by the GEO in a database, from which they can be extracted for analysis. This report presents a selection of rainfall parameters for the whole year, for individual months and for individual rainstorms.

The weather in 2007, as described by the HKO (2008), is excerpted as follows:

> "In the northern hemisphere, the year 2007 was the second warmest year on record. In Hong Kong, 2007 was the fifth

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> warmest year since record began in 1884. The annual mean temperature of 23.7 degrees was 0.7 degree higher than normal. With a weaker northeast monsoon, the monthly mean temperature of February 2007 of 19.5 degrees was the highest on record for February. The year sees another new record of hot weather as the Very Hot Weather Warning was issued for 13 days in a row during a hot spell in late July and early August. The year 2007 was also drier than usual. The annual rainfall of 1,706.9 millimetres was about 23 per cent below normal."
>
> "The less-than-normal rainfall and fewer number of tropical cyclones affecting Hong Kong were mainly due to the stronger-than-normal sub-tropical ridge of high pressure over the western North Pacific and the South China Sea in July, September and October, thus suppressing the convection over the areas."
>
> "Under the influence of active troughs of low pressure and southerly airstream, June was wetter than usual. The monthly rainfall amount of 490.1 millimetres was about 30 percent above normal."
>
> "July was unseasonably dry and warm. The monthly rainfall of 76.9 millimetres, less than one fourth of the normal figure of 323.5 millimetres, was the lowest on record for July."

The following are excerpts from the HKO's Monthly Weather Summary describing the weather condition when the most intense rainstorms occurred in the wet season (i.e. between April and September 2007). Further details on the monthly weather are available on the HKO Website (http://www.hko.gov.hk/wxinfo/pastwx/mws.htm).

> "Under the influence of a trough of low pressure over southern China, there were heavy rain and squally thunderstorms on 23 and 24 April. The Red Rainstorm Warning Signal was issued for the first time this year on 24 April. More than 70 millimetres of rainfall were recorded over Hong Kong Island, Tseung Kwan O, Sha Tin and the northern part of the New Territories."
>
> "With the trough of low pressure lingering along the south China coast, there were heavy showers and thunderstorms between 19 and 22 May. During the heavy downpour on 20 May, two landslips and 15 cases of flooding were reported."
>
> "On 10 June, a squall line swept across Hong Kong from northwest to southeast in the early morning, bringing severe gusts and heavy showers. Peak gusts over 120 kilometres per hour were recorded at Tai O. Heavy rain during the day brought over 100 millimetres of rainfall to most parts of the

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territory. There were seven reports of flooding and about 100 reports of fallen trees."

"The outer rainband of the tropical storm over the central part of the South China Sea brought scattered showers and thunderstorms to the territory on 5 and 6 August. There were heavy showers on 6 August. Over 70 millimetres of rainfall was generally recorded in Kowloon and the Hong Kong Island."

The rainfall of 64.1 mm recorded at the HKO in the first quarter of 2007 is 53.7% below normal. The monthly rainfall recorded during the wet season, except August, are all below the corresponding monthly normal. The total rainfall of 1,571.5 mm in the wet season is 15.9% below normal. The monthly rainfall in July of 76.9 mm, which is less than one fourth of the normal figure of 323.5 mm, was the lowest on record since 1884. For the last quarter of 2007, the total rainfall of 71.3 mm is 65.6% below normal. The annual rainfall for 2007 of 1,706.9 mm was about 22.9% below the mean rainfall (2,214.3 mm) recorded between 1961 and 1990. The cumulative rainfall for 2007 is compared with the highest, lowest and mean rainfall in Figure 2.

Figures 3a, 3b, 3c and 3d show the total monthly rainfall distribution in 2007.

Figure 4 shows the total annual rainfall distribution during 2007, together with the locations of the reported landslides.

2.3 Rainstorms in 2007

Table 1 tabulated the rainfall parameters for 15 rainstorms in 2007, during which the daily rainfall exceeded 50 mm at either the HKO's Principal Raingauge at Tsim Sha Tsui or any of the GEO raingauges. The parameters include the maximum 24-hour, 5-hour and 1-hour rolling rainfalls (based on 5-minute rainfall data). Table 1 also includes the 4-day and 15-day antecedent rainfalls at the HKO's Principal Raingauge, the number of reported landslides and the corresponding Landslide Potential Index (LPI) (GEO, 2005). The LPI of a rainstorm depicts the relative severity of the rainstorm with respect to its potential to cause landslides and has been calculated where a landslip warning is issued. Similar data for selected major rainstorms in previous years are included in Table 1 for comparison. Other rainfall parameters for these 15 rainstorms are also shown in Table A1 of Appendix A.

Figures 5 to 19 show the isohyets of the maximum rolling 24-hour rainfall during the above 15 rainstorms, together with the landslide locations, the locations and values of maximum rainfall for durations ranging from five minutes to 48 hours.

The rainstorm of 7 to 16 June 2007 had caused 18 reported landslides. All the other rainstorms in 2007 generated not more than 10 reported landslides.

2.4 Warnings Issued by the Hong Kong Observatory

Table 2 summarises the details of the Thunderstorm, Flood, Landslip, Tropical

Cyclone and Rainstorm Warnings issued by the HKO in 2007. Two Red Rainstorm Warnings were issued between 24 April 2007 and 10 June 2007, and 12 Amber Rainstorm Warnings were issued between 24 April 2007 and 22 August 2007. One Landslip Warnings was issued on 20 May 2007.

3. LANDSLIDES

3.1 Landslides in 2007

Landslide incidents reported to the GEO and other Government Departments in 2007 are summarised in Table 3.

A total of 86 landslide incidents were reported to various Government Departments. These include 63 incidents reported to the GEO, three of which were identified by the landslide investigation consultants, Halcrow China Limited, and 23 other incidents were reported to other Government Departments (i.e. AFCD, Arch SD, DSD, FSD, HyD, HD, Lands D or WSD) only. Of these 86 reported incidents, 83 were classified by the GEO's Landslip Preventive Measures Division 1 as genuine landslides (see details in Appendix B). The other three reported incidents were non-landslide events (e.g. tree fall) with no geotechnical concern.

Of the 83 landslides, two (2.4%) were major landslides (see Table B1 in Appendix B), 66 were minor landslides, and 15 were very minor landslides with negligible consequences (see Section 1).

Selected notable landslides are presented in Section 4 and illustrated in Plates 1 to 4. For those landslide incidents inspected by the GEO, the information on the landslides was recorded in Incident Reports prepared by the GEO (as well as in Landslip Cards for major landslides). For those landslide incidents attended to by other Government Departments responsible for slope maintenance, landslide incident reports were prepared by the respective Departments. The above information, together with the scanned images of all the Incident Reports and Landslip Cards prepared by the GEO and other Government Departments, has been uploaded onto the Slope Information System (SIS), which is accessible by the general public through computer terminals in the GEO. Further details of these slope failures can be found in the relevant files of the three District Divisions and the Landslip Preventive Measures Division 1 of the GEO.

Wherever possible, the dates and times of the landslides were assessed by geotechnical professionals. Some incidents were not reported to the GEO or other Government Departments until several days or even weeks after occurrence. For these incidents, it is not possible to establish the exact time of failure. Of the 83 landslides, the timing of occurrence was determined to within one day for 27 incidents based on the date of report of failure and the date of landslide occurrence as recorded in the incident reports.

It should be noted that almost certainly some other genuine landslides had not been reported to the Government, such as those in remote areas with no immediate consequences.

3.2 Consequence of Landslides

3.2.1 General

The consequence of landslides in terms of the types of facilities affected (e.g. buildings, roads, registered squatter dwellings, catchwaters, etc.) in different regions is summarised in Table 4. It should be noted that a failure might affect more than one type of facility.

Significant consequences of the reported landslides (e.g. casualties, evacuation of buildings or registered squatter dwellings, temporary closure of roads, etc.), as classified with respect to the type of slope failure, are shown in Table 5. The distribution of the different facility groups affected by the major landslides is presented in Table 6. Further descriptions of some selected notable landslides in 2007 are given in Section 4 below.

3.2.2 Buildings

Eight minor landslides affected buildings but no significant consequences arising from these incidents.

3.2.3 Roads and Transport Facilities

Fifteen landslides, one of which was major, affected sections of roads. Five landslides resulted in the temporary partial closure/blockage of road sections. Landslide Incidents Nos. 2007/06/0020 and 2007/07/0050 are described in Sections 4.3 and 4.4 respectively.

3.2.4 Registered Squatter Dwellings

Six landslides, none of which was major, affected registered squatter dwellings (i.e. dwellings that contain tolerated squatter structures, which were covered by the Housing Department's 1982 Squatter Structure Survey). Two landslides resulted in the permanent evacuation of a total of two registered squatter dwellings (comprising two squatter structures) and one resulted in the temporary evacuation of two registered squatter dwellings (comprising two squatter structures). The breakdown is shown in Table 5.

3.2.5 Catchwaters

Four landslides, one of which was major, affected catchwaters. None of these resulted in any significant direct consequence or any knock-on effects on the areas downhill of the affected catchwaters.

3.2.6 Construction Sites

Two minor landslides affected two active construction sites. There were no significant consequences.

3.2.7 Other Facilities

Other facilities affected by landslides included pedestrian pavements, footways, minor footpaths, minor access facilities, carparks, playgrounds, parks, gardens, backyards, open areas, etc. Twenty one landslides, all of which were minor, affected pedestrian pavements, footways, minor footpaths and access facilities. Of these 21 landslides, 6 resulted in the temporary closure of sections of pedestrian pavements, footpaths and other forms of minor accesses. A total of 27 landslides affected carparks, playgrounds, parks, gardens, backyards, open areas, etc., none of which was major.

3.3 Types of Slope Failures

3.3.1 General

Landslides reported to the GEO and other Government Departments have been classified into five types of slope failures, i.e. fill slope, cut slope, retaining wall, natural hillsides and registered Disturbed Terrain. The breakdown of the different types of slope failures is shown in Table 7.

3.3.2 Fill Slopes

Failures occurred on 5 fill slopes, which comprised 6.0% of all reported landslides. None of these was major.

3.3.3 Cut Slopes

Failures occurred on 54 cut slopes, which comprised 65% of all reported landslides. These were further classified according to the types of materials involved, viz. soil, soil/rock and rock.

Thirty five landslides occurred on soil cuts, one of which was major. Twelve landslides occurred on soil/rock cuts, none of which was major. Seven minor landslides occurred on rock cuts.

3.3.4 Retaining Walls

Eleven landslides involved the failure of retaining walls, which amounted to 13.3% of all reported landslides. One of these (Incident No. 2007/07/0050) was a major failure, which is described further in Section 4.4.

3.3.5 Natural Hillsides

There were a total of 11 natural hillside failures, which comprised 13.3% of all reported landslides. None of these was major. Three of the reported landslides (Landslide Incidents Nos. LI2007/04/2001, LI2007/04/2002 & LI2007/04/2003) are described in Section 4.2.

3.3.6 Registered Disturbed Terrain Features

Two failures occurred on registered Disturbed Terrain features, which comprised 2.4% of all reported landslides. None of these was major.

3.4 Landslide Volume Distribution

Tables 8 and 9 show the distribution of failure volumes for all the reported landslides. A total of 69 landslides (about 83.2%) involved less than 5 m^3 of material. Only two of the reported landslides (2.4%) involved a failure volume of 50 m^3 or more. Of these two major failures, one affected a retaining wall and one affected a soil cut.

4. NOTABLE LANDSLIDES

4.1 General

Of the 83 genuine landslides reported to the Government in 2007, five incidents are described in more detail below. These five incidents have been selected mainly on the basis of their consequences or scale of failure.

4.2 Signs of Distress on the Natural Hillsides near Kwu Tung (Incidents Nos. LI2007/04/2001, LI2007/04/2002 & LI2007/04/2003)

(Signs of distress were identified on the natural hillsides near Kwu Tung following a hillfire on 1 April 2007, Plates 1 and 2)

Signs of distress, comprising extensive tension cracks, were identified on both the north-facing and south-facing hillsides near Kwu Tung following a hillfire on 1 April 2007, which removed the vegetation cover. On the north-facing hillside, persistent tension cracks were up to approximately 35 m in length, with a maximum depth of about 800 mm and a horizontal separation of up to about 250 mm. Five natural terrain landslide scars (ENTLI Nos. 02SEB0050E, 02SEB0051E, 02SEB0052E, 02SEB0066E and 02SEB0067E) were exposed on the south-facing hillside as a result of the hillfire. Tension cracks were also identified above and adjacent to these natural terrain landslide scars, the most significant of which was approximately 8 m in length. The width of these tension cracks ranged from 100 mm to 300 mm and the vertical displacement of the scarp was up to 500 mm. All the tension cracks observed on the north-facing and south-facing hillsides were found to be infilled with burnt vegetation. The tension cracks were likely to have been in existence for a fairly long time, such as several years or more.

The north-facing and south-facing hillsides are approximately 70 m in height and are inclined at about 35° to 40°. The hillsides are generally covered with a thin veneer of colluvium overlying shallow rockhead. The natural terrain landslide scars exposed on the south-facing hillside were shallow open hillslope failures with scarps of less than 1 m deep.

A total of about 10 occupied registered squatter dwellings located at the toe of the south-facing hillside, some of which were previously recommended by the GEO for

Non-Development Clearance (NDC) Category 2 in 1993, could be affected in the event of detachment of the distressed groundmass. Subsequent to the inspection carried out by the GEO District Division, another eight registered squatter dwellings located at the toe of the south-facing hillside were also recommended for NDC Category 2 in September 2007.

4.3 The 3 June 2007 Failure on an Unregistered Retaining Wall on Disturbed Hillside above Slope No. 11SW-D/C258, Peak Road (Incident No. 2007/06/0020)

(Detachment of several sizeable masonry blocks from an unregistered masonry retaining wall, which resulted in the temporary closure of one lane of Peak Road, Plate 3)

In the morning of 3 June 2007, a failure occurred on an old, about 2.2 m high squared masonry wall located on the disturbed hillsides about 12 m above cut slope No. 11SW-D/C258, Peak Road. The failure involved the detachment of several masonry blocks from the subject masonry wall, amongst which the largest one measured 0.5 m by 0.3 m by 0.3 m. Some of the detached masonry blocks were deposited on the hillside, while some travelled further downslope, which came to rest on Peak Road. As a result, one lane of Peak Road was temporarily closed. Signs of distress in the form of bulging of the wall face and missing masonry blocks were noted on the masonry wall after the incident. In addition, tree root wedging action was evidenced on the wall face. No casualties were reported as a result of the failure.

4.4 The 30 June 2007 Landslide on Retaining Wall No. 11SE-C/R7 and the Adjoining Natural Hillside below Repulse Bay Road (Incident No. 2007/07/0050)

(A major landslide occurred on a masonry retaining wall and the adjoining natural hillsides, which resulted in the temporary closure of the north-bound lane of Repulse Bay Road for about eight weeks, Plate 4)

In the morning of 30 June 2007 during light rainfall, the southern portion of a masonry retaining wall (registered as No. 11SE-C/R7 in the Government's Slope Catalogue), together with the adjoining natural hillsides, failed. The estimated failure volume was about 600 m^3. Most of the landslide debris was deposited on the natural hillsides below the retaining wall, whilst some was deposited on an ephemeral drainage line approximately 30 m below Repulse Bay Road. As a result of the landslide, several reinforced concrete columns supporting the elevated pedestrian footway were damaged and the foundation of the north-bound lane of Repulse Bay Road was undermined. Two water mains mounted onto the surface of the subject retaining wall were ruptured, while the buried water-carrying services, including one sewer and one cross-road stormwater drain, were also damaged. The north-bound lane and the adjacent pedestrian pavement of Repulse Bay Road were temporarily closed. The affected north-bound lane of Repulse Bay Road was subsequently re-opened on 24 August 2007 after completion of emergency repair works. No casualties were reported as a result of the landslide.

5. CONCLUSIONS

Rainfall recorded at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 1,706.9 mm in 2007, which was about 22.9% below the mean value of 2,214.3 mm between 1961 and 1990. In 2007, one Landslip Warning was issued on 20 May 2007. Of the 83 genuine landslides, 2 were major failures, 66 were minor failures and 15 were very minor failures that were reported to the Government.

None of the landslide incidents in 2007 resulted in any fatality or injury. Notable consequences of the landslides included the permanent evacuation of two registered squatter dwellings and the temporary evacuation of two registered squatter dwellings. Eight squatter dwellings were subjected to NDC Category 2 recommendations. Fifteen landslides affected roads, five of which resulted in the temporary closure of sections of roads.

6. REFERENCES

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Table 1 - Rainfall and Landslides in 2007 as Compared with Selected Previous Major Rainstorms (Sheet 1 of 2)

Date of Rainstorm Event [1]	Maximum Rainfall (mm) [2]								Number of Landslides Reported to GEO [4]
	Hong Kong Observatory (HKO)					GEO Raingauges [3]			
	24-hr	5-hr	1-hr	Antecedent		24-hr	5-hr	1-hr	
				4-day	15-day				
19-23 May 2007	127.7	62.0	25.1	13.9	23.1	229.0 (N51)	113.5 (N21)	58.0 (N21)	7
6-12 August 2007	100.4	46.5	40.3	7.7	7.7	140.0 (N36)	68.0 (H06, H25)	49.0 (N22)	2
7-16 June 2007	98.5	63.2	24.9	1.5	84.1	191.5 (N19)	142.5 (N26)	89.5 (N33)	18
26 June - 3 July 2007	94.4	48.2	31.8	3.2	94.1	192.5 (K04)	104.0 (K04)	67.0 (K04, K05)	10
14-17 August 2007	88.4	49.9	22.2	103.0	280.0	139.0 (N04)	84.5 (K06, N04)	49.5 (N04)	0
4-5 September 2007	70.0	28.9	12.6	14.3	31.5	65.0 (N05)	65.0 (N05)	65.0 (N05)	0
24-25 April 2007	64.4	51.6	29.4	7.8	21.0	91.5 (N12, N28)	78.5 (N28)	66.0 (N28)	1
27-28 May 2007	53.0	27.8	22.6	0.6	210.3	86.5 (N47)	68.5 (N47)	63.0 (N47)	4
5-6 July 2007	29.7	13.9	6.7	38.1	271.9	62.0 (N46)	38.0 (N43)	27.5 (N41)	1
3-4 October 2007	29.2	19.0	8.2	17.6	95.1	61.5 (N14)	42.5 (N46)	20.5 (N15, N46)	1
2-3 April 2007	25.4	23.4	10.5	0.0	14.0	52.0 (N06)	51.0 (N06)	31.0 (N03)	1
20-23 August 2007	15.1	13.9	8.9	89.8	395.4	116.0 (N47)	87.0 (N47)	71.5 (N47)	1
1-2 November 2007	3.6	1.9	1.8	8.0	8.0	137.5 (N19)	115.0 (N19)	45.5 (N19)	0
24-25 September 2007	3.5	1.8	1.2	3.7	96.7	141.5 (H21)	56.5 (H21)	45.0 (N44)	0
1-2 August 2007	0.0	0.0	0.0	1.0	10.7	61.0 (N44)	61.0 (N44)	60.5 (N44)	0

Notes:
(1) Rainstorms are arranged in order of the rolling 24-hour rainfall at the Hong Kong Observatory in Tsim Sha Tsui.
(2) The maximum rainfalls are calculated using 5-minute rainfall as the basic unit, except those recorded at the HKO. They are the rolling rainfall amounts using one-clock hour rainfall as the basic unit.
(3) The maximum rainfalls are selected from the 86 GEO Raingauges for the rainstorms. The GEO Raingauge reference number is shown in brackets.
(4) Reported totals are for those genuine landslides that can be attributed to the rainstorm events.

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Table 1 - Rainfall and Landslides in 2007 as Compared with Selected Previous Major Rainstorms (Sheet 2 of 2)

Date of Rainstorm Event	Maximum Rainfall (mm) [1]								Number of Landslides Reported to GEO [2]
	Hong Kong Observatory (HKO)					GEO Raingauges			
	24-hr	5-hr	1-hr	Antecedent		24-hr	5-hr	1-hr	
				4-day	15-day				
Selected Major Rainstorms in Previous Years (for comparison only)									
17 June 1983	347.0	274.0	69.0	2.0	77.0	460.0	303.0	101.0	155
20-21 May 1989	388.0	149.0	37.0	28.0	42.0	566.0	224.0	51.0	378
7-9 May 1992	324.0	196.0	110.0	65.0	71.0	385.0	244.0	110.0	314
15-16 June 1993	155.0	129.0	54.0	18.0	275.0	285.0	195.0	111.0	123
4-5 November 1993	107.0	31.0	9.0	8.0	8.0	742.0	350.0	94.0	394
21-25 July 1994	290.0	138.5	62.5	18.5	297.5	956.0	394.5	211.5	208
3-11 August 1994	69.5	46.5	26.0	8.0	717.5	381.0	206.5	103.5	46
11-15 August 1995	314.5	117.5	59.5	5.5	442.5	468.0	268.5	106.0	110
3-5 June 1997	139.5	85.5	62.0	1.0	31.5	367.5	277.0	128.5	81
1-4 July 1997	110.0	49.0	18.0	183.0	380.0	799.0	296.0	125.0	150
8-9 June 1998	429.0	164.0	48.0	58.0	181.0	562.0	223.0	98.0	96
22-26 August 1999	313.0	143.0	51.0	11.0	175.0	565.0	249.0	121.0	269
16-21 August 2005	385.5	134.0	41.5	101.0	200.5	570.0	195.0	82.0	229

Notes: (1) The maximum rainfalls are calculated using 5-minute rainfall as the basic unit, except those recorded at the HKO. They are the rolling rainfall amounts using one-clock hour rainfall as the basic unit.

(2) Reported totals are for those genuine landslides that can be attributed to the rainstorm events.

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Table 2 - Warnings Issued by the Hong Kong Observatory in 2007

Month	Monthly Total Rainfall (mm)	Dates on which Warnings [1] were in Effect				
		Thunderstorm [2]	Flooding	Landslip [3]	Tropical Cyclone [4]	Rainstorm
January	29.6	-	-	-	-	-
February	6.9	-	-	-	-	-
March	27.6	19	-	-	-	-
April	125.5	2, 3, 4, 17, 22, 23, 24, 25	-	-	-	24 (2 nos. Amber, Red)
May	288.3	16, 18, 19, 20, 22, 23, 27, 28, 30, 31	-	20 (09:00-14:30)	-	19 (Amber), 20 (Amber), 27 (2 nos. Amber)
June	490.1	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30	10	-	-	10 (2 nos. Amber, Red), 28 (Amber), 29 (Amber)
July	76.9	1, 2, 5, 6, 16, 17, 18, 19, 27, 28, 29, 30, 31	-	-	-	-
August	488.4	1, 4, 5, 6, 7, 8, 12, 13, 14, 15, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31	-	-	10-11 (1, 3, 8, PABUK)	6 (Amber), 22 (Amber)
September	102.3	2, 3, 4, 5, 11, 12, 24, 25	-	-	23-24 (1, FRANCISCO)	-
October	51.7	-	-	-	-	-
November	3.9	-	-	-	-	-
December	15.7	-	-	-	-	-
Total	1706.9	137 Warnings	1 Warning	1 Warning	2 Warnings	14 Warnings (12 nos. Amber, 2 nos. Red)

Notes:
(1) Warnings and signals in this Table were based on the information from the HKO.
(2) More than one Thunderstorm Warning may have been issued within a day but have only been shown once in this Table for clarity.
(3) Landslip Warning was issued after consultation between the GEO and the HKO.
(4) Tropical Cyclone Warning signal no. hoisted is shown in the bracket followed by the name of the tropical cyclone.

Table 3 - Breakdown of Landslides Reported to Government Departments in 2007

Department	Total Number of Landslides	Genuine Landslides
Agriculture, Fisheries and Conservation Department	0 (0)	0 (0)
Architectural Services Department	9 (6)	9 (6)
Drainage Services Department	0 (0)	0 (0)
Fire Services Department	0 (0)	0 (0)
Geotechnical Engineering Office, Civil Engineering and Development Department	63 (1)	63 (1)
Highways Department	16 (14)	14 (14)
Housing Department	0 (0)	0 (0)
Lands Department	11 (1)	10 (1)
Water Supplies Department	8 (0)	8 (0)
Total	107 (21) (2)	104 (21) (2)

Legend:

9 (6) Nine incidents were reported to the Government Department concerned, six of which were also reported to the GEO separately by other parties.

Notes:

(1) A total of 63 landslide incidents that occurred in 2007 (discounting false alarms, duplicated cases, etc.) were reported to the GEO, three of which were reported by the LIC. All reported incidents were classified as genuine landslides.

(2) A total of 86 landslide incidents that occurred in 2007 (discounting false alarms, duplicate cases, etc.) were reported to various Government Departments. Of these, 83 were classified as genuine landslides.

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Table 4 - Breakdown of Landslides Affecting Different Facilities

Affected Facility	Hong Kong Island	Kowloon	New Territories and Outlying Islands	All
Buildings	0 (0)	0 (0)	8 (0)	8 (0)
Registered Squatter Dwellings	0 (0)	0 (0)	6 (0)	6 (0)
Roads	5 (1)	2 (0)	8 (0)	15 (1)
Transportation Facilities (e.g. railways, tramways, LRT, etc.)	0 (0)	0 (0)	0 (0)	0 (0)
Pedestrian Pavements/ Footways	2 (0)	2 (0)	0 (0)	4 (0)
Minor Footpaths/Access Paths	5 (0)	0 (0)	12 (0)	17 (0)
Construction Sites	0 (0)	0 (0)	2 (0)	2 (0)
Open Areas	0 (0)	2 (0)	10 (0)	12 (0)
Catchwaters	1 (0)	0 (0)	3 (1)	4 (1)
Others (e.g. carparks, parks, playgrounds, gardens, backyards, etc.)	3 (0)	1 (0)	11 (0)	15 (0)
Total	16 (1)	7 (0)	60 (1)	83 (2)

Legend:

5 (1) Five landslides, one of which was a major failure.

Notes: (1) A given landslide may affect more than one type of facility.
(2) Incidents that were not genuine landslides have been excluded.

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Table 5 - Landslide Consequences Related to Type of Slope Failure

Type of Slope Failure		Number of Squatter Dwellings [1] Evacuated		Number of Blocks, Houses or Flats Evacuated or Partially Closed	Number of Closure			Deaths	Injuries
		Permanent	Temporary		Roads	Pedestrian Pavements	Footpaths, Alleyways or Private Access Paths		
Fill Slope		0	0	0	1	0	1	0	0
Cut Slope	Soil	1 (1)	0	0	0	0	0	0	0
	Soil/Rock	0	2 (2)	0	2	1	0	0	0
	Rock	0	0	0	0	0	0	0	0
Retaining Wall		1 (1)	0	0	2	0	0	0	0
Natural Hillsides		0	0	0	0	0	4	0	0
Registered Disturbed Terrain		0	0	0	0	0	0	0	0

Legend:

1 (1) Number of squatter dwellings evacuated, with the number of tolerated squatter structures evacuated shown in brackets.

Notes:

(1) A squatter dwelling is defined as a place of residence that contains one or more tolerated squatter structures, i.e. structures built for domestic purposes or non-domestic purposes and registered in the 1982 Housing Department's Squatter Structure Survey (GEO, 2004a).

(2) A failure may give rise to more than one type of consequence.

Table 6 - Distribution of Facility Groups Affected by Major Landslides

Type of Major Landslide	Facility Group Affected by Major Landslides (Group No.)						
	1a	1b	2a	2b	3	4	5
All Major Landslides	0	0	0	0	1	0	1
Major Landslides on Man-made Slopes	0	0	0	0	1	0	1
Major Landslides on Natural Hillsides	0	0	0	0	0	0	0

Notes: (1) Facility groups are classified in accordance with that adopted for the New Priority Classification Systems (Wong, 1998).
(2) A given landslide may affect more than one type of facility.

Table 7 - Breakdown of Landslides by Type of Slope Failure

Type of Slope Failure		Number	Percentage (%)
Fill Slope		5 (0)	6.0
Cut Slope	Soil	35 (1)	42.2
	Soil/Rock	12 (0)	14.4
	Rock	7 (0)	8.4
Retaining Wall		11 (1)	13.3
Natural Hillsides		11 (0)	13.3
Registered Disturbed Terrain		2 (0)	2.4
Total		83 (2)	100

Legend:

35 (1) Thirty five landslides, one of which was a major failure.

Notes: (1) Where a landslide involved more than one type of failure, the predominant type of failure has been considered in the above classification.
(2) Incidents which were not genuine landslides have been excluded.

Table 8 - Landslide Volume Distribution with Respect to Geographical Locations

Volume of Failure (m^3)	Hong Kong Island	Kowloon	New Territories and Outlying Islands	All
< 5	12	7	50	69 (83.2%)
≥ 5 to < 10	0	0	3	3 (3.6%)
≥ 10 to < 20	2	0	3	5 (6.0%)
≥ 20 to < 50	0	0	4	4 (4.8%)
≥ 50 to < 200	0	0	1	1 (1.2%)
≥ 200 to < 500	0	0	0	0 (0%)
≥ 500 to < 1000	1	0	0	1 (1.2%)
≥ 1000	0	0	0	0 (0%)
Total	15	7	61	83 (100%)

Legend:

69 (83.2%) Sixty nine landslides, which amount to 83.2% of the 83 genuine landslides reported to the Government.

Table 9 - Landslide Volume Distribution with Respect to Type of Slope Failure

Volume of Failure (m^3)	Fill Slope	Cut Slope			Retaining Wall	Natural Hillsides	Registered Disturbed Terrain	Total
		Soil	Soil/Rock	Rock				
< 5	5	32	12	7	7	5	1	69 (83.2%)
≥ 5 to < 10	0	0	0	0	1	2	0	3 (3.6%)
≥ 10 to < 20	0	1	0	0	2	1	1	5 (6.0%)
≥ 20 to < 50	0	1	0	0	0	3	0	4 (4.8%)
≥ 50 to < 200	0	1	0	0	0	0	0	1 (1.2%)
≥ 200 to < 500	0	0	0	0	0	0	0	0 (0%)
≥ 500 to < 1000	0	0	0	0	1	0	0	1 (1.2%)
≥ 1000	0	0	0	0	0	0	0	0 (0%)
Total	5 (6.0%)	35 (42.2%)	12 (14.4%)	7 (8.4%)	11 (13.3%)	11 (13.3%)	2 (2.4%)	83 (100%)

Legend:

5 (6.0%) Five landslides, which amount to 6.0% of the 83 genuine landslides reported to the Government.

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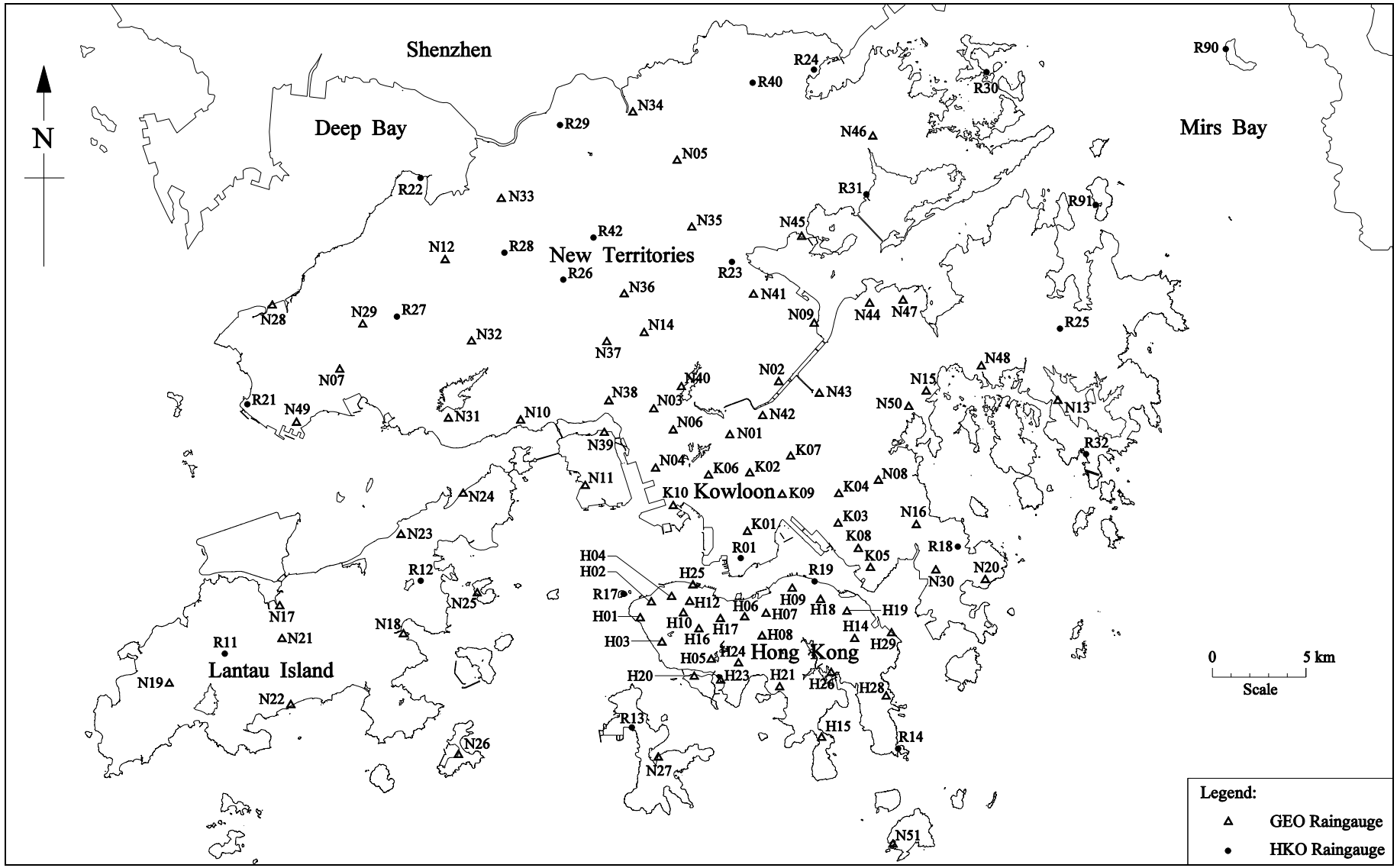

Figure 1 - Locations of GEO and HKO Automatic Raingauges

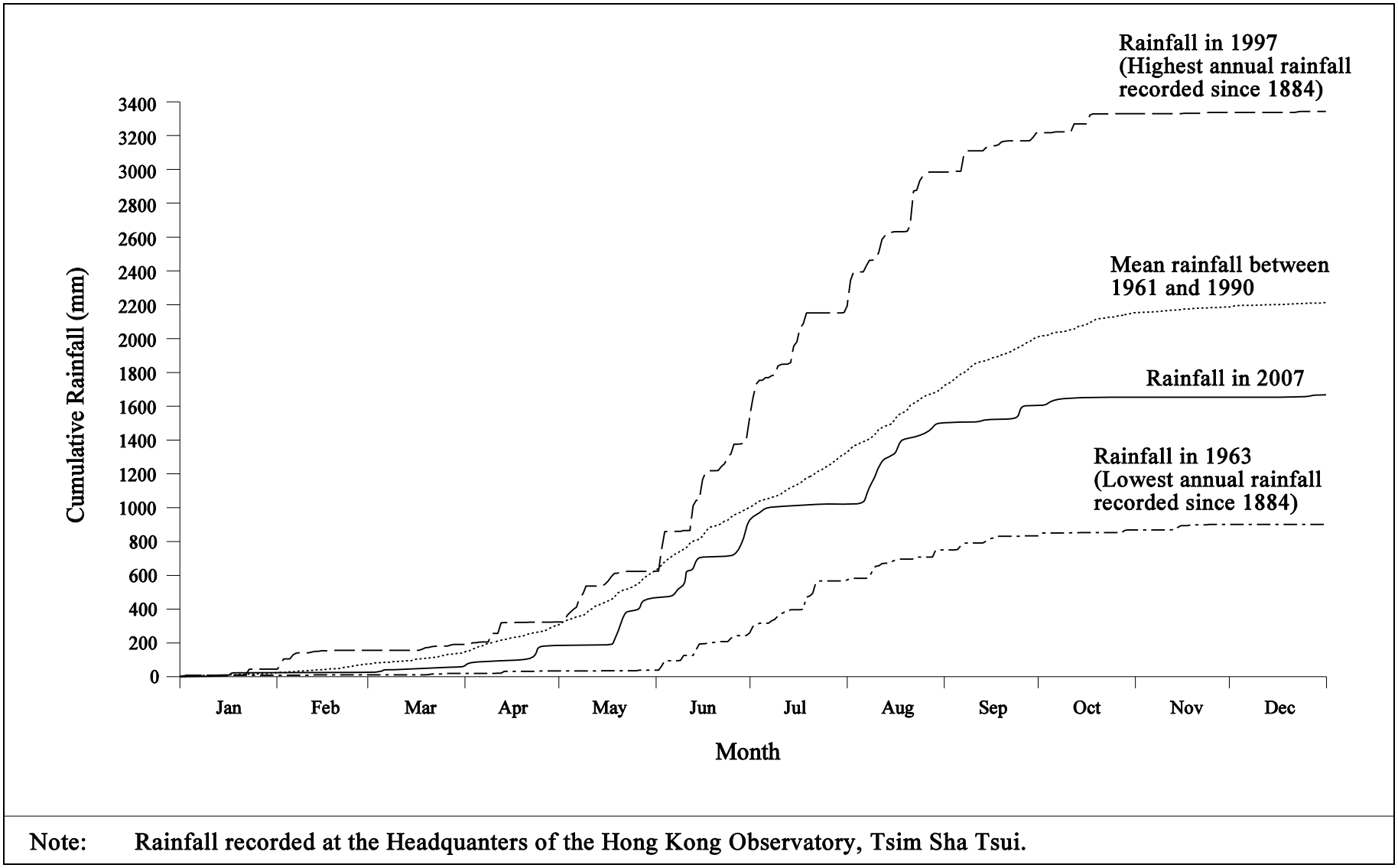

Figure 2 - Cumulative Rainfall for 2007 at the Hong Kong Observatory and its Recorded Highest, Mean and Lowest Cumulative Rainfalls

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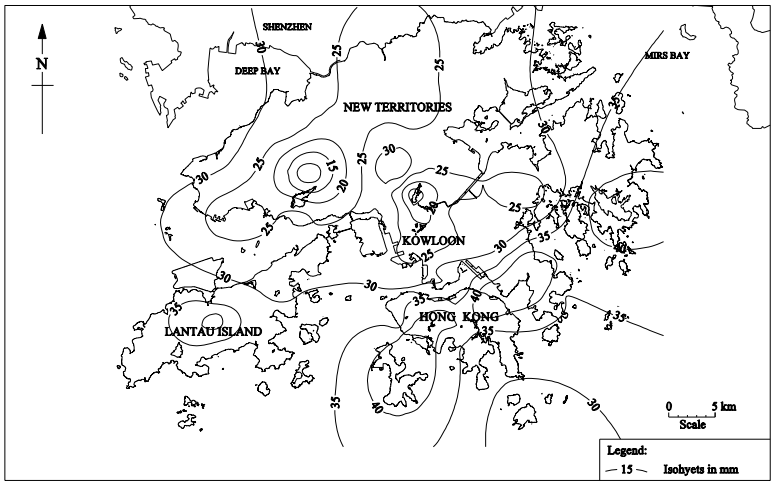

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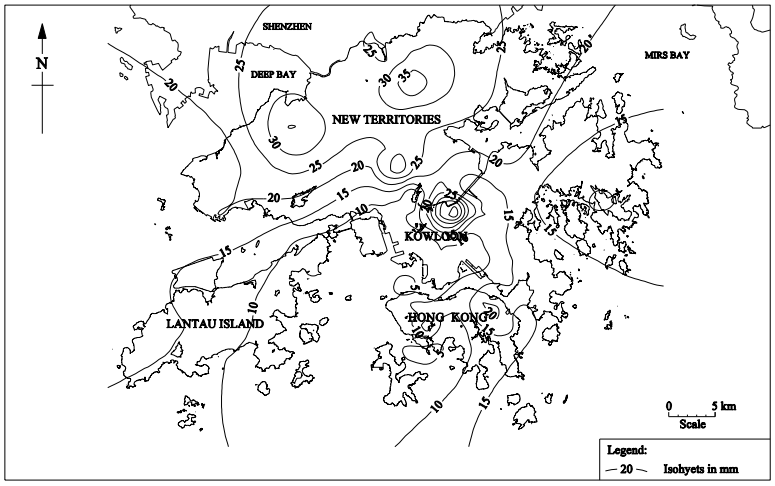

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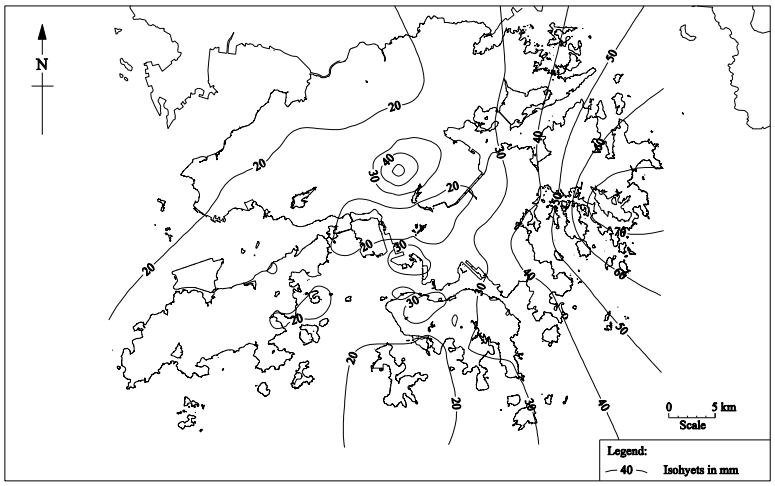

March 2007

Note: **Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.**

Figure 3a - Total Monthly Rainfall Distribution in 2007

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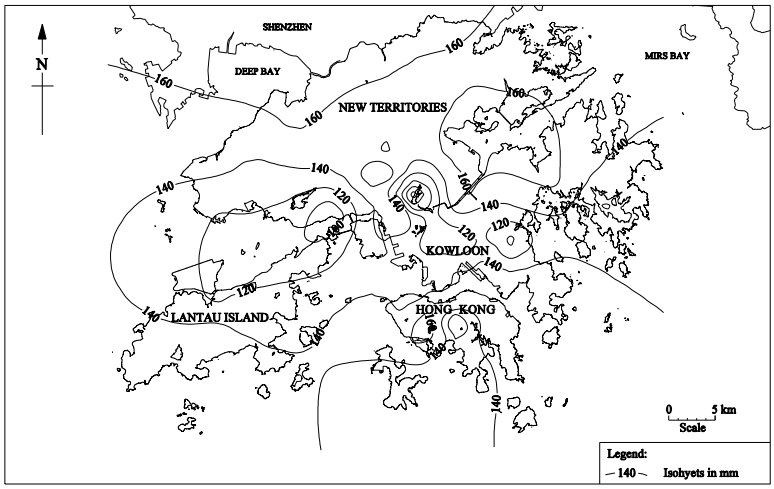

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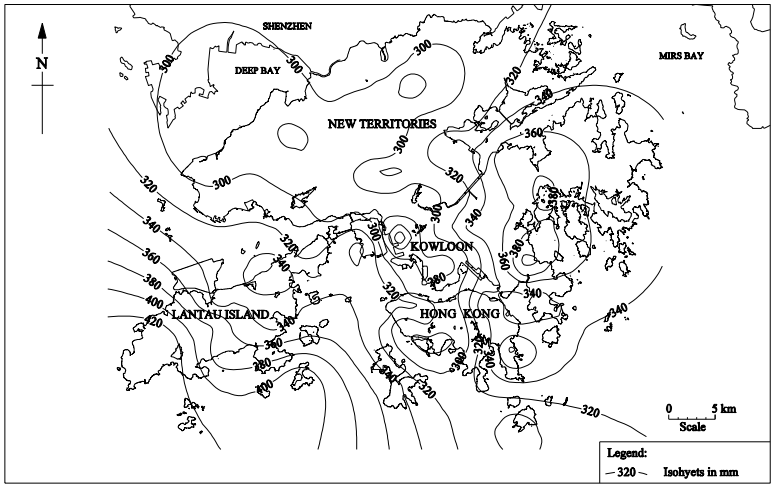

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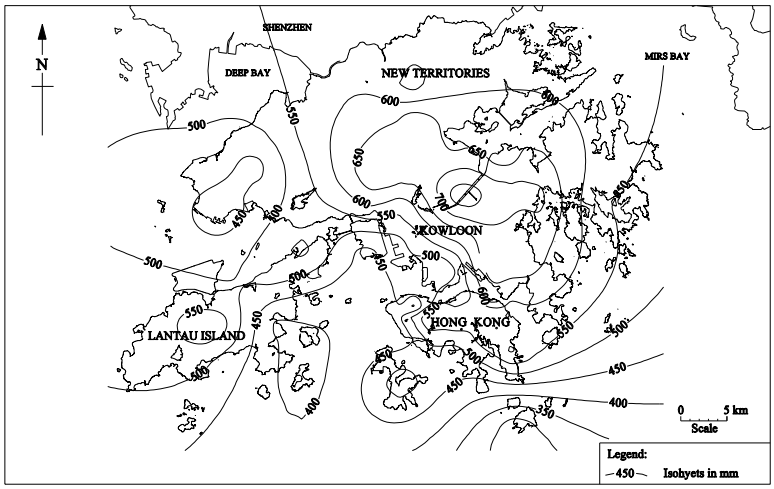

June 2007

Note: Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.

Figure 3b - Total Monthly Rainfall Distribution in 2007

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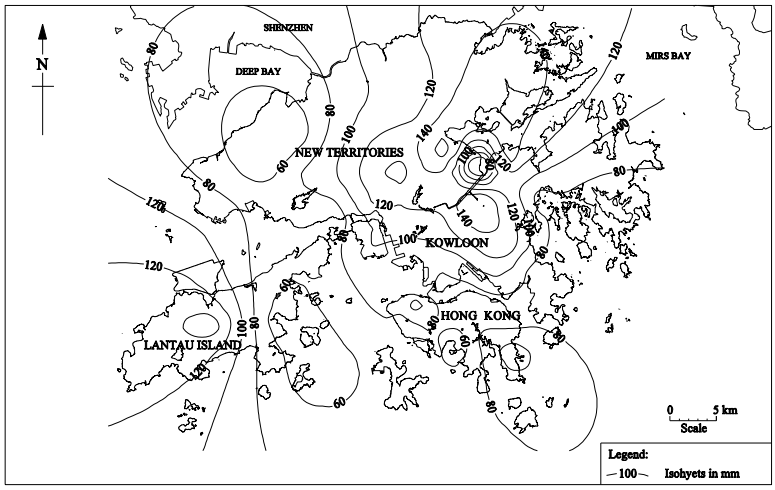

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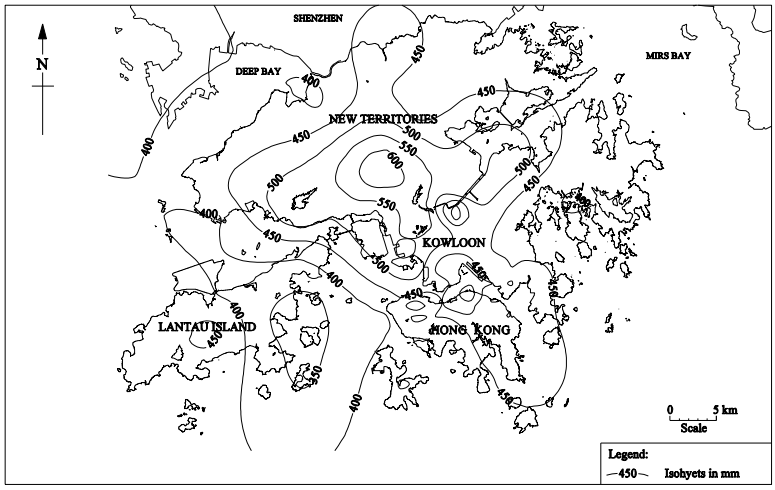

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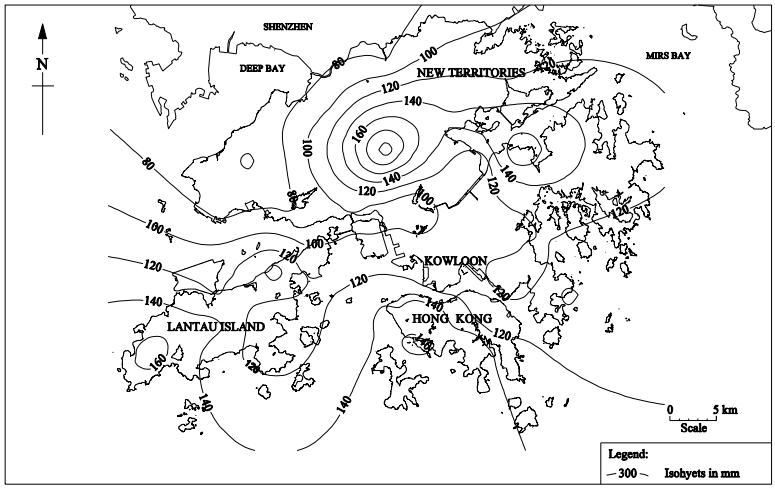

September 2007

Note: **Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.**

Figure 3c - Total Monthly Rainfall Distribution in 2007

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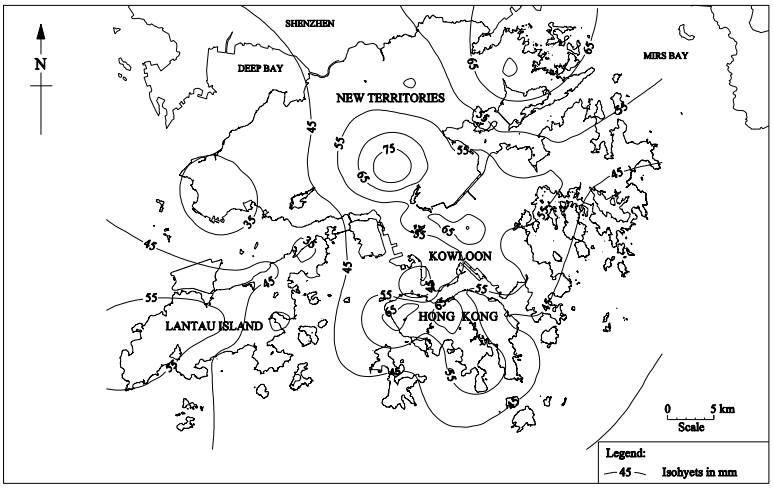

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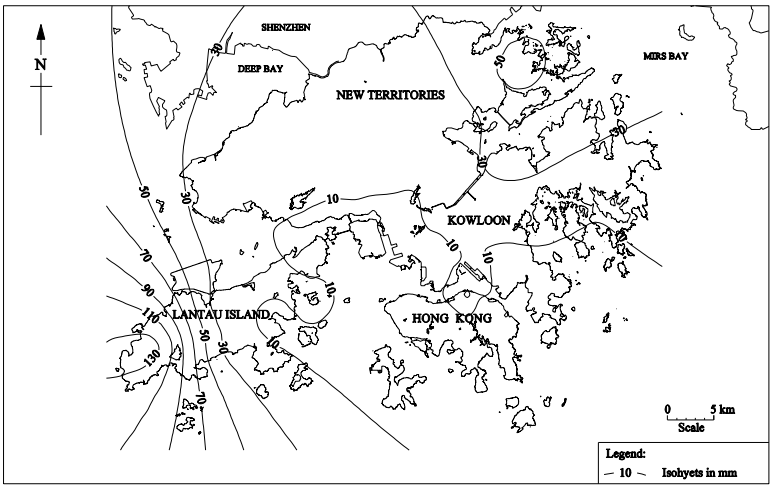

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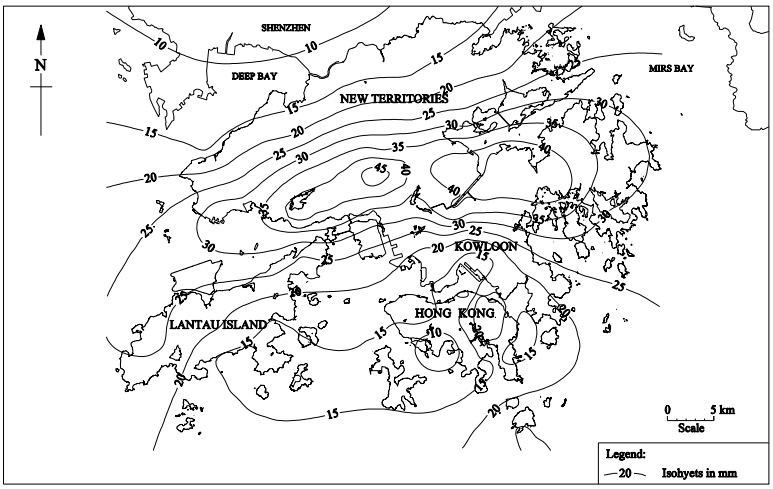

December 2007

Note: Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.

Figure 3d - Total Monthly Rainfall Distribution in 2007

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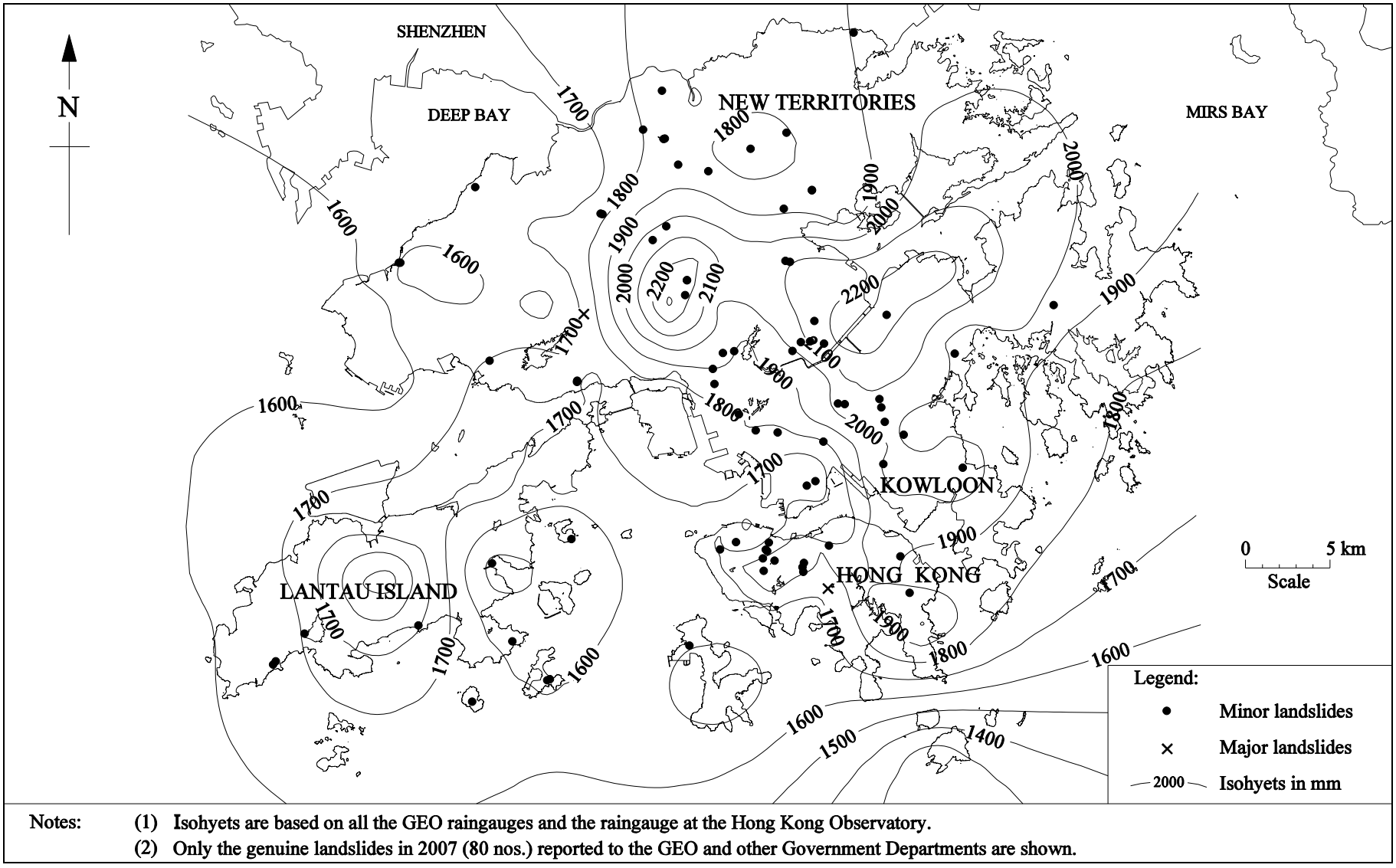

Notes: (1) Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.
(2) Only the genuine landslides in 2007 (80 nos.) reported to the GEO and other Government Departments are shown.

Figure 4 - Total Annual Rainfall Distribution and Locations of Reported Landslides in 2007

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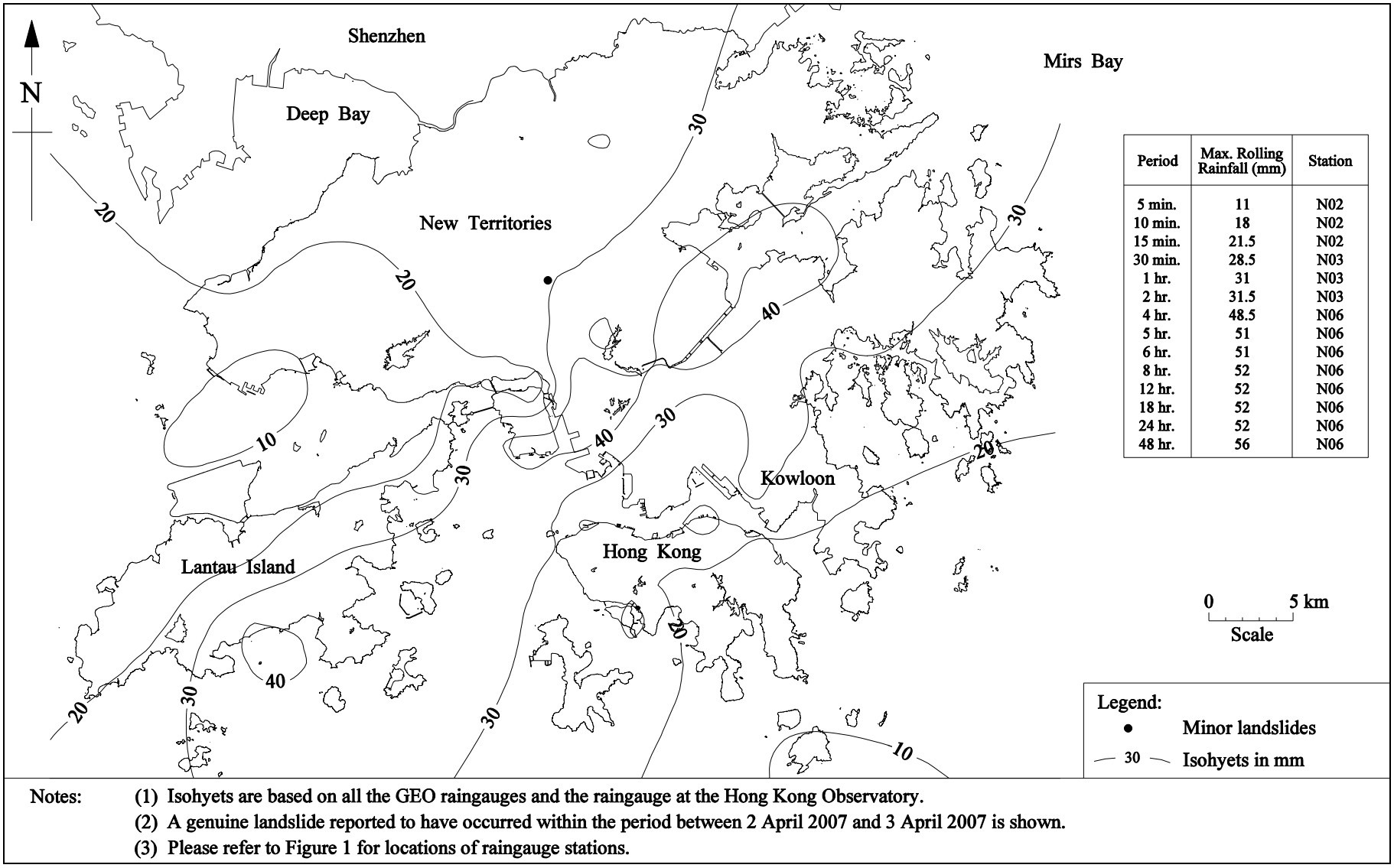
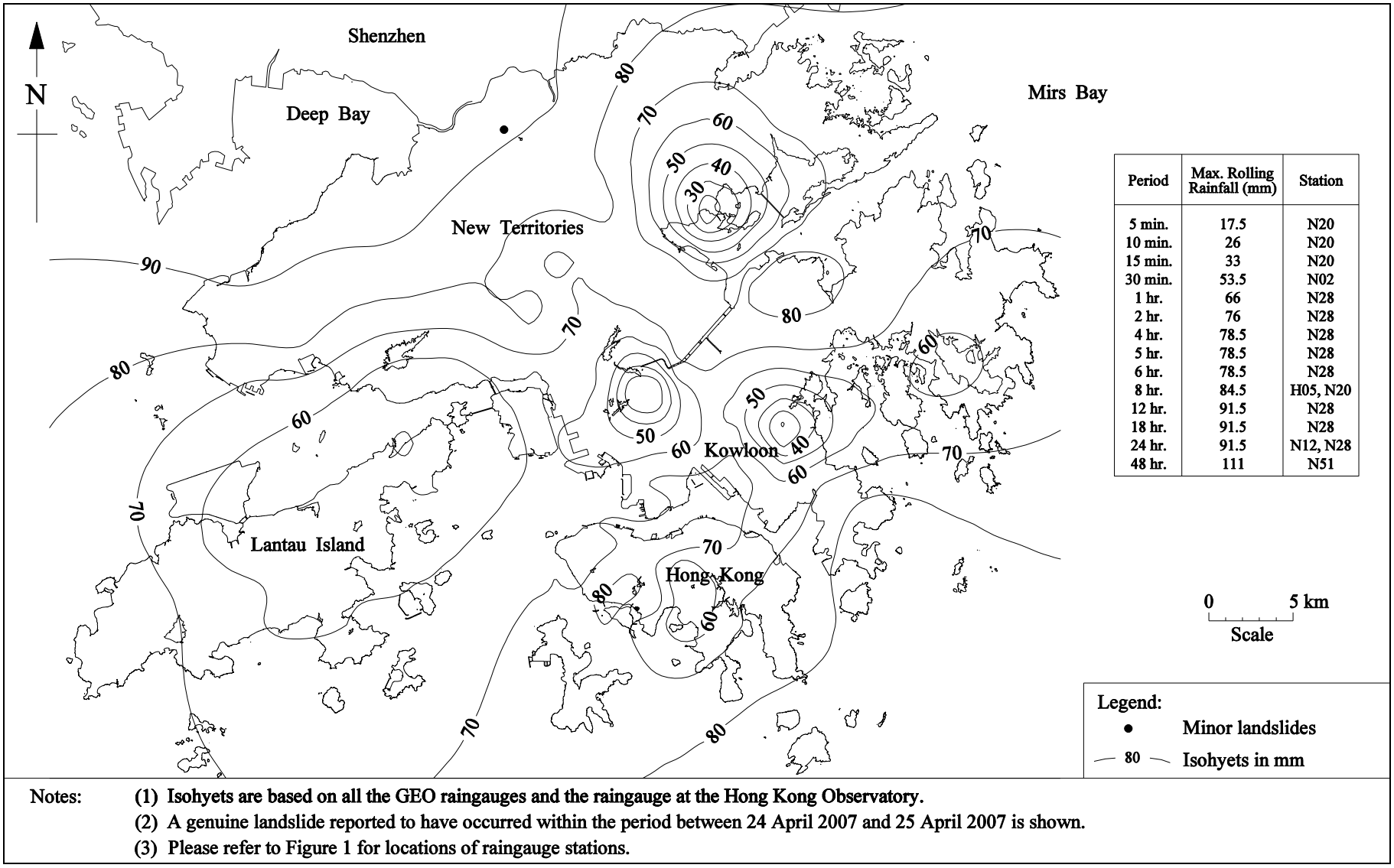


Period	Max. Rolling Rainfall (mm)	Station
5 min.	11	N02
10 min.	18	N02
15 min.	21.5	N02
30 min.	28.5	N03
1 hr.	31	N03
2 hr.	31.5	N03
4 hr.	48.5	N06
5 hr.	51	N06
6 hr.	51	N06
8 hr.	52	N06
12 hr.	52	N06
18 hr.	52	N06
24 hr.	52	N06
48 hr.	56	N06

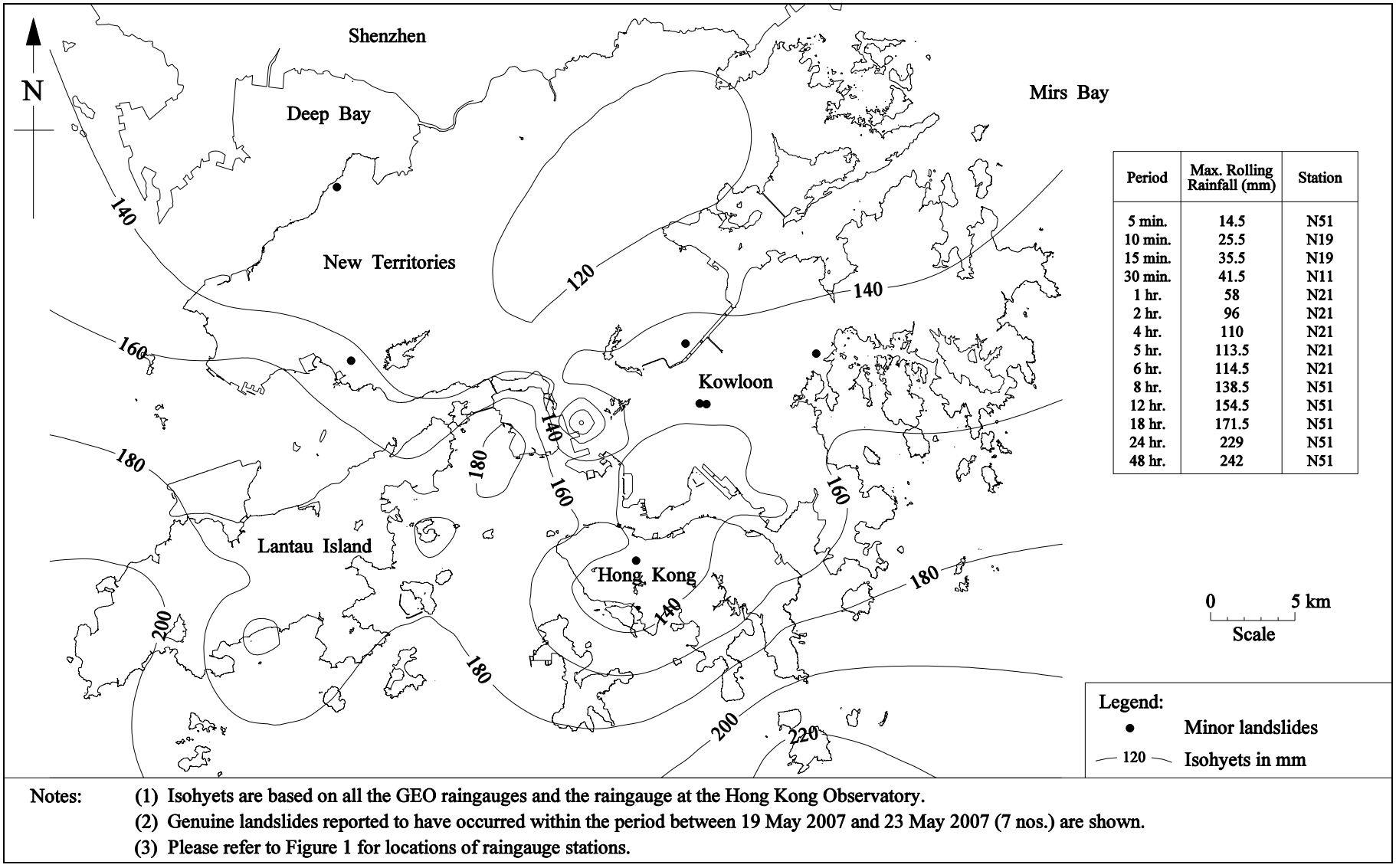
Figure 5 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 2 April 2007 (00:00) and 3 April 2007 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	17.5	N20
10 min.	26	N20
15 min.	33	N20
30 min.	53.5	N02
1 hr.	66	N28
2 hr.	76	N28
4 hr.	78.5	N28
5 hr.	78.5	N28
6 hr.	78.5	N28
8 hr.	84.5	H05, N20
12 hr.	91.5	N28
18 hr.	91.5	N28
24 hr.	91.5	N12, N28
48 hr.	111	N51

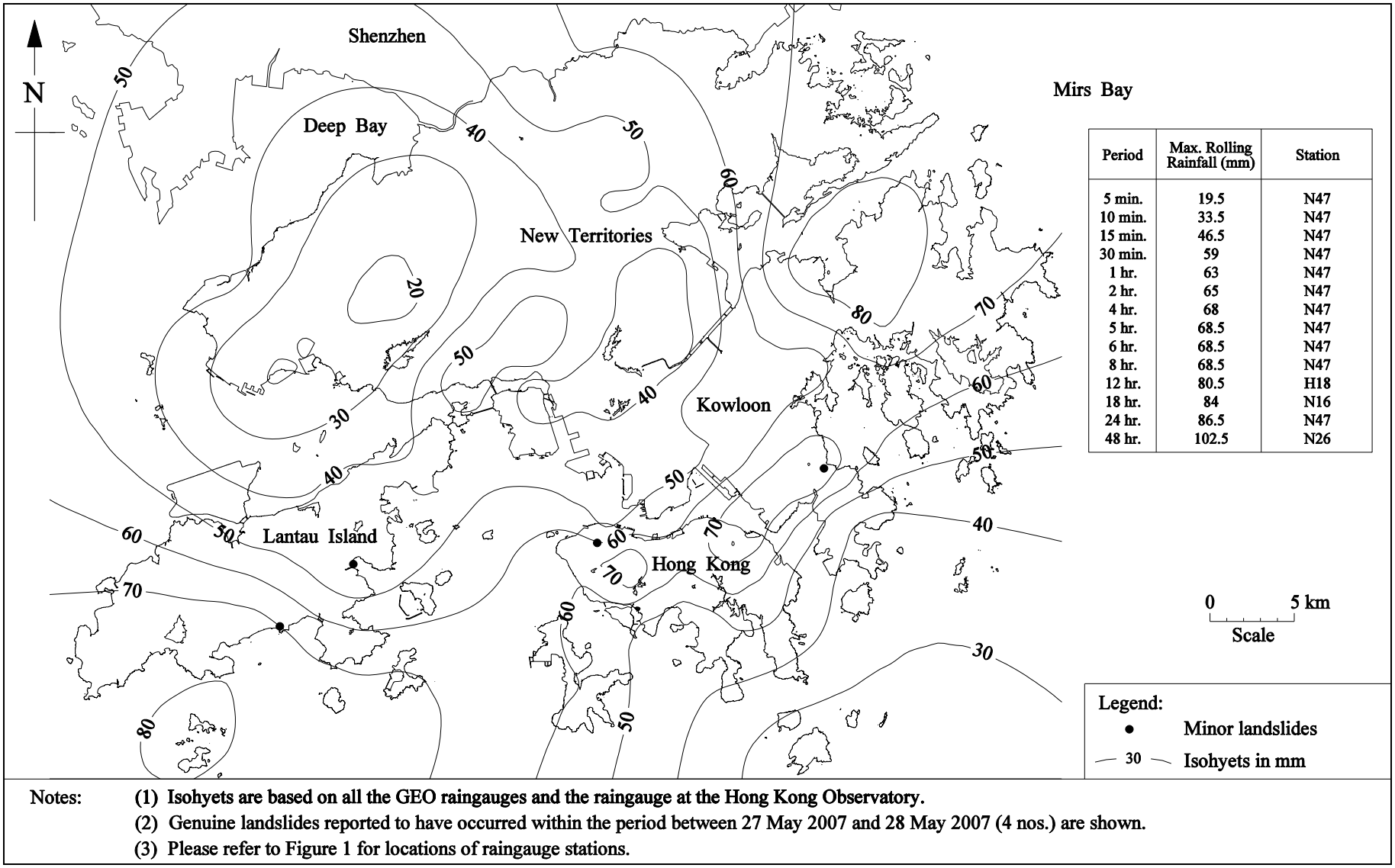
Notes:
(1) Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.
(2) A genuine landslide reported to have occurred within the period between 24 April 2007 and 25 April 2007 is shown.
(3) Please refer to Figure 1 for locations of raingauge stations.

Figure 6 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 24 April 2007 (00:00) and 25 April 2007 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	14.5	N51
10 min.	25.5	N19
15 min.	35.5	N19
30 min.	41.5	N11
1 hr.	58	N21
2 hr.	96	N21
4 hr.	110	N21
5 hr.	113.5	N21
6 hr.	114.5	N21
8 hr.	138.5	N51
12 hr.	154.5	N51
18 hr.	171.5	N51
24 hr.	229	N51
48 hr.	242	N51

Figure 7 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 19 May 2007 (00:00) and 23 May 2007 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	19.5	N47
10 min.	33.5	N47
15 min.	46.5	N47
30 min.	59	N47
1 hr.	63	N47
2 hr.	65	N47
4 hr.	68	N47
5 hr.	68.5	N47
6 hr.	68.5	N47
8 hr.	68.5	N47
12 hr.	80.5	H18
18 hr.	84	N16
24 hr.	86.5	N47
48 hr.	102.5	N26

Figure 8 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 27 May 2007 (00:00) and 28 May 2007 (24:00) and Locations of Landslides

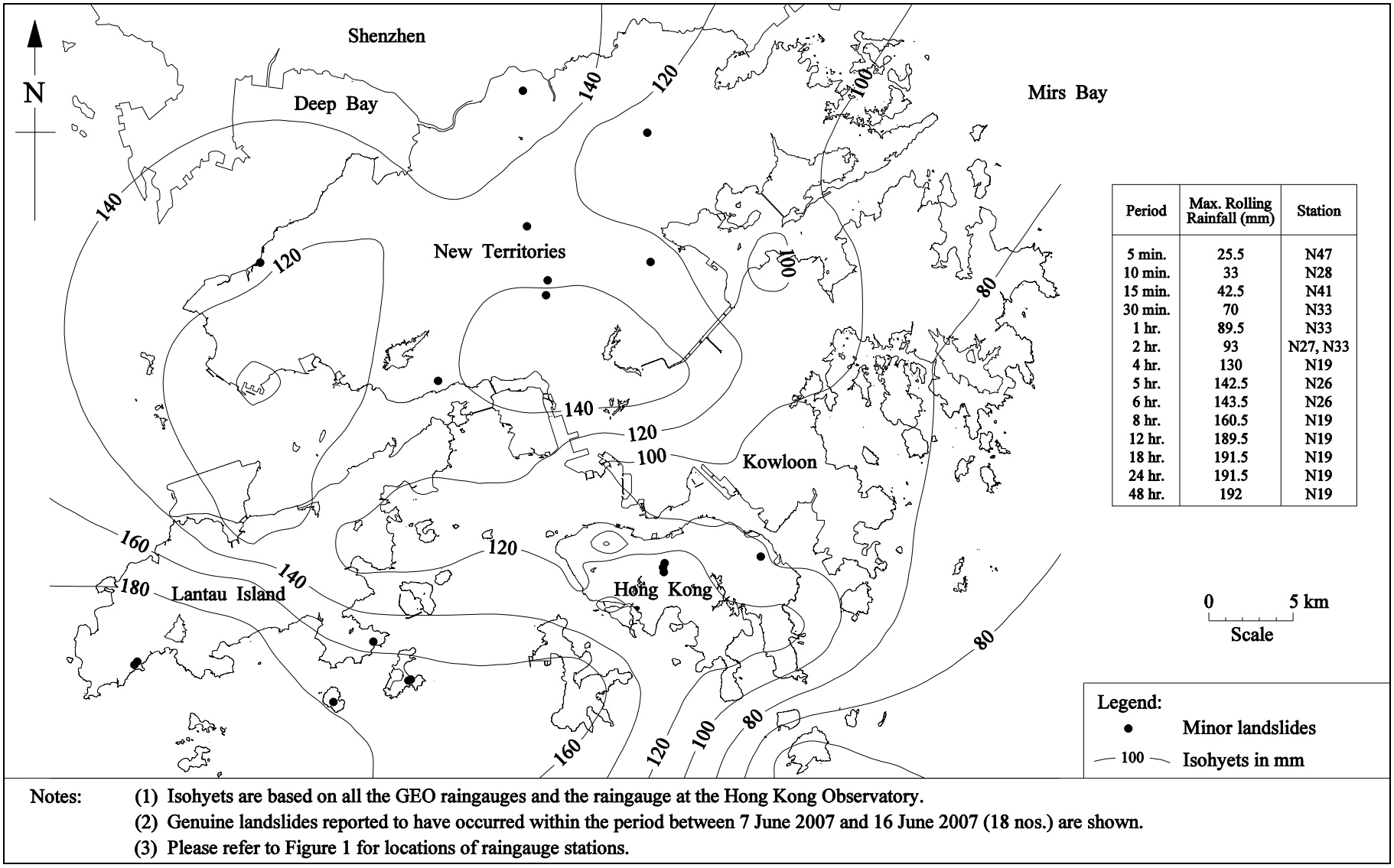


Figure 9 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 7 June 2007 (00:00) and 16 June 2007 (24:00) and Locations of Landslides

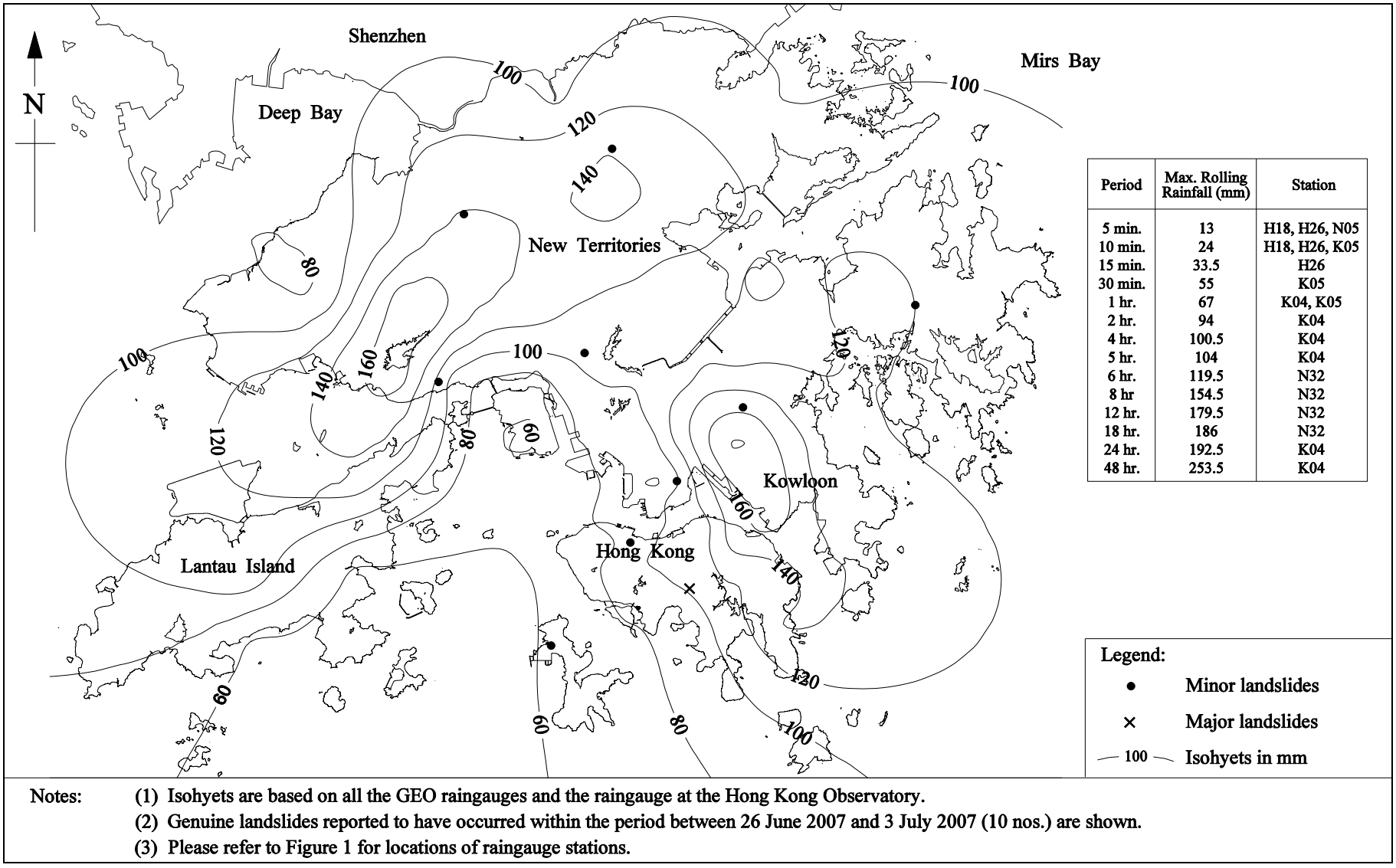


Figure 10 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 26 June 2007 (00:00) and 3 July 2007 (24:00) and Locations of Landslide

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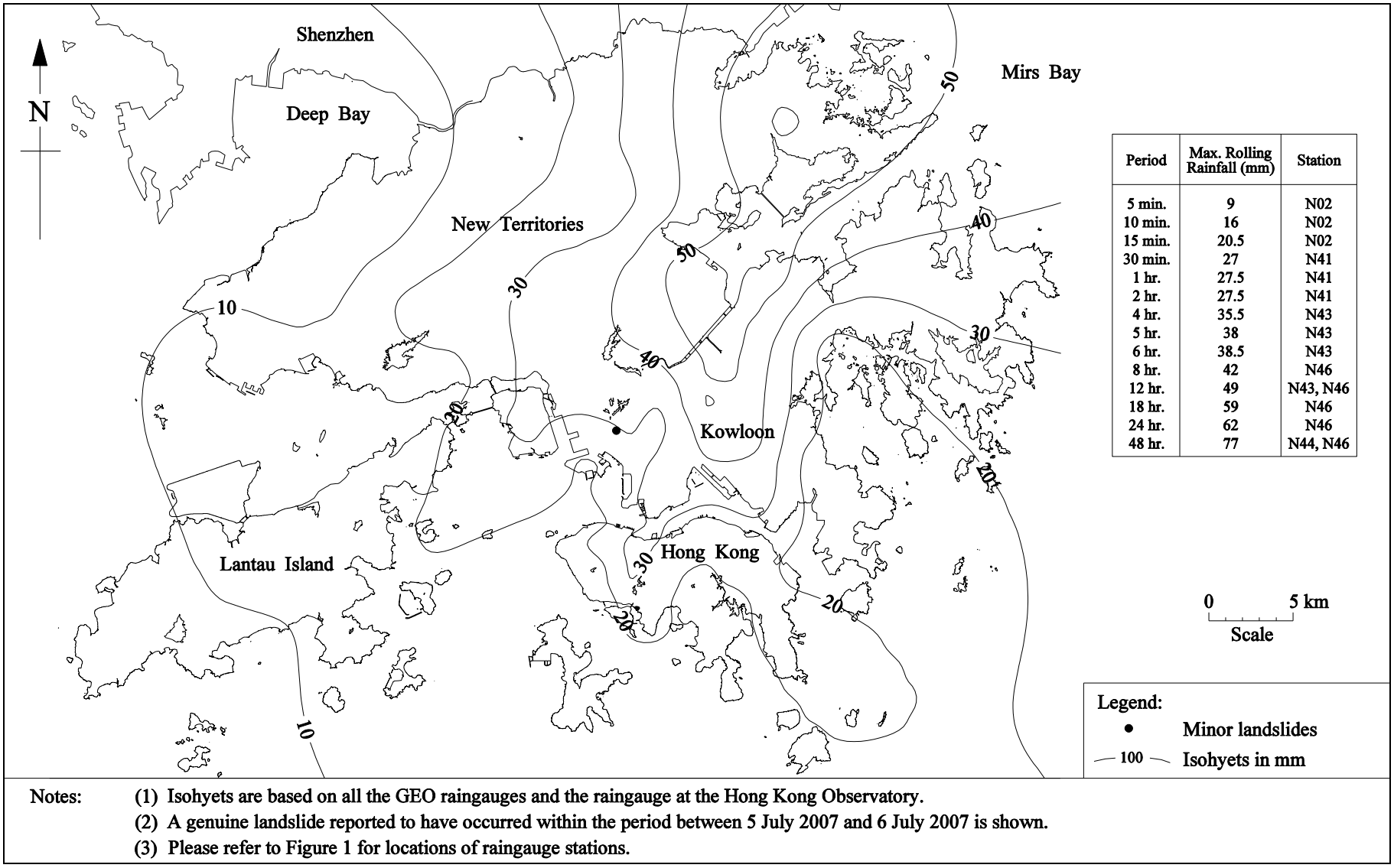

Period	Max. Rolling Rainfall (mm)	Station
5 min.	9	N02
10 min.	16	N02
15 min.	20.5	N02
30 min.	27	N41
1 hr.	27.5	N41
2 hr.	27.5	N41
4 hr.	35.5	N43
5 hr.	38	N43
6 hr.	38.5	N43
8 hr.	42	N46
12 hr.	49	N43, N46
18 hr.	59	N46
24 hr.	62	N46
48 hr.	77	N44, N46

Notes:
(1) Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.
(2) A genuine landslide reported to have occurred within the period between 5 July 2007 and 6 July 2007 is shown.
(3) Please refer to Figure 1 for locations of raingauge stations.

Figure 11 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 5 July 2007 (00:00) and 6 July 2007 (24:00) and Locations of Landslides

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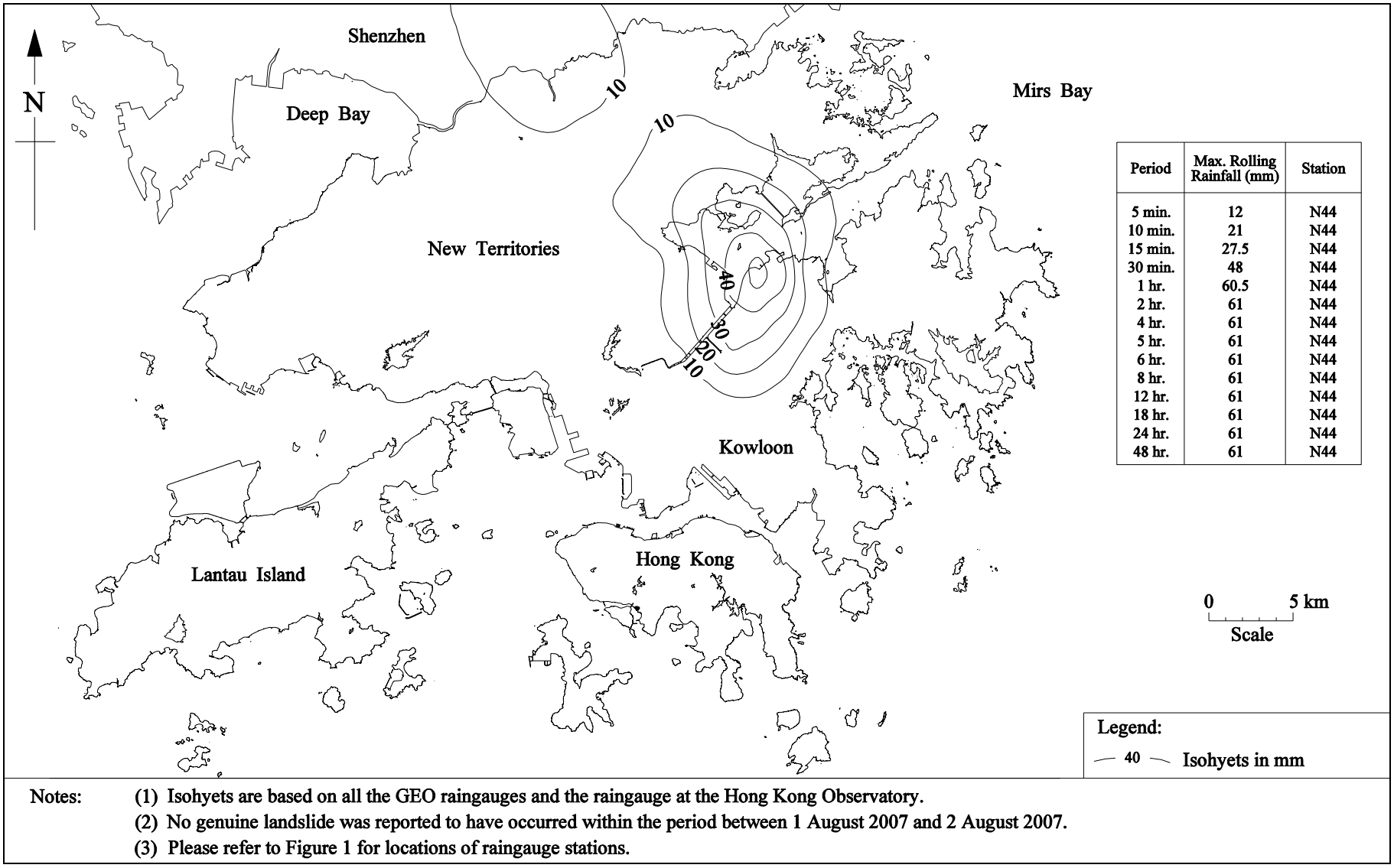
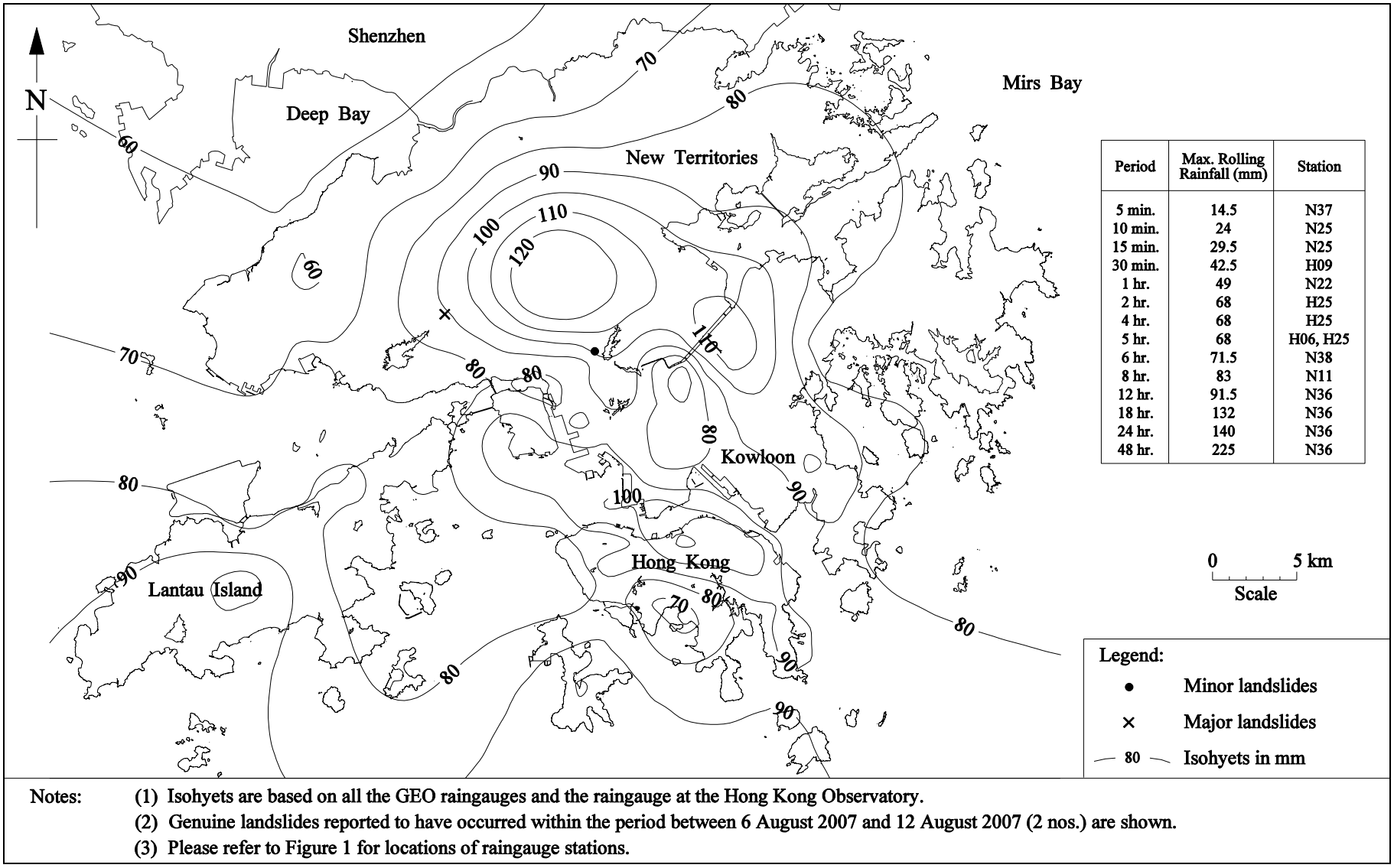


Period	Max. Rolling Rainfall (mm)	Station
5 min.	12	N44
10 min.	21	N44
15 min.	27.5	N44
30 min.	48	N44
1 hr.	60.5	N44
2 hr.	61	N44
4 hr.	61	N44
5 hr.	61	N44
6 hr.	61	N44
8 hr.	61	N44
12 hr.	61	N44
18 hr.	61	N44
24 hr.	61	N44
48 hr.	61	N44

Notes: (1) Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.
(2) No genuine landslide was reported to have occurred within the period between 1 August 2007 and 2 August 2007.
(3) Please refer to Figure 1 for locations of raingauge stations.

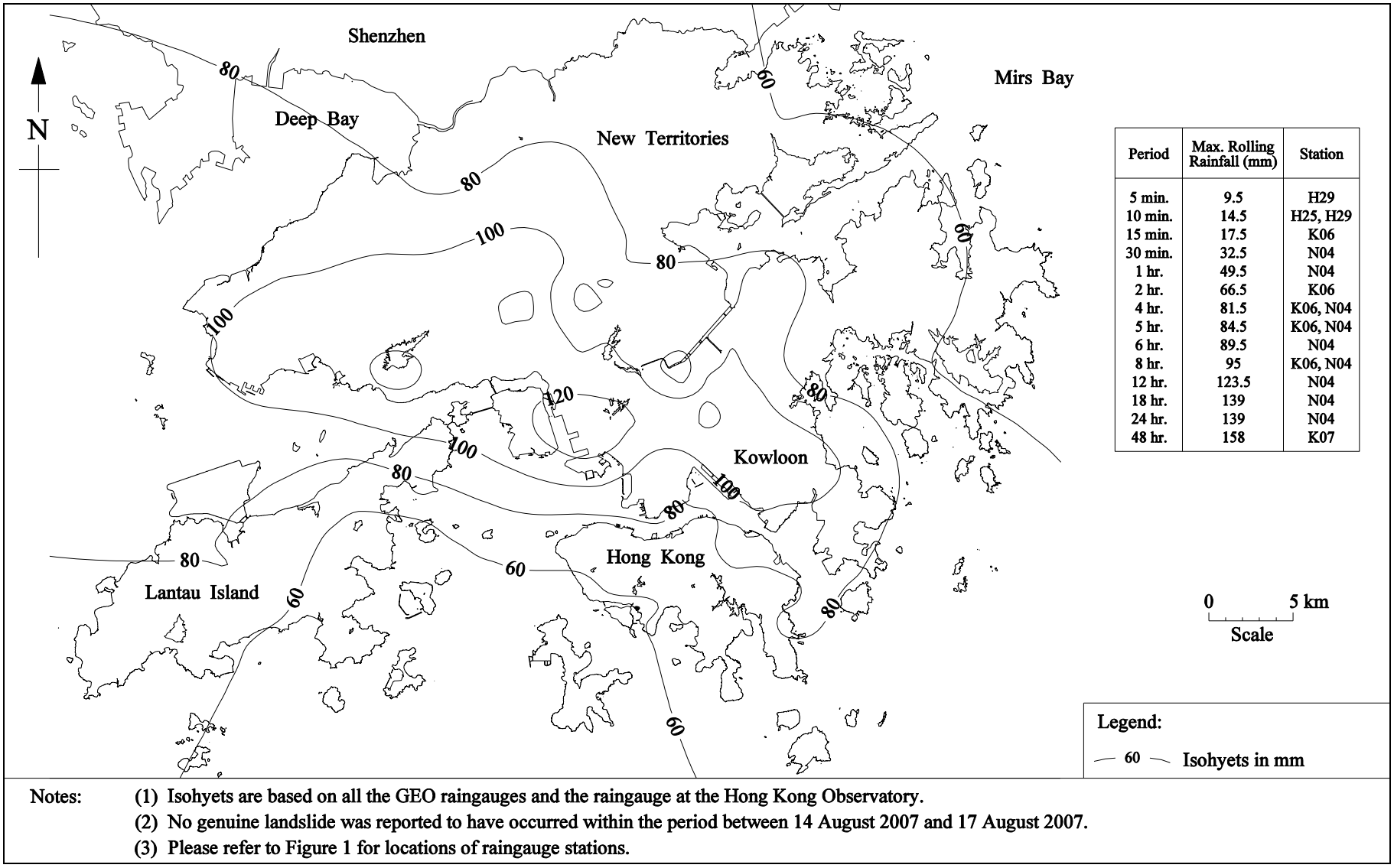
Figure 12 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 1 August 2007 (00:00) and 2 August 2007 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	14.5	N37
10 min.	24	N25
15 min.	29.5	N25
30 min.	42.5	H09
1 hr.	49	N22
2 hr.	68	H25
4 hr.	68	H25
5 hr.	68	H06, H25
6 hr.	71.5	N38
8 hr.	83	N11
12 hr.	91.5	N36
18 hr.	132	N36
24 hr.	140	N36
48 hr.	225	N36

Notes: (1) Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.
(2) Genuine landslides reported to have occurred within the period between 6 August 2007 and 12 August 2007 (2 nos.) are shown.
(3) Please refer to Figure 1 for locations of raingauge stations.

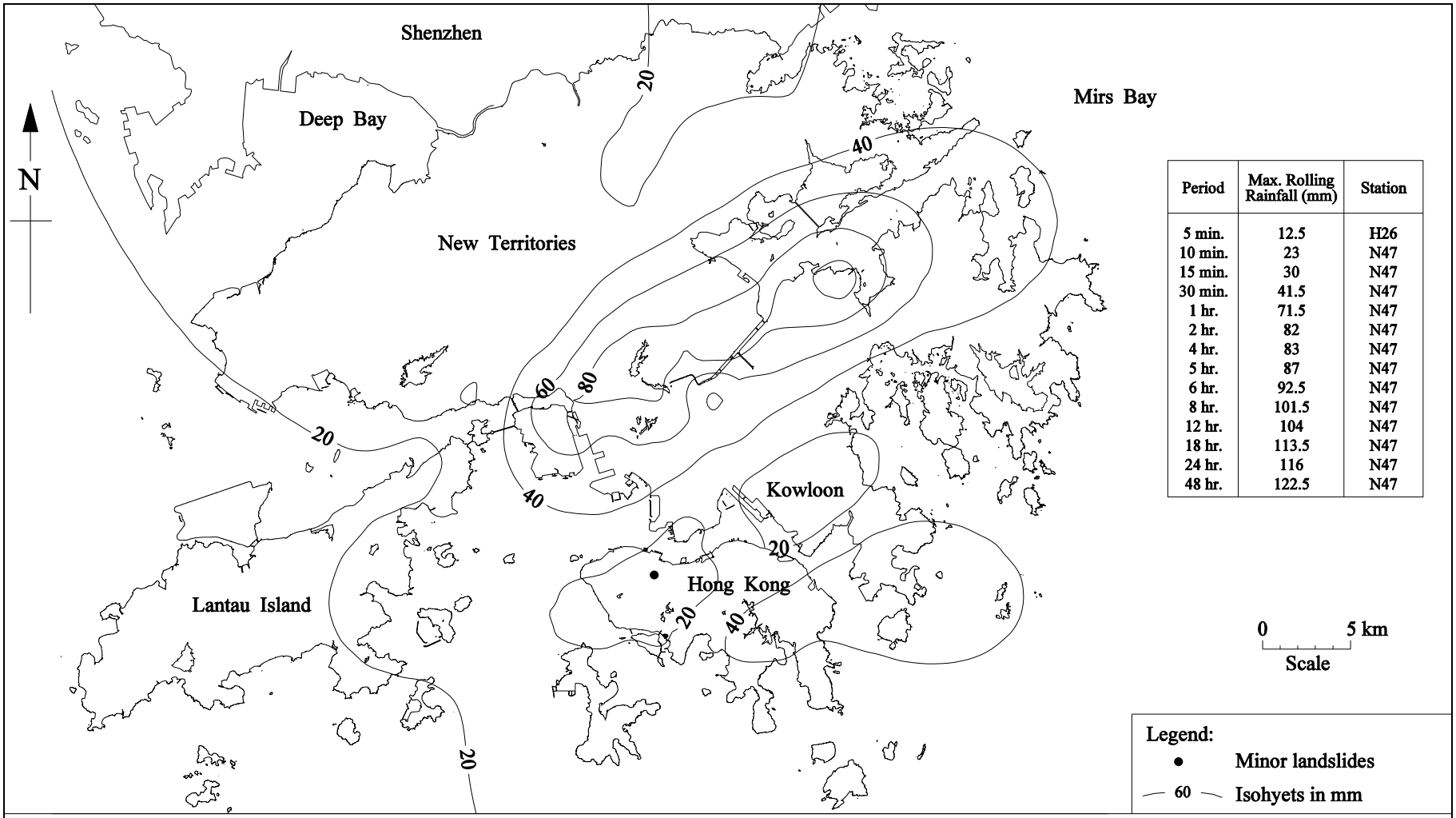
Figure 13 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 6 August 2007 (00:00) and 12 August 2007 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	9.5	H29
10 min.	14.5	H25, H29
15 min.	17.5	K06
30 min.	32.5	N04
1 hr.	49.5	N04
2 hr.	66.5	K06
4 hr.	81.5	K06, N04
5 hr.	84.5	K06, N04
6 hr.	89.5	N04
8 hr.	95	K06, N04
12 hr.	123.5	N04
18 hr.	139	N04
24 hr.	139	N04
48 hr.	158	K07

Notes: (1) Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.
(2) No genuine landslide was reported to have occurred within the period between 14 August 2007 and 17 August 2007.
(3) Please refer to Figure 1 for locations of raingauge stations.

Figure 14 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 14 August 2007 (00:00) and 17 August 2007 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	12.5	H26
10 min.	23	N47
15 min.	30	N47
30 min.	41.5	N47
1 hr.	71.5	N47
2 hr.	82	N47
4 hr.	83	N47
5 hr.	87	N47
6 hr.	92.5	N47
8 hr.	101.5	N47
12 hr.	104	N47
18 hr.	113.5	N47
24 hr.	116	N47
48 hr.	122.5	N47

Notes: (1) Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.
(2) A genuine landslide reported to have occurred within the period between 20 August 2007 and 23 August 2007 is shown.
(3) Please refer to Figure 1 for locations of raingauge stations.

Figure 15 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 20 August 2007 (00:00) and 23 August 2007 (24:00) and Locations of Landslides

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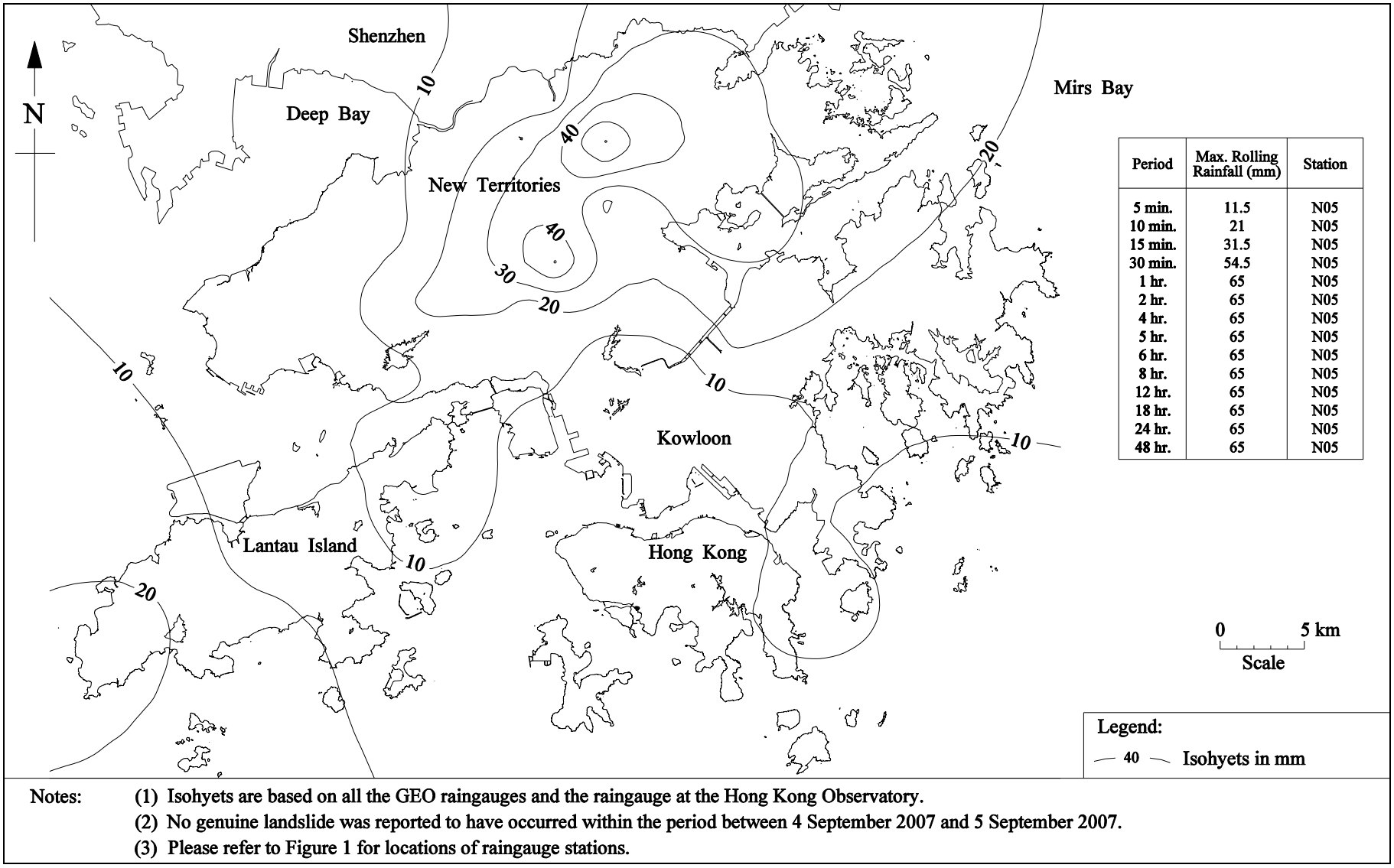
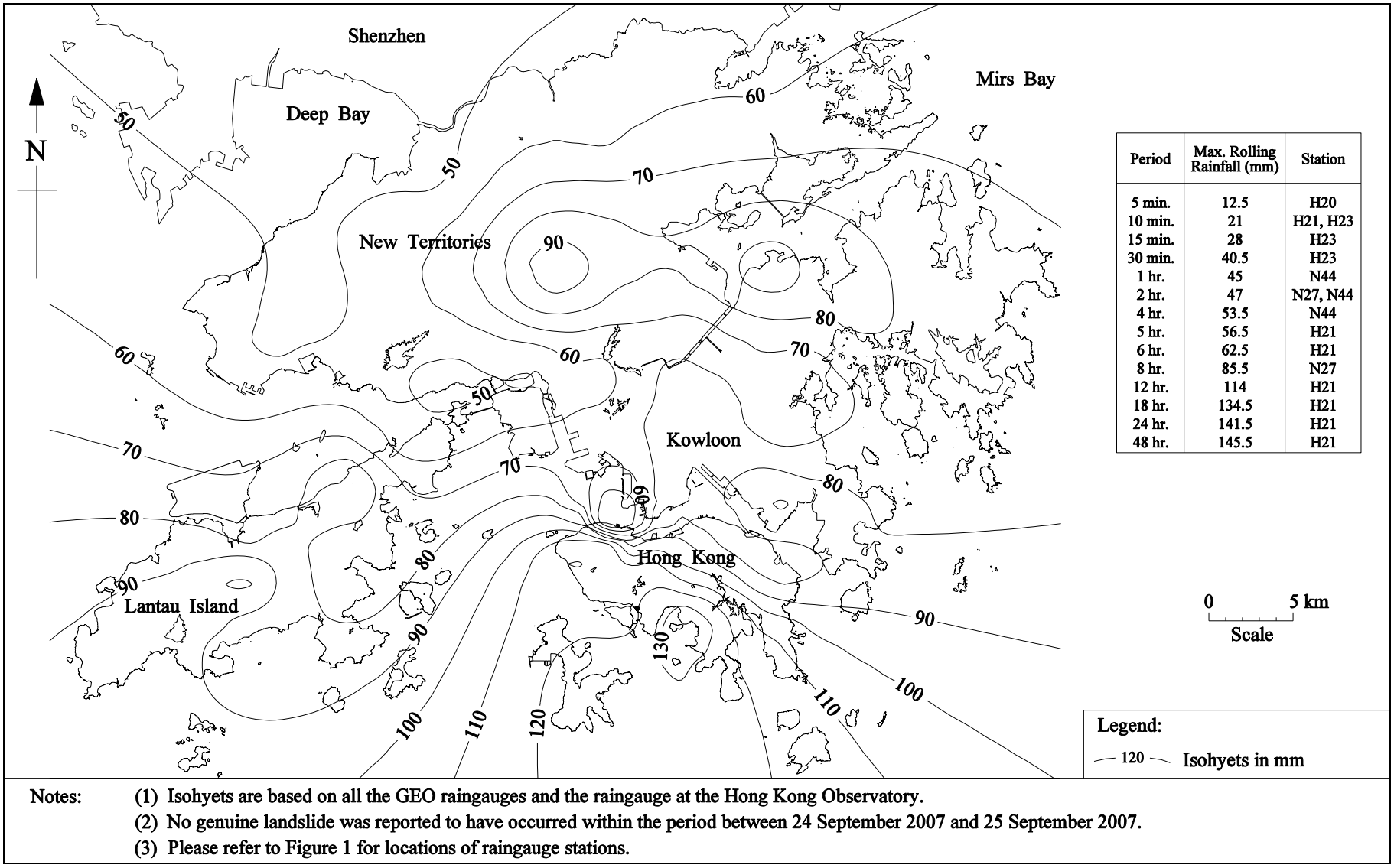


Period	Max. Rolling Rainfall (mm)	Station
5 min.	11.5	N05
10 min.	21	N05
15 min.	31.5	N05
30 min.	54.5	N05
1 hr.	65	N05
2 hr.	65	N05
4 hr.	65	N05
5 hr.	65	N05
6 hr.	65	N05
8 hr.	65	N05
12 hr.	65	N05
18 hr.	65	N05
24 hr.	65	N05
48 hr.	65	N05

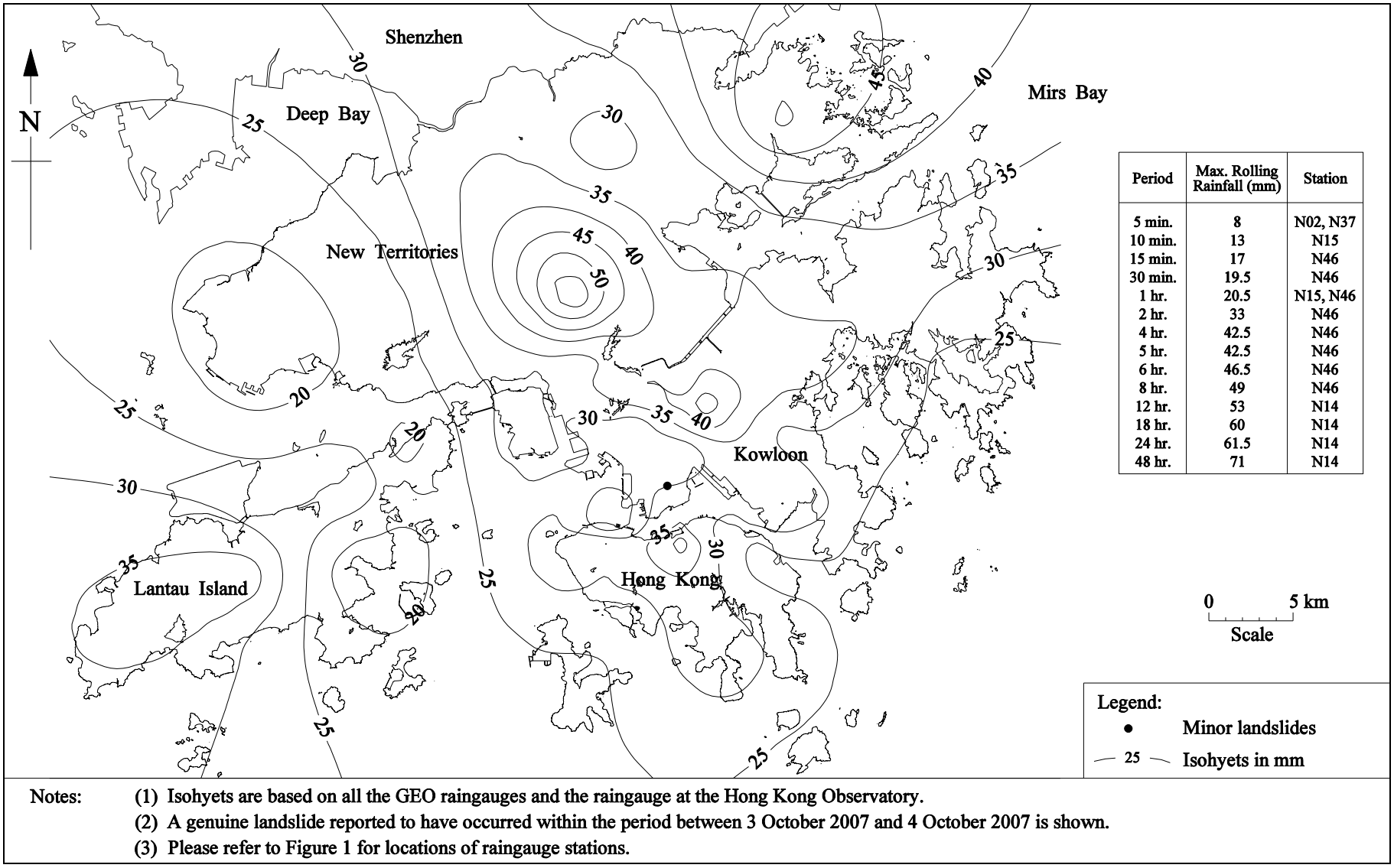
Figure 16 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 4 September 2007 (00:00) and 5 September 2007 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	12.5	H20
10 min.	21	H21, H23
15 min.	28	H23
30 min.	40.5	H23
1 hr.	45	N44
2 hr.	47	N27, N44
4 hr.	53.5	N44
5 hr.	56.5	H21
6 hr.	62.5	H21
8 hr.	85.5	N27
12 hr.	114	H21
18 hr.	134.5	H21
24 hr.	141.5	H21
48 hr.	145.5	H21

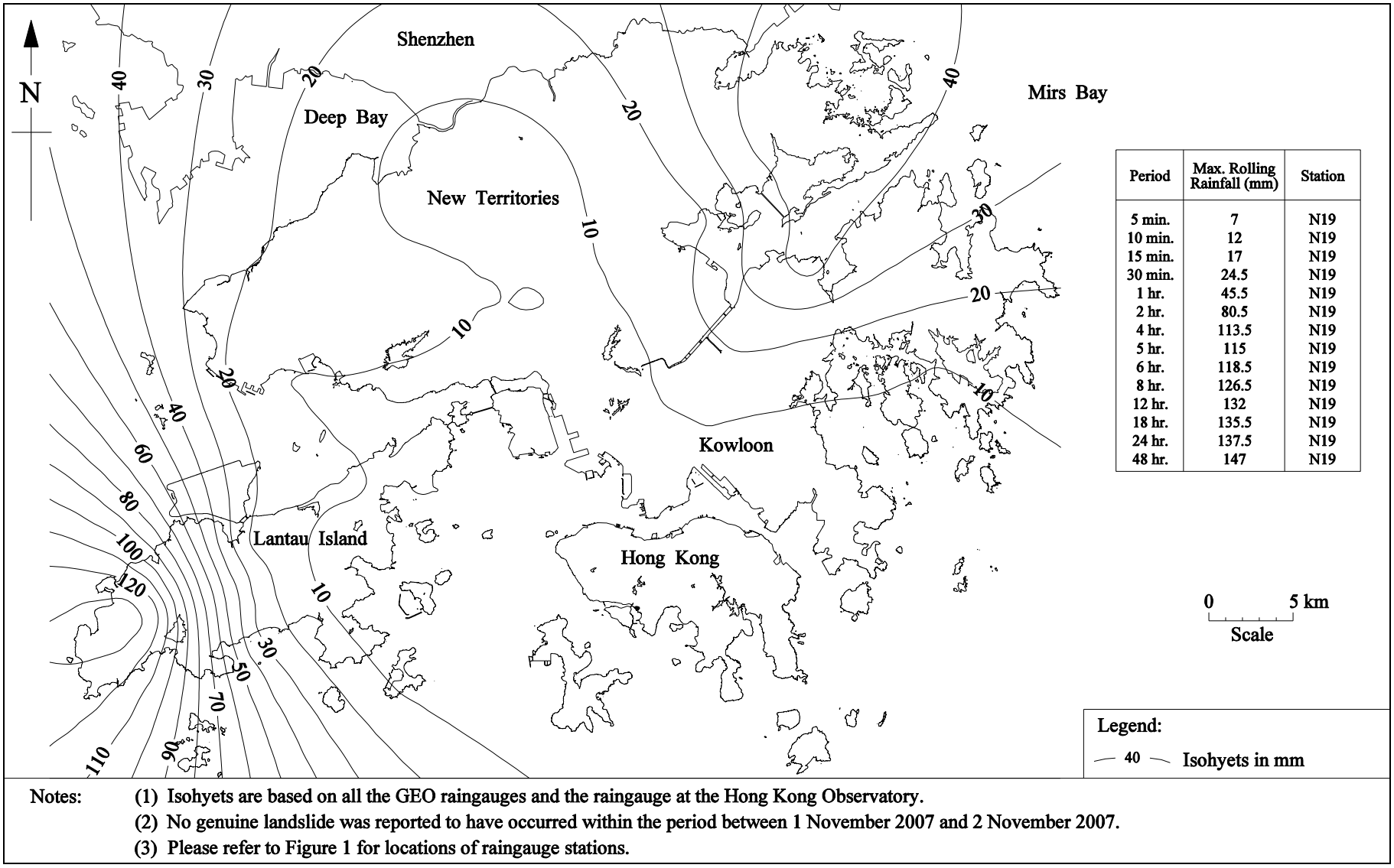
Notes: (1) Isohyets are based on all the GEO raingauges and the raingauge at the Hong Kong Observatory.
(2) No genuine landslide was reported to have occurred within the period between 24 September 2007 and 25 September 2007.
(3) Please refer to Figure 1 for locations of raingauge stations.

Figure 17 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 24 September 2007 (00:00) and 25 September 2007 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	8	N02, N37
10 min.	13	N15
15 min.	17	N46
30 min.	19.5	N46
1 hr.	20.5	N15, N46
2 hr.	33	N46
4 hr.	42.5	N46
5 hr.	42.5	N46
6 hr.	46.5	N46
8 hr.	49	N46
12 hr.	53	N14
18 hr.	60	N14
24 hr.	61.5	N14
48 hr.	71	N14

Figure 18 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 3 October 2007 (00:00) and 4 October 2007 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	7	N19
10 min.	12	N19
15 min.	17	N19
30 min.	24.5	N19
1 hr.	45.5	N19
2 hr.	80.5	N19
4 hr.	113.5	N19
5 hr.	115	N19
6 hr.	118.5	N19
8 hr.	126.5	N19
12 hr.	132	N19
18 hr.	135.5	N19
24 hr.	137.5	N19
48 hr.	147	N19

Figure 19 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 1 November 2007 (00:00) and 2 November 2007 (24:00)

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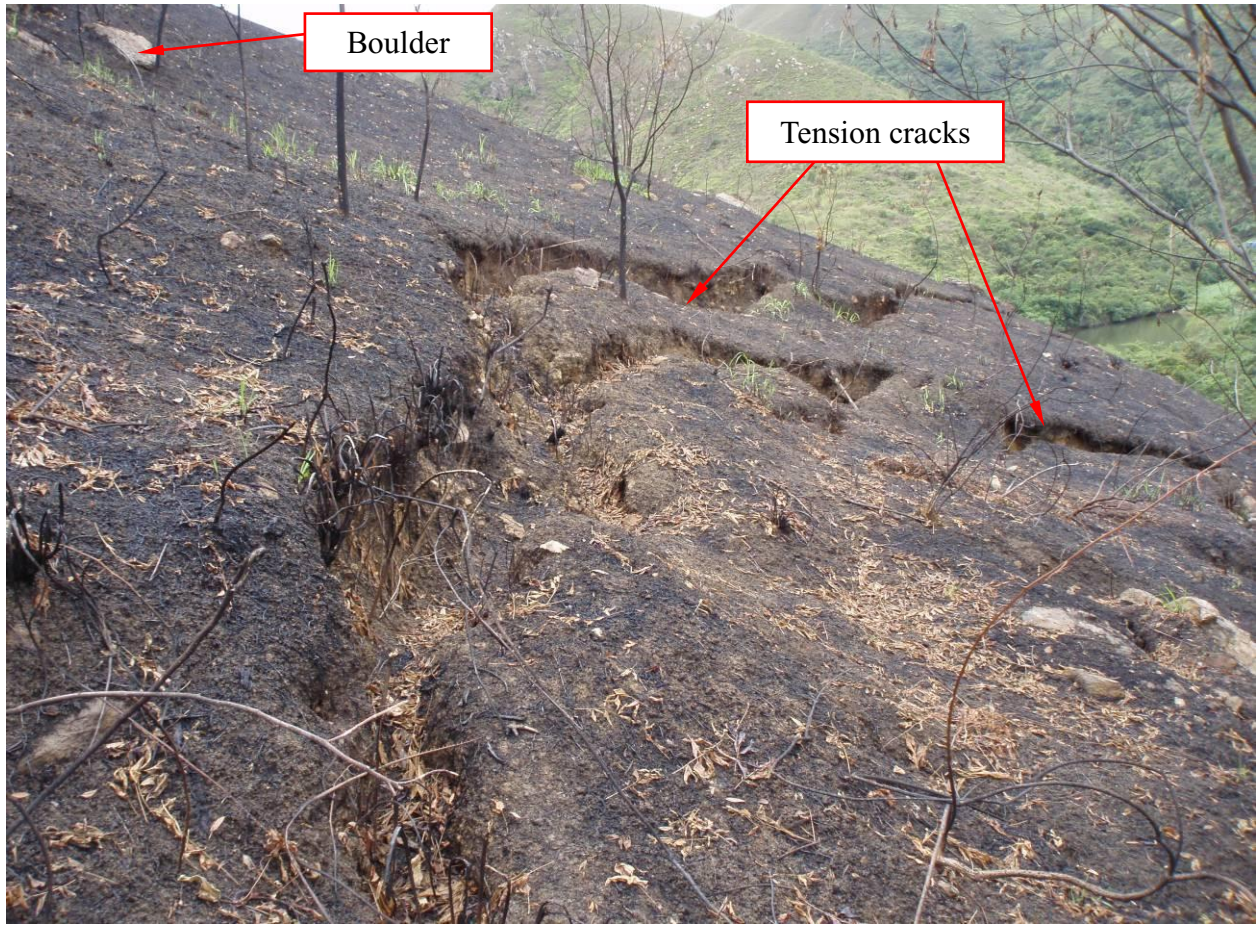
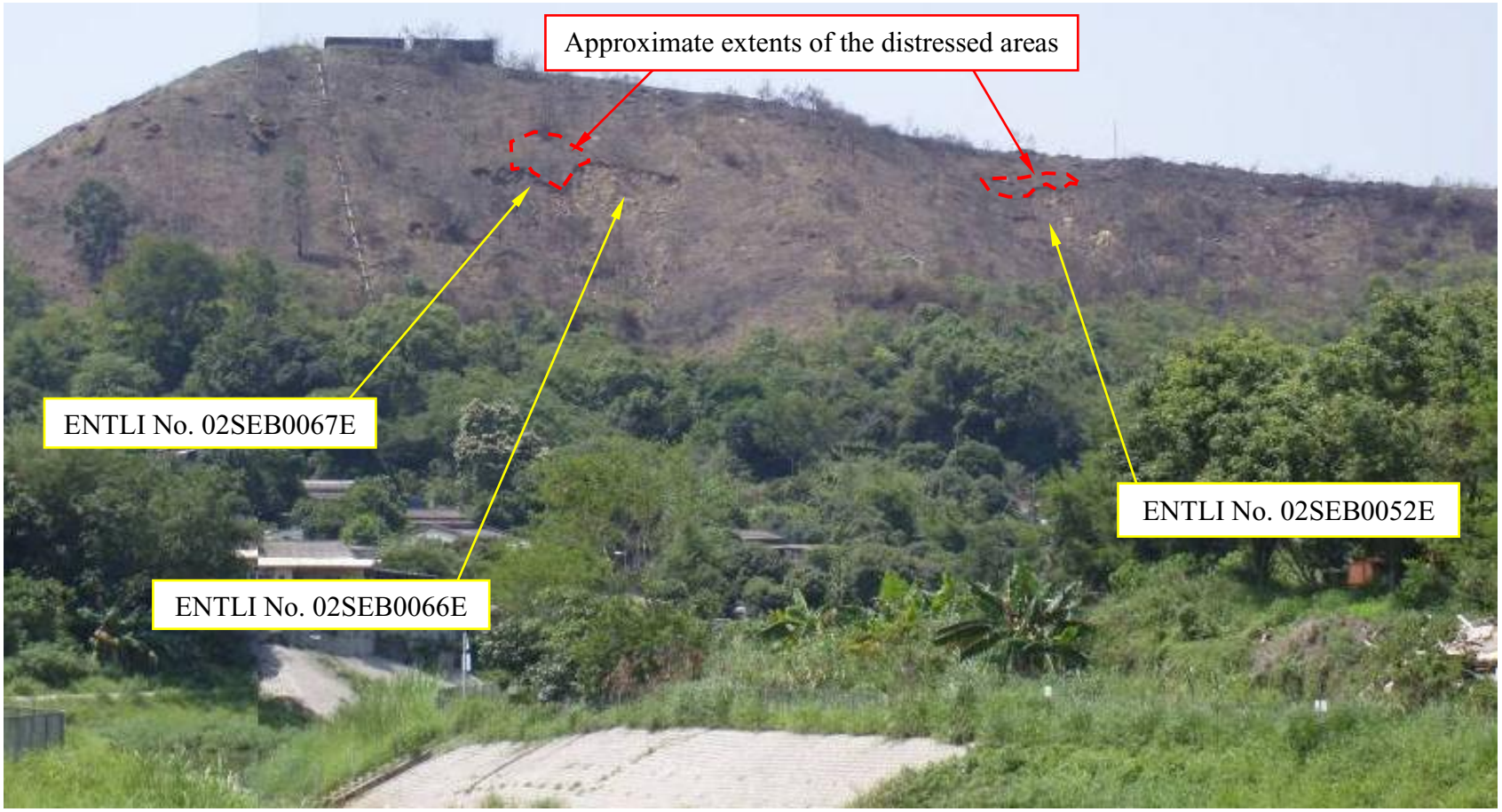


Description: Significant signs of distress were identified on the natural hillsides near Kwu Tung following a hillfire on 1 April 2007.

Plate 1 - Signs of Distress on a North-facing Hillside near Kwu Tung (Incident No. LI2007/04/2001)



Description: Significant signs of distress were identified on the natural hillsides near Kwu Tung following a hillfire on 1 April 2007.

Plate 2 - Signs of Distress on a South-facing Hillside near Kwu Tung (Incidents Nos. LI2007/04/2002 & LI2007/04/2003)

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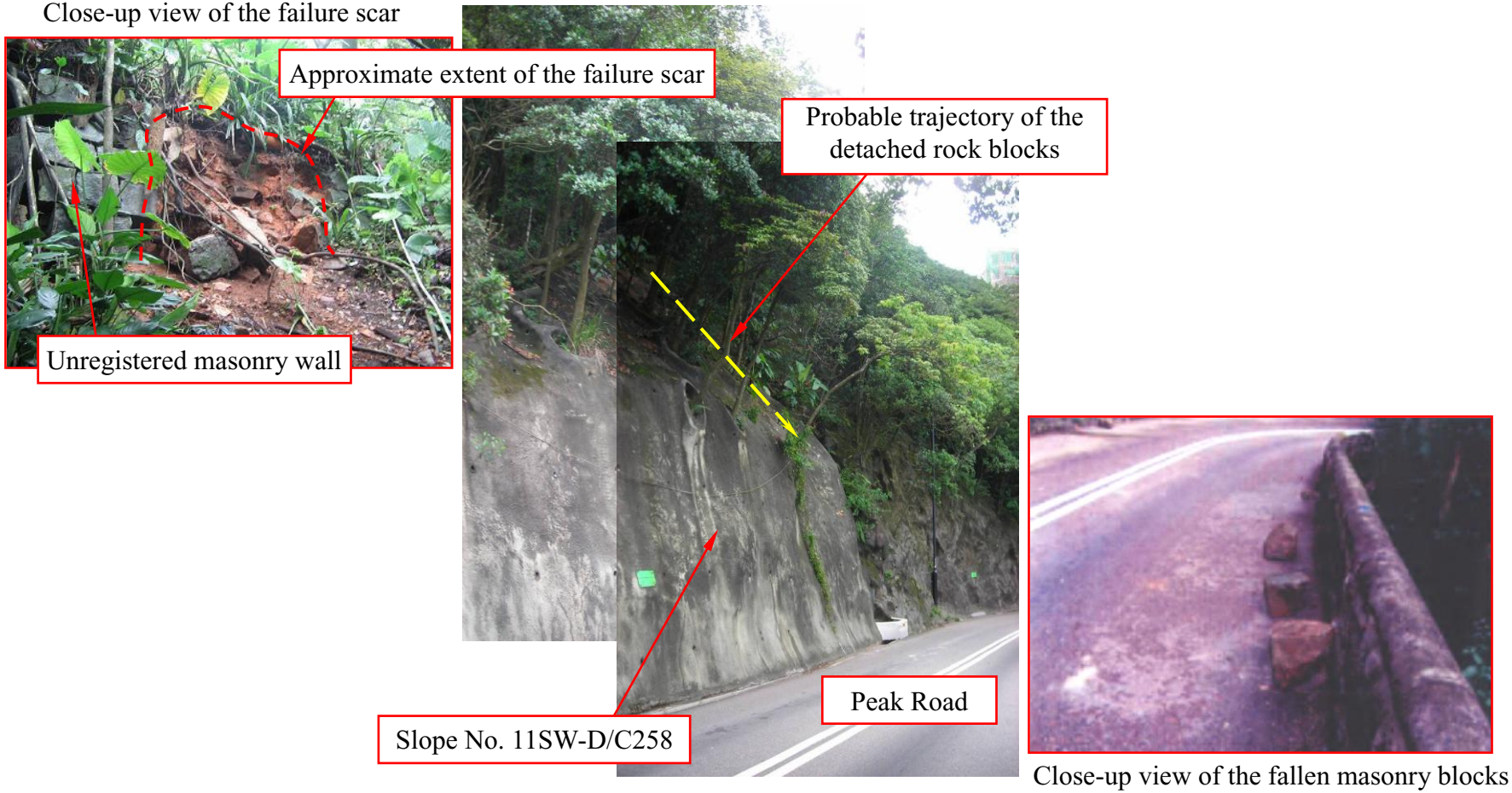
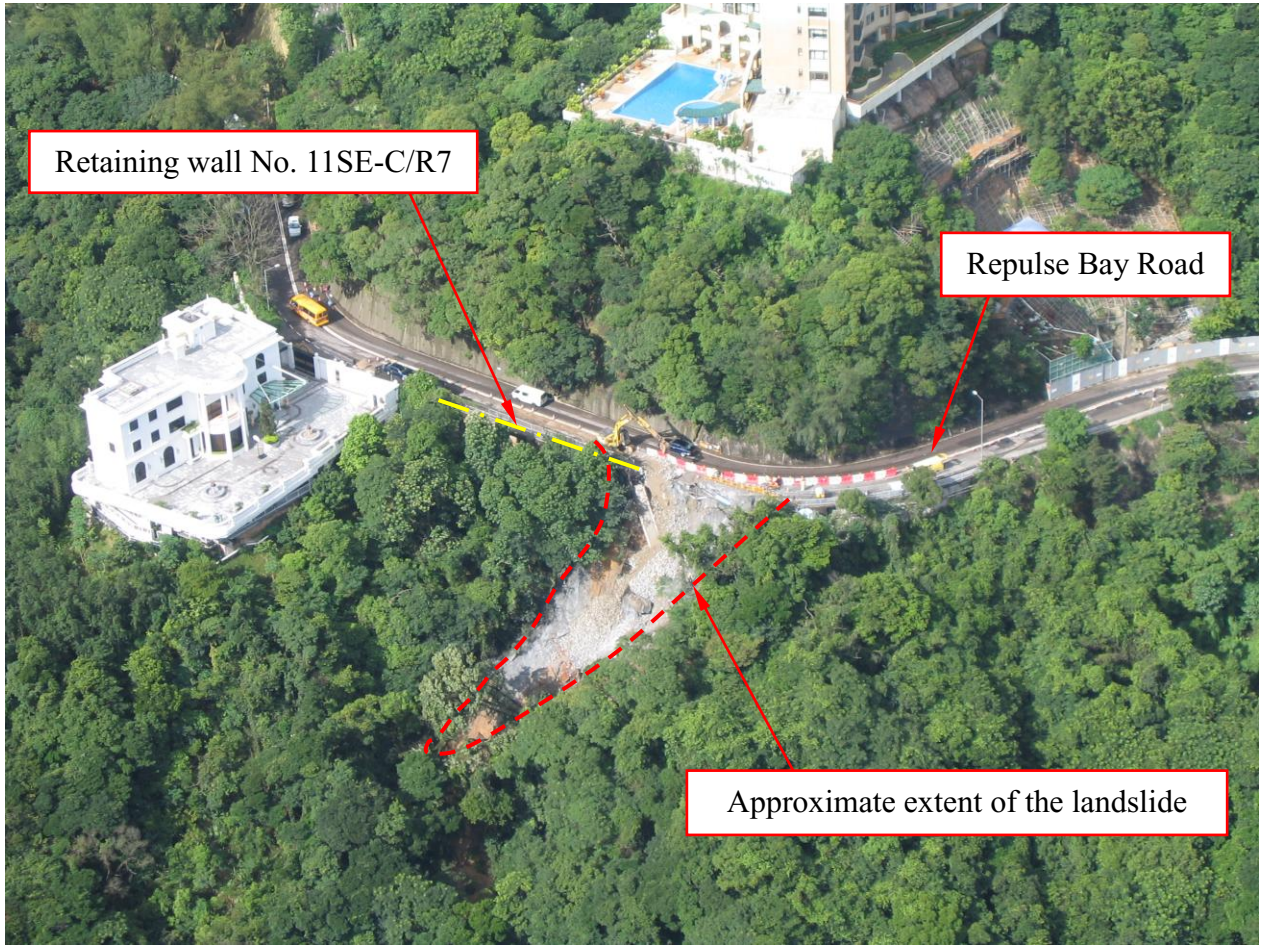


Description: Detachment of several sizeable masonry blocks from an unregistered masonry retaining wall, which resulted in the temporary closure of one lane of Peak Road.

Plate 3 - The 3 June 2007 Failure on an Unregistered Retaining Wall on Disturbed Hillside above Slope No. 11SW-D/C258, Peak Road (Incident No. 2007/06/0020)



Description: A major landslide occurred on a masonry retaining wall and the adjoining natural hillsides, which resulted in the temporary closure of the north-bound lane of Repulse Bay Road for about eight weeks.

Plate 4 - The 30 June 2007 Landslide on Retaining Wall No. 11SE-C/R7 and the Adjoining Natural Hillside below Repulse Bay Road (Incident No. 2007/07/0050)

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APPENDIX A

SOME SELECTED RAINFALL PARAMETERS FOR THE 15 RAINSTORMS WITH DAILY RAINFALL EXCEEDING 50 mm

LIST OF TABLES

Table A1 - Some Selected Rainfall Parameters for the 15 Rainstorms with Daily Rainfall exceeding 50 mm in 2007 (Sheet 1 of 3)

Rainstorm		5-min		10-min		15-min		30-min	
		Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station
1	2-3 April 2007	11	N02	18	N02	21.5	N02	28.5	N03
2	24-25 April 2007	17.5	N20	26	N20	33	N20	53.5	N02
3	19-23 May 2007	14.5	N51	25.5	N19	35.5	N19	41.5	N11
4	27-28 May 2007	19.5	N47	33.5	N47	46.5	N47	59	N47
5	7-16 June 2007	25.5	N47	33	N28	42.5	N41	70	N33
6	26 June - 3 July 2007	13	H18, H26, N05	24	H18, H26, K05	33.5	H26	55	K05
7	5-6 July 2007	9	N02	16	N02	20.5	N02	27	N41
8	1-2 August 2007	12	N44	21	N44	27.5	N44	48	N44
9	6-12 August 2007	14.5	N37	24	N25	29.5	N25	42.5	H09
10	14-17 August 2007	9.5	H29	14.5	H29, H25	17.5	K06	32.5	N04
11	20-23 August 2007	12.5	H26	23	N47	30	N47	41.5	N47
12	4-5 September 2007	11.5	N05	21	N05	31.5	N05	54.5	N05
13	24-25 September 2007	12.5	H20	21	H21, H23	28	H23	40.5	H23
14	3-4 October 2007	8	N02, N37	13	N15	17	N46	19.5	N46
15	1-2 November 2007	7	N19	12	N19	17	N19	24.5	N19

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Table A1 - Some Selected Rainfall Parameters for the 15 Rainstorms with Daily Rainfall exceeding 50 mm in 2007 (Sheet 2 of 3)

Rainstorm		1-hr		2-hr		4-hr		5-hr		6-hr	
		Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station
1	2-3 April 2007	31	N03	31.5	N03	48.5	N06	51	N06	51	N06
2	24-25 April 2007	66	N28	76	N28	78.5	N28	78.5	N28	78.5	N28
3	19-23 May 2007	58	N21	96	N21	110	N21	113.5	N21	114.5	N21
4	27-28 May 2007	63	N47	65	N47	68	N47	68.5	N47	68.5	N47
5	7-16 June 2007	89.5	N33	93	N27, N33	130	N19	142.5	N26	143.5	N26
6	26 June - 3 July 2007	67	K04, K05	94	K04	100.5	K04	104	K04	119.5	N32
7	5-6 July 2007	27.5	N41	27.5	N41	35.5	N43	38	N43	38.5	N43
8	1-2 August 2007	60.5	N44	61	N44	61	N44	61	N44	61	N44
9	6-12 August 2007	49	N22	68	H25	68	H25	68	H06, H25	71.5	N38
10	14-17 August 2007	49.5	N04	66.5	K06	81.5	K06, N04	84.5	K06, N04	89.5	N04
11	20-23 August 2007	71.5	N47	82	N47	83	N47	87	N47	92.5	N47
12	4-5 September 2007	65	N05	65	N05	65	N05	65	N05	65	N05
13	24-25 September 2007	45	N44	47	N27, N44	53.5	N44	56.5	H21	62.5	H21
14	3-4 October 2007	20.5	N15, N46	33	N46	42.5	N46	42.5	N46	46.5	N46
15	1-2 November 2007	45.5	N19	80.5	N19	113.5	N19	115	N19	118.5	N19

Table A1 - Some Selected Rainfall Parameters for the 15 Rainstorms with Daily Rainfall exceeding 50 mm in 2007 (Sheet 3 of 3)

Rainstorm		8-hr		12-hr		18-hr		24-hr		48-hr	
		Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station
1	2-3 April 2007	52	N06	52	N06	52	N06	52	N06	56	N06
2	24-25 April 2007	84.5	H05, N20	91.5	N28	91.5	N28	91.5	N12, N28	111	N51
3	19-23 May 2007	138.5	N51	154.5	N51	171.5	N51	229	N51	242	N51
4	27-28 May 2007	68.5	N47	80.5	H18	84	N16	86.5	N47	102.5	N26
5	7-16 June 2007	160.5	N19	189.5	N19	191.5	N19	191.5	N19	192	N19
6	26 June - 3 July 2007	154.5	N32	179.5	N32	186	N32	192.5	K04	253.5	K04
7	5-6 July 2007	42	N46	49	N43, N46	59	N46	62	N46	77	N44, N46
8	1-2 August 2007	61	N44	61	N44	61	N44	61	N44	61	N44
9	6-12 August 2007	83	N11	91.5	N36	132	N36	140	N36	225	N36
10	14-17 August 2007	95	K06, N04	123.5	N04	139	N04	139	N04	158	K07
11	20-23 August 2007	101.5	N47	104	N47	113.5	N47	116	N47	122.5	N47
12	4-5 September 2007	65	N05	65	N05	65	N05	65	N05	65	N05
13	24-25 September 2007	85.5	N27	114	H21	134.5	H21	141.5	H21	145.5	H21
14	3-4 October 2007	49	N46	53	N14	60	N14	61.5	N14	71	N14
15	1-2 November 2007	126.5	N19	132	N19	135.5	N19	137.5	N19	147	N19

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APPENDIX B

LIST OF LANDSLIDE INCIDENTS REPORTED TO THE GOVERNMENT

LIST OF TABLES

Table B1 - List of Major Landslide Incidents

Incident No.	Location	Feature Registration No.	Failure			Facility Affected	Consequence
			Date (Time)	Feature Type	Scale (m^3)		
2007/07/0050	4 Repulse Bay Road near Wong Nai Chung Gap Road	11SE-C/R7	30/6 (05:00)	Retaining wall	600	Road	North-bound lane of road and pedestrian pavement temporarily closed for about eight weeks
WSD/2007/8/1/NTW	Near Section A & E, Tai Lam Chung Catchwater	6SE-A/CR114	12/8	Soil cut	50^	Catchwater	Catchwater channel partially blocked by landslide debris

Legend:

^ Failure volume estimated by GEO's landslide investigation consultants.

Table B2 - List of Landslide Incidents on Hong Kong Island (Sheet 1 of 2)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2007/04/0002	Behind Wun Sha Tower, 33 Wun Sha Street, Tai Hang	11SE-A/CR152	20/1	Police	20/1 (09:00)	Retaining wall	16 (Ground loss at wall crest)	Alleyway of a building	-
2007/05/0011	Natural slope to the west of 11SW-D/C444, Barker Road (near lamp post No. 32906)	Natural hillsides	20/5	HyD	20/5 (10:30)	Natural hillside	0.5* (Boulder fall)	Footpath	-
2007/05/0016	Below No. 8 Po Shan Road	Unregistered at the time of failure	27/5	FSD	27/5 (16:25)	Fill	0.5* (Boulder fall)	Road	One road lane temporarily closed
2007/06/0020	Above northwest of 11SW-D/C258, Peak Road (near lamp post No. 37464)	Unregistered at the time of failure	3/6	HyD	3/6 (04:30)	Retaining wall	1*	Road	One road lane temporarily closed
2007/06/0023	Mt. Nicholson Road	11SW-D/C333	9/6	HyD	9/6 (15:00)	Soil/rock cut	0.03	Pedestrian pavement	-
2007/06/0030	Stubbs Road below Andy Lau Leap Centre (near lamp post No. 32731)	11SW-D/C27	11/6	HyD	11/6 (15:00)	Soil/rock cut	0.2 (Boulder fall)	Pedestrian pavement	Pedestrian pavement blocked
2007/06/0037	46 Stubbs Road	11SW-D/C1117	14/6	Police	14/6 (00:00)	Soil/rock cut	0.3 (Rockfall)	Road	-
2007/06/0038	Sai Wan Fort Morning Trail	11SE-D/C373	15/6	Arch SD	14/6	Rock cut	0.6 (Rockfall)	Minor footpath	-
2007/06/0046	Battery Path, Central	11SW-B/FR7	29/6	Public	29/6 (09:00)	Fill	0.2 (Boulder fall)	Access road	Access road partially blocked

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Table B2 - List of Landslide Incidents on Hong Kong Island (Sheet 2 of 2)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2007/07/0050	4 Repulse Bay Road near Wong Nai Chung Gap Road	11SE-C/R7	30/6	Police	30/6 (05:00)	Retaining wall	600	Road	North-bound lane of road and pedestrian pavement temporarily closed for about eight weeks
2007/07/0057	Opposite No. 31 Barker Road (near lamp post No. 19140)	Natural hillsides	22/7	HyD	22/7 (17:00)	Natural hillside	1.8	Access road	One access road lane temporarily closed
2007/08/0063	21-23 MacDonnell Road	11SW-B/R276	21/8	Police	21/8 (10:15)	Retaining wall	0.25	Building court yard	-
2007/09/0067	42 MacDonnell Road	11SW-B/C85	17/9	BD	17/9 (09:00)	Soil/rock cut	0.04 (Rockfall)	Road	-
2007/12/0074	Behind 94D Pok Fu Lam Road	1.5 m high rubble wall (1)	24/12	Public	22/12 (02:00)	Retaining wall	0.01	Open car park	Carpark closed
WSD/2007/7/1/HKI	Near 320, Mount Collinson Catchwater	Natural hillsides	-	WSD	11/7	Natural hillside	15 (Boulder fall)	Catchwater & access road	Access road blocked and hand-railing damaged

Legend:

(1) The slope feature does not comply with the slope registration criteria given in GEO Circular No. 15 (GEO, 2004b).

* Information obtained by GEO's landslide investigation consultants and agreed with the relevant GEO's District Division.

Table B3 - List of Landslide Incidents in Kowloon

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2007/05/0007	Natural terrain above feature No. 11NW-B/C62 (below Chak On Estate)	Natural hillsides	25/4	Public	19/4	Natural hillside	2	Pedestrian pavement	-
2007/05/0008	Hong Ning Road, Sau Mau Ping (Opposite Sau Mau Ping Police Station)	11NE-C/C62	4/5	ICC	4/5 (18:30)	Soil/rock cut	0.03 (Rockfall)	Road	Half road lane temporarily closed
2007/05/0013	Shatin Pass Road	11NE-A/C493	22/5	GEO	20/5 (17:00 -20:00)	Rock cut	0.5 (Rockfall)	Road	-
2007/07/0055	Natural terrain above Wing Hong Street Rest Garden	Natural hillsides	12/7	GEO	7/7 (12:05)	Natural hillside	3 (Boulder fall)	Rest garden	Rest garden fenced off
2007/11/0070#	Pui Man Street, Kowloon	11NE-A/F444	22/11	Lands D	14/11	Fill	2	Open area	-
ArchSD/QB/ 2007/06/0001	Ko Shan Park near KIL 10655	Unregistered at the time of failure	30/6	Arch SD	30/6 (15:00)	Rock cut	0.4 (Rockfall)	Open area	Open area fenced off
WSD/2007/ 10/1/K	Northeast of football field, King's Park Freshwater Service Reservoir	11NW-D/C457	5/10	WSD	5/10	Rock cut	1 (Rockfall)	Pedestrian pavement	-

Legend:

Very minor landslide with negligible consequence (see Section 1 of the report for definition).

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Table B4 - List of Landslide Incidents in the New Territories and Outlying Islands (Sheet 1 of 7)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2007/04/0001#	400 m northeast of Ha Pak Nai, near Nim Wan Road	5NE-D/DT2	17/1	Lands D	Unknown	Registered disturbed terrain	4	Streamcourse	-
2007/04/0003	Route Twisk	6NE-D/C137	2/4	Police	2/4 (08:00)	Soil cut	0.5	Road	-
2007/05/0005	Natural slope above access road to Sha Lo Tung, Tai Po	Natural hillsides	1/5	Police	1/5	Natural hillside	5	Access road	Access road temporarily closed
2007/05/0006#	Sha Lo Tung, Tai Po	3SW-D/C154	2/5	Police	Unknown	Soil cut	2	Access road	-
2007/05/0009	Ki Lun Shan, San Tin, Kwu Tung Road	2.4 m high fill slope (1)	3/5	DO	24/4 (13:00)	Fill	0.5	Open area	-
2007/05/0010	House No. 20 Pun Shan Chau, Tai Po	7NW-D/C114	15/5	DO	8/5	Soil cut	0.3	Open area	-
2007/05/0012	Behind 37 Sheung Wo Che Village, Shatin, N.T.	7SE-A/C306	20/5	FSD, Police	20/5 (13:04)	Masonry wall	6*	Squatter dwelling	Collapsed of crest platform (in front of House No. 119)
2007/05/0014#	Shatin Pass Road, Sha Tin Pass (opposite lamp post No. AF0648)	11NE-A/C281	20/5	HyD	20/5 (15:00)	Rock cut	0.005* (Rockfall)	Road	Road pavement damaged
2007/05/0015	Near slope No. 6SW-C/C319, So Kwun Wat	2.3 m high masonry wall (1)	23/5	Lands D	21/5 (09:00)	Retaining wall	2.5	Poultry shed	-
2007/05/0018	Along South Lantau Road near Cheung Sha School	13NE-B/C25	29/5	Public	28/5 (13:15)	Soil cut	4	Construction site	-
2007/06/0019#	Ming Oi Sun Tsuen	1.1 m high rubble wall (1)	30/5	GEO	27/5 (15:00)	Retaining wall	0.5	Open area	-

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Table B4 - List of Landslide Incidents in the New Territories and Outlying Islands (Sheet 2 of 7)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2007/06/0021#	Lots Nos. 1964sA & sB in DD129, Lau Fau Shan, Yuen Long	1.7 m high soil cut slope (1)	4/6	ICC	25/5	Soil cut	1	Access road	-
2007/06/0025	Wong Chuk Yeung Tsuen Path, Shatin (near lamp post No. V4429)	7SW-B/C304	10/6	ICC	Unknown	Soil/rock cut	0.2*	Access road	-
2007/06/0026	Route Twisk	6NE-D/C131	10/6	ICC	10/6 (07:00)	Soil/rock cut	4 (Rockfall)	Road	Two road lanes temporarily closed
2007/06/0027	Shui Kan Shek, Kam Tin	6NE-B/C93	11/6	Public	10/6 (06:45)	Soil cut	2	Flimsy structure	-
2007/06/0028	Route Twisk	6NE-D/C137	11/6	HyD	10/6 (07:00)	Soil cut	0.3	Road	-
2007/06/0029	Within Shek Kwu Chau Treatment and Rehabilitation Centre	14NW-C/C94	11/6	Lands D	10/6 (14:00)	Soil cut	13	Open area	-
2007/06/0033	Government portion of the slope No. 5NE-D/DT2, Nim Wan Road, Tuen Mun	5NE-D/DT2	12/6	Lands D	10/6 (02:00)	Registered disturbed terrain	10	Streamcourse	-
2007/06/0035	Near House No. 1, Lau Shui Heung Village, Fanling	3SW-B/F41	14/6	Police	12/6	Fill	1.5	Open area	-
2007/06/0036	Ma Tso Lung Shun Yee San Tsuen	2NE-D/CR53	14/6	Lands D	13/6 (00:01)	Soil cut	1	Squatter dwelling	-
2007/06/0039	Cheung Chau Playground	14NW-D/C267	15/6	Arch SD	15/6 (08:30)	Soil cut	3	Open area	-

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Table B4 - List of Landslide Incidents in the New Territories and Outlying Islands (Sheet 3 of 7)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2007/06/0040	Natural terrain above Ha Keng, Chi Ma Wan, Lantau Island (near lamp post No. VC 0779)	Natural hillsides	19/6	Police	17/6 (10:30)	Natural hillside	1* (Boulder fall)	Minor footpath	Footpath blocked
2007/06/0041	Lot No. 2323 BRP in DD111, Fan Kam Road, Wing Ling Lei	2.7 m high retaining wall (1)	25/6	DSD	24/6 (09:15)	Retaining wall	15	Squatter dwelling	1 squatter dwelling permanently evacuated
2007/06/0042#	Lung Yu Road, Tsing Lung Tau, Tsuen Wan	< 3 m high soil cut slope (1)	28/6	Lands D	28/6 (10:00)	Soil cut	0.5	Access road	-
2007/06/0043	192 Pai Tau Village, Shatin	7SW-B/C726	28/6	Public	24/6	Soil/rock cut	0.5	Squatter dwelling	2 squatter dwellings temporarily evacuated
2007/06/0044	Fung Kat Heung Road	1.8 m high soil cut slope (1)	28/6	Public	23/6 (11:30)	Soil cut	0.5	Road	-
2007/06/0045	Fei Ngo Shan Road	11NE-A/C517	28/6	HyD	28/6 (17:30)	Rock cut	1.5 (Rockfall)	Road	-
2007/06/0047	Near slope No. 7SW-C/C454, Wo Yi Hop Village	Unregistered at the time of failure	29/6	ICC	29/6 (11:00)	Soil cut	2	Squatter dwelling	1 squatter dwelling permanently evacuated
2007/07/0048	23 Tai Yuen Tsuen, Yung Shue Wan, Lamma Island	1.5 m high masonry wall (1)	1/7	Police	1/7 (10:30)	Retaining wall	1.5	Open area	-
2007/07/0049	Near House No.3, Tong Hang Village, Fanling	3SW-A/CR160	3/7	Lands D	3/7	Soil cut	4	Squatter dwelling	-
2007/07/0051	Fei Ngo Shan Road	11NE-B/C591	29/6	GEO	Unknown	Soil cut	0.25	Road	-

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Table B4 - List of Landslide Incidents in the New Territories and Outlying Islands (Sheet 4 of 7)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2007/07/0052#	Access road to Gilwell Campsite, Fei Ngo Shan (opposite lamp post No. VE0775)	2.2 m high soil cut slope (1)	29/6	GEO	Unknown	Soil cut	2	Access road	-
2007/07/0053	Fung Kat Heung Road (near lamp post No. H1143)	1.2 m high soil cut slope (1)	3/7	Public	1/7 (12:30)	Soil cut	0.5	Road	-
2007/07/0056#	Natural terrain below footpath Cho Ma Wo, Nam Hang, Tai Po (near lamp post No. VA4847)	Natural hillsides	18/7	DO	Unknown	Natural hillside	5	Minor footpath	Footpath undermined
2007/07/0058	Zone 255-256, Lin Ma Hang Road, Sha Tau Kok (near lamp post No. 62)	3NE-A/C129	24/7	Police	Unknown	Soil/rock cut	1 (Rockfall)	Nil (rock block deposited on a slope)	-
2007/08/0061	In front of House No. 41 Wo Yi Hop Village, Tsuen Wan	1.8 m high masonry wall (1)	14/8	DO	10/8 (12:00)	Masonry wall	2.2	Building	-
2007/08/0062	Near Hut No. 64 Cheung Hang Village, Kau Wa Keng	11NW-A/C727	17/8	Public	Unknown	Soil/rock cut	0.06 (Rockfall)	Minor footpath	-
2007/09/0065	House 99, Tseung Lan Shue Upper Village, Sai Kung	2.3 m high soil cut slope (1)	31/7	DO	20/7	Soil cut	2	Building	-
2007/09/0066	The Methodist Lee Wai Lee College, Kwai Shing Circuit	7SW-C/C67	13/9	ICC	Unknown	Rock cut	0.5 (Rockfall)	Edge of pedestrian pavement	-
2007/10/0068	DSD works site adjacent to Chevalier Garden, Tai Shui Hang, Ma On Shan	4 m high temporary soil cut slope (1)	28/9	Police	28/9 (13:30)	Soil cut	1	Construction site	-

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Table B4 - List of Landslide Incidents in the New Territories and Outlying Islands (Sheet 5 of 7)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2007/11/0071	No. 26 C4 Tong Kung Leng, Sheung Shui	2SE-D/C314	20/11	District council member	20/11 (10:45)	Soil cut	Signs of distress	Abandoned facility behind a village house / squatter dwelling[+]	-
ArchSD/SK/ 2007/05/0001[#]	High Island Water Scheme Staff Quarter, Sai Kung	8SW-C/C178	-	Arch SD	21/5	Soil cut	0.5	Nil (debris deposited on a slope)	-
ArchSD/SK/ 2007/06/0002	Lady MacLehose Holiday Village, Sai Kung	8SW-B/C15	-	Arch SD	26/6	Soil cut	2	Alleyway of a bungalow	-
LandsD/N/ 2007/02/0001	Tai Lung, Fan Kam Road, Fanling	3SW-C/C265	21/2	Lands D	Unknown	Soil cut	35	Access road	-
LandsD/IS/ 2007/05/0001	Behind House No. 8, Yue Kong Tsuen, Mui Wo, Lantau Island	10SW-C/C77	-	Lands D	30/5	Soil cut	0.1	Building	-
LandsD/ST/ 2007/05/002	186 Ming Tau Yuen, To Fung Shan Road, Sha Tin	7SW-B/C185	-	Lands D	18/5	Soil cut	< 1	Building	-
LandsD/ST/ 2007/05/003	House No. 99, Pak Tin Village, Area 2, Sha Tin	7SW-B/C495	23/5	Lands D	Unknown	Soil cut	< 3	Access road	-
LandsD/TP/ 2007/06/0001	House No.16, Pun Shan Chau, Tai Po	7NW-D/C115	-	Lands D	10/6	Soil cut	1	Building	-
LandsD/TW/ 2007/06/0001	Behind House No. 64A, Yuen Tun Tsuen, Tsing Lung Tau	6SE-C/C239	-	Lands D	10/6	Soil/rock cut	0.5	Building	-
LandsD/IS/ 2007/06/0001	No. 2F, Hillside Road, Cheung Chau	14NW-D/CR273	-	Lands D	10/6	Soil cut	0.1	Building	-

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Table B4 - List of Landslide Incidents in the New Territories and Outlying Islands (Sheet 6 of 7)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
LandsD/TP/ 2008/01/0001#	Kon Hang Village, Tai Po Road, Tai Po	7NE-C/C361	18/12	Lands D	Unknown	Soil cut	1	Horticulture garden	-
LandsD/TP/ 2008/01/0002	Behind House Nos. 26 & 27, Shuen Wan Chim Uk, Tai Po	3SE-C/C23	31/12	Lands D	Unknown	Soil cut	1	Building	-
LI2007/04/ 2001	North-facing Hillside east of Kwu Tung Reservoir, Kwu Tung	Natural hillsides	20/4	LIC	Unknown	Natural hillside	40^	Open area+	-
LI2007/04/ 2002	South-facing Hillside east of Kwu Tung Reservoir, Kwu Tung (Western distressed area)	Natural hillsides	20/4	LIC	Unknown	Natural hillside	25^	Open area+ and squatter dwelling+	-
LI2007/04/ 2003	South-facing Hillside east of Kwu Tung Reservoir, Kwu Tung (Eastern distressed area)	Natural hillsides	20/4	LIC	Unknown	Natural hillside	30^	Open area+ and squatter dwelling+	-
WSD/2007/ 6/1/HK#	Tai Long Wan Catchwater	13NW-D/CR2	-	WSD	11/6	Soil cut	2	Catchwater	-
WSD/2007/ 6/2/HK#	West of Shek Pik Reservoir, along WSD access road, Lantau Island	13NW-D/C48	-	WSD	11/6	Soil cut	2	Nil (debris deposited on a slope)	-
WSD/2007/ 8/1/NTW	Near Sections A & E, Tai Lam Chung Catchwater	6SE-A/CR114	-	WSD	12/8	Soil cut	50^	Catchwater	Catchwater channel partially blocked by landslide debris
WSD/2007/ 8/1/HK	Adjoining access road to Peng Chau Service Reservoir	10SE-A/C6	-	WSD	30/8	Soil/rock cut	1.5 (Rockfall)	Minor access	-

Table B4 - List of Landslide Incidents in the New Territories and Outlying Islands (Sheet 7 of 7)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
WSD/2007/8/2/HK#	Near CH. 2+40, Shek Pik Catchwater within Lantau South Country Park, Lantau Island	13NW-B/CR223	-	WSD	30/8	Soil cut	3	Catchwater	-
WSD/2007/11/1/NTW#	Adjoining Tsuen Wan Freshwater Service Reservoir	7SW-C/C871	-	WSD	26/11	Soil cut	4^	Open area	-

Legend:

#	Very minor landslide with negligible consequence (see Section 1 of the report for definition).
(1)	The slope feature does not comply with the slope registration criteria given in GEO Circular No. 15 (GEO, 2004b).
^	Failure volume estimated by GEO's landslide investigation consultants.
*	Information obtained by GEO's landslide investigation consultants and agreed with the relevant GEO's District Division.
+	Facilities potentially affected by Incident Nos. 2007/11/0071, LI2007/04/2001, LI2007/04/2002 and LI2007/04/2003.

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Geotechnical Manual for Slopes, 2nd Edition (1984), 300 p. (English Version), (Reprinted, 2000).

斜坡岩土工程手冊(1998)，308頁(1984年英文版的中文譯本)。

Highway Slope Manual (2000), 114 p.

GEOGUIDES

Geoguide 1	Guide to Retaining Wall Design, 2nd Edition (1993), 258 p. (Reprinted, 2007).
Geoguide 2	Guide to Site Investigation (1987), 359 p. (Reprinted, 2000).
Geoguide 3	Guide to Rock and Soil Descriptions (1988), 186 p. (Reprinted, 2000).
Geoguide 4	Guide to Cavern Engineering (1992), 148 p. (Reprinted, 1998).
Geoguide 5	Guide to Slope Maintenance, 3rd Edition (2003), 132 p. (English Version).
岩土指南第五冊	斜坡維修指南，第三版(2003)，120頁(中文版)。
Geoguide 6	Guide to Reinforced Fill Structure and Slope Design (2002), 236 p.
Geoguide 7	Guide to Soil Nail Design and Construction (2008), 97 p.

GEOSPECS

Geospec 1	Model Specification for Prestressed Ground Anchors, 2nd Edition (1989), 164 p. (Reprinted, 1997).
Geospec 3	Model Specification for Soil Testing (2001), 340 p.

GEO PUBLICATIONS

GCO Publication No. 1/90	Review of Design Methods for Excavations (1990), 187 p. (Reprinted, 2002).
GEO Publication No. 1/93	Review of Granular and Geotextile Filters (1993), 141 p.
GEO Publication No. 1/2000	Technical Guidelines on Landscape Treatment and Bio-engineering for Man-made Slopes and Retaining Walls (2000), 146 p.
GEO Publication No. 1/2006	Foundation Design and Construction (2006), 376 p.
GEO Publication No. 1/2007	Engineering Geological Practice in Hong Kong (2007), 278 p.
GEO Publication No. 1/2009	Prescriptive Measures for Man-Made Slopes and Retaining Walls (2009), 76 p.

GEOLOGICAL PUBLICATIONS

The Quaternary Geology of Hong Kong, by J.A. Fyfe, R. Shaw, S.D.G. Campbell, K.W. Lai & P.A. Kirk (2000), 210 p. plus 6 maps.

The Pre-Quaternary Geology of Hong Kong, by R.J. Sewell, S.D.G. Campbell, C.J.N. Fletcher, K.W. Lai & P.A. Kirk (2000), 181 p. plus 4 maps.

TECHNICAL GUIDANCE NOTES

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