# FACTUAL REPORT ON HONG KONG RAINFALL AND LANDSLIDES IN 2004

**GEO REPORT No. 205**

**A.F.H. Ng & T.H.H. Hui**

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

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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

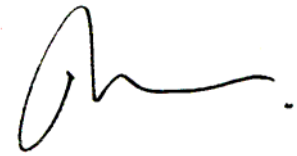
In keeping with our policy of releasing information which may be of general interest to the geotechnical profession and the public, we make available selected internal reports in a series of publications termed the GEO Report series. The GEO Reports can be downloaded from the website of the Civil Engineering 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
February 2007

# FOREWORD

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2004. Details of most of the landslides were obtained from the records of incidents reported to the Geotechnical Engineering Office (GEO). 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 carried out a review of the available rainfall records and rainfall analysis, and prepared Section 2 of this report. All contributions are gratefully acknowledged.



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

## ABSTRACT

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2004. Rainfall information was obtained from the Geotechnical Engineering Office (GEO) and the Hong Kong Observatory (HKO). Details of most of the landslides were obtained from the records of incidents reported to the GEO. 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, namely Fugro Scott Wilson Joint Venture and Maunsell Geotechnical Services limited.

Rainfall at the HKO's Principal Raingauge at Tsim Sha Tsui in 2004 amounted to 1739 mm. This was about 21% lower than the mean rainfall of 2214 mm recorded between 1961 and 1990, and it was the seventeenth driest year in Hong Kong since records began in 1884. One Black Rainstorm Warning and two Red Rainstorm Warnings were issued on 8 May 2004, and 16 Amber Rainstorm Warnings were issued between 30 March 2004 and 21 September 2004.

Two Landslip Warnings were issued between 17 July 2004 and 29 August 2004. A total of 74 incidents that occurred in 2004 was reported to the Government. Of these, 69 were classified as genuine landslides. Of the 69 genuine landslides, one was a major failure with a failure volume of about 350 $m^3$.

No injury or fatality was reported as a result of the landslide incidents that occurred in 2004. Notable consequences of the landslides included the temporary evacuation of three squatter dwellings. Four landslides resulted in the temporary closure of sections of roads and footpaths.

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# 1. INTRODUCTION

This report presents a summary of the factual information on rainfall and landslides that occurred in Hong Kong throughout 2004. Rainfall information was obtained from the Geotechnical Engineering Office (GEO) of the Civil Engineering & Development Department (CEDD) and from the Hong Kong Observatory (HKO). Details of most of the landslides were obtained from the records of incidents reported to the GEO. Supplementary information was collected from 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) and the GEO's landslide investigation consultants, namely Fugro Scott Wilson Joint Venture (FSW) and Maunsell Geotechnical Services limited (MGS).

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 hillside, 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 $\geq$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. $\leq$5 $m^3$ for failure involving soil or $\leq$0.1 $m^3$ for rockfall/boulder fall) and does not give rise to notable consequences (e.g. casualty, 'near-miss', evacuation of buildings or squatter dwellings, road closure, nuisance to the public, etc.). Landslide that is not classified as 'major' landslide or 'very minor' landslide is taken as 'minor' landslide. This report presents rainfall and landslide information throughout the year rather than highlighting any specific rainstorms or landslides.

Diagnosis of the landslides occurred in 2004 and review of areas that warrant attention will be presented in a separate report.

# 2. RAINFALL

## 2.1 The Raingauge System

The GEO, in cooperation with the HKO, operates an automatic raingauge system that transmits real-time rainfall data through either telephone lines or General Packet Radio Service (GPRS), viz. a wireless transmission technology, to the GEO and HKO at five-minute intervals. During 2004 this system comprised 86 GEO raingauges and 24 HKO raingauges. The locations of the raingauges are shown in Figure 1. The raingauges are of the tipping-bucket type, tipping every 0.5 mm of rainfall.

## 2.2 Rainfall Records

The data from the raingauge system are checked, verified and stored by the GEO in an Oracle database, from which they can be extracted and analysed. This report presents a selection of rainfall parameters for the year, for individual month and individual rainstorm. Further analyses can be carried out for specific tasks if required.

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The weather in 2004 was described by the HKO, in the Monthly Weather Summary for December 2004 (HKO, 2005), as follows:

> "Globally, the year 2004 was the fourth warmest year since instrumental temperature record began in 1861. In Hong Kong, 2004 was the ninth warmest year on record. The annual mean temperature was 23.4 degrees, 0.4 degree above normal. In June 2004, the rain-bearing monsoon trough spent less time near the South China coast, resulting in more sunshine and hence higher temperatures in Hong Kong. This made June 2004 the eighth hottest June on record. The northeast monsoon was also weak during the last two months of the year, giving rise to above-normal temperatures in Hong Kong in these two months."
>
> "Three tropical cyclones affected Hong Kong this year, about half of the normal figure. Most of the tropical cyclones originating from the western North Pacific moved north or northeast on approaching Luzon and Taiwan and did not enter the South China Sea. They therefore failed to bring the usual rainfall to Hong Kong. The monsoon trough also brought less than normal rainfall to Hong Kong in May and June. Thus, 2004 turned out to be the seventeenth driest year in Hong Kong since records began in 1884. The annual rainfall of 1738.6 millimetres was 475.7 millimetres or about 21 percent below normal. Similar dry condition was also widespread in southern China."
>
> "January was cloudier and wetter than usual. The monthly rainfall was 51.0 millimetres, more than double the normal figure. February was warmer and slightly wetter than usual. The deluge from a rainstorm late in the month made March wetter than usual. The monthly rainfall was 104.3 millimetres, about 56 per cent more than the normal figure. In contrast to the first three months, April was slightly drier than usual."
>
> "Although May was drier than usual, the heavy downpour on 8 May led to the issuance of a Black Rainstorm Warning - the first such warning since September 2001. There were also reports of a tornado in the eastern part of Hong Kong during the rainstorm. The weather of June was warmer, sunnier and drier than usual. The mean temperature of 28.6 degrees was 0.8 degree above normal, the eighth highest for June. The Standby Signal No. 1 was issued for the first time in the year to warn the public of Typhoon Conson in the South China Sea. "
>
> "July was wetter than normal. Tropical Storm Kompasu made a direct hit on Hong Kong, necessitating the issuance of the No. 8 Gale or Storm Warning Signal. "

> "Wetter-than-normal conditions continued in August. The Standby Signal No. 1 was issued during the approach of Typhoon Aere."
>
> "As none of the four tropical cyclones originating from the western Pacific came close to Hong Kong during the month, September was drier than usual. The monthly rainfall of 167.3 millimetres was about 44 percent below the normal figure. October was sunnier and much drier than normal. The monthly rainfall of 2.3 mm amounted to only about 2 percent of the normal figure."
>
> "November and December were much warmer than usual, except for a cold snap in the last few days of the year. Both months were also very dry. November got 0.4 millimetre of rainfall, about 1 percent of normal, and December got just a trace of rainfall."

The cumulative rainfall for 2004 of 1739 mm as recorded at the HKO was about 21% lower than the mean rainfall (2214 mm) recorded between 1961 and 1990. The cumulative rainfall for 2004 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 2004.

Figure 4 shows the total annual rainfall distribution during 2004, together with the locations of reported landslides.

## 2.3 Rainstorms in 2004

The maximum 24-hour, five-hour and one-hour rolling rainfall (with five-minute basic units) for 11 rainstorms in 2004 during which time the daily rainfall exceeded 50 mm at the HKO are given in Table 1, together with the maximum amounts at any of the GEO raingauges. Landslide Potential Index (LPI) for those rainstorms that resulted in the issue of Landslip Warning is also presented. The LPI of a rainstorm indicates the relative severity of the rainstorm in comparison with the most severe rainstorm in the past 20 years in terms of the number of landslides that the rainstorm could lead to. Similar data from selected major rainstorms in recent years are included for comparison. Also included in Table 1 are the 4-day and 15-day antecedent rainfall at the HKO and the number of reported landslides.

Figures 5 to 15 show isohyets of the maximum rolling 24-hour rainfall during these 11 storms, together with the landslide locations and the locations and values of maximum rainfall for durations ranging from five minutes to 48 hours.

Two storms generated significant numbers of landslides. The storms of 8 and 9 May 2004, and 29 and 30 August 2004 generated 10 and 12 reported landslides respectively. No other storms produced more than four reported landslides.

There were 22 storms that generated more than 50 mm of rainfall in 24 hours if all the GEO raingauges are considered (including the 11 storms summarised in Table 1). The corresponding rainfall parameters for these 22 storms are shown in Appendix A, Table A1.

### 2.4 Warnings Issued by the Hong Kong Observatory

Table 2 summarises the details of the Thunderstorm, Flood, Landslip, Tropical Storm and Rainstorm Warnings issued by the HKO and the GEO as appropriate in 2004. One Black Rainstorm Warning and two Red Rainstorm Warnings were issued on 8 May 2004. Sixteen Amber Rainstorm Warnings were issued between 30 March 2004 and 21 September 2004. Two Landslip Warnings were issued between 17 July 2004 and 29 August 2004.

## 3. LANDSLIDES

### 3.1 Landslide Occurrence in 2004

The numbers of landslides reported to the GEO and other Government departments in 2004 are summarised in Table 3.

A total of 74 landslides was reported to the various Government departments. These included 60 landslides reported to the GEO and 14 landslides reported only to other Government departments (i.e. AFCD, Arch SD, DSD, FSD, HyD, HD, Lands D and WSD). Of these 74 landslides, 69 were classified as genuine landslides (see Appendix B). The other reported incidents either did not involve landslides (e.g. tree falls) or were of no geotechnical concern (e.g. small surface erosion or washout incidents) and hence were not considered in the analysis below.

Of the 69 genuine landslides, one (1.5%) was a ‘major’ landslide (see Table B1 in Appendix B), 62 were ‘minor’ landslides and six were ‘very minor’ landslides with negligible consequence.

For those landslide incidents inspected by the GEO, the information about the landslides was recorded in GEO Incident Reports (and also in Landslip Cards where major landslides are involved). For those landslide incidents attended to by other Government departments responsible for slope maintenance, landslide incident reports were prepared by the respective departments to document the relevant information. The above information, together with the scanned images of all 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 failures can be found in the incident 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 of the GEO. Some of the incidents were not reported to the GEO or other Government departments until several days or weeks after they had occurred. For these cases, it is difficult to determine the exact time of occurrence. Of the 69 genuine landslides, the times of occurrences were established to within a day for 50 incidents.

It should be noted that there were almost certainly other landslides that were not reported to the Government, many of which probably occurred in remote areas with no immediate consequences.

## 3.2 Consequence of Landslides

### 3.2.1 General

The consequence of landslides in terms of number of landslide incidents affecting various types of facilities (e.g. buildings, roads, etc.) in different regions is shown in Table 4. It should be noted that a failure may affect more than one type of facility.

Significant consequences of landslides (e.g. casualties, evacuation of buildings or squatter dwellings, closure of roads, etc.), as classified with respect to the type of slope failure, are presented in Table 5.

The distribution of the different facility groups affected by major landslides is shown in Table 6. The only major landslide incident (in term of failure volume) in 2004 affected a consequence-to-life category 3 facility (WBTC 13/99), which was a Group 5 facility in accordance with the GEO's New Priority Classification Systems for slopes and retaining walls (Wong, 1998). There was no notable landslide incident in 2004 in term of landslide consequence.

### 3.2.2 Buildings

Four landslides affected buildings, none of which was major. No serious consequence was reported.

### 3.2.3 Roads and Transport Facilities

Six minor landslides affected sections of roads. Two of these landslides resulted in temporary road closures.

### 3.2.4 Squatter Dwellings

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

Six minor landslides affected squatter dwellings. Two of these resulted in the temporary evacuation of three squatter dwellings (comprising nine tolerated squatter structures).

### 3.2.5 Construction Sites

Two landslides affected active construction sites. None of these was major.

### 3.2.6 Catchwaters and Reservoirs

One minor landslide affected a catchwater. No serious consequence was reported.

### 3.2.7 Other Facilities

Other facilities affected by landslides included pedestrian pavements, a school, footpaths, access roads, carparks, back-lanes, open areas, a nullah, etc. Sixteen landslides (none of which was major) affected pedestrian pavements, footpaths and access roads. Of these 16 landslides, two resulted in the temporary closure of sections of footpaths. Thirty-four landslides affected a school, carparks, back-lanes, open areas, a nullah, etc. Of these landslide incidents, one was a major failure that affected an open area.

## 3.3 Types of Slope Failures

### 3.3.1 General

Genuine 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 hillside and registered Disturbed Terrain. The numbers of different types of slope failures are shown in Table 7.

### 3.3.2 Fill Slopes

There were three fill slope failures comprising about 4% of all landslides reported. None of these was a major failure.

### 3.3.3 Cut Slopes

There were 48 cut slope failures comprising about 70% of all landslides reported. None of these was a major failure.

There were 27 landslides on soil cut slopes, 16 on soil/rock cut slopes and five on rock cut slopes.

### 3.3.4 Retaining Walls

There were two landslides involving failure of retaining walls, which amounted to about 3% of all landslides reported. None of these was a major failure.

3.3.5 Natural Hillside

There were 15 natural hillside failures comprising about 22% of all landslides reported. One of these was a major failure.

3.3.6 Disturbed Terrain

There was one registered Disturbed Terrain failure comprising about 1.5% of all landslides reported.

3.4 Landslide Volume Distribution

Tables 8 and 9 show the distribution of landslide volumes for all the reported genuine landslides. A total of 52 landslides (about 75%) involved less than 5 $m^3$ of material in each case. One of the reported landslide incidents (about 1.5%) involved a failure volume exceeding 50 $m^3$. This major landslide incident affected a natural hillside and had a failure volume of about 350 $m^3$.

## 4. CONCLUSIONS

Rainfall at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 1739 mm in 2004, which was about 21% lower than the mean rainfall recorded between 1961 and 1990. One Black Rainstorm Warning and two Red Rainstorm Warnings were issued on 8 May 2004. Two Landslip Warnings were issued between 17 July 2004 and 29 August 2004. Of the 74 incidents reported to the Government, 69 were genuine landslides. Of these, only one was a 'major' landslide incident with a failure volume of about 350 $m^3$.

None of the landslide incidents in 2004 resulted in injury or death. Notable consequences of landslides in 2004 included the temporary evacuation of three squatter dwellings (comprising nine tolerated squatter structures). Two landslides resulted in the temporary closure of sections of roads and another two resulted in the temporary closure of sections of footpaths.

## 5. REFERENCES

Geotechnical Engineering Office (2004). GEO Circular No. 3 - Non Development Clearance (Slope Safety) of Squatters. Geotechnical Engineering Office, Hong Kong, 16 p.

Hong Kong Observatory (2005). Monthly Weather Summary December 2004. Hong Kong Observatory, Hong Kong, 32 p.

Wong, C.K.L. (1998). The New Priority Classification Systems for Slopes and Retaining Walls. Geotechnical Engineering Office, Hong Kong, 117 p. (GEO Report No. 68).

Works Bureau (1999). Geotechnical Manual for Slopes - Guidance on Interpretation and Updating. Works Bureau Technical Circular No. 13/99. Hong Kong SAR Government, Hong Kong, 15 p.

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Table 1 - Rainfall and Landslides in 2004, Compared with Selected Previous Major Rainstorms

| Date[1] of Rainstorm Event | Maximum Rainfall (mm)[2] | | | | | | | | LPI[4] | Number of Landslides[5] Reported to GEO |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hong Kong Observatory (HKO) | | | | | GEO Raingauges[3] | | | | |
| | 24-hr | 5-hr | 1-hr | Antecedent | | 24-hours | 5-hours | 1-hour | | |
| | | | | 4 days | 15 days | | | | | |
| 8-9 May 2004 | 122.5 | 117.5 | 84 | 6.5 | 16 | 183 (N50) | 145 (N25) | 96 (N21) | - | 10 |
| 29-30 Aug 2004[6] | 119.5 | 80 | 28.5 | 32.5 | 179 | 246.5 (N17) | 126.5 (N47) | 67 (N17) | 1 | 12 |
| 16-22 Jul 2004[6] | 103 | 48 | 27 | 13 | 47 | 206.5 (N37) | 138.5 (N37) | 75.5 (N10) | 1 | 1 |
| 29-30 Jul 2004 | 97 | 68 | 35 | 9 | 224.5 | 178 (N50) | 143 (N08) | 77 (N50) | - | 4 |
| 30-31 Mar 2004 | 87 | 59 | 27.5 | 3.5 | 9 | 114.5 (H06) | 101 (N47) | 48 (N09) | - | 0 |
| 6-7 Aug 2004 | 77.5 | 68.5 | 38.5 | 36.5 | 164.5 | 232.5 (N13) | 216.5 (N13) | 67.5 (N13) | - | 2 |
| 21-22 Aug 2004 | 62.5 | 40 | 34.5 | 10.5 | 142 | 100 (N16) | 59 (H09) | 47 (N50) | - | 2 |
| 21 Jun 2004 | 62 | 45.5 | 24.5 | 37.5 | 75 | 158 (N19) | 139 (N19, N25) | 89 (N22) | - | 0 |
| 19-20 Sep 2004 | 58 | 49.5 | 38.5 | 6.5 | 67.5 | 83.5 (K05) | 77 (H21) | 64.5 (H21) | - | 1 |
| 17-18 Apr 2004 | 55 | 50.5 | 40.5 | 54 | 58 | 72.5 (H02) | 67.5 (N26) | 54 (H02) | - | 1 |
| 14-15 Apr 2004 | 51.5 | 51 | 26.5 | 0 | 112.5 | 136 (H20) | 135 (H20) | 87 (N27) | - | 1 |
| Selected Major Rainstorms in Previous Years (for comparison only) | | | | | | | | | | |
| 28-29 May 1982 | 394 | 153 | 44 | 1 | 11 | 430 | 237 | 111 | - | 238 |
| 17 Jun 1983[6] | 347 | 274 | 69 | 2 | 77 | 460 | 303 | 101 | N/A[7] | 155 |
| 20-21 May 1989[6] | 388 | 149 | 37 | 28 | 42 | 566 | 224 | 51 | 6 | 378 |
| 7-9 May 1992[6] | 324 | 196 | 110 | 65 | 71 | 385 | 244 | 110 | 3 | 314 |
| 15-16 Jun 1993[6] | 155 | 129 | 54 | 18 | 275 | 285 | 195 | 111 | 1 | 123 |
| 4-5 Nov 1993[6] | 107 | 31 | 9 | 8 | 8 | 742 | 350 | 94 | 3 | 394 |
| 1-4 Jul 1997[6] | 110 | 49 | 18 | 183 | 380 | 799 | 296 | 125 | 6 | 150 |
| 8-9 Jun 1998[6] | 429 | 164 | 48 | 58 | 181 | 562 | 223 | 98 | 9 | 96 |
| 22-26 Aug 1999[6] | 313 | 143 | 51 | 11 | 175 | 565 | 249 | 121 | 8 | 269 |

Notes:
(1) Rainstorms in which rolling 24-hour rainfall at the Hong Kong Observatory, Tsim Sha Tsui, exceeded 50 mm are arranged in order of the intensity of 24-hour rainfall.
(2) The maxima are calculated using 5-minute rainfall as the basic unit, except those recorded at the HKO for the previous major rainstorms. They are the rolling rainfall amounts using one-clock hour rainfall as the basic unit. The 1-hour maximum rainfall at the HKO refers to clock hours.
(3) The maxima are selected from the 86 GEO Raingauges for the rainstorms. The GEO Raingauge reference number is shown in brackets.
(4) Landslide Potential Index (LPI) has been calculated for the rainstorm that resulted in the issue of Landslip Warning.
(5) Reported totals are for landslides attributed to the events.
(6) Landslip Warnings were issued for these events.
(7) LPI is not calculated since comprehensive rainfall data before 1984 are not available.

Table 2 - Warnings Issued by the Hong Kong Observatory in 2004[1, 2]

| Month | Monthly Total Rainfall (mm) | Dates on which Warnings were in Effect | | | | |
|---|---|---|---|---|---|---|
| | | Thunderstorm[3] | Flooding | Landslip | Tropical Storm | Rainstorm |
| January | 51.0 | - | - | - | - | - |
| February | 51.8 | - | - | - | - | - |
| March | 104.3 | 17, 30, 30-31 | - | - | - | 30-31 (Amber) |
| April | 147.2 | 1, 13, 14, 17, 27 | - | - | - | 14 (Amber), 17 (Amber), 27 (Amber) |
| May | 194.4 | 4, 8, 14, 27, 28-29, 29, 30 | - | - | - | 8(2 x Amber, 2 x Red, Black), 14 (Amber) |
| June | 144.7 | 1, 2, 15, 16, 17, 20-21, 30 | - | - | 8-9 (1, Conson) | - |
| July | 386.7 | 1, 2, 3, 4, 6, 7, 10, 10-11, 11, 12, 13, 17, 18, 19, 20, 21, 22, 26, 27, 28, 29 | 29 | 17(05:30) - 17(11:00) | 14-16 (1-8, Kompasu) | 16 (Amber), 17 (Amber), 21 (Amber), 29 (Amber) |
| August | 488.5 | 4, 5, 6, 8, 10, 11, 12, 14, 18, 19, 20, 21, 22, 23, 24, 29, 30, 31 | 11, 29 | 29(15:30) - 30(06:15) | 26-27 (1, Aere) | 6 (Amber), 14 (Amber), 29 (2 x Amber) |
| September | 167.3 | 2, 3, 6, 7, 8, 9, 17, 18, 19, 20, 21, 22 | 9 | - | - | 21 (Amber) |
| October | 2.3 | 1 | - | - | - | - |
| November | 0.4 | - | - | - | - | - |
| December | 0.0 | - | - | - | - | - |
| Total | 1738.6 | 114 Warnings | 4 Warnings | 2 Warnings | 3 Warnings | 19 Warnings (16 x Amber, 2 x Red, Black) |

Notes:
(1) Landslip Warnings were issued after consultation between GEO and HKO.
(2) Warnings and signals in this Table were based on HKO.
(3) More than one Thunderstorm Warning may have been issued within a day but showed once in this Table for clarity.



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Table 3 - Number of Landslides in 2004 Reported to Government

| Department | Total Number of Landslides | Genuine Landslides |
|---|---|---|
| Agriculture, Fisheries and Conservation Department | 3 (0) | 3 (0) |
| Architectural Services Department | 6 (5) | 5 (4) |
| Drainage Services Department | 0 (0) | 0 (0) |
| Fire Services Department | 0 (0) | 0 (0) |
| Geotechnical Engineering Office, Civil Engineering and Development Department | 60* | 56 |
| Highways Department | 3 (3) | 3 (3) |
| Housing Department | 1 (1) | 1 (1) |
| Lands Department | 9 (1) | 8 (1) |
| Water Supplies Department | 3 (1) | 3 (1) |
| Legend: 6 (5) Six incidents of which five were reported to the GEO. | | |
| Note: * denotes number of landslides reported to the GEO discounting false alarm, duplicate cases, etc. | | |

Table 4 - Number of Landslides Affecting Different Facilities

| Affected Facility | Hong Kong Island | Kowloon | New Territories and Outlying Islands | All |
|---|---|---|---|---|
| Squatter Dwellings (1) | 0 (0) | 1 (0) | 5 (0) | 6 (0) |
| Buildings | 0 (0) | 1 (0) | 3 (0) | 4 (0) |
| Roads | 3 (0) | 1 (0) | 2 (0) | 6 (0) |
| Transportation Facilities (railways, tramways, etc.) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Pedestrian Pavements/Footways | 2 (0) | 0 (0) | 0 (0) | 2 (0) |
| Minor Footpaths/Access | 4 (0) | 0 (0) | 10 (0) | 14 (0) |
| Construction Sites | 1 (0) | 1 (0) | 0 (0) | 2 (0) |
| Open Areas | 4 (0) | 3 (0) | 13 (1) | 20 (1) |
| Catchwaters | 0 (0) | 0 (0) | 1 (0) | 1 (0) |
| Others (e.g. carparks, parks, playgrounds, gardens, backyards, etc.) | 3 (0) | 1 (0) | 10 (0) | 14 (0) |

Legend:

5 (0) Five landslides of which none was a major failure

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 purpose or non-domestic purpose and registered in the 1982 Housing Department’s Squatter Structure Survey (GEO, 2004).
(2) Incidents which are not genuine landslides have been excluded.
(3) A given landslide may affect more than one type of facility.

Table 5 - Landslide Consequence Related to Type of Failure

| Type of 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, Back-lanes, Private Access | | |
| Fill Slope | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cut Slope | Soil | 0 | 1 (7) | 0 | 0 | 0 | 1 | 0 | 0 |
| | Soil/Rock | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Rock | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Retaining Wall | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Natural Hillside | | 0 | 2 (2) | 0 | 0 | 0 | 1 | 0 | 0 |
| Registered Disturbed Terrain | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Legned:

1 (7) Number of squatter dwellings evacuated with the number of tolerated squatter structures evacuated shown in blanket

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 purpose or non-domestic purpose and registered in the 1982 Housing Department’s Squatter Structure Survey (GEO, 2004).
(2) A failure may give rise to more than one type of consequence.



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Table 6 - Distribution of Facility Groups Affected by Major Landslides

| | Facility Group Affected by Major Landslides (Group Nos.) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1a | 1b | 2a | 2b | 3 | 4 | 5 |
| All Major Landslides | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Major Landslide on Man-made Slope | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Major Landslide on Natural Hillside | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

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

Table 7 - Numbers of Reported Landslides Classified by Type of Failure

| Type of Failure | | Number | Percentage (%) |
|---|---|---|---|
| Fill Slope | | 3 (0) | 4.4 |
| Cut Slope | Soil | 27 (0) | 39.1 |
| | Soil/Rock | 16 (0) | 23.2 |
| | Rock | 5 (0) | 7.2 |
| Retaining Wall | | 2 (0) | 2.9 |
| Natural Hillside | | 15 (1) | 21.7 |
| Registered Disturbed Terrain | | 1 (0) | 1.5 |
| Total | | 69 (1) | 100 |

Legend:

15 (1) Fifteen landslides of which one was major failure

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

Table 8 - Landslide Volume Distribution with Respect to Geographical Locations

| Failure Volume ($m^3$) | Hong Kong Island | Kowloon | New Territories and Outlying Islands | All |
|---|---|---|---|---|
| <5 | 16 | 4 | 32 | 52 (75.4%) |
| ≥5 to <10 | 1 | 2 | 1 | 4 (5.8%) |
| ≥10 to <20 | 0 | 1 | 4 | 5 (7.2%) |
| ≥20 to <50 | 0 | 1 | 6 | 7 (10.1%) |
| ≥50 to <200 | 0 | 0 | 0 | 0 (0%) |
| ≥200 to <500 | 0 | 0 | 1 | 1 (1.5%) |
| ≥500 to <1000 | 0 | 0 | 0 | 0 (0%) |
| ≥1000 | 0 | 0 | 0 | 0 (0%) |
| Total | 17 | 8 | 44 | 69 (100%) |

Legend:

52 (75.4%) 52 landslides which amount to 75.4% of the 69 genuine landslides reported to Government in 2004

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

| Volume of Failure ($m^3$) | Fill Slope | Cut Slope | | | Retaining Wall | Natural Hillside | Registered Disturbed Terrain | Total |
|---|---|---|---|---|---|---|---|---|
| | | Soil Slope | Soil/Rock | Rock | | | | |
| <5 | 3 | 21 | 12 | 5 | 1 | 10 | 0 | 52 (75.4%) |
| ≥5 to <10 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 4 (5.8%) |
| ≥10 to <20 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 5 (7.2%) |
| ≥20 to <50 | 0 | 4 | 1 | 0 | 1 | 1 | 0 | 7 (10.1%) |
| ≥50 to <200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 (0%) |
| ≥200 to <500 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 (1.5%) |
| ≥500 to <1000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 (0%) |
| ≥1000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 (0%) |
| Total | 3 (4.4%) | 27 (39.1%) | 16 (23.2%) | 5 (7.2%) | 2 (2.9%) | 15 (21.7%) | 1 (1.5%) | 69 (100%) |

Legend:

52 (75.4%) 52 landslides which amount to about 75.4% of the 69 genuine landslides reported to Government in 2004

LIST OF FIGURES


Figures 1 - Locations of GEO and HKO Automatic Raingauges

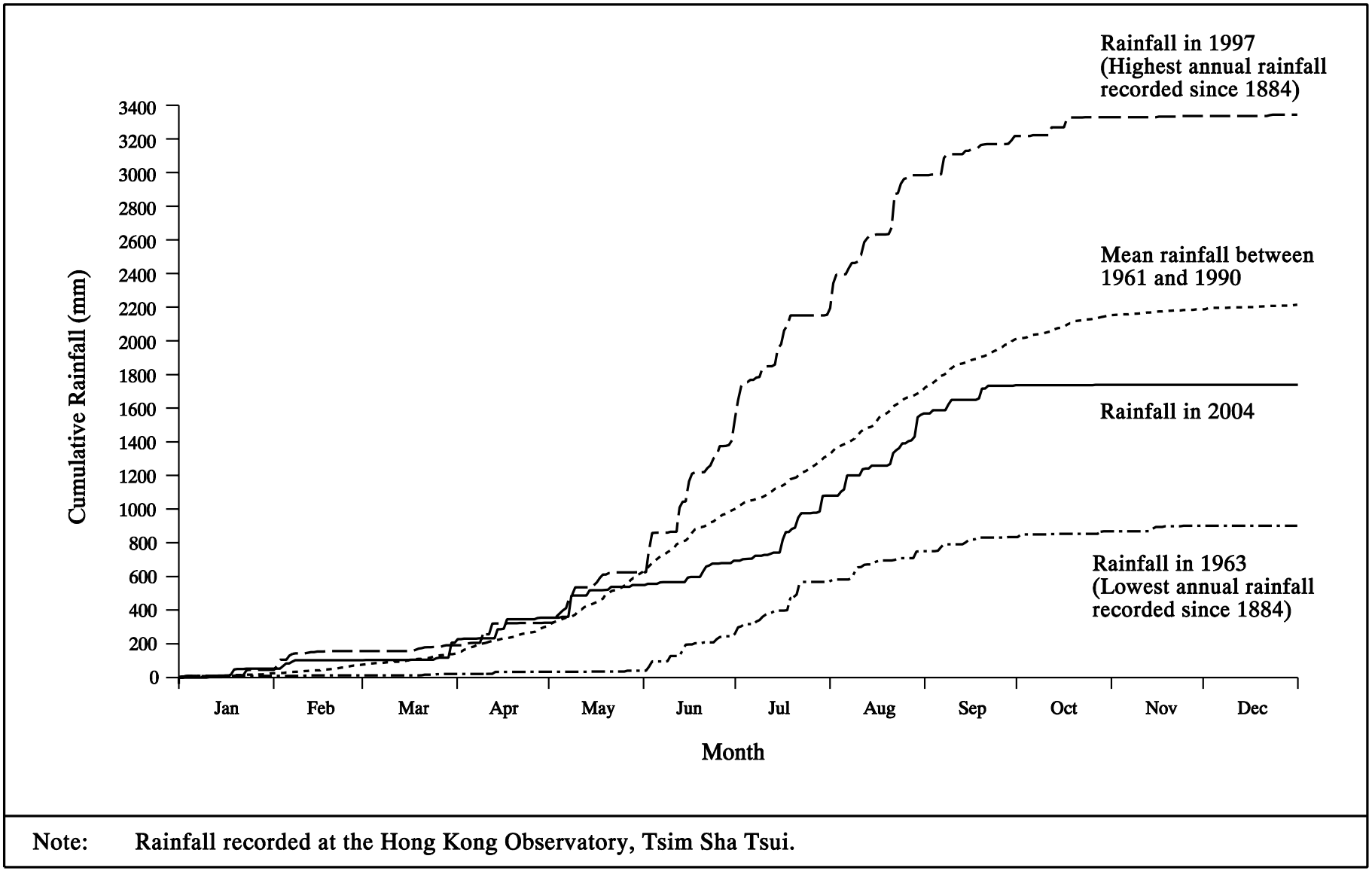


Figure 2 - Cumulative Rainfall for 2004 at the Hong Kong Observatory and its Recorded Highest, Mean and Lowest Cumulative Rainfalls



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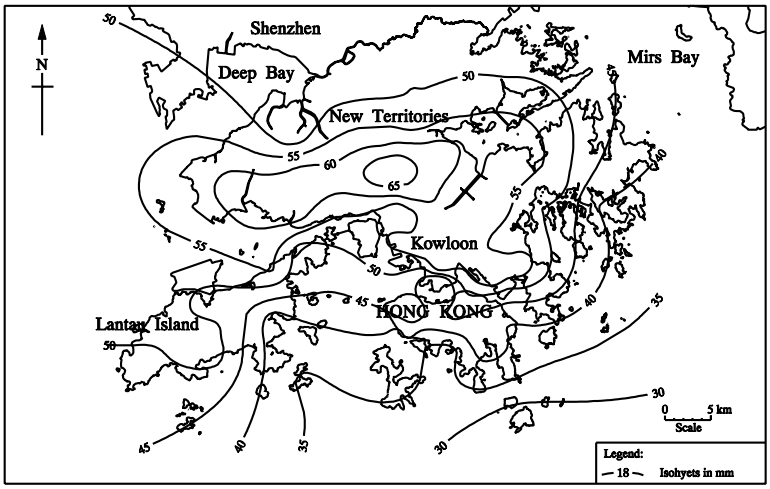
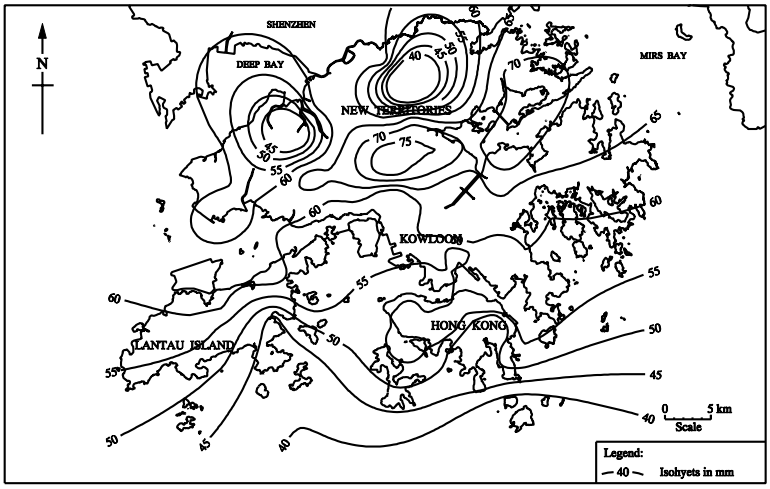
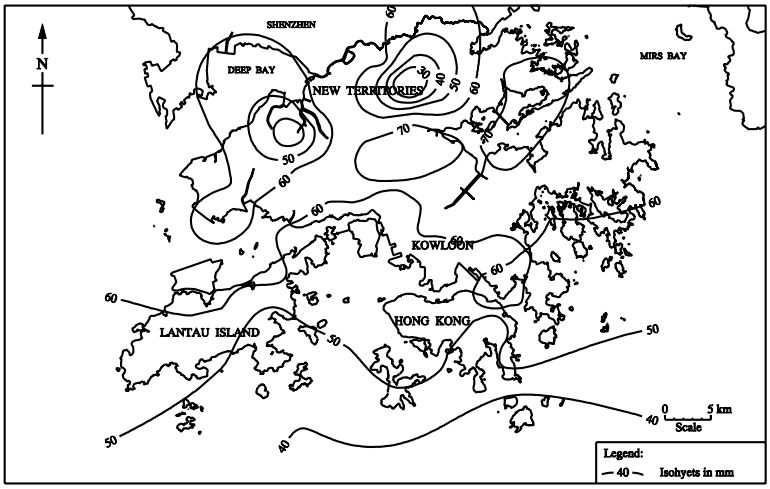



January 2004



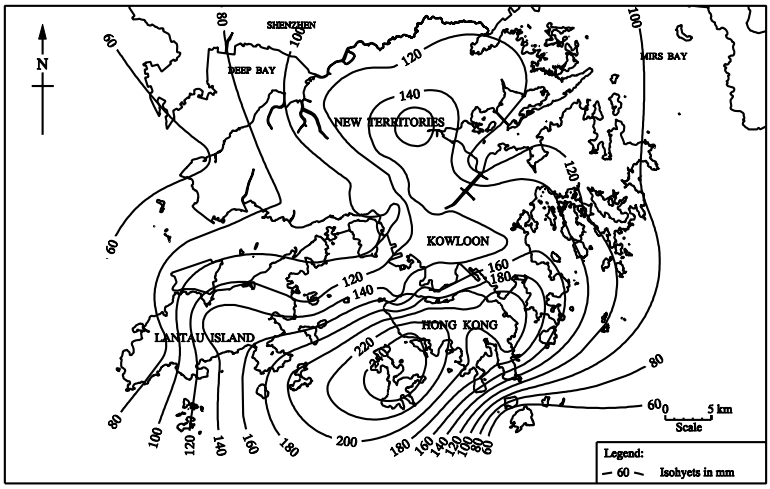

February 2004



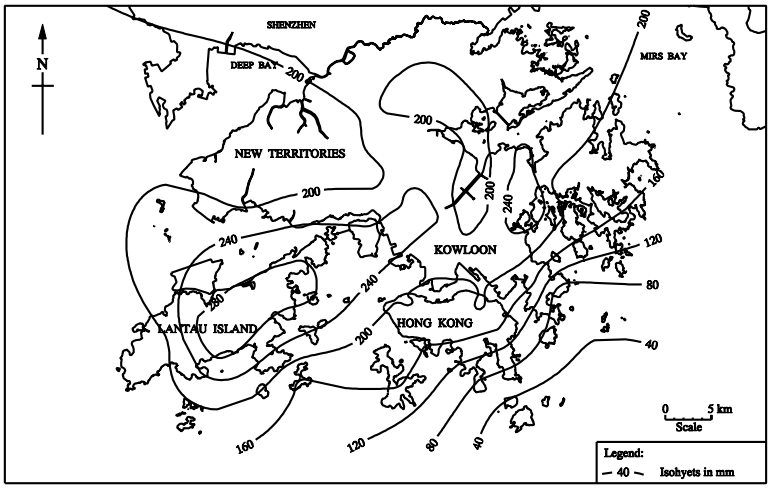

March 2004

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

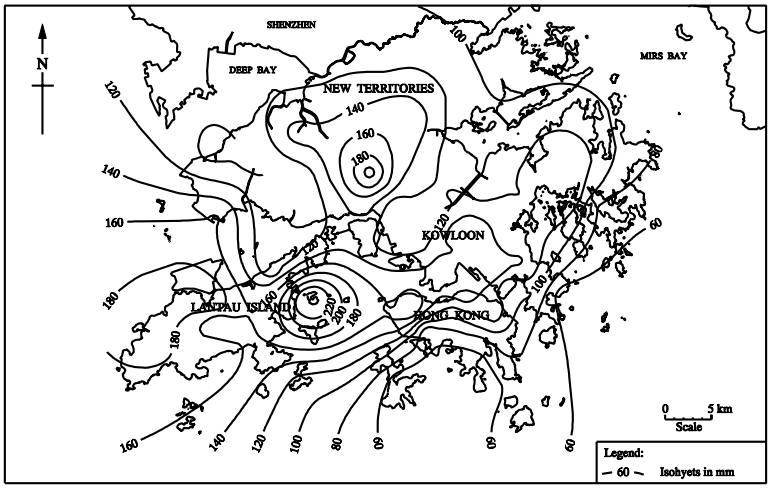
Figure 3a - Total Monthly Rainfall Distribution in 2004




April 2004



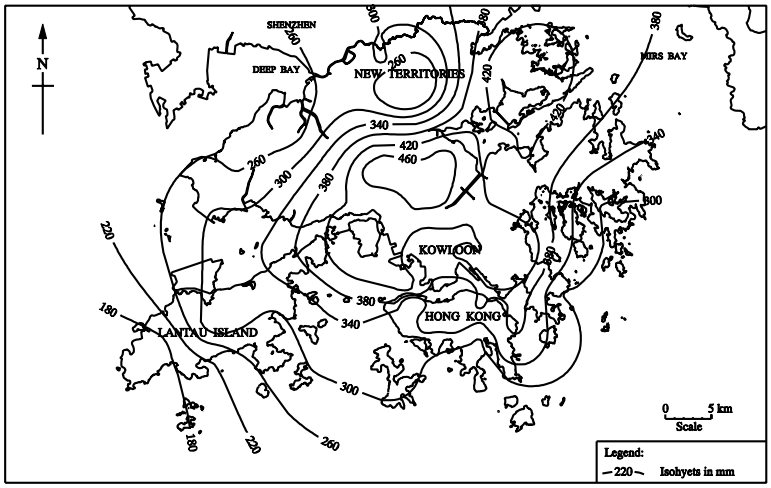

May 2004



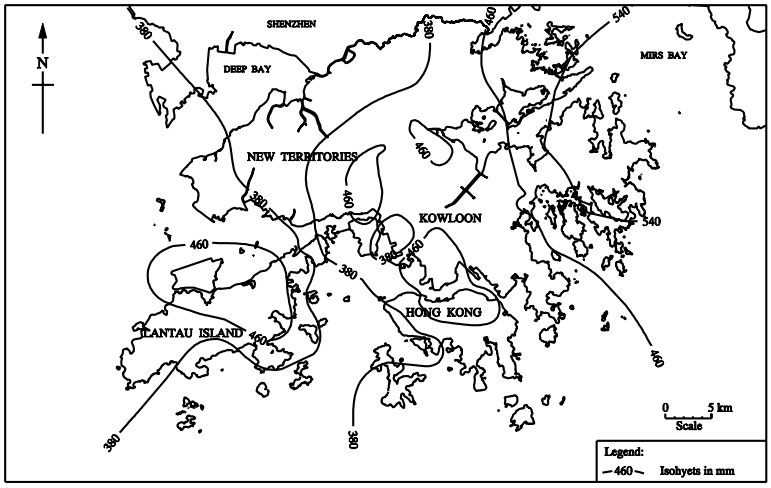

June 2004

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

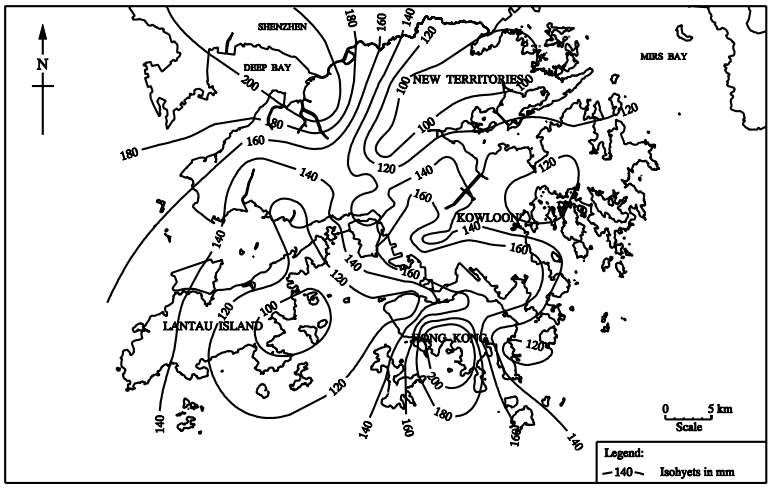
Figure 3b - Total Monthly Rainfall Distribution in 2004




July 2004




August 2003




September 2004

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

Figure 3c - Total Monthly Rainfall Distribution in 2004

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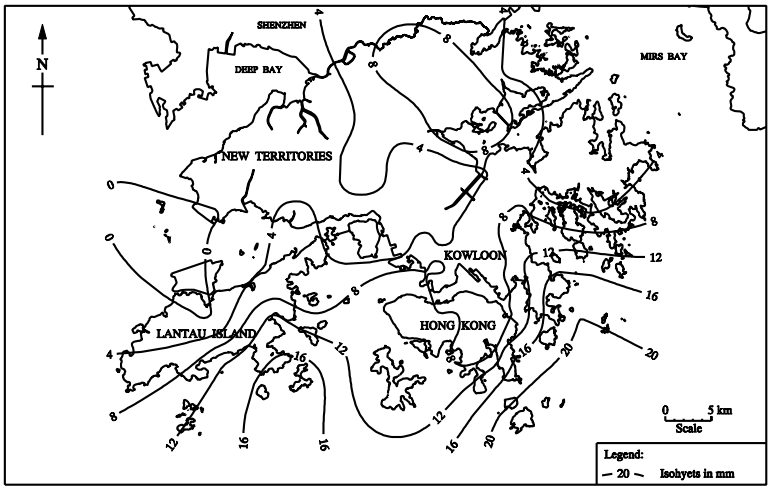
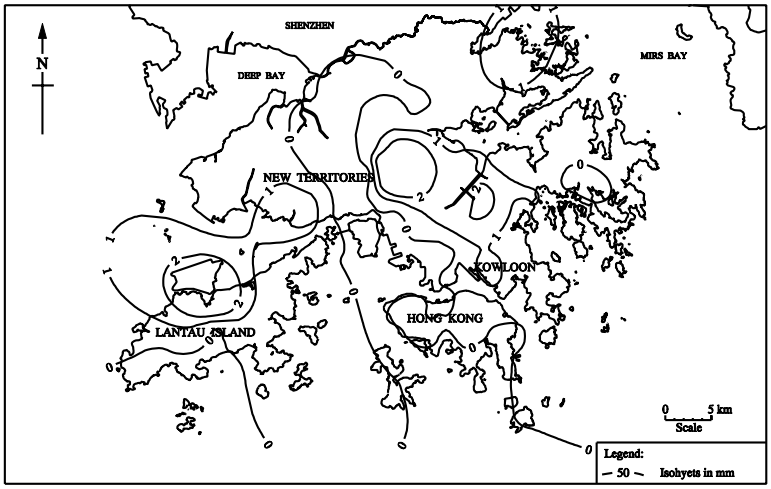
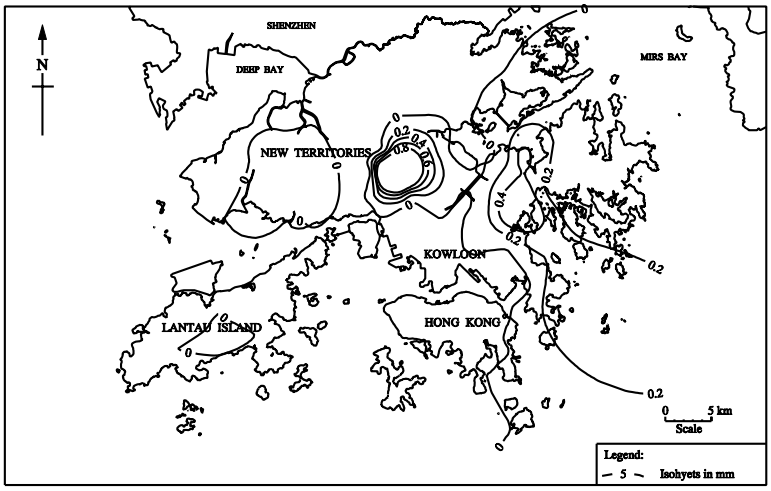



October 2004




November 2004




December 2004

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

Figure 3d - Total Monthly Rainfall Distribution in 2004

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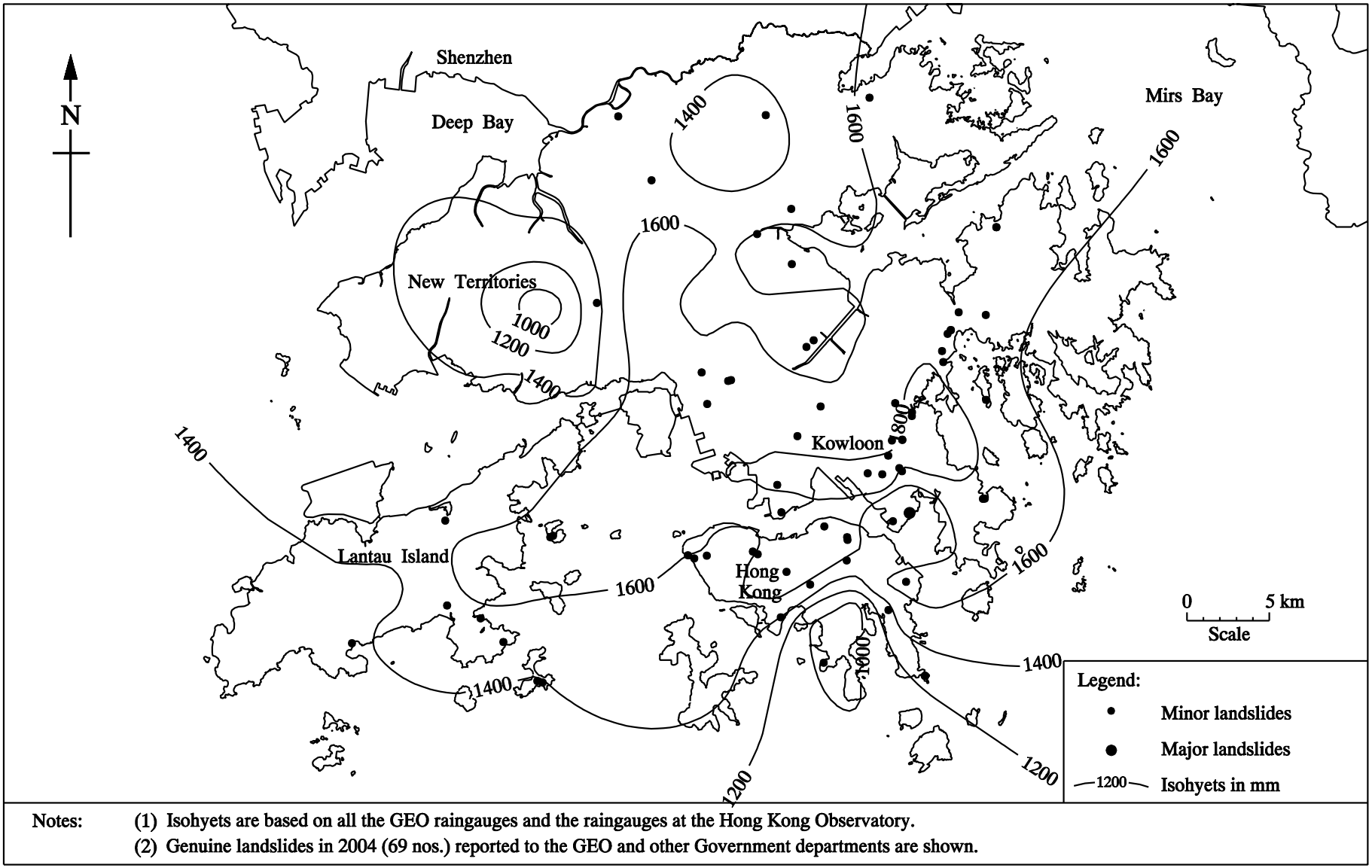
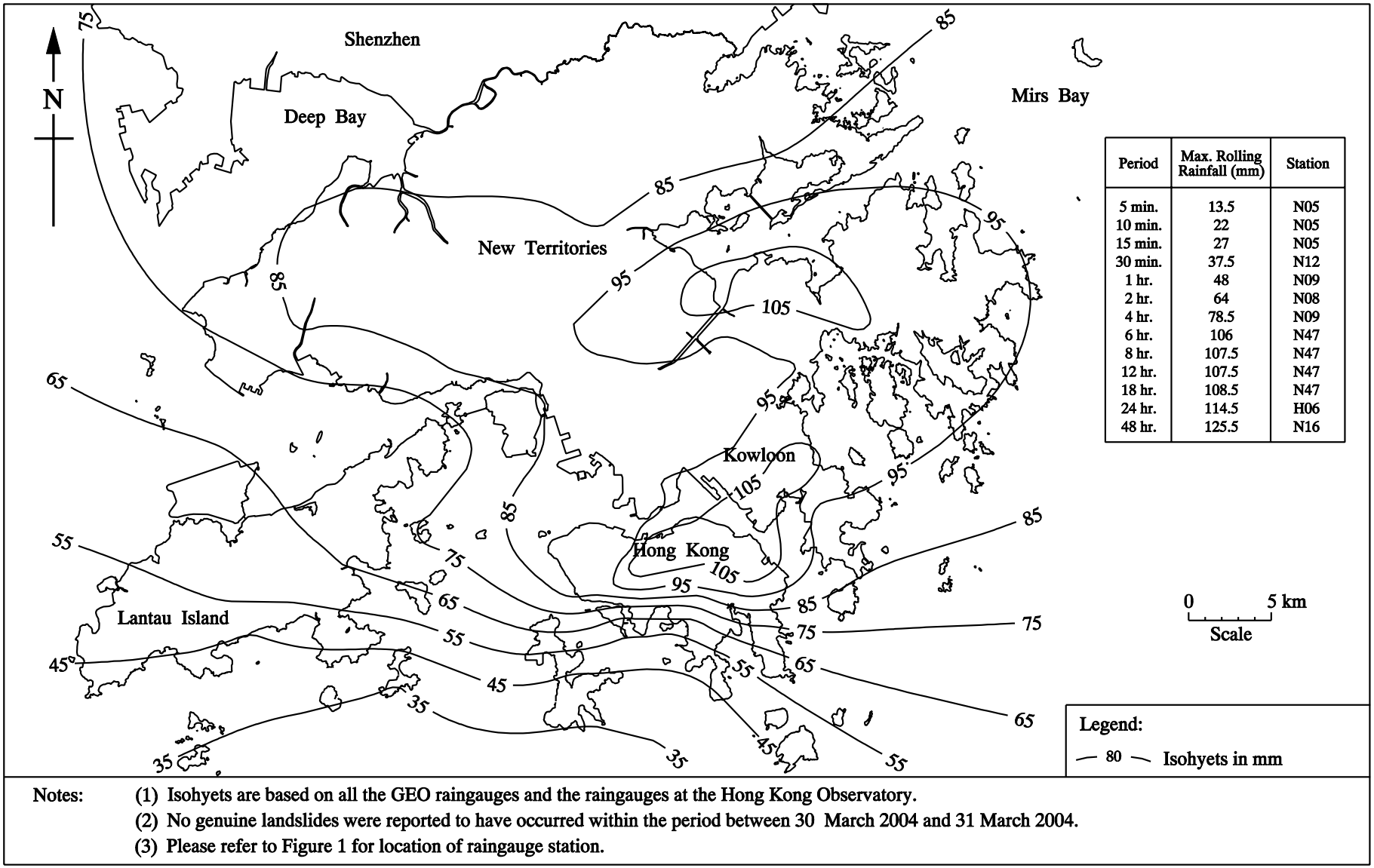


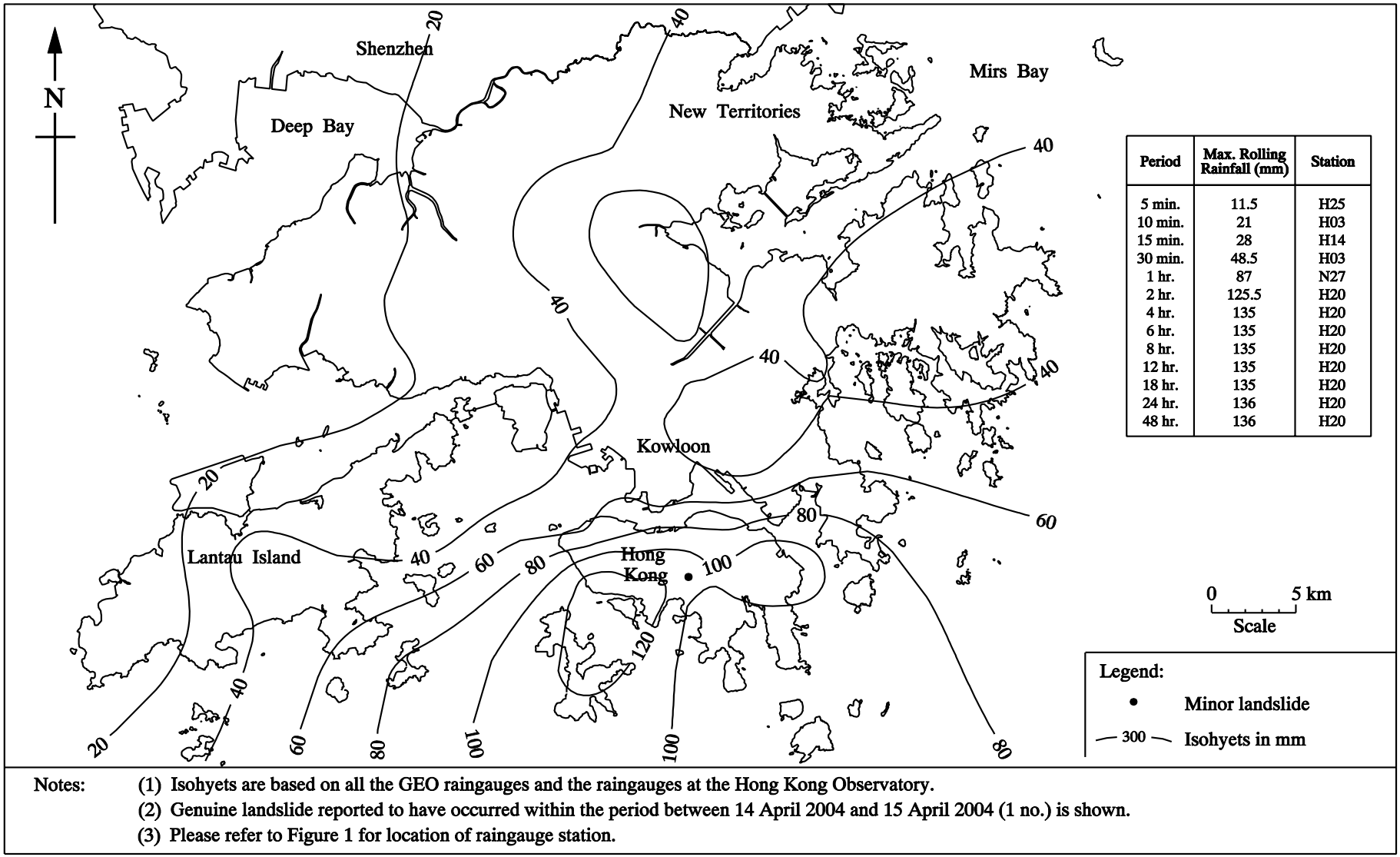

Notes: (1) Isohyets are based on all the GEO raingauges and the raingauges at the Hong Kong Observatory.
(2) Genuine landslides in 2004 (69 nos.) reported to the GEO and other Government departments are shown.

Figure 4 - Total Annual Rainfall Distribution and Locations of Landslides in 2004




| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 13.5 | N05 |
| 10 min. | 22 | N05 |
| 15 min. | 27 | N05 |
| 30 min. | 37.5 | N12 |
| 1 hr. | 48 | N09 |
| 2 hr. | 64 | N08 |
| 4 hr. | 78.5 | N09 |
| 6 hr. | 106 | N47 |
| 8 hr. | 107.5 | N47 |
| 12 hr. | 107.5 | N47 |
| 18 hr. | 108.5 | N47 |
| 24 hr. | 114.5 | H06 |
| 48 hr. | 125.5 | N16 |

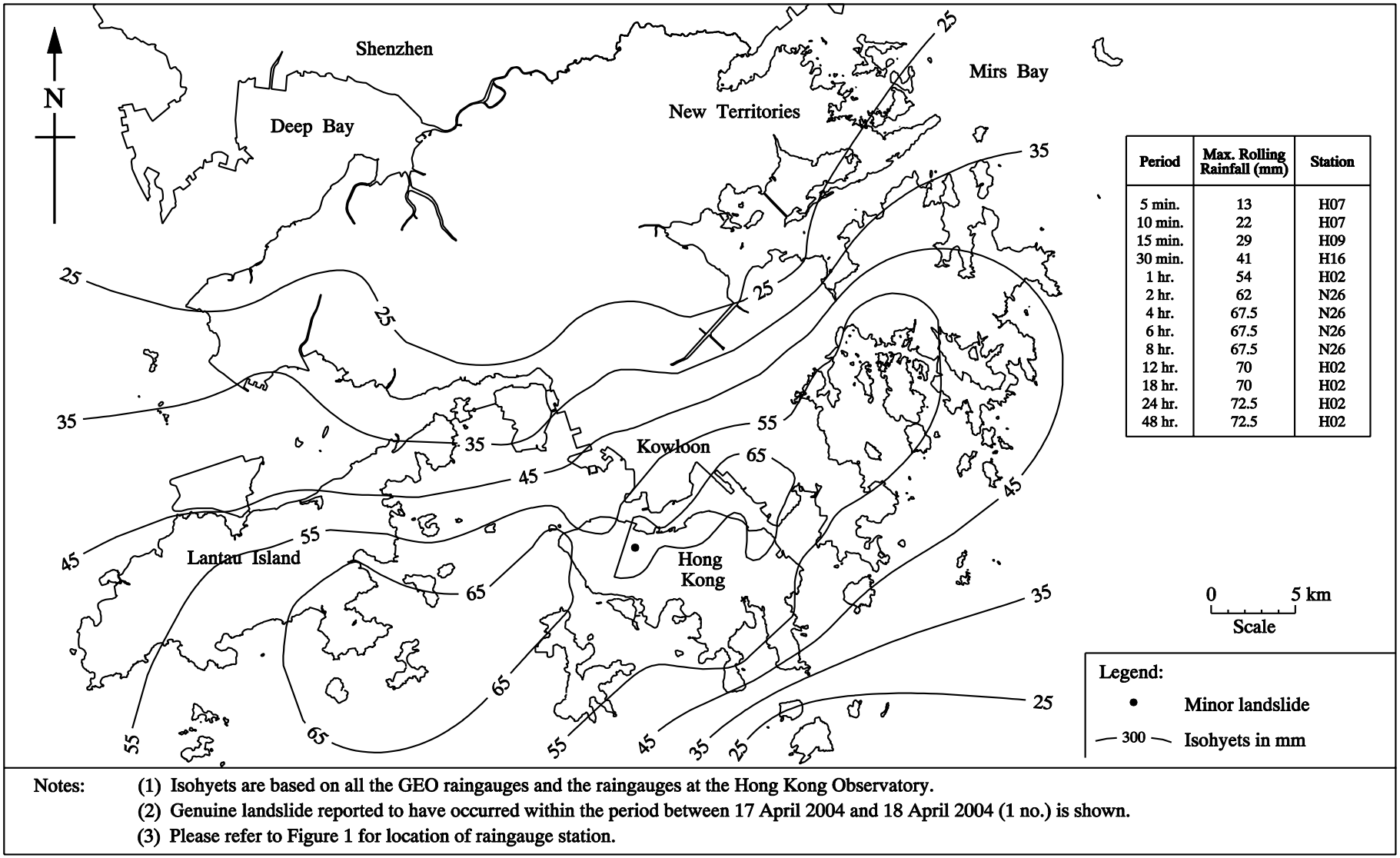
Figure 5 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 30 March 2004 and 23:55 on 31 March 2004




| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 11.5 | H25 |
| 10 min. | 21 | H03 |
| 15 min. | 28 | H14 |
| 30 min. | 48.5 | H03 |
| 1 hr. | 87 | N27 |
| 2 hr. | 125.5 | H20 |
| 4 hr. | 135 | H20 |
| 6 hr. | 135 | H20 |
| 8 hr. | 135 | H20 |
| 12 hr. | 135 | H20 |
| 18 hr. | 135 | H20 |
| 24 hr. | 136 | H20 |
| 48 hr. | 136 | H20 |

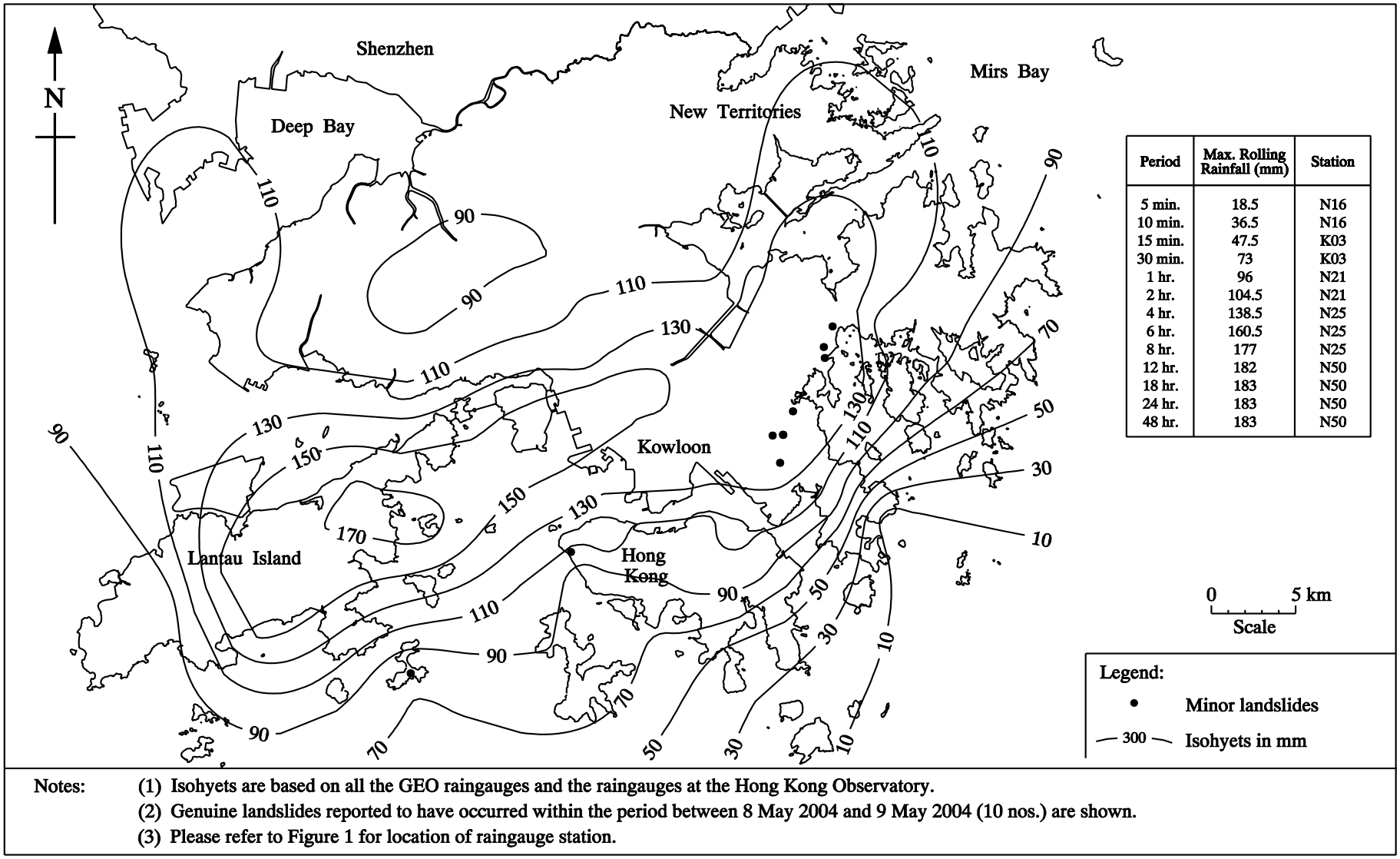
Notes:
(1) Isohyets are based on all the GEO raingauges and the raingauges at the Hong Kong Observatory.
(2) Genuine landslide reported to have occurred within the period between 14 April 2004 and 15 April 2004 (1 no.) is shown.
(3) Please refer to Figure 1 for location of raingauge station.

Figure 6 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 14 April 2004 and 23:55 on 15 April 2004 and Locations of Landslides



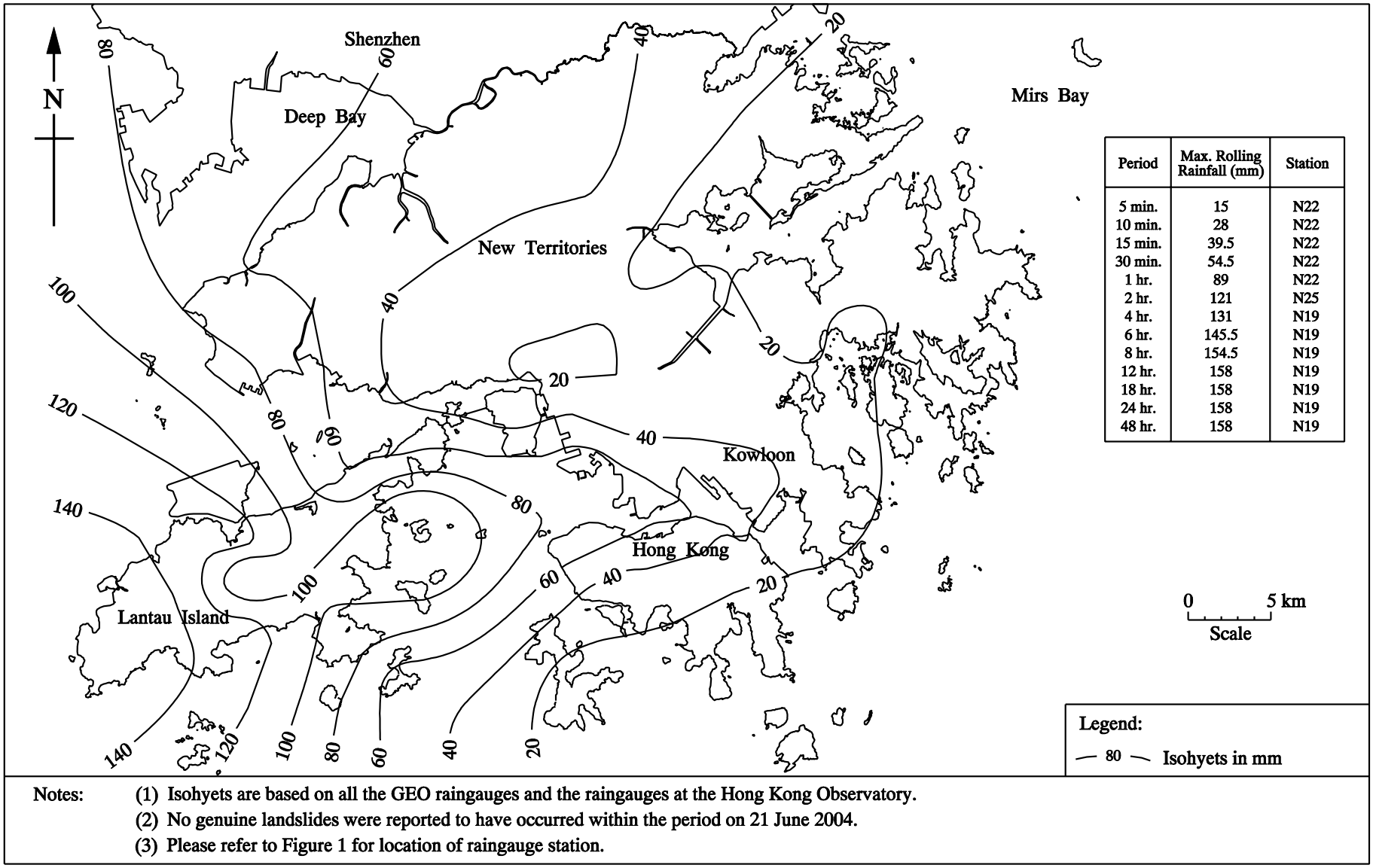

| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 13 | H07 |
| 10 min. | 22 | H07 |
| 15 min. | 29 | H09 |
| 30 min. | 41 | H16 |
| 1 hr. | 54 | H02 |
| 2 hr. | 62 | N26 |
| 4 hr. | 67.5 | N26 |
| 6 hr. | 67.5 | N26 |
| 8 hr. | 67.5 | N26 |
| 12 hr. | 70 | H02 |
| 18 hr. | 70 | H02 |
| 24 hr. | 72.5 | H02 |
| 48 hr. | 72.5 | H02 |

Figure 7 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 17 April 2004 and 23:55 on 18 April 2004 and Locations of Landslides



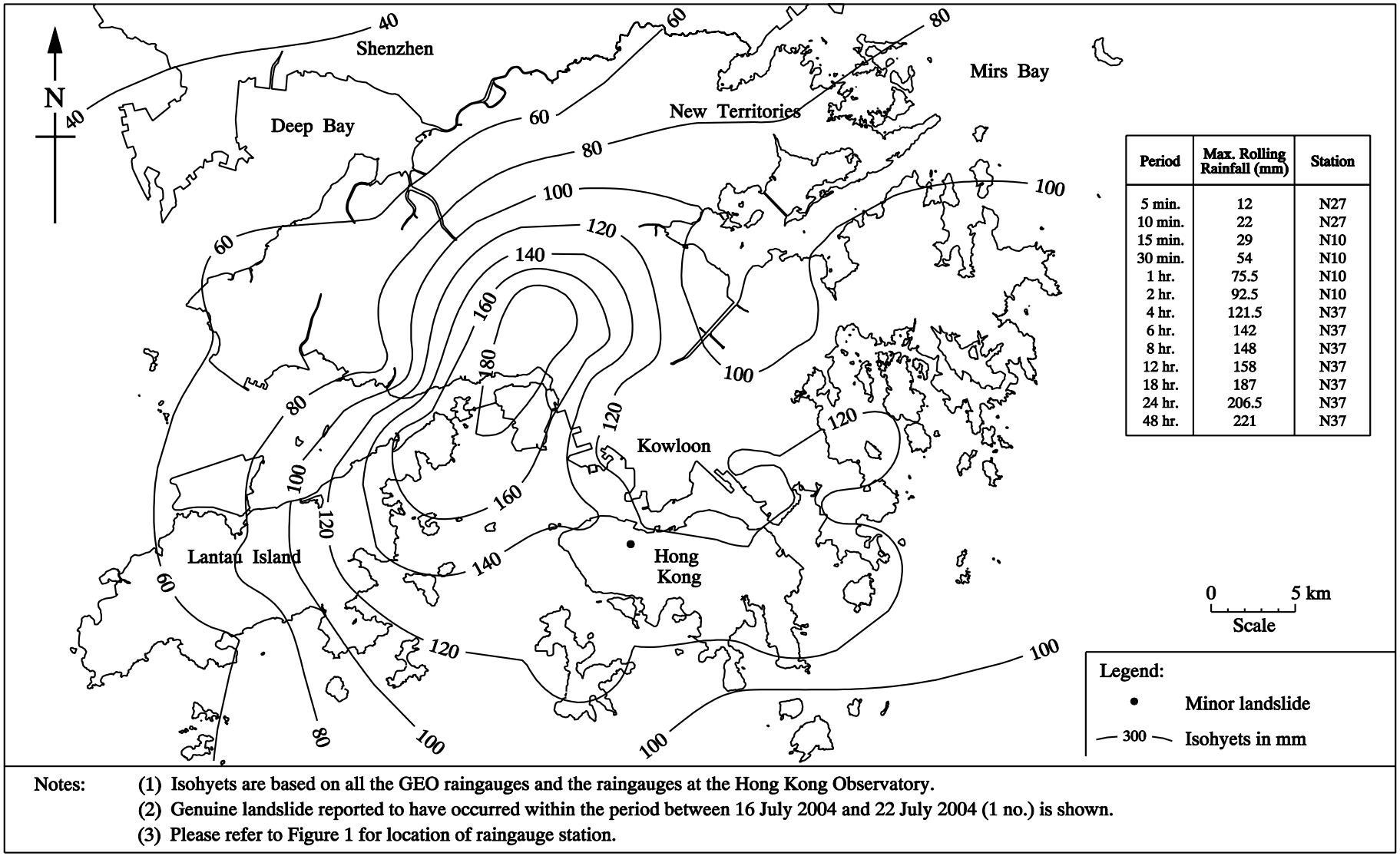

| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 18.5 | N16 |
| 10 min. | 36.5 | N16 |
| 15 min. | 47.5 | K03 |
| 30 min. | 73 | K03 |
| 1 hr. | 96 | N21 |
| 2 hr. | 104.5 | N21 |
| 4 hr. | 138.5 | N25 |
| 6 hr. | 160.5 | N25 |
| 8 hr. | 177 | N25 |
| 12 hr. | 182 | N50 |
| 18 hr. | 183 | N50 |
| 24 hr. | 183 | N50 |
| 48 hr. | 183 | N50 |

Figure 8 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 8 May 2004 and 23:55 on 9 May 2004 and Locations of Landslides




| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 15 | N22 |
| 10 min. | 28 | N22 |
| 15 min. | 39.5 | N22 |
| 30 min. | 54.5 | N22 |
| 1 hr. | 89 | N22 |
| 2 hr. | 121 | N25 |
| 4 hr. | 131 | N19 |
| 6 hr. | 145.5 | N19 |
| 8 hr. | 154.5 | N19 |
| 12 hr. | 158 | N19 |
| 18 hr. | 158 | N19 |
| 24 hr. | 158 | N19 |
| 48 hr. | 158 | N19 |

Figure 9 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 21 June 2004 and 23:55 on 21 June 2004




| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 12 | N27 |
| 10 min. | 22 | N27 |
| 15 min. | 29 | N10 |
| 30 min. | 54 | N10 |
| 1 hr. | 75.5 | N10 |
| 2 hr. | 92.5 | N10 |
| 4 hr. | 121.5 | N37 |
| 6 hr. | 142 | N37 |
| 8 hr. | 148 | N37 |
| 12 hr. | 158 | N37 |
| 18 hr. | 187 | N37 |
| 24 hr. | 206.5 | N37 |
| 48 hr. | 221 | N37 |

Notes:
(1) Isohyets are based on all the GEO raingauges and the raingauges at the Hong Kong Observatory.
(2) Genuine landslide reported to have occurred within the period between 16 July 2004 and 22 July 2004 (1 no.) is shown.
(3) Please refer to Figure 1 for location of raingauge station.

Figure 10 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 16 July 2004 and 23:55 on 22 July 2004 and Locations of Landslides



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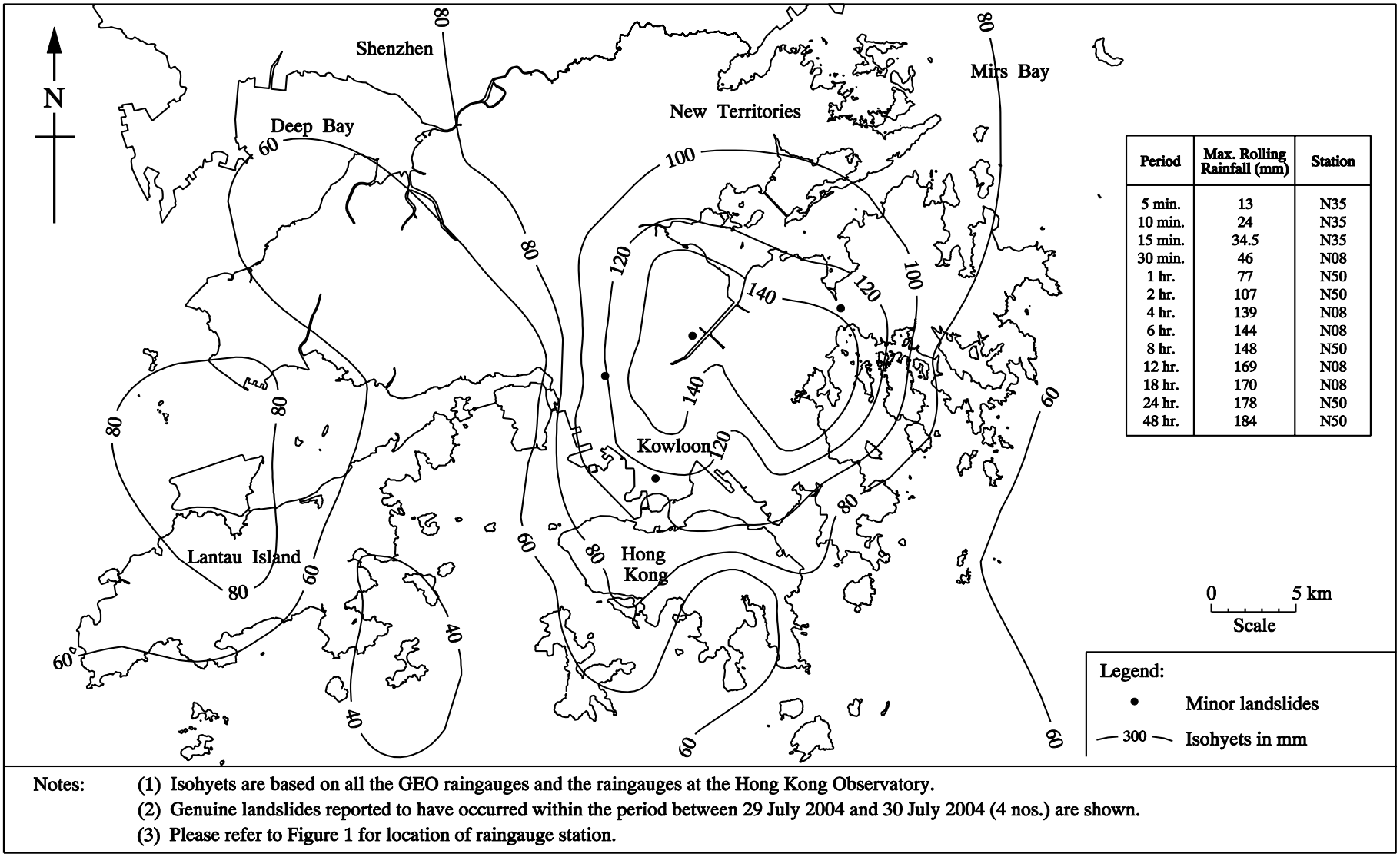
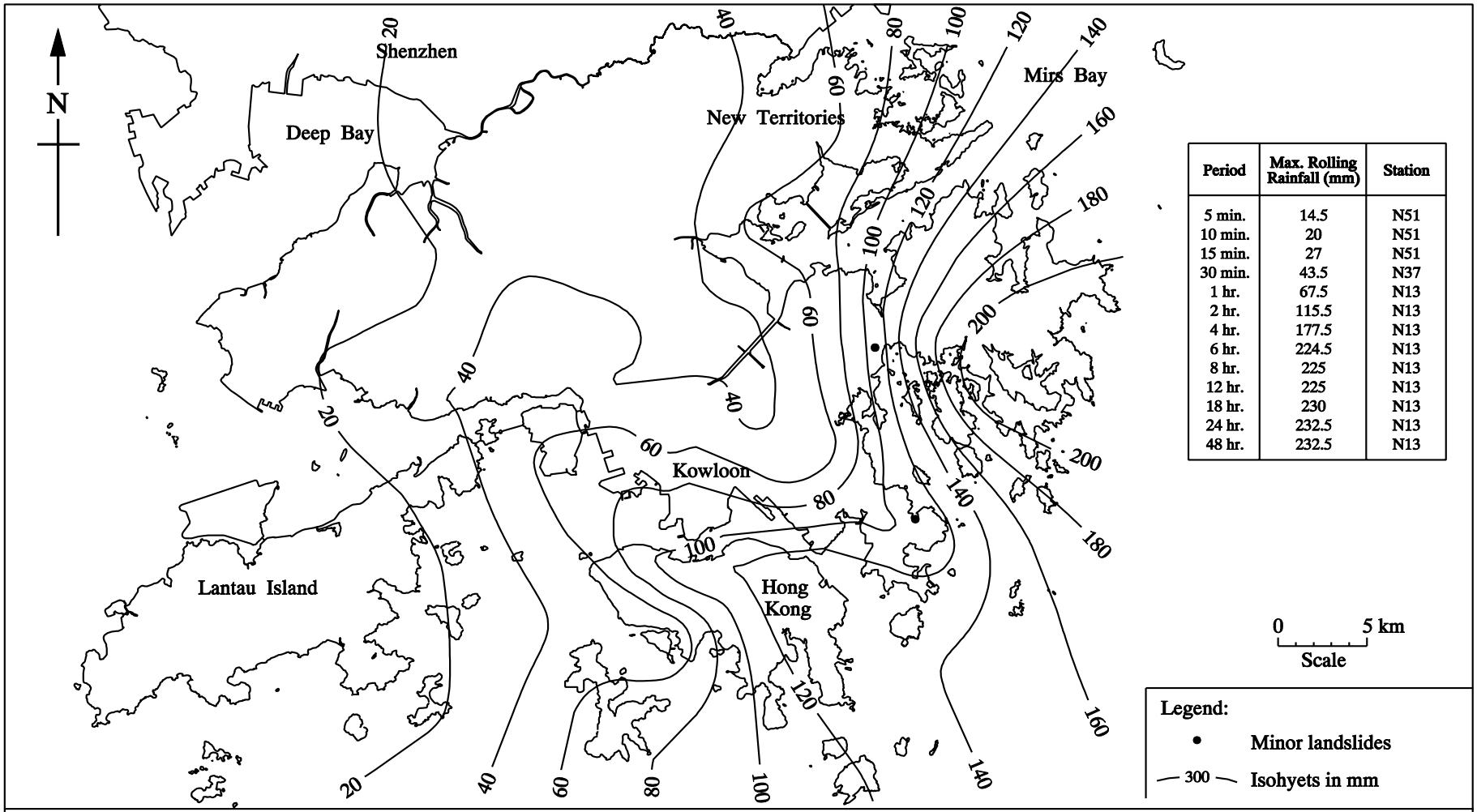


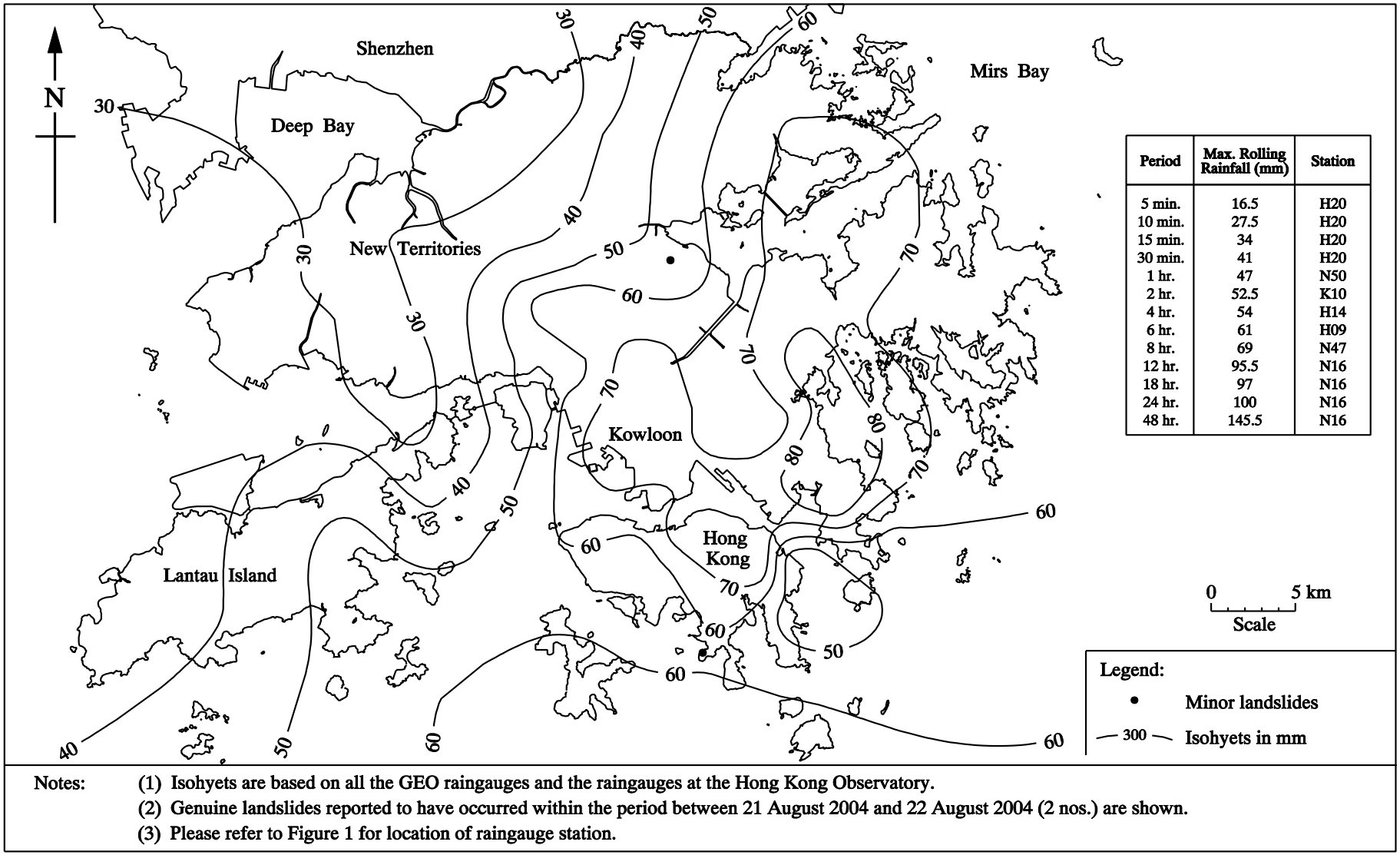

Figure 11 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 29 July 2004 and 23:55 on 30 July 2004 and Locations of Landslides




| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 14.5 | N51 |
| 10 min. | 20 | N51 |
| 15 min. | 27 | N51 |
| 30 min. | 43.5 | N37 |
| 1 hr. | 67.5 | N13 |
| 2 hr. | 115.5 | N13 |
| 4 hr. | 177.5 | N13 |
| 6 hr. | 224.5 | N13 |
| 8 hr. | 225 | N13 |
| 12 hr. | 225 | N13 |
| 18 hr. | 230 | N13 |
| 24 hr. | 232.5 | N13 |
| 48 hr. | 232.5 | N13 |

Notes:
(1) Isohyets are based on all the GEO raingauges and the raingauges at the Hong Kong Observatory.
(2) Genuine landslides reported to have occurred within the period between 6 August 2004 and 7 August 2004 (2 nos.) are shown.
(3) Please refer to Figure 1 for location of raingauge station.

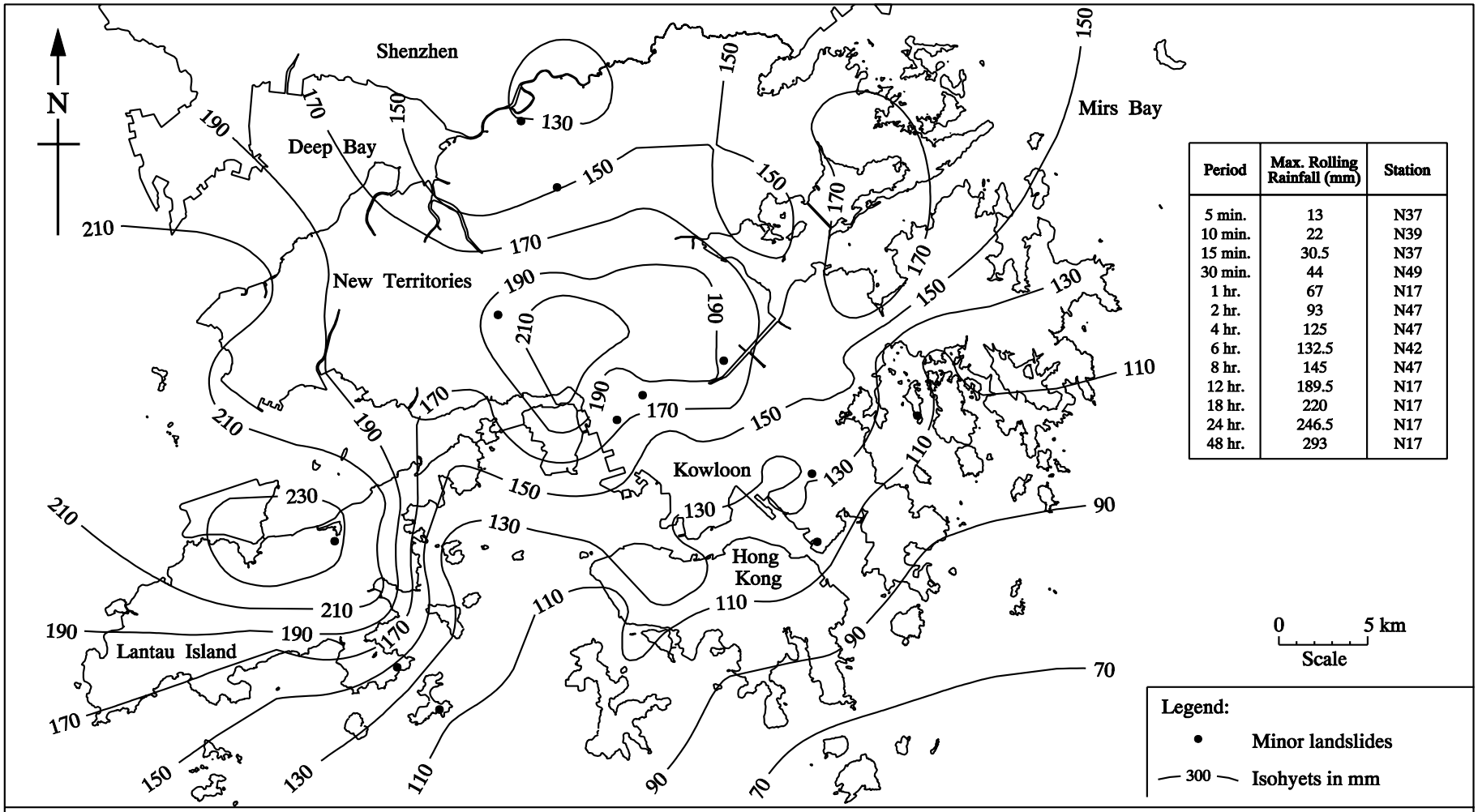
Figure 12 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 6 August 2004 and 23:55 on 7 August 2004 and Locations of Landslides




| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 16.5 | H20 |
| 10 min. | 27.5 | H20 |
| 15 min. | 34 | H20 |
| 30 min. | 41 | H20 |
| 1 hr. | 47 | N50 |
| 2 hr. | 52.5 | K10 |
| 4 hr. | 54 | H14 |
| 6 hr. | 61 | H09 |
| 8 hr. | 69 | N47 |
| 12 hr. | 95.5 | N16 |
| 18 hr. | 97 | N16 |
| 24 hr. | 100 | N16 |
| 48 hr. | 145.5 | N16 |

Notes:
(1) Isohyets are based on all the GEO raingauges and the raingauges at the Hong Kong Observatory.
(2) Genuine landslides reported to have occurred within the period between 21 August 2004 and 22 August 2004 (2 nos.) are shown.
(3) Please refer to Figure 1 for location of raingauge station.

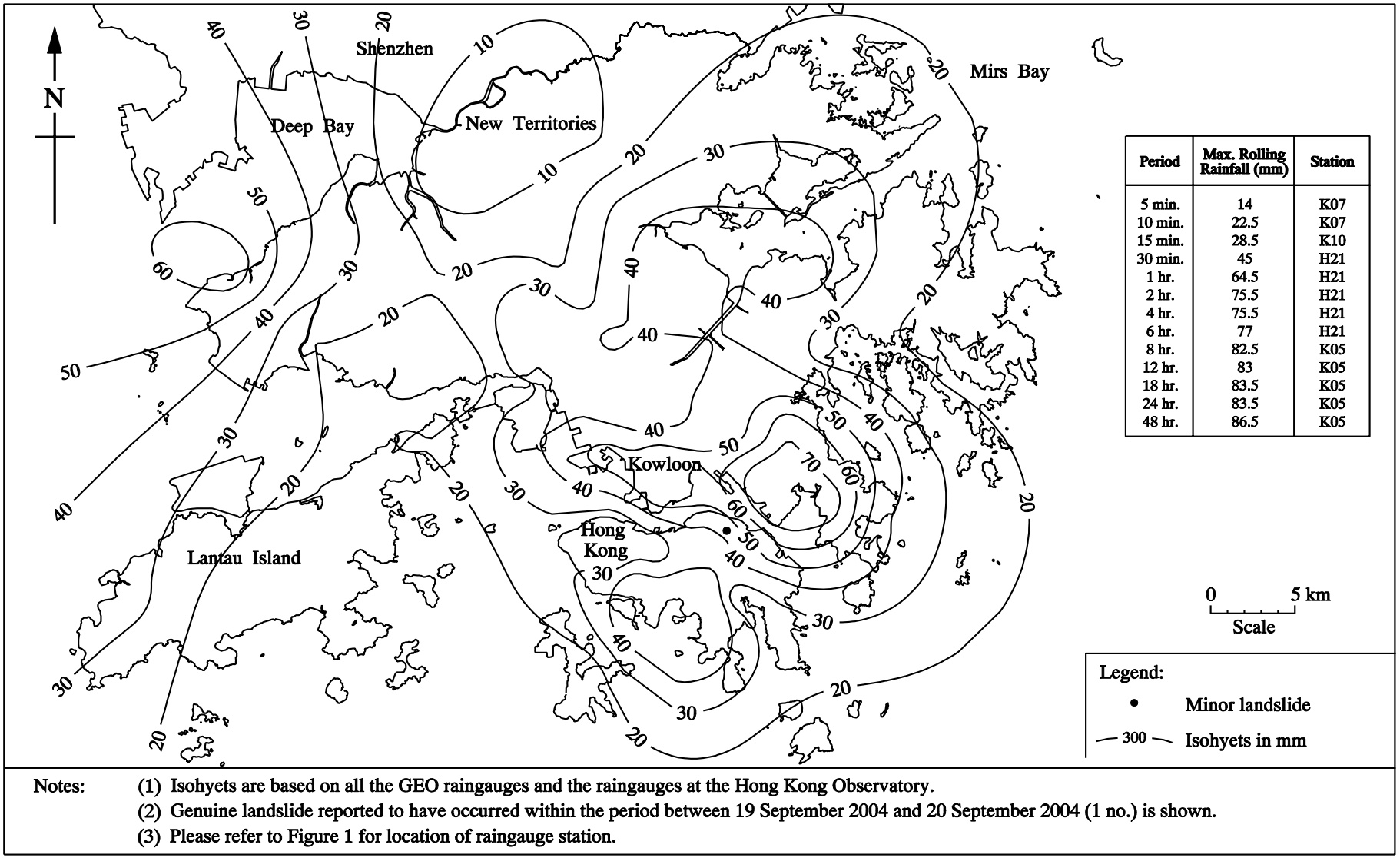
Figure 13 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 21 August 2004 and 23:55 on 22 August 2004 and Locations of Landslides




| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 13 | N37 |
| 10 min. | 22 | N39 |
| 15 min. | 30.5 | N37 |
| 30 min. | 44 | N49 |
| 1 hr. | 67 | N17 |
| 2 hr. | 93 | N47 |
| 4 hr. | 125 | N47 |
| 6 hr. | 132.5 | N42 |
| 8 hr. | 145 | N47 |
| 12 hr. | 189.5 | N17 |
| 18 hr. | 220 | N17 |
| 24 hr. | 246.5 | N17 |
| 48 hr. | 293 | N17 |

Notes:
(1) Isohyets are based on all the GEO raingauges and the raingauges at the Hong Kong Observatory.
(2) Genuine landslides reported to have occurred within the period between 29 August 2004 and 30 August 2004 (12 nos.) are shown.
(3) Please refer to Figure 1 for location of raingauge station.

Figure 14 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 29 August 2004 and 23:55 on 30 August 2004 and Locations of Landslides




| Period | Max. Rolling Rainfall (mm) | Station |
|---|---|---|
| 5 min. | 14 | K07 |
| 10 min. | 22.5 | K07 |
| 15 min. | 28.5 | K10 |
| 30 min. | 45 | H21 |
| 1 hr. | 64.5 | H21 |
| 2 hr. | 75.5 | H21 |
| 4 hr. | 75.5 | H21 |
| 6 hr. | 77 | H21 |
| 8 hr. | 82.5 | K05 |
| 12 hr. | 83 | K05 |
| 18 hr. | 83.5 | K05 |
| 24 hr. | 83.5 | K05 |
| 48 hr. | 86.5 | K05 |

Figure 15 - Maximum Rolling 24-hour Rainfall Distribution for the Period between 00:00 on 19 September 2004 and 23:55 on 20 September 2004 and Locations of Landslides

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# APPENDIX A

## RAINFALL OF SELECTED RAINSTORMS RECORDED AT GEO RAINGAUGES

# LIST OF TABLES

Table A1 - Rainstorms in which Rolling 24-hour Rainfall Exceeded 50 mm at any GEO Raingauge (Sheet 1 of 3)

| Rainstorm (2004) | | 5 min | | 10 min | | 15 min | | 30 min | |
|---|---|---|---|---|---|---|---|---|---|
| | | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station |
| 1 | 19 Jan 2004 | 5 | N23 | 9.5 | N23 | 11.5 | N23 | 13.5 | K03, N23 |
| 2 | 30-31 Mar 2004 | 13.5 | N05 | 22 | N05 | 27 | N05 | 37.5 | N12 |
| 3 | 14-15 Apr 2004 | 11.5 | H25 | 21 | H03 | 28 | H14 | 48.5 | H03, N27 |
| 4 | 17-18 Apr 2004 | 13 | H07, H17, H21 | 22 | H07 | 29 | H09, H17 | 41 | H16 |
| 5 | 27-28 Apr 2004 | 10.5 | N43 | 20.5 | N43 | 26.5 | N43 | 38.5 | N43 |
| 6 | 8-9 May 2004 | 18.5 | N16, N30 | 36.5 | N16 | 47.5 | K03 | 73 | K03 |
| 7 | 14-15 May 2004 | 12 | N25 | 22 | N23 | 32 | N23 | 44 | N23 |
| 8 | 28-29 May 2004 | 10.5 | N34 | 20 | N34 | 28.5 | N34 | 42.5 | N34 |
| 9 | 2-3 Jun 2004 | 8 | H10, K07, K09 | 15.5 | K07 | 23 | K07 | 32 | K07 |
| 10 | 15-16 Jun 2004 | 13 | N48 | 22 | N48 | 29 | N48 | 48.5 | N48 |
| 11 | 20-22 Jun 2004 | 15 | N22 | 28 | N22 | 39.5 | N22 | 54.5 | N22 |
| 12 | 30 Jun 2004 - 1 Jul 2004 | 10 | N37 | 18.5 | N37 | 25.5 | N37 | 34 | N37 |
| 13 | 3-4 Jul 2004 | 10 | K08 | 16.5 | N13 | 20 | N13 | 30.5 | N20 |
| 14 | 16-22 Jul 2004 | 12 | N27 | 22 | N27 | 29 | N10 | 54 | N10 |
| 15 | 29-30 Jul 2004 | 13 | N35 | 24 | N35 | 34.5 | N35 | 46 | N08 |
| 16 | 5-7 Aug 2004 | 14.5 | N51 | 20 | H07, N51 | 27 | N51 | 43.5 | N37 |
| 17 | 11-12 Aug 2004 | 14 | N34 | 23 | N34 | 33 | N34 | 51 | N34 |
| 18 | 14-15 Aug 2004 | 14 | N17 | 27 | N17 | 34 | N17 | 54 | N17 |
| 19 | 20-25 Aug 2004 | 16.5 | H20, N27 | 27.5 | H20 | 34 | H20 | 41 | H20 |
| 20 | 27-31 Aug 2004 | 13 | N37 | 22 | N39 | 30.5 | N37 | 44 | N49 |
| 21 | 6-10 Sep 2004 | 13 | H08 | 20 | K03 | 26 | N28, N34 | 39.5 | N10 |
| 22 | 17-22 Sep 2004 | 14 | K07 | 22.5 | K07 | 28.5 | K10 | 45 | H21 |



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Table A1 - Rainstorms in which Rolling 24-hour Rainfall Exceeded 50 mm at any GEO Raingauge (Sheet 2 of 3)

| Rainstorm (2004) | | 1 hr | | 2 hr | | 4 hr | | 6 hr | |
|---|---|---|---|---|---|---|---|---|---|
| | | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station |
| 1 | 19 Jan 2004 | 17 | K03 | 20.5 | K03 | 21.5 | K01, K03 | 26 | N07 |
| 2 | 30-31 Mar 2004 | 48 | N09 | 64 | N08 | 78.5 | N09 | 106 | N47 |
| 3 | 14-15 Apr 2004 | 87 | N27 | 125.5 | H20 | 135 | H20 | 135 | H20 |
| 4 | 17-18 Apr 2004 | 54 | H02 | 62 | N26 | 67.5 | N26 | 67.5 | N26 |
| 5 | 27-28 Apr 2004 | 48 | N35 | 63.5 | N35 | 63.5 | N35 | 63.5 | N35 |
| 6 | 8-9 May 2004 | 96 | N21 | 104.5 | N21 | 138.5 | N25 | 160.5 | N25 |
| 7 | 14-15 May 2004 | 57 | N23 | 67 | N22 | 67.5 | N22, N31 | 72.5 | N22 |
| 8 | 28-29 May 2004 | 53 | N40 | 56.5 | N35 | 61.5 | N40 | 62.5 | N40 |
| 9 | 2-3 Jun 2004 | 41.5 | K07 | 51.5 | K07 | 61.5 | K07 | 61.5 | K07 |
| 10 | 15-16 Jun 2004 | 84.5 | N48 | 102.5 | N48 | 103.5 | N48 | 103.5 | N48 |
| 11 | 20-22 Jun 2004 | 89 | N22 | 121 | N25 | 131 | N19 | 145.5 | N19 |
| 12 | 30 Jun 2004 - 1 Jul 2004 | 57.5 | N37 | 63.5 | N37 | 63.5 | N37 | 63.5 | N37 |
| 13 | 3-4 Jul 2004 | 50 | K03 | 54.5 | K03, K08 | 64.5 | K03 | 64.5 | K03 |
| 14 | 16-22 Jul 2004 | 75.5 | N10 | 92.5 | N10 | 121.5 | N37 | 142 | N37 |
| 15 | 29-30 Jul 2004 | 77 | N50 | 107 | N50 | 139 | N08 | 144 | N08 |
| 16 | 5-7 Aug 2004 | 67.5 | N13 | 115.5 | N13 | 177.5 | N13 | 224.5 | N13 |
| 17 | 11-12 Aug 2004 | 61.5 | N34 | 75 | N36 | 75.5 | N36 | 77 | N36 |
| 18 | 14-15 Aug 2004 | 74 | N21 | 85 | N23 | 87 | N23 | 87 | N23 |
| 19 | 20-25 Aug 2004 | 47 | N50 | 52.5 | K10 | 54 | H14 | 61 | H09, N01 |
| 20 | 27-31 Aug 2004 | 67 | N17 | 93 | N47 | 125 | N47 | 132.5 | N42 |
| 21 | 6-10 Sep 2004 | 63 | N34 | 68.5 | N33 | 77.5 | N33 | 84 | N33 |
| 22 | 17-22 Sep 2004 | 64.5 | H21 | 75.5 | H21 | 75.5 | H21 | 77 | H21 |

Table A1 - Rainstorms in which Rolling 24-hour Rainfall Exceeded 50 mm at any GEO Raingauge (Sheet 3 of 3)

| Rainstorm (2004) | | 8 hr | | 12 hr | | 18 hr | | 24 hr | | 48 hr | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station | Max. rainfall (mm) | Station |
| 1 | 19 Jan 2004 | 32 | K03 | 37 | N41 | 52 | K03 | 59 | N07 | 59.5 | N07 |
| 2 | 30-31 Mar 2004 | 107.5 | N47 | 107.5 | N47 | 108.5 | N47 | 114.5 | H06 | 125.5 | N16 |
| 3 | 14-15 Apr 2004 | 135 | H20 | 135 | H20 | 135 | H20 | 136 | H20 | 136 | H20 |
| 4 | 17-18 Apr 2004 | 67.5 | N26 | 70 | H02 | 70 | H02, H19 | 72.5 | H02 | 72.5 | H02 |
| 5 | 27-28 Apr 2004 | 63.5 | N35 | 63.5 | N35 | 63.5 | N35 | 63.5 | N35 | 63.5 | N35 |
| 6 | 8-9 May 2004 | 177 | N25 | 182 | N50 | 183 | N50 | 183 | N50 | 183 | N50 |
| 7 | 14-15 May 2004 | 73 | N22 | 73 | N22 | 73 | N22 | 73 | N22 | 73 | N22 |
| 8 | 28-29 May 2004 | 73 | N40 | 85.5 | N40 | 86.5 | N40 | 89 | N40 | 89 | N40 |
| 9 | 2-3 Jun 2004 | 74 | K07 | 74 | K07 | 74 | K07 | 74 | K07 | 74.5 | K07 |
| 10 | 15-16 Jun 2004 | 103.5 | N48 | 103.5 | N48 | 103.5 | N48 | 103.5 | N48 | 106 | N48 |
| 11 | 20-22 Jun 2004 | 154.5 | N19 | 158 | N19 | 158 | N19 | 158 | N19 | 158 | N19 |
| 12 | 30 Jun 2004 - 1 Jul 2004 | 63.5 | N37 | 63.5 | N37 | 63.5 | N37 | 63.5 | N37 | 63.5 | N37 |
| 13 | 3-4 Jul 2004 | 64.5 | K03 | 65.5 | K03 | 66 | K03 | 66.5 | K03 | 80 | K08 |
| 14 | 16-22 Jul 2004 | 148 | N37 | 158 | N37 | 187 | N37 | 206.5 | N37 | 221 | N37 |
| 15 | 29-30 Jul 2004 | 148 | N50 | 169 | N08 | 170 | N08 | 178 | N50 | 184 | N50 |
| 16 | 5-7 Aug 2004 | 225 | N13 | 225 | N13 | 230 | N13 | 232.5 | N13 | 232.5 | N13 |
| 17 | 11-12 Aug 2004 | 78.5 | N36 | 78.5 | N36 | 78.5 | N36 | 97 | N36 | 97 | N36 |
| 18 | 14-15 Aug 2004 | 87 | N23 | 87 | N23 | 90.5 | N23 | 92 | N23 | 92 | N23 |
| 19 | 20-25 Aug 2004 | 69 | N47 | 95.5 | N16 | 97 | N16 | 100 | N16 | 145.5 | N16 |
| 20 | 27-31 Aug 2004 | 145 | N47 | 189.5 | N17 | 220 | N17 | 246.5 | N17 | 293 | N17 |
| 21 | 6-10 Sep 2004 | 85.5 | N33 | 92 | N06 | 93 | K03 | 123.5 | N51 | 134.5 | K03 |
| 22 | 17-22 Sep 2004 | 82.5 | K05 | 83 | K05 | 83.5 | K05 | 83.5 | K05 | 86.5 | K05 |

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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 | Slope No. | Failure | | | Facility Affected | Consequence |
|---|---|---|---|---|---|---|---|
| | | | Date (Time) | Feature Type | Scale ($m^3$) | | |
| 2004/08/0041 | Tseung Kwan O Chinese Permanent Cemetery, Yau Tong | Drainage line between Slopes Nos. 11SE-B/FR151 & 11SE-B/FR152 | Unknown | Natural hillside | 350* | Open area | - |

Legend:

| | |
|---|---|
| * | Information obtained by GEO's landslide investigation consultants and agreed with GEO's District Divisions |
| # | 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 |

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

| Incident No. | Location | Slope No. | Call | | Failure | | | Facility Affected | Consequence |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | From | Date (Time) | Feature Type | Scale ($m^3$) | | |
| 2004/03/0003 | Below the platform at the south-eastern corner of Block 5, Nam Fung Sun Chuen | Natural hillside | 18/3 | Public | Mid-February | Natural hillside | 1 | Open area | - |
| 2004/03/0004 | No. 1 to 7 Peacock Road, Ming Yuen Mansions, North Point | 11SE-A/CR169 | 25/3 | Lands D | 25/3 (10:30) | Rock cut | 0.6 (Rock fall) | Carpark | A car damaged |
| 2004/03/0005 | Along footpath to the jetty at Hok Tsui Wan at Cape D'Aguilar, Shek O | Unregistered at time of failure | 31/3 | Public | Unknown | Rock cut | 3 (Rock fall) | Footpath | - |
| 2004/04/0001 | Along access road to the Swire Marine Research Centre at Cape D'Aguilar Road, Shek O | 1.8 m high soil/rock cut slope (1) | 1/4 | Public | Unknown | Soil/rock cut | 2 | Access road | - |
| 2004/04/0005 | Feature No. 11SW-C/C450 (near 61 Mount Davis Road) | 11SW-C/C450 | 13/4 | BD | 13/4 | Soil/rock cut | 0.1 | Pedestrian pavement | - |
| 2004/04/0006 | Feature No. 115NE-B/FR34 downslope side of Shek O Road opposite to catchpit nos. SD36 and SD37 | 15NE-B/FR34 | 14/4 | CEDD | Unknown | Fill | Significant sign of distress | Open area | - |
| ArchSD/WCS/2004/04/0001 | Deep Water Bay Road | 11SE-C/C730 | 19/4 | Arch SD | 15/4 | Soil cut | 0.5 | Access road | - |
| 2004/04/0008 | Natural hillside behind Fairlane Tower, Bowen Road | Natural hillside | 21/4 | Public | 17/4 (at night) | Natural hillside | 0.025* (Boulder fall) | Open area | Garden furniture damaged |
| 2004/05/0012 | The Duchess of Kent Children Hospital (Natural hillside above 11SW-C/C470) | Natural hillside | 10/5 | Public | 8/5 | Natural hillside | 1* | Open area | - |
| 2004/06/0026 | Slope No. 11SW-C/C79, Pok Fu Lam Road near Queen Mary Hospital | 11SW-C/C79 | 17/6 | HyD | 16/6 (20:15) | Soil/rock cut | 1 (Rock fall) | Pedestrian pavement | - |
| 2004/07/0032 | 38A - 38D, MacDonnell Road | 11SW-B/C85 | 21/7 | WSD | 21/7 (10:00) | Soil/rock cut | 6 | Road | - |
| AFCD/HK/2004/08/0001# | Hong Pak Country Trail, Quarry Bay, Tai Tam Country Park | 2.8 m high soil cut slope (1) | 19/8 | AFCD | 16/8 | Soil cut | 1 | Footpath | - |

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

| Incident No. | Location | Slope No. | Call | | Failure | | | Facility Affected | Consequence |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | From | Date (Time) | Feature Type | Scale ($m^3$) | | |
| 2004/08/0045 | 15NE-C/C93 at Chung Hom Kok Road, Stanley (Lamp post 48980) | 15NE-C/C93 | 22/8 | Police | 22/8 (10:00) | Rock cut | 1 (Rockfall) | Road | 1 lane of road closed |
| 2004/09/0058 | Black's Link (Feature No. 11SW-D/C1094) | 11SW-D/C1094 | 9/9 | HyD | 9/9 (approx. 06:00) | Soil/rock cut | 1.5 | Road | - |
| 2004/09/0060 | Brick Hill, Ocean Park | Natural hillside | 23/8 | Ocean Park | Early August | Natural hillside | 1 (Rockfall) | Cable car ropeway right-of-way | Electric cables damaged |
| 2004/09/0062 | 121 Quarry Bay Street, behind Tai Chow House on the rock slope portion of 11SE-A/C179 | 11SE-A/C179 | 19/9 | Police | 19/9 (01:30) | Soil/rock cut | 0.76 (Rockfall) | Back-lane | - |
| 2004/12/0070 | Cape Collinson Road at the Chinese Permanent Cemetery (between slopes nos. 11SE-D/C539 & 11SE-D/C214 | Temporary stockpile in construction site | 17/12 | FSD | 17/12 (13:30) | Fill | 1.3 (Rockfall) | Construction site | - |

Legend:

* Information obtained by GEO's landslide investigation consultants and agreed with GEO's District Divisions

\# 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




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Table B3 - List of Landslide Incidents in Kowloon

| Incident No. | Location | Slope No. | Call | | Failure | | | Facility Affected | Consequence |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | From | Date (Time) | Feature Type | Scale ($m^3$) | | |
| 2004/04/0002 | Signal Hill Garden behind Minden Avenue | 11SW-B/C51 | 2/4 | ICC | 2/4 (17:00) | Soil/rock cut | 0.2 (Rock fall) | Open area | - |
| 2004/05/0009 | Adjacent to Slope No. 11NW-B/C443, south of Basketball Court, Junction Road Park | Natural hillside | 5/5 | CEDD | Unknown | Natural hillside | 10 | Open area | - |
| 2004/05/0017 | Feature No. 11NE-A/C503, Shatin Pass Road | 11NE-A/C503 | 13/5 | Public | Unknown | Soil/rock cut | 0.05 (Rock fall) | Road | - |
| 2004/05/0024 | Service lane behind No. 37 Wan Hon Street | 11NE-C/C41 | 31/5 | ICC | Unknown | Soil/rock cut | 0.15 (Rock fall) | Back-lane | - |
| 2004/07/0034 | Behind Caritas Bianchi Lodge, Cliff Road | 11NW-D/CR10 | 29/7 | Public | 29/7 (07:00) | Soil cut | 2 | Open area | - |
| 2004/09/0053 | Slope behind squatter structure RKT/12/C/195, On Lei Sai Chuen, Lei Yue Mun | Natural hillside | 6/9 | Lands D | 29/8 | Natural hillside | 25 | Squatter dwelling | - |
| 2004/10/0066 | Anderson Road Quarry Site | Slope under construction | 4/10 | CEDD | 31/8 | Soil/rock cut | 6 | Construction site | - |
| 2004/11/0068 | Feature No. 11NE-D/CR15 at Sau Mau Ping Estate Phase 9 | 11NE-D/CR15 | 23/11 | WSD | 23/11 | Soil cut | 5 | School | - |

Legend:

* Information obtained by GEO's landslide investigation consultants and agreed with GEO's District Divisions
\# 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




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Table B4 - List of Landslide Incidents in New Territories and Outlying Islands (Sheet 1 of 4)

| Incident No. | Location | Slope No. | Call | | Failure | | | Facility Affected | Consequence |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | From | Date (Time) | Feature Type | Scale ($m^3$) | | |
| 2004/02/0002 | Slope No.3NE-D/C98, Bride's Pool Road | 3NE-D/C98 | 19/2 | HyD | Unknown | Soil/rock cut | 0.5 (Rock fall) | Open area | - |
| 2004/04/0003 | No. 67 Hoi Pa San Tsuen, Kwok Shui Road | 7SW-C/C265 | 3/4 | Public | 2/4 | Soil/rock cut | 0.005 (Rock fall) | Back-lane | - |
| LandsD/SK/2004/02/0001 | House No. 5A, Shan Liu | 8SW-A/C257 | 19/4 | Lands D | 23/2 | Soil cut | 25 | Footpath | Footpath temporarily closed |
| 2004/05/0010 | Slope No. 8SW-C/C57, Chui Tong Road, Tui Min Hoi | 8SW-C/C57 | 8/5 | FEHD | 8/5 (09:00) | Soil cut | 30 | Public toilet | Public toilet temporarily closed |
| 2004/05/0011 | Tan Cheung Road | 8SW-A/C163 | 8/5 | ICC | 8/5 | Soil/rock cut | 10 | Carpark | - |
| 2004/05/0013 | Slope No. 11NE-B/C542, Mok Tse Che Road | 11NE-B/C542 | 10/5 | ICC | Unknown | Soil/rock cut | 1 | Access road | - |
| 2004/05/0014 | Nos. 60D & 60E, Tseng Lan Shue Village | 1.4 m high retaining wall (1) | 10/5 | DLO | 8/5 | Retaining wall | 4 | Carpark | A car damaged |
| 2004/05/0015 | Behind house No. 5A, Shan Liu | 8SW-A/C257 | 11/5 | ICC | 8/5 (08:00) | Soil cut | 1.5 | Footpath | - |
| 2004/05/0016 | Near No. 14, Ma Yau Tong Village, Ma Yau Tong | Natural hillside | 12/5 | DO | 8/5 (08:00) | Natural hillside | 4.5 | Footpath | Footpath temporarily closed |
| 2004/05/0018 | Behind house Nos. 4 & 5, Lai Chi Chong | Natural hillside | 12/5 | DO | 3/3 (09:00) | Natural hillside | 15 | Open area | - |
| 2004/05/0019 | Feature No. 8NW-B/DT13, Lai Chi Chong | 8NW-B/DT13 | 12/5 | CEDD | Unknown | Disturbed terrain | 10 | Open area | - |
| 2004/05/0021 | Behind 14C Hill Side Road, Cheung Chau | 1.3 m high soil cut slope | 14/5 | DO/Is | 8/5 (15:00) | Soil cut | 0.1 | Back-lane | - |
| 2004/05/0022 | DD223 Lot No 267 & 268, Mok Tse Che Sai Kung Feature No. 11NE-B/C778 | 11NE-B/C778 | 20/5 | Public | 8/5 | Soil cut | 2 | Open area | - |
| 2004/05/0023# | Ma Yau Tong Road near slope No. 11NE-D/C466 | 1.5 m high soil cut slope | 21/5 | CEDD | Unknown | Soil cut | 0.5 | Access road | - |




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Table B4 - List of Landslide Incidents in New Territories and Outlying Islands (Sheet 2 of 4)

| Incident No. | Location | Slope No. | Call | | Failure | | | Facility Affected | Consequence |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | From | Date (Time) | Feature Type | Scale ($m^3$) | | |
| WSD/2004/5/1/NTE[#] | Ho Chung Road to Intake 1A | 7SE-D/C212 | 25/5 | WSD | 20/5 (16:45) | Soil cut | 1 | Access road | - |
| LandsD/SK/2004/05/0002 | Pak Shek Terrace | 11NE-B/C390 | 08/5 | Lands D | 8/5 | Soil cut | 0.2 | Open area | - |
| LandsD/SK/2004/05/0003[#] | Unregistered slope (east of 11NE-B/C390), Pak Shek Terrace | Natural hillside | 08/5 | Lands D | 8/5 | Natural hillside | 0.1 | Open area | - |
| 2004/06/0025 | Behind No. 129 Lo Wai Village, Pui O, Lantau Island | 2.2 m high soil cut slope | 07/6 | Public | 6/6 | Soil cut | 0.2 | Back-lane | - |
| 2004/06/0028 | Behind 1B Wai Tsai San Tsuen, Peng Chau | Natural hillside | 28/6 | Police | 27/6 | Natural hillside | 0.15 (Boulder fall) | Others | - |
| 2004/07/0033 | Fung Yuen Road | 7NW-B/R35 | 22/7 | ICC | Unknown | Retaining wall | 0 | Road | 1 lane of road closed |
| 2004/07/0035 | Shek Lei Hang Tsuen | Natural hillside & 7SW-C/C999 | 29/7 | DO | 29/7 (10:30) | Natural hillside | 10 | Squatter dwelling | 2 squatters temporarily evacuated |
| 2004/08/0040 | No. 2A, Tai Hang Hau Village, Clear Water Bay | Natural hillside | 07/8 | Public | 6/8 (17:00) | Natural hillside | 0.5 | Open area | - |
| 2004/08/0041 | Tseung Kwan O Chinese Permanent Cemetery, Yau Tong | Drainage line between Slopes Nos. 11SE-B/FR151 & 11SE-B/FR152 | 10/8 | CEDD | Unknown | Natural hillside | 350 | Open area | - |
| 2004/08/0042 | To the east of the NE corner of feature No. 8SW-A/C72, west of Wong Mo Ying Village | 2.9 m high soil cut slope | 12/8 | - | Unknown | Soil cut | 2 | Footpath | - |
| 2004/08/0048 | Above slope No. 7SE-A/CR290, behind house No. 172 Sheung Wo Che Village | 2.7 m high soil cut slope | 29/8 | Police | 29/8 (07:45) | Soil cut | 2 | Squatter dwelling | 1 squatter temporarily evacuated |

Table B4 - List of Landslide Incidents in New Territories and Outlying Islands (Sheet 3 of 4)

| Incident No. | Location | Slope No. | Call | | Failure | | | Facility Affected | Consequence |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | From | Date (Time) | Feature Type | Scale ($m^3$) | | |
| 2004/08/0049# | Slope below footpath fronting light pole No. VA4336, between Pak Mong and Ngau Kwu Long, Lantau | 3 to 4 m high fill slope | 30/8 | DO/Is | 29/8 (15:00) | Fill | 2 | Footpath | - |
| 2004/08/0050 | Behind hut No. A-21, Tsiu King Village, Sheung Shui | 2SE-D/C46 | 06/9 | CEDD | 29/8 (14:30) | Soil cut | 4 | Squatter dwelling | - |
| 2004/08/0051 | No. 201 Lok Ma Chau Road | 2SE-A/C92 | 30/8 | Police | 30/8 (21:30) | Soil/Rock cut | 22 | Open area | - |
| 2004/09/0052 | Slope No. 11NW-A/C152, Ha Kwai Chung Village, Kwai Chung | 11NW-A/C152 | 01/9 | DSD | 30/8 | Rock cut | 3 (Rockfall) | Nullah | - |
| WSD/2004/8/1/NTE | South Conduit Ch 350, Shek Lek Hang Chuen | 7SW-C/C980 | 31/8 | WSD | 30/8 (10:00) | Soil cut | 25 | Catchwater | - |
| 2004/09/0054 | Behind house No. 61 Greenfield Villa, Ngau Liu | Natural hillside | 07/9 | BD | 7/8 | Natural hillside | 0.01 (Boulder fall) | Garden | - |
| 2004/09/0055 | Access road near Ho Pui Village | 6NE-C/C247 | 06/9 | WSD | 29/8 | Soil cut | 2 | Road | - |
| 2004/09/0057 | Above access footpath to Hap Mun Bay near the Ferry Pier, Kiu Tsui Chau | Unregistered | 06/9 | LCSD | 29/8 | Rock cut | 0.005 (Rockfall) | Footpath | - |
| 2004/09/0059 | House 69A1, Kam Shan Village | 7NW-B/C593 | 13/9 | DO | 8/9 (03:00) | Soil cut | 0.02 | Squatter dwelling | - |
| LandsD/ST/2004/07/0001 | Adjacent to house No. 285A, Ha Wo Che Village | 7SE-A/C396 | 30/7 | Lands D | 29/7 | Soil cut | 0.3 | Open area | - |
| AFCD/NT/2004/07/0001 | SLW Trench in Ma On Shan Country Park | 8SW-A/C204 | 29/7 | AFCD | 29/7 | Soil/Rock cut | 2 | Verge | - |
| AFCD/NT/2004/08/0002 | Tai Po Kau Track, Tai Po Kau Nature Reserve (SA) | Natural hillside | 23/8 | AFCD | 22/8 | Natural hillside | <1 (Boulder fall) | Access road | - |
| LandsD/N/2004/11/0001 | Ko Po Village, Sha Tau Kok Road | 3SW-B/C375 | 29/10 | Lands D | Unknown | Soil cut | 47 | Squatter dwelling | - |
| LandsD/SK/2004/10/0001 | Tai Hang Hau, Clearwater Bay | 12NW-C/C472 | 04/10 | Lands D | Unknown | Soil cut | <5 | Temple | - |
| 2004/09/0061# | Abandoned road near Tong Fuk, Lantau Island, at 13NE-A/C80 | 13NE-A/C80 | 15/9 | CEDD | Unknown | Soil cut | 2 | Abandoned access road | - |

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

| Incident No. | Location | Slope No. | Call | | Failure | | | Facility Affected | Consequence |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | From | Date (Time) | Feature Type | Scale ($m^3$) | | |
| 2004/09/0063 | Behind Girls Dormitory at Christian Zhang Sheng College, Chi Ma Wan, Lantau Island | 14NW-B/C12 | 21/9 | Public | 29/8 (13:00) | Soil cut | 1 (Boulder fall) | Open area | - |
| 2004/09/0064 | Near Lamp Post no. H9404 at Don Bosco Road, Cheung Chau | 1.5 m high soil cut slope | 22/9 | DLO/IS | 29/8 | Soil cut | 0.05 (Rock fall) | Footpath | - |
| 2004/09/0065 | No. 53A Nam Wan, Peng Chau | 10SW-B/C87 | 25/9 | Lands D | 18/9 | Soil/Rock cut | 4 | Cottage | - |
| LandsD/Is/2004 /11/0001 | Chi Ma Wan Road, Lantau | 14NW-A/C58 | 23/11 | Lands D | Unknown | Soil cut | 3 | Unmanned sub-station | - |

Legend:

| | |
|---|---|
| * | Information obtained by GEO's landslide investigation consultants and agreed with GEO's District Divisions |
| # | 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 PUBLICATIONS AND ORDERING INFORMATION
# 土力工程處刊物及訂購資料

A selected list of major GEO publications is given in the next page. An up-to-date full list of GEO publications can be found at the CEDD Website http://www.cedd.gov.hk on the Internet under "Publications". Abstracts for the documents can also be found at the same website. Technical Guidance Notes are published on the CEDD Website from time to time to provide updates to GEO publications prior to their next revision.

部份土力工程處的主要刊物目錄刊載於下頁。而詳盡及最新的土力工程處刊物目錄，則登載於土木工程拓展署的互聯網網頁 http://www.cedd.gov.hk 的"刊物"版面之內。刊物的摘要及更新刊物內容的工程技術指引，亦可在這個網址找到。

**Copies of GEO publications (except maps and other publications which are free of charge) can be purchased either by:**

writing to
Publications Sales Section,
Information Services Department,
Room 402, 4th Floor, Murray Building,
Garden Road, Central, Hong Kong.
Fax: (852) 2598 7482

or
- Calling the Publications Sales Section of Information Services Department (ISD) at (852) 2537 1910
- Visiting the online Government Bookstore at http://bookstore.esdlife.com
- Downloading the order form from the ISD website at http://www.isd.gov.hk and submit the order online or by fax to (852) 2523 7195
- Placing order with ISD by e-mail at puborder@isd.gov.hk

**讀者可採用以下方法購買土力工程處刊物(地質圖及免費刊物除外):**

書面訂購
香港中環花園道
美利大廈4樓402室
政府新聞處
刊物銷售組
傳真: (852) 2598 7482

或
- 致電政府新聞處刊物銷售小組訂購 (電話：(852) 2537 1910)
- 進入網上「政府書店」選購，網址爲 http://bookstore.esdlife.com
- 透過政府新聞處的網站 (http://www.isd.gov.hk) 於網上遞交訂購表格，或將表格傳真至刊物銷售小組 (傳真：(852) 2523 7195)
- 以電郵方式訂購 (電郵地址：puborder@isd.gov.hk)

1:100 000, 1:20 000 and 1:5 000 maps can be purchased from:

Map Publications Centre/HK,
Survey & Mapping Office, Lands Department,
23th Floor, North Point Government Offices,
333 Java Road, North Point, Hong Kong.
Tel: 2231 3187
Fax: (852) 2116 0774

讀者可於下列地點購買1:100 000，1:20 000及1:5 000地質圖：

香港北角渣華道333號
北角政府合署23樓
地政總署測繪處
電話: 2231 3187
傳真: (852) 2116 0774

**Requests for copies of Geological Survey Sheet Reports, publications and maps which are free of charge should be sent to:**

For Geological Survey Sheet Reports and maps which are free of charge:
Chief Geotechnical Engineer/Planning,
(Attn: Hong Kong Geological Survey Section)
Geotechnical Engineering Office,
Civil Engineering and Development Department,
Civil Engineering and Development Building,
101 Princess Margaret Road,
Homantin, Kowloon, Hong Kong.
Tel: (852) 2762 5380
Fax: (852) 2714 0247
E-mail: jsewell@cedd.gov.hk

For other publications which are free of charge:
Chief Geotechnical Engineer/Standards and Testing,
Geotechnical Engineering Office,
Civil Engineering and Development Department,
Civil Engineering and Development Building,
101 Princess Margaret Road,
Homantin, Kowloon, Hong Kong.
Tel: (852) 2762 5345
Fax: (852) 2714 0275
E-mail: ykhui@cedd.gov.hk

**如欲索取地質調查報告、其他免費刊物及地質圖，請致函：**

地質調查報告及地質圖:
香港九龍何文田公主道101號
土木工程拓展署大樓
土木工程拓展署
土力工程處
規劃部總土力工程師
(請交:香港地質調查組)
電話: (852) 2762 5380
傳真: (852) 2714 0247
電子郵件: jsewell@cedd.gov.hk

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土力工程處
標準及測試部總土力工程師
電話: (852) 2762 5345
傳真: (852) 2714 0275
電子郵件: ykhui@cedd.gov.hk

# MAJOR GEOTECHNICAL ENGINEERING OFFICE PUBLICATIONS
# 土力工程處之主要刊物

## GEOTECHNICAL MANUALS

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, 2000). |
| 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. |

## GEOSPECS

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| 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

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| 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. |

## 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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| TGN 1 | Technical Guidance Documents |


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