CORRELATIONS BETWEEN RAINFALL, LANDSLIDE FREQUENCY AND SLOPE INFORMATION FOR REGISTERED MAN-MADE SLOPES

GEO REPORT No. 144

Y.F. Yu

GEOTECHNICAL ENGINEERING OFFICE
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THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

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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 Department (http://www.ced.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 specific review. 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 last page of this report.

R.K.S. Chan
Head, Geotechnical Engineering Office
June 2004

FOREWORD

This Report describes a study of the correlation between rainfall, landslide frequency and slope information for registered man-made slopes.

Data on landslides reported to the GEO between 1984 and 2000, and rainfall values measured by the GEO automatic raingauges over the same period, have been used to establish various databases. Using information from the Slope Information System, correlations between landslide frequency, rainfall intensity and slope information for different types of man-made slopes have been developed.

This study was carried out by Dr Y.F. Yu under the supervision of the undersigned initially and later Mr N.C. Evans. Dr P.L.R. Pang and Mr Y.K. Shiu directed the project when they were CGE/SP respectively. A draft version of this Report was circulated within GEO and colleagues provided useful comments. All contributions, including those of technical officers Mr C.H. Chan and Mr C.K. Lee, who carried out the data collection and analysis, are gratefully acknowledged.

W.K. Pun
Chief Geotechnical Engineer/Special Projects

ABSTRACT

Statistical methods and database manipulation have been used to study the correlation between rainfall, landslide frequency and slope information for registered man-made slopes. The approach can be summarised as follows:

- Review rainfall, slope and landslide records.
- Establish databases of rainfall, slope information and landslide records.
- Using a sample of slopes for which comprehensive data are available, establish correlations between rainfall and landslide frequency for different classes of slopes.
- By applying the correlations to the total population of registered slopes in a study area for the period 1996-2000, estimate the number of landslides which would be expected for different slope classes under different rainfall conditions in the area.
- Assess the reliability of the correlations by comparing the number of actual failures with the number of failures estimated from the correlations.

The correlations for soil cut slopes, rock cut slopes, fill slopes and retaining walls appear to follow a semi-log relationship. Slope characteristics such as slope height and angle have a significant effect on the correlations. Based on the correlations, corresponding models have been proposed and used to predict the number of landslides expected for the selected rainstorms in the years 1984 to 2000. The assessment of the expected numbers of landslides shows that the numbers of landslides predicted by the proposed models are reasonably close to the actual numbers of landslides, especially for the soil cut slopes. Uncertainties in the models include errors in the estimation of rainfall intensities by interpolation, and improvement of slopes under the LPM, maintenance and development programmes. It is therefore recommended that the correlations and the landslide prediction models are kept under review.

CONTENTS

1. OBJECTIVE

The objective of this study is to investigate the correlations between rainfall, landslide frequency and slope information for registered man-made slopes.

2. APPROACH

The following approach has been adopted:

(a) Review rainfall, slope and landslide records.

(b) Establish databases of rainfall, slope information and landslide records.

(c) Using a sample of slopes for which comprehensive data are available, establish correlations between rainfall and landslide frequency for different classes of slopes.

(d) By applying the above correlations to the total population of registered slopes for the period 1984-2000, estimate the number of landslides which would be expected for different slope classes under given rainfall conditions.

(e) Compare the actual numbers of landslides with the numbers predicted in order to check the validity of the correlations.

3. DATABASES

3.1 Rainfall

Hong Kong-wide automatic raingauge data have been available since 1984, when the GEO raingauge system was commissioned. The analyses in this Report use these data.

Rainstorm events with a maximum rolling 24-hour rainfall exceeding 50 mm recorded at the Hong Kong Observatory were identified. These rainstorms were chosen because they included all the large rainstorm events and could be readily identified from the GEO Annual Rainfall and Landslide Reports. There were 184 rainstorms of this nature during the period 1984 to 2000, with heavy rain during each storm lasting up to about 5 days (about 2 days on average). Rainfall data from these events were retrieved from the GEO raingauge system database compiled from the GEO automatic raingauges.

For each rainstorm event, the maximum rolling 24-hour rainfall values were calculated for each raingauge. The rolling 24-hour rainfall has previously been found to correlate reasonably well with observed landslide densities (Premchitt, 1985; Pun et al, 1999).

3.2 Slopes

Information on catalogued man-made slope features, based on the digital data available in the GEO Slope Information System (SIS) (Lam et al, 1998), as of January 2000, was used to establish a slope database (a breakdown of the slope feature types and numbers is shown in Figure A1 in Appendix A). Slopes are classified as pre-1978 or post-1978 features based on whether the feature was formed or substantially modified on or before 30 June 1978 (when the geotechnical checking system was first implemented). For this study, no attempt is made to identify whether the features which are post-1978 are checked and accepted by the GEO or not. Such data are not readily available.

The slopes in the database are separated into four groups: soil cut slopes (Soil Cut), rock cut slopes (Rock Cut), fill slopes (Fill) and retaining walls (Wall). A feature is classified as a Rock Cut if its material description in the SIS database is rock only. Mixed features such as a cut or fill slope with a retaining wall (CR and FR features) have been assigned to one of the groups to avoid double counting. Where the associated retaining wall was equal to or greater than 3 m and comprised over 50% of the total feature height, the feature was grouped under "Wall".

Instability Scores (IS), which are part of the New Priority Classification System (NPCS) (Wong, 1998), were obtained from the SIS for the pre-1978 features, and slope geometry classes were obtained for both the pre-1978 and post-1978 features (see Figure A2 in Appendix A). NPCS scores are available for most of the slope features formed before 1978 (about 78% of soil cut slopes, 92% of rock cut slopes, 89% of retaining walls, and 82% of fill slopes formed before 1978). The IS and slope geometry classes were used in the exercises to correlate landslide frequency with rainfall (see Section 5). Only a relatively small proportion (10%) of pre-1978 and post-1978 slope features have no slope geometry information. As the data collection for the establishment of the major part of the SIS was in the period 1995 to 1997, the IS and slope geometry classes reflect the conditions of the features at that time. The period 1984 to 1995 has been used to establish the rainfall/landslide correlations.

3.3 Landslides

A landslide database was established based on GEO's landslide records (Chan et al, 1998). A total of 6,290 landslide incidents were reported to GEO during the period 1984 to 2000 inclusive.

Landslides with more than one incident number (i.e. multiple reports of a single event) were counted once only. Incidents which were not genuine landslides (e.g. fallen trees, construction site/quarry accidents, etc) and incidents with inadequate information (e.g. incident reports with no location information) were screened out.

The remaining incidents (5,820 in number or 93%) were taken to be genuine landslides. Of these, only those landslides with a known date of occurrence at slope features registered in the SIS and identifiable as soil cut, rock cut, fill or retaining wall were considered in this study (a total of 2,158 or 37%). The size of these landslides ranges from a few cubic metres to about one hundred thousand cubic metres (Lai Ping Road, Kau To Shan, Sha Tin). Size

distribution of these 2,158 landslides is as follows: 91.5% or 1,975 incidents < 50 m^3; 7.3% or 157 incidents within 50-500 m^3; 1.0% or 21 incidents within 500-2,000 m^3; 0.1% or 3 incidents within 2,000-10,000 m^3 and 0.1% or 2 incidents > 10,000 m^3. These landslides form the project dataset. The incidents rejected are mainly those involving slopes without a feature number (38%, e.g. natural slope failures, failures at unregisterable slopes), slopes with a feature number but not yet included in the SIS (8%), and slope failures with no known date of occurrence (9%) (see Figures A3 and A5 to A8 in Appendix A).

For each selected rainstorm, landslides at SIS slope features which were reported to have occurred within the rainstorm period (as given in the relevant GEO Annual Rainfall and Landslide Report, plus a further two days) were attributed to that rainstorm (a total of 1,890 out of the 2,158 landslides, see Table B1 in Appendix B). Landslides which occurred outside the rainstorms considered were discarded (12% of the total, see Table 1). A review of the data in the landslide database indicated that most landslides with known date of occurrence which occurred outside the rainstorms considered were mostly failures relatively minor in scale, some of which were triggered by events other than rain (e.g. bursting of water main).

Some rainstorms overlap into the next rainstorm. In such cases, the two rainstorms were combined into a single event and landslides which occurred within this period and the following two days were attributed to the combined event.

Table 2 presents a breakdown of landslides at SIS features under the different slope feature types. The data were separated into two groups: landslides which occurred in the period 1984 to 1995 (1,339 in total), and those which occurred from 1996 to 2000 (551 in total). Data from the period 1984 to 1995 were used for the establishment of the correlation models, and data from the period 1996 to 2000 were used for assessment of the correlation models for different slope feature types (see Section 6).

4. CORRELATION

4.1 Study Area

The study area chosen covers the whole of Hong Kong Island, Kowloon and the New Territories, but excludes Lantau and the other outlying islands (Figure 1). This area was selected because it has good raingauge coverage and contains a high proportion of the man-made slopes registered in the SIS (89%, and 1,622 out of the 1,890 landslides, i.e. 86%, at SIS features occurred within this area). The study area was divided into 681 map cells each having a plan area 1.5 km by 1.2 km (following the gridding system used by Lands Department for their 1:1 000 scale maps). Figure 1 shows the approximate locations of the 1,160 landslides in the project (dataset) which occurred within the study area during the period 1984 to 1995, and Figure 2 shows the approximate locations of the 462 landslides during the period 1996 to 2000 which occurred within the study area.

4.2 Rainfall

The maximum rolling 24-hour rainfall was evaluated for all the GEO raingauges for all the rainstorms considered. These data were then used to derive the maximum rolling

24-hour rainfall values for each map cell in the Study Area during each rainstorm by interpolation, using the contouring function of the computer software "SURFER". In the urban area of Hong Kong Island and Kowloon, the centres of the map cells are usually within 1 to 2 km of a raingauge.

4.3 Slope and Landslide Data

Figures A3 to A8 in Appendix A show the distribution of SIS slope features in the Study Area, and the landslides affecting these features during the studied rainstorms.

Within the Study Area, 1,479 (73%) of reported pre- or post-1978 soil cut slope failures have a known date of occurrence and, of these, 1,324 (90%) occurred during the studied rainstorms. The equivalent figures for pre- or post-1978 rock cut slope failures are 163 (81%) and 117 (72%); for pre- or post-1978 fill slope failures 146 (68%) and 118 (81%); and for pre- or post-1978 retaining wall failures 83 (73%) and 63 (76%). Of the 1,622 landslides at pre- or post-1978 SIS features within the Study Area, 1,324 (81.6%), 117 (7.2%), 118 (7.3%) and 63 (3.9%) affected soil cut slopes, rock cut slopes, fill slopes and retaining walls respectively.

The number of major failures (landslide volume ≥ 50 m^3; pre- or post-1978 features) within the Study Area affecting soil cut slopes, rock cut slopes, fill slopes and retaining walls is respectively 143, 11, 37 and 4, in which correspondingly 111 (78%), 11 (100%), 25 (68%) and 2 (50%), have a known date of occurrence. For the major failures (pre- or post-1978 features) with a known date of occurrence, 103 (93%) of soil cut slope, 9 (82%) of rock cut slope, 19 (76%) of fill slope and 2 (100%) of retaining wall occurred during the studied rainstorms.

4.4 Analysis of Rainfall and Landslide Data

In each map cell the slope features contained in the SIS were separated into classes based on slope geometry. Soil cut slopes were classified based on a combination of height and angle (see Figure A2). Height was used to classify rock slopes and retaining walls. Slope angles was used to classify fill slopes. For soil cut slopes, the features were also classified using their Instability Score assigned under the NPCS. The numbers of features in each slope class were then counted (also see Tables A1 to A4 in Appendix A).

For each of the 184 rainstorms between 1984 and 2000 inclusive, the appropriate rainfall class based on the maximum rolling 24-hour rainfall during the storm was determined for each map cell and assigned to all of the features in the cell. The rainfall classes used are 0-50 mm, > 50-100 mm, > 100-150 mm, > 150-200 mm, > 200-250 mm, > 250-300 mm, > 300-350 mm, > 350-400 mm, > 400-450 mm and > 450 mm. For each feature, it was determined whether or not failure had occurred, for each rainstorm that happened within the above period.

This process was repeated for all the map cells in the Study Area. The data from the entire Study Area were then combined. Given these data it is possible to determine the number of times that each slope class was subjected to a rainstorm of a particular maximum

rainfall class, together with the number of failures that resulted (see Tables A1 to A4 in Appendix A). Using the data from 1984 to 1995 (see Section 3.3), the frequency of failure during rainstorms with different maximum rainfall classes was determined for each slope class.

This analytical procedure is summarised in Figure 3.

The correlation between frequency of failure during a given rainstorm, and the maximum rainfall class reached during that rainstorm, appears to follow a semi-log relationship. The correlations using the data from 1984 to 1995 for the various slope classes are shown in Figures 4 to 7 (see Tables A1 to A4 and Figures A9 to A16 in Appendix A for details).

The main assumption made in this analysis is that there is a statistical link between the frequency of slope failure in a given rainstorm and the maximum rolling 24-hour rainfall during that storm. It is not claimed that the maximum rolling 24-hour rainfall is the direct cause of individual observed landslides. Landslides might occur before or after this peak value is reached. The times of occurrence of the landslides in the dataset are only known to within one day. About 19% of the landslides apparently occurred on the days before the maximum rolling 24-hour rainfall was reached. About 62%, 10% and 9% of landslides occurred on the same day as the rolling 24-hour rainfall peak was reached, on the following day/days but within the rainstorm period and within 2 days after the rainstorm periods, respectively. The maximum rolling 24-hour rainfall is used as a convenient parameter with which to characterise the intensity of rainfall and the frequency of failure of the slope population in any given rainstorm. The observed correlations appear to support this hypothesis. Note that there may occasionally be unusual rainstorms in which the maximum rolling 24-hour rainfall is not a good indicator of the landsliding potential, e.g. a rainstorm with a very long duration such that the maximum rolling 24-hour rainfall is not particularly high but the total amount of rainfall is large. In these situations the general correlations may break down.

5. RESULTS OF ANALYSIS AND DISCUSSION

For the population of soil cut slopes, the landslide frequency (in log scale) increases approximately linearly with rainfall intensity between 50 mm to 350 mm per 24 hours (see Figure 7a). The correlation coefficient is about 0.9 on average. For the pre-1978 soil cut slopes, both the IS score class and slope geometry class are able to separate the data into four distinct groups, although there is some overlap between different classes due to the scatter of the data. There seems to be a limiting value of approximately 1% landslide frequency at high rainfall intensities (maximum rolling 24-hour rainfall > 350 mm). There are relatively few data where the rainfall intensity exceeds 400 mm, giving a low reliability in the correlation at and beyond such an intensity range.

The IS score class does not appear to offer any distinct improvement in the correlation over the slope geometry class, and as slope geometry data are available for the majority of the SIS soil cut slopes it was decided not to use the IS score classes for subsequent work.

Pre-1978 rock cut slopes, fill slopes and retaining walls have a similar trend to soil cut

slopes (see Figures 5a to 5d). Due to the small amount of data available for correlation, the trends shown in Figures 6 and 7 for post-1978 features should be treated with caution.

There appears to be relatively little difference between the pre- and post-1978 failure rates. However, it should be noted that comparison of the statistics of pre- and post-1978 slopes should be treated with caution because the post-1978 slopes have not been screened in this study to confirm that the features have been checked and accepted by the GEO.

A similar exercise was carried out to examine the frequency of 'major' landslides (defined as those with a failure volume ≥ 50 m^3). The results are given in Figure 7 (see Tables A4c, A4f, A4i and A4l in Appendix A for details). It can be seen that the frequency of major landslides is approximately an order of magnitude smaller than that of all landslides. There are insufficient data to compare major failure frequencies under different rainfall conditions pre- and post-1978. Due to the lack of data, there are no obvious trends for major landslides at rock cut slopes and retaining walls. Amongst the major landslides at soil cut slopes and fill slopes, 27% and 26% respectively involve post-1978 slopes. However, no major rain-induced failure has been recorded for post-1978 rock cut slopes and pre-1978 retaining walls.

6. ASSESSMENT OF THE CORRELATION MODELS

The landslide data from 1984 to 2000 were used to assess the correlation models developed in Section 4.4 (see Appendix C for details). Two types of model were used, one with the effects of slope geometry, and one without. As shown in Figures 5 and 6, the effect of slope geometry on landslides at soil cut slopes can be easily identified but this is not the case for landslides at rock slopes, fill slopes and retaining walls. It should be noted that the correlation models assume that the slope geometries during the period 1984 to 1995 were as measured during 1996 to 1998 when the SIS was commissioned. As shown in Figure 8, the correlation models were used to calculate the expected numbers of landslides for the selected rainstorms experienced in the period 1984 to 2000. The expected numbers of landslides were then compared with the corresponding actual numbers of genuine landslides.

The expected numbers of landslides calculated were plotted against the corresponding actual numbers of landslides. The results are given in Figures 9 to 14. The plots were separated into two main groups: one for the period 1984 to 1995 and the other for the period 1996 to 2000. They are used to examine whether there is any difference between the condition of slopes before and after 1995. The expected number of major landslides at rock cut slopes, fill slopes and retaining walls have not been calculated due to the small amount of data available. Therefore, only figures related to major landslides involving soil cut slopes were given.

For soil cut slopes, Figures 9 and 11 look similar irrespective of whether the models take account of slope geometry or not. Figures 9a and 11a show that the data cluster along the 45° line. This means that the expected numbers of landslides are highly correlated with those of actual landslides. Figures 9b and 11b show that the data shift slightly to the right of the 45° line, i.e. the expected number of landslides is larger than that actually occurred.

For rock cut slopes, fill slopes and retaining walls, Figures 12 to 14 show a weaker

correlation between the expected and actual number of landslides, as compared to that of soil cut slope. However, they all show slight right shifting of data for the period 1996 to 2000. It can also be observed that obvious errors exist in the prediction when its value is smaller than 1.

The right shifting of data and errors mentioned in the last section may be due to the uncertainties in the process of modelling. They include: data availability; changes in pattern of incident reporting behaviour; errors in the estimation of rainfall intensities by interpolation for map cells; uncertainties (scatter) in the correlation models; possible errors in attributing landslides to given rainstorms; the presence of a few 'delayed failures', i.e. those which occur beyond the rainstorm periods, even though rain induced; the assumption that 24-hour rainfall is always the best parameter for characterising a rainstorm; and slope modification under the LPM, maintenance and development programme.

7. CONCLUSIONS AND RECOMMENDATIONS

Based on a review of data on rainfall and landslides, a procedure has been developed for establishing correlations between rainfall, landslide frequency and slope information. The available data suggest that usable correlations exist between rainfall, landslide frequency and slope information for soil cut slopes, rock slopes, fill slopes and retaining walls. These correlations can be used to predict landslide numbers during a given rainstorm. There is also a potential in using the correlations to examine possible changes in the overall performance of groups of different types of slope.

The correlation models and procedures should be checked and improved with more recent rainfall and landslide data. It is recommended that a new set of correlation models be established using data from 1996 onward.

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LIST OF TABLES

Table 1 - Distribution of Genuine Landslides at SIS Slope Features

Year	Total No. of Reported Landslides in the Year	No. of Landslides with Known Date of Occurrence		No. of Landslides without Known Date of Occurrence		No. of Landslides which Occurred within the Rainstorm Periods[(1)]		No. of Landslides which Occurred Outside the Rainstorm Periods[(1)]	
1984	39	24	(62%)	15	(38%)	12	(50%)	12	(50%)
1985	73	58	(79%)	15	(21%)	42	(72%)	16	(28%)
1986	77	54	(70%)	23	(30%)	41	(76%)	13	(24%)
1987	117	94	(80%)	23	(20%)	78	(83%)	16	(17%)
1988	58	39	(67%)	19	(33%)	30	(77%)	9	(23%)
1989	321	277	(86%)	44	(14%)	253	(91%)	24	(9%)
1990	42	28	(67%)	14	(33%)	19	(68%)	9	(32%)
1991	44	27	(61%)	17	(39%)	18	(67%)	9	(33%)
1992	383	304	(79%)	79	(21%)	275	(90%)	29	(10%)
1993	363	298	(82%)	65	(18%)	280	(94%)	18	(6%)
1994	255	193	(76%)	62	(24%)	176	(91%)	17	(9%)
1995	171	129	(75%)	42	(25%)	115	(89%)	14	(11%)
Sub-total (1984-1995)	1943	1525	(78%)	418	(22%)	1339	(88%)	186	(12%)
1996	87	51	(59%)	36	(41%)	39	(76%)	12	(24%)
1997	195	165	(85%)	30	(15%)	152	(92%)	13	(8%)
1998	137	106	(77%)	31	(23%)	86	(81%)	20	(19%)
1999	232	205	(88%)	27	(12%)	186	(91%)	19	(9%)
2000	141	106	(75%)	35	(25%)	88	(83%)	18	(17%)
Sub-total (1996-2000)	792	633	(80%)	159	(20%)	551	(87%)	82	(13%)
Total (1984-2000)	2735	2158	(79%)	577	(21%)	1890	(88%)	268	(12%)

Note: (1) See Section 3.3 for definition of "rainstorm period". The percentages shown are with respect to the number of landslides with known date of occurrence.
(2) Genuine landslides at features with incorrect or no SIFT class information, removed after failure, of natural slope type, or failed before they are modified or new slope constructed are not included.

Table 2 - Distribution of Genuine Landslides at SIS Slope Features within Rainstorm Periods Based on Slope Feature Type

Year	Pre-1978 Features								Post-1978 Features			
	With NPCS Scores				Without NPCS Scores							
	Soil Cut	Rock Cut	Fill	Wall	Soil Cut	Rock Cut	Fill	Wall	Soil Cut	Rock Cut	Fill	Wall
1984-1995	626	65	42	43	292	16	16	5	189	3	31	11
1996-2000	302	42	26	14	70	4	10	0	71	2	9	1
Sub-total	928	107	68	57	362	20	26	5	260	5	40	12
Total	1160				413				317			

Notes: (1) Only genuine landslides the locations of which match with SIS features are counted.
(2) Landslides which occurred outside the rainstorm periods have been excluded (see Section 3.3).

LIST OF FIGURES

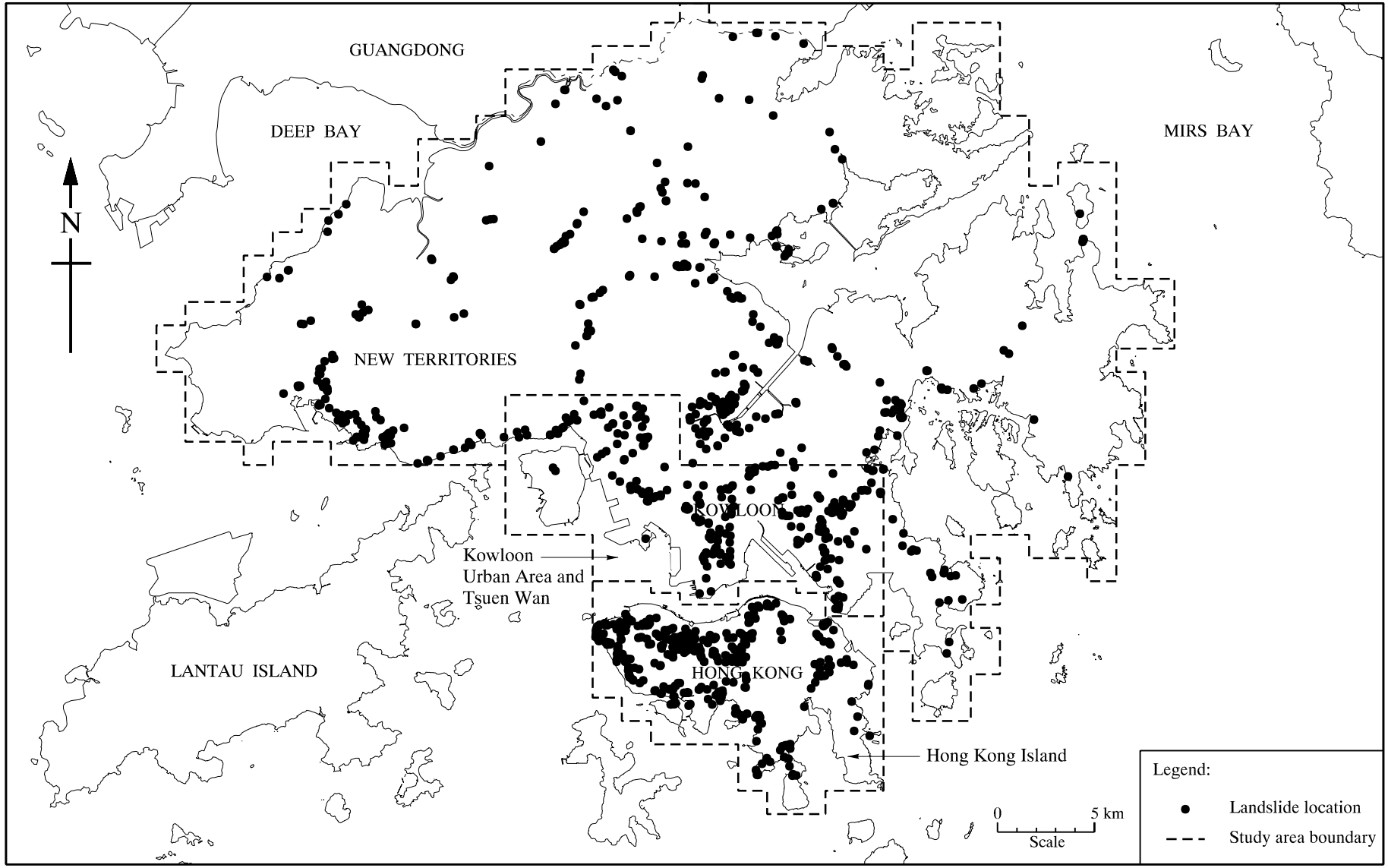


Figure 1 - Locations of Landslides in the Period 1984 to 1995

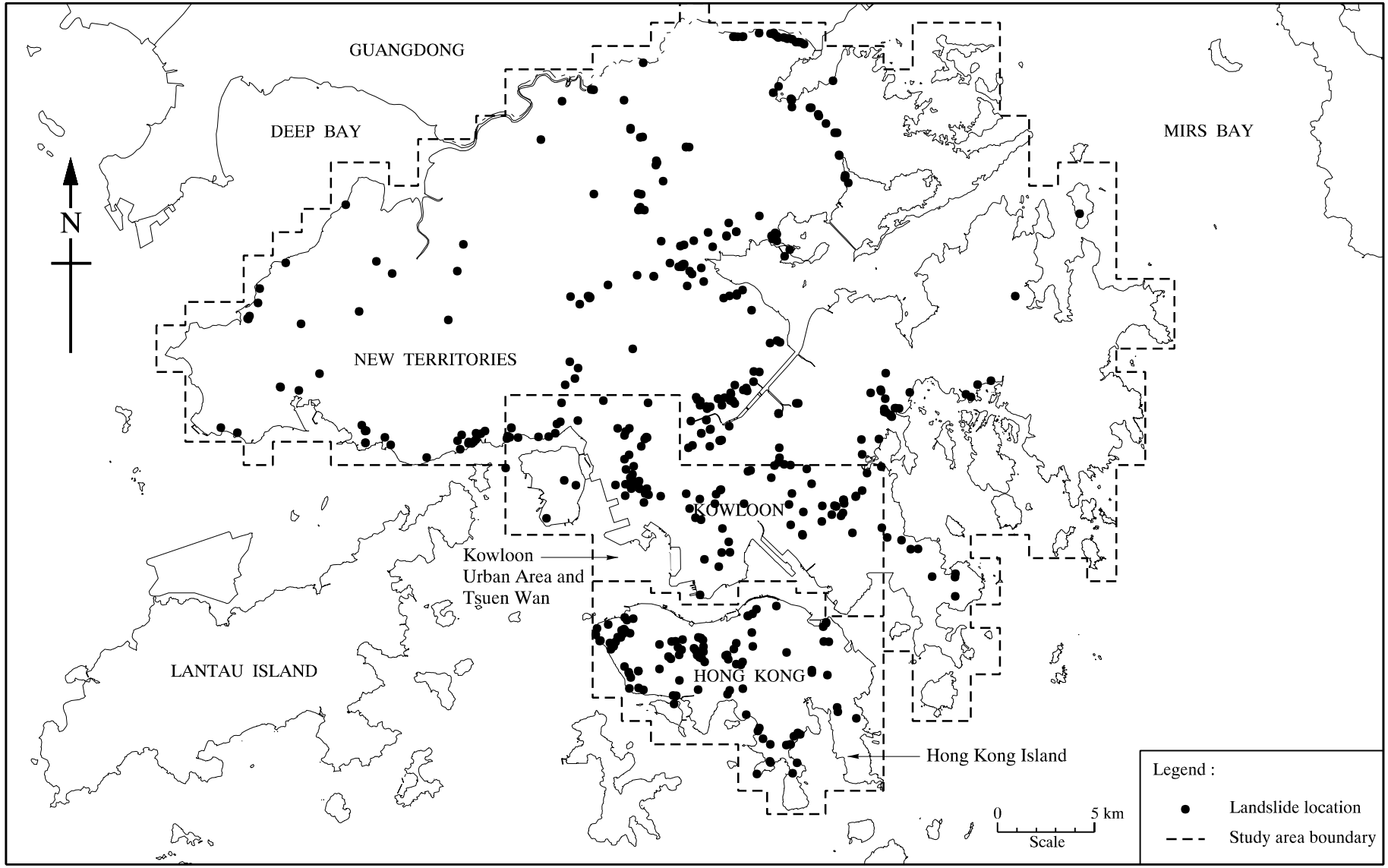


Figure 2 - Locations of Landslides in the Period 1996 to 2000

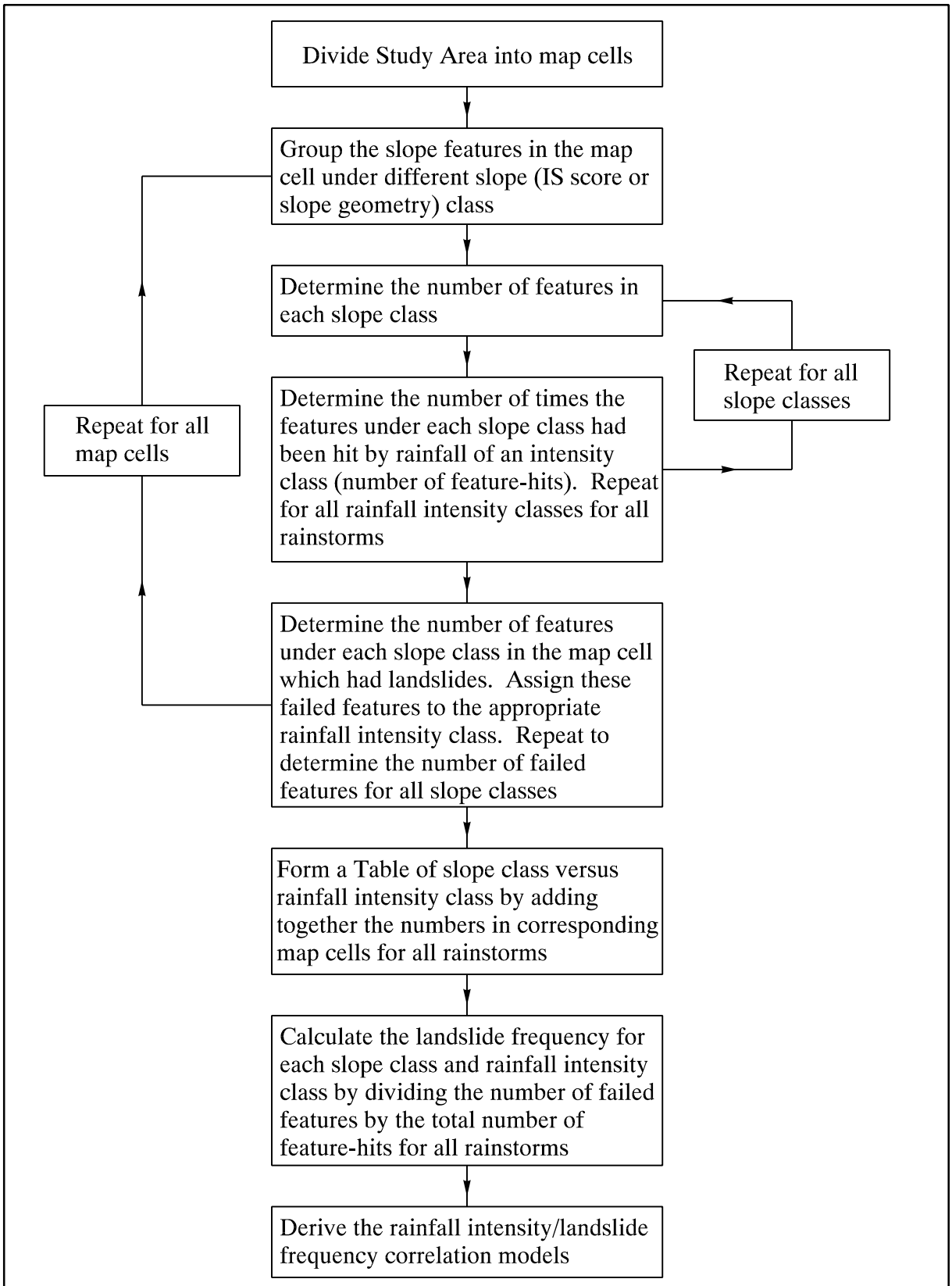
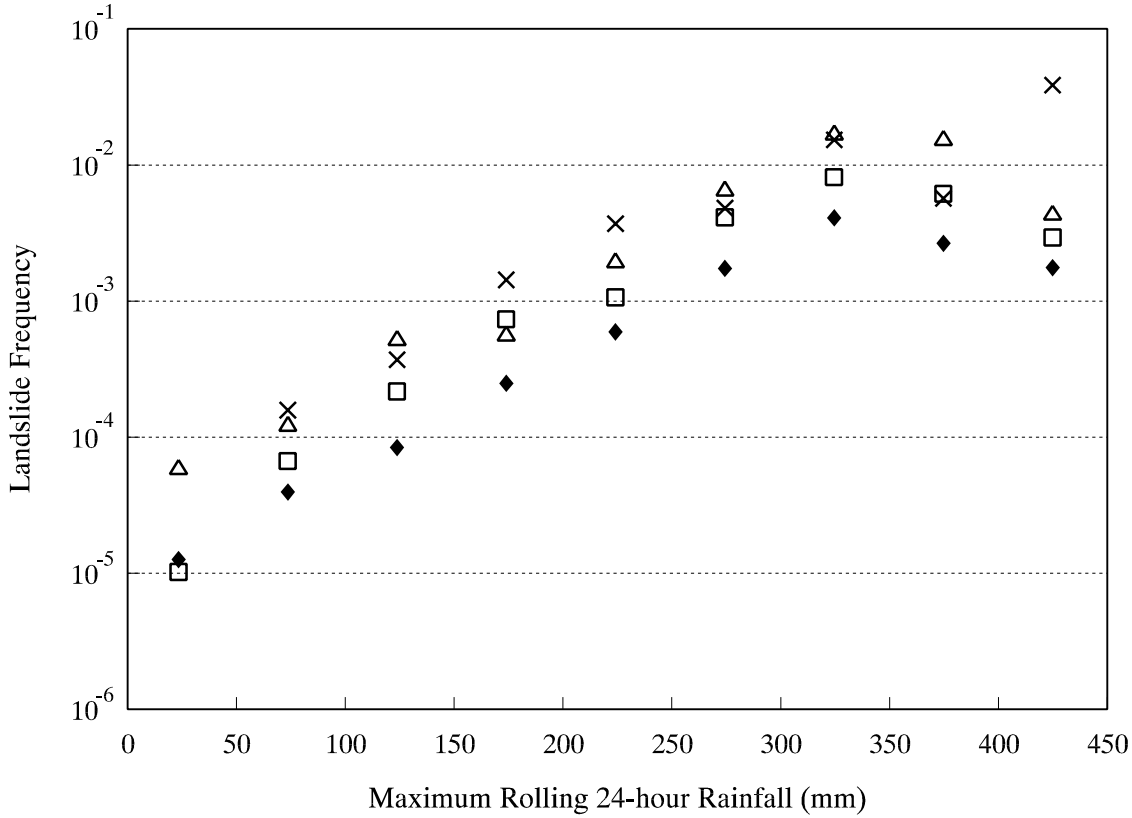


Figure 3 - Procedures for Deriving Rainfall Intensity/Landslide Frequency Correlation Models

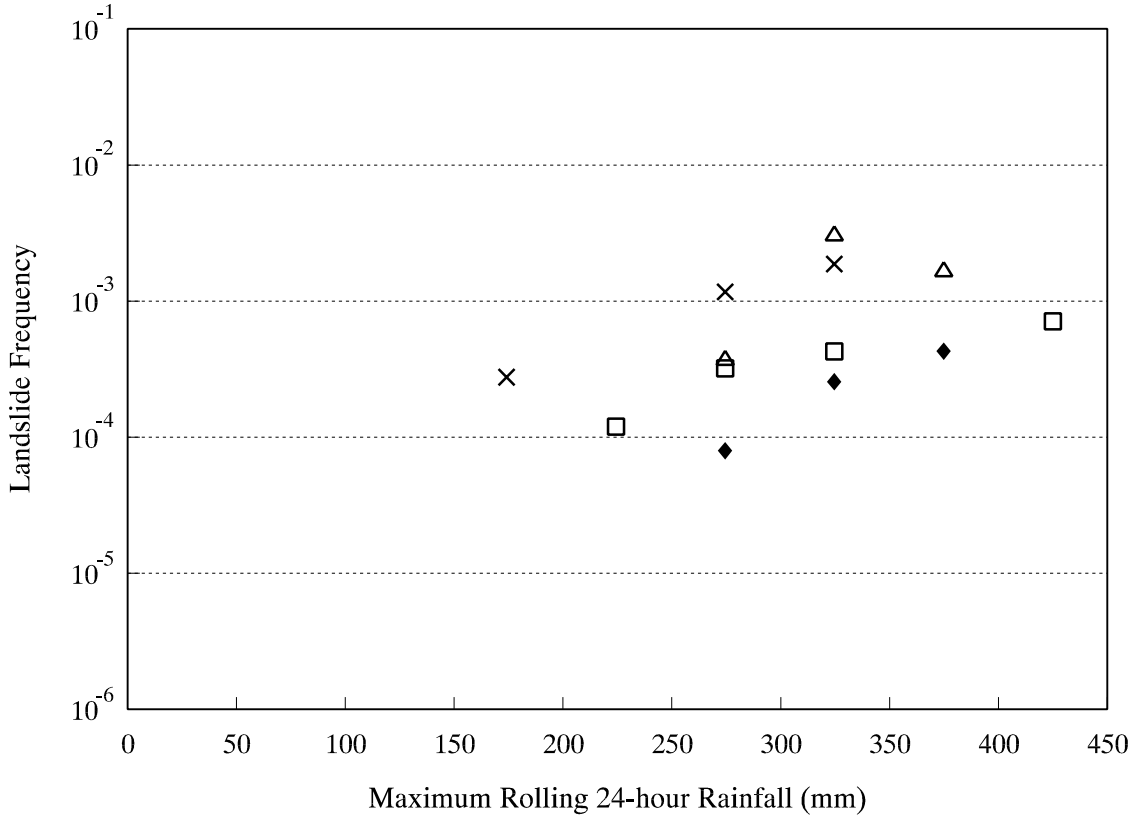


Legend:

♦	IS < 100	□	100 ⩽ IS < 150
△	150 ⩽ IS < 180	×	IS ⩾ 180

Note: For definition of IS Score (Instability Score), see Wong (1998).

Figure 4a - Rainfall Intensity/Landslide Frequency Correlation Based on IS Score Class for Pre-1978 Soil Cut Slopes

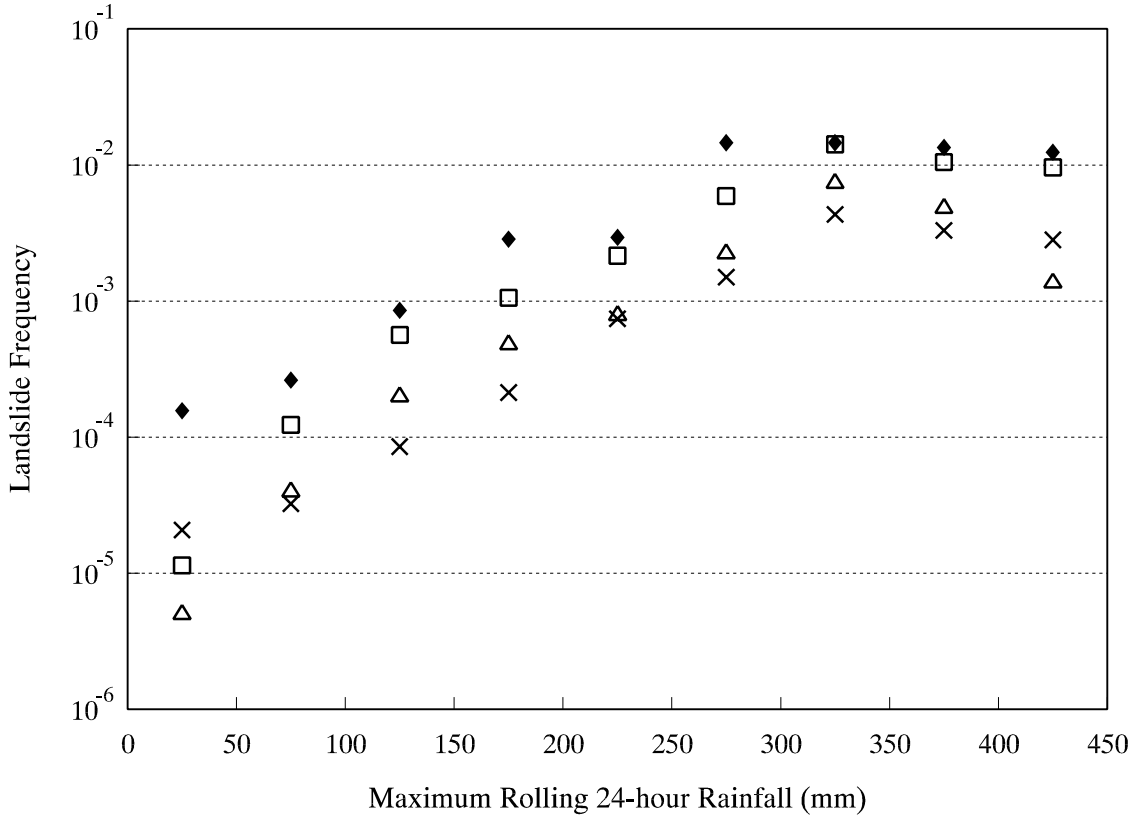


Legend:

♦	IS < 100	□	100 ⩽ IS < 150
△	150 ⩽ IS < 180	×	IS ⩾ 180

Note: For definition of IS Score (Instability Score), see Wong (1998).

Figure 4b - Rainfall Intensity/Major Landslide Frequency Correlation Based on IS Score Class for Pre-1978 Soil Cut Slopes



Legend:

♦ Slope Geometry Class S1	□ Slope Geometry Class S2
△ Slope Geometry Class S3	× Slope Geometry Class S4

Note: For slope geometry classes S1 to S4, see Figure A2.

Figure 5a - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (with and without NPCS Scores)

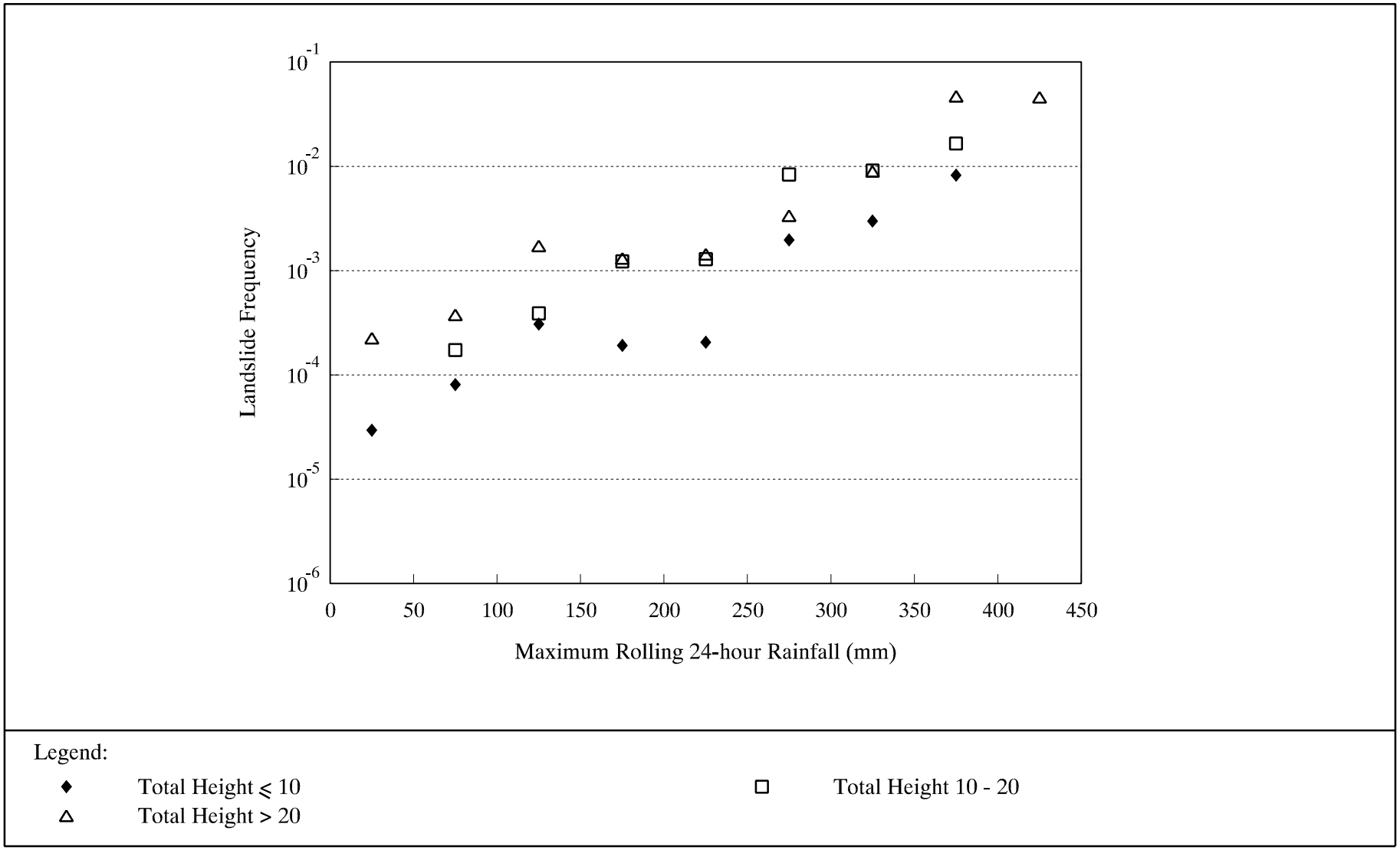


Figure 5b - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Rock Slopes (with and without NPCS Scores)

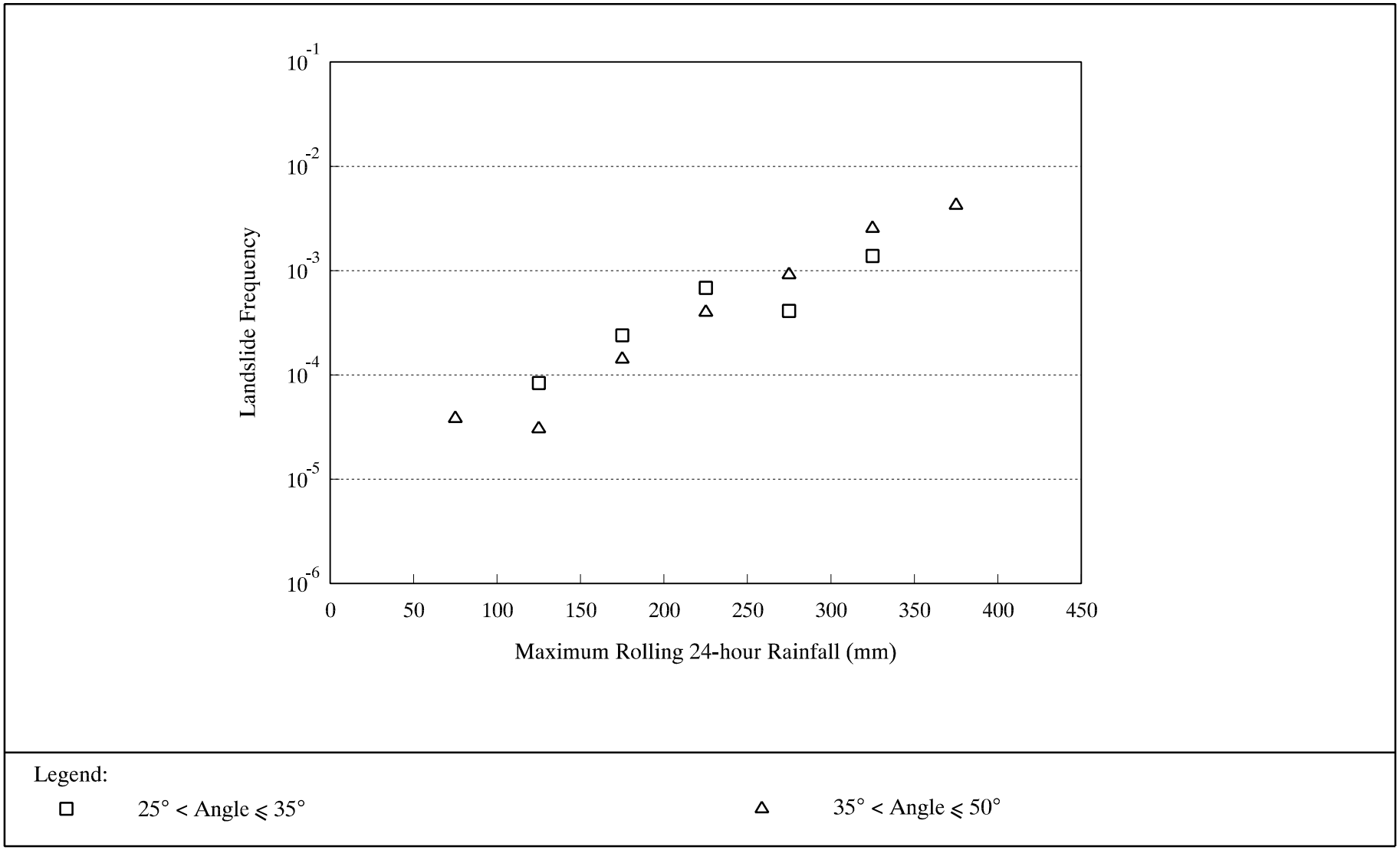


Figure 5c - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Fill Slopes (with and without NPCS Scores)

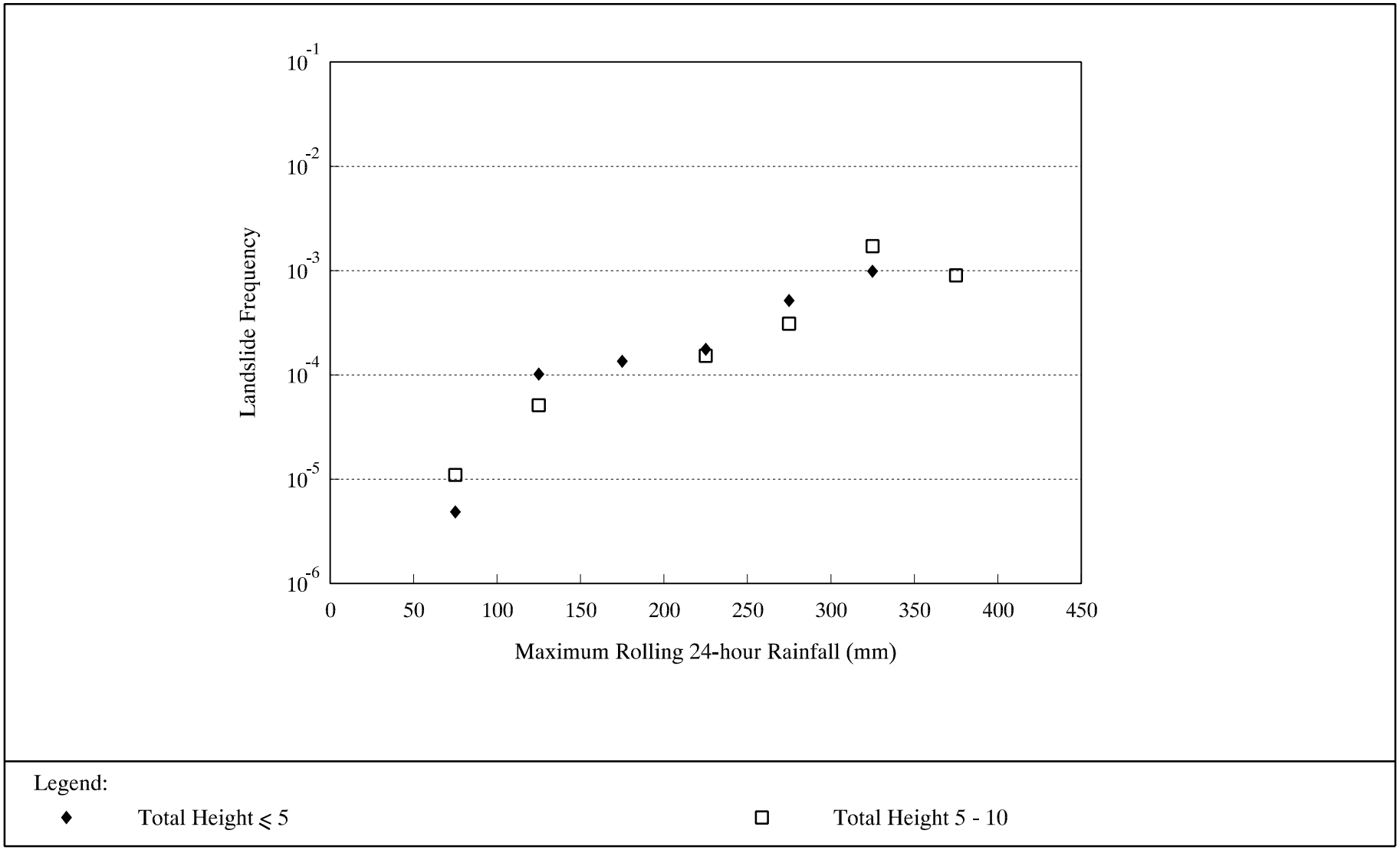
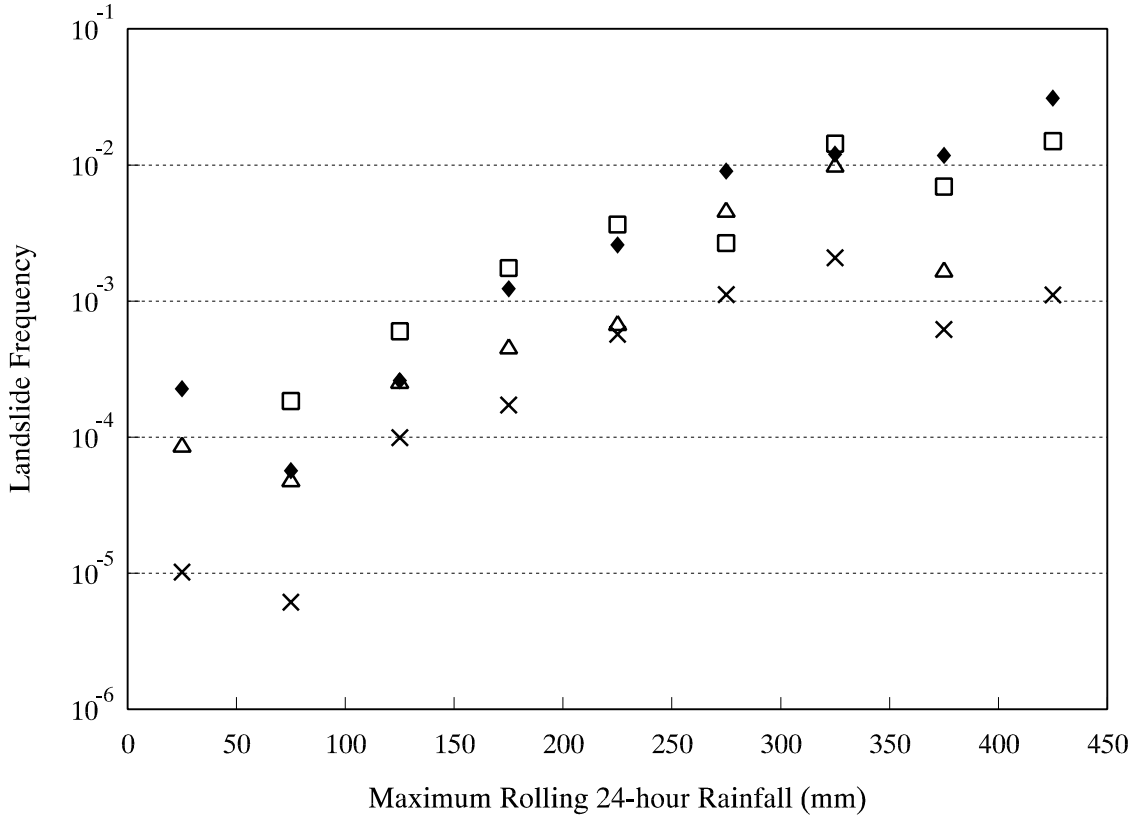


Figure 5d - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Retaining Walls (with and without NPCS Scores)



Legend:

♦	Slope Geometry Class S1	□	Slope Geometry Class S2
△	Slope Geometry Class S3	×	Slope Geometry Class S4

Note: For slope geometry classes S1 to S4, see Figure A2.

Figure 6a - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Soil Cut Slopes

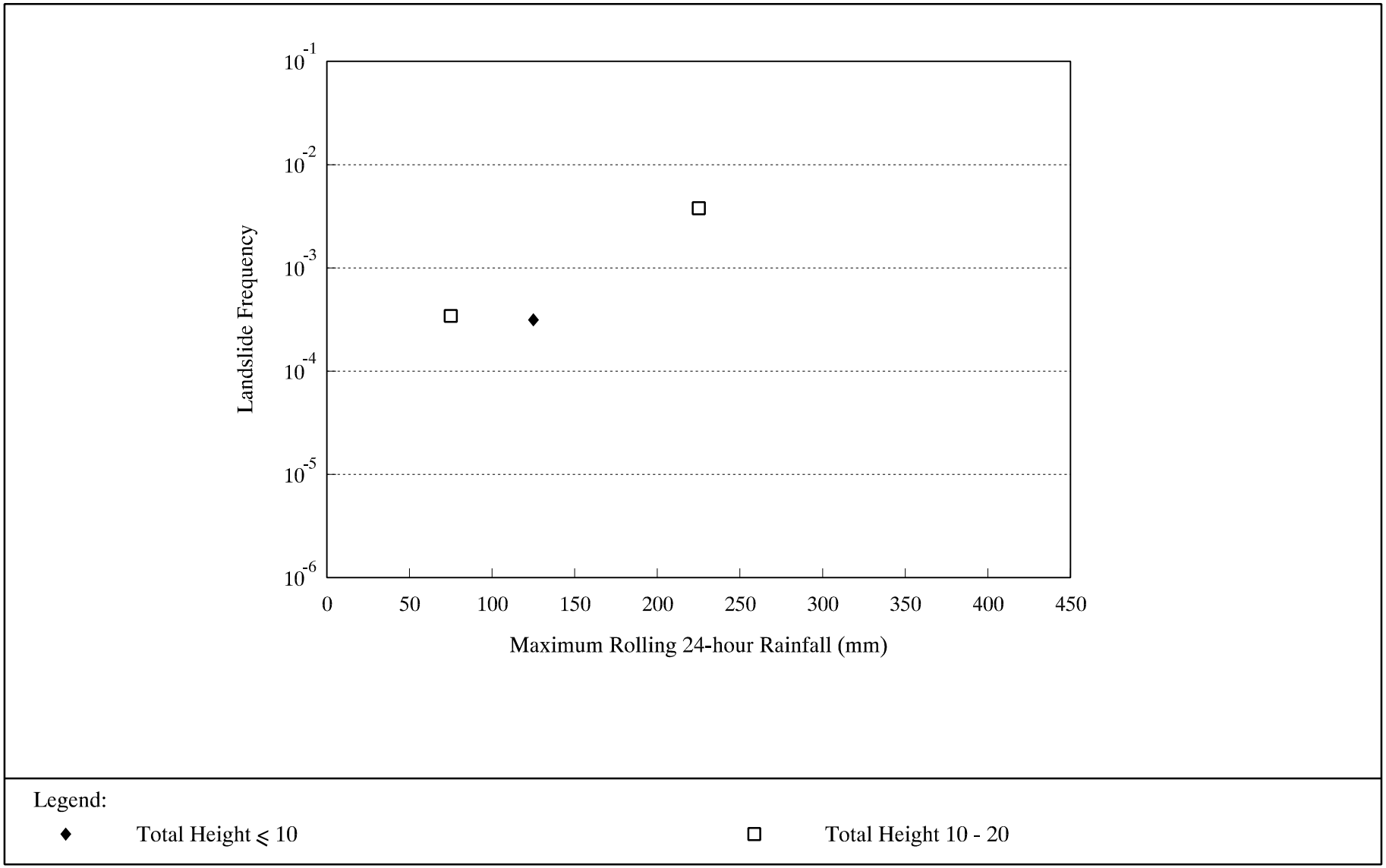


Figure 6b - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Rock Slopes

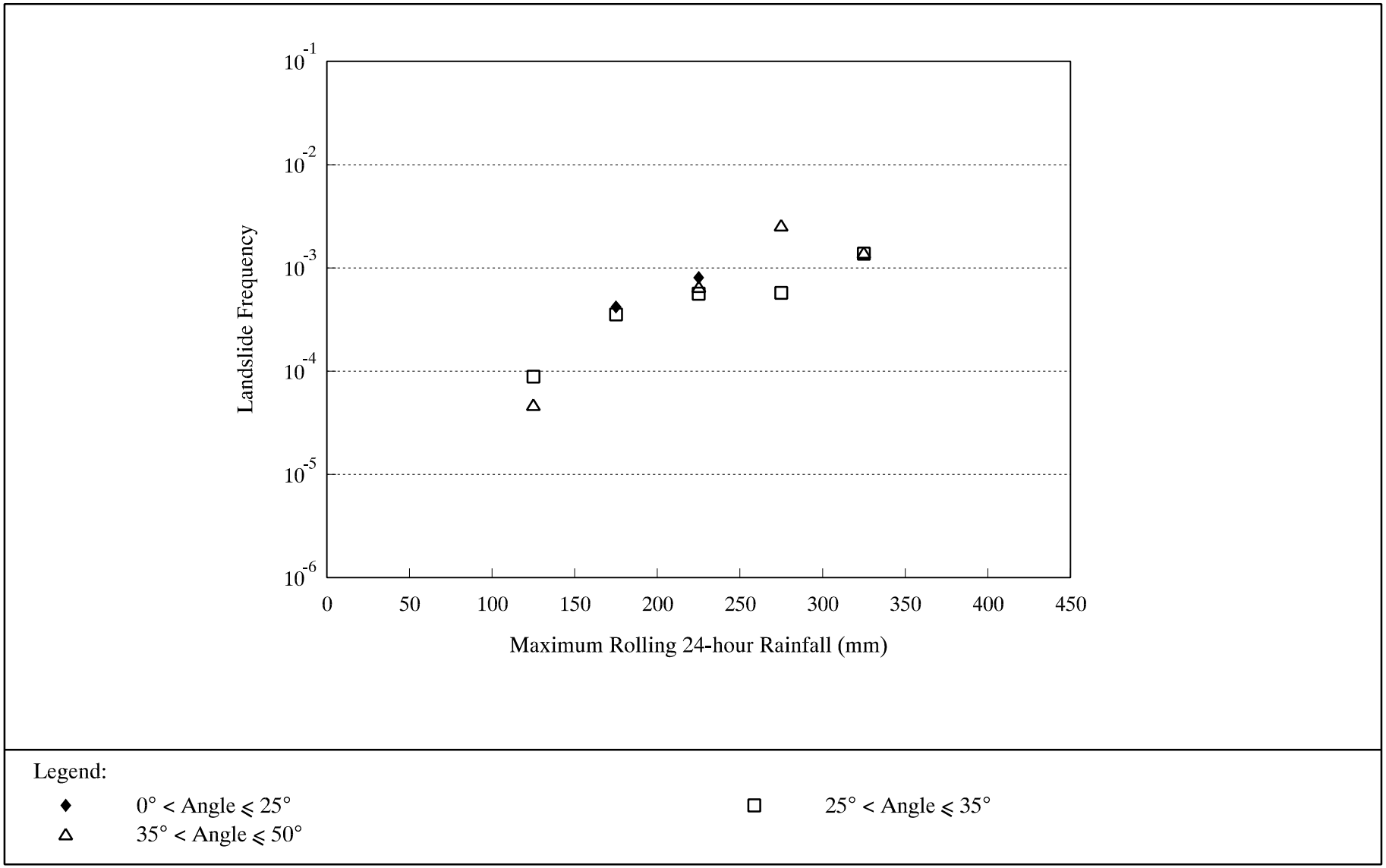


Figure 6c - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Fill Slopes

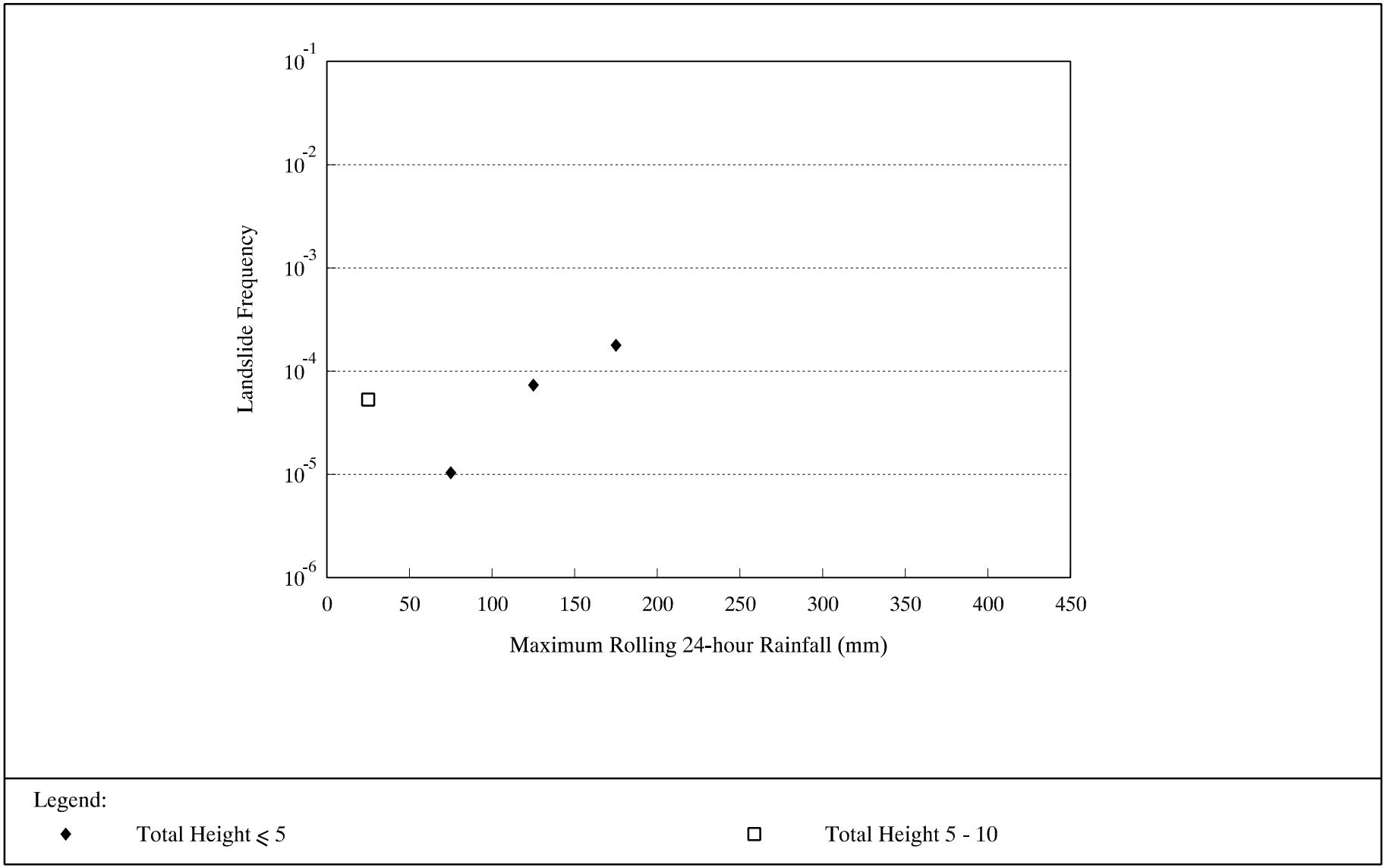


Figure 6d - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Retaining Walls

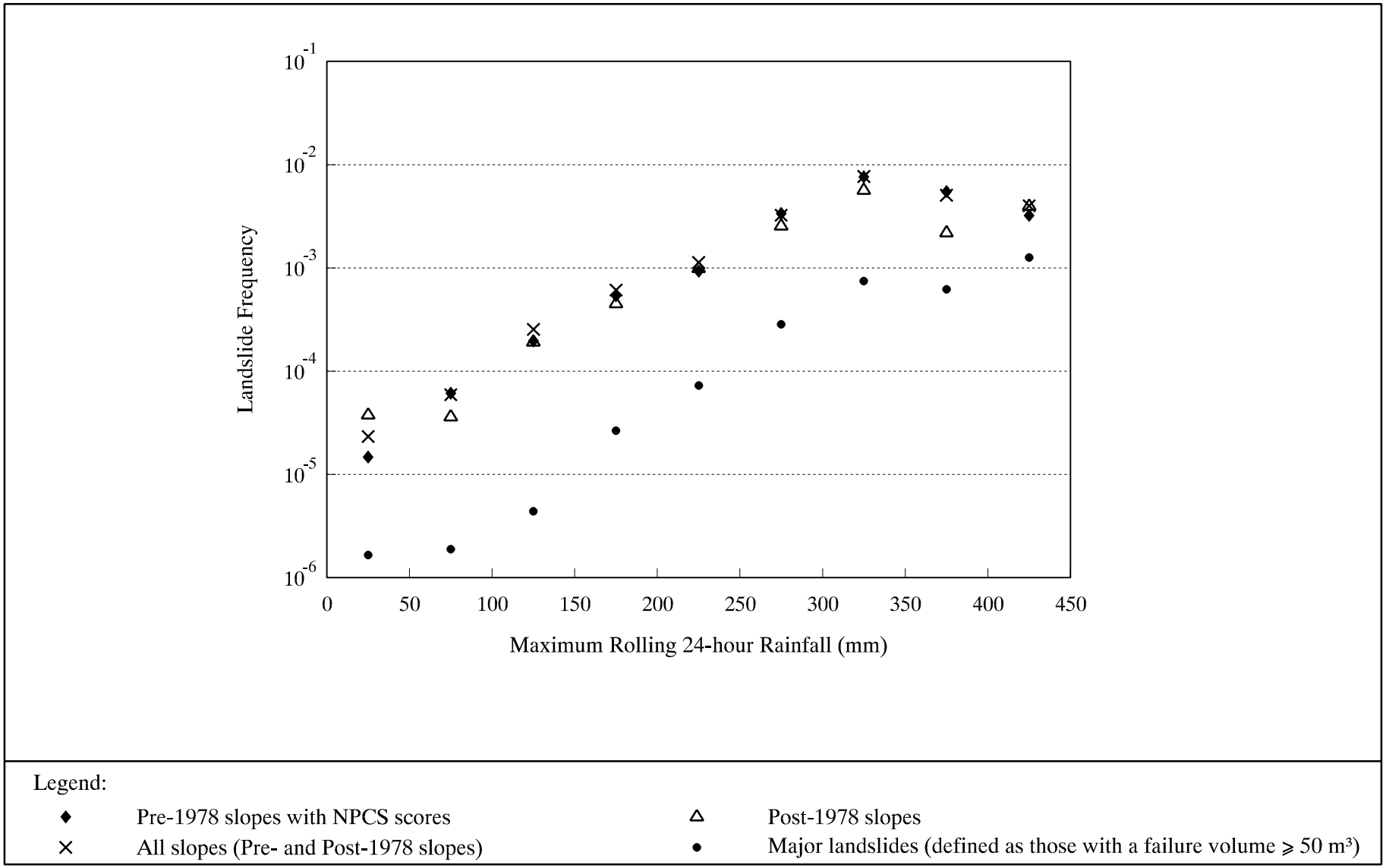


Figure 7a - Comparison of Rainfall Intensity/Landslide Frequency Correlation for Landslides at Different Types of Soil Cut Slopes

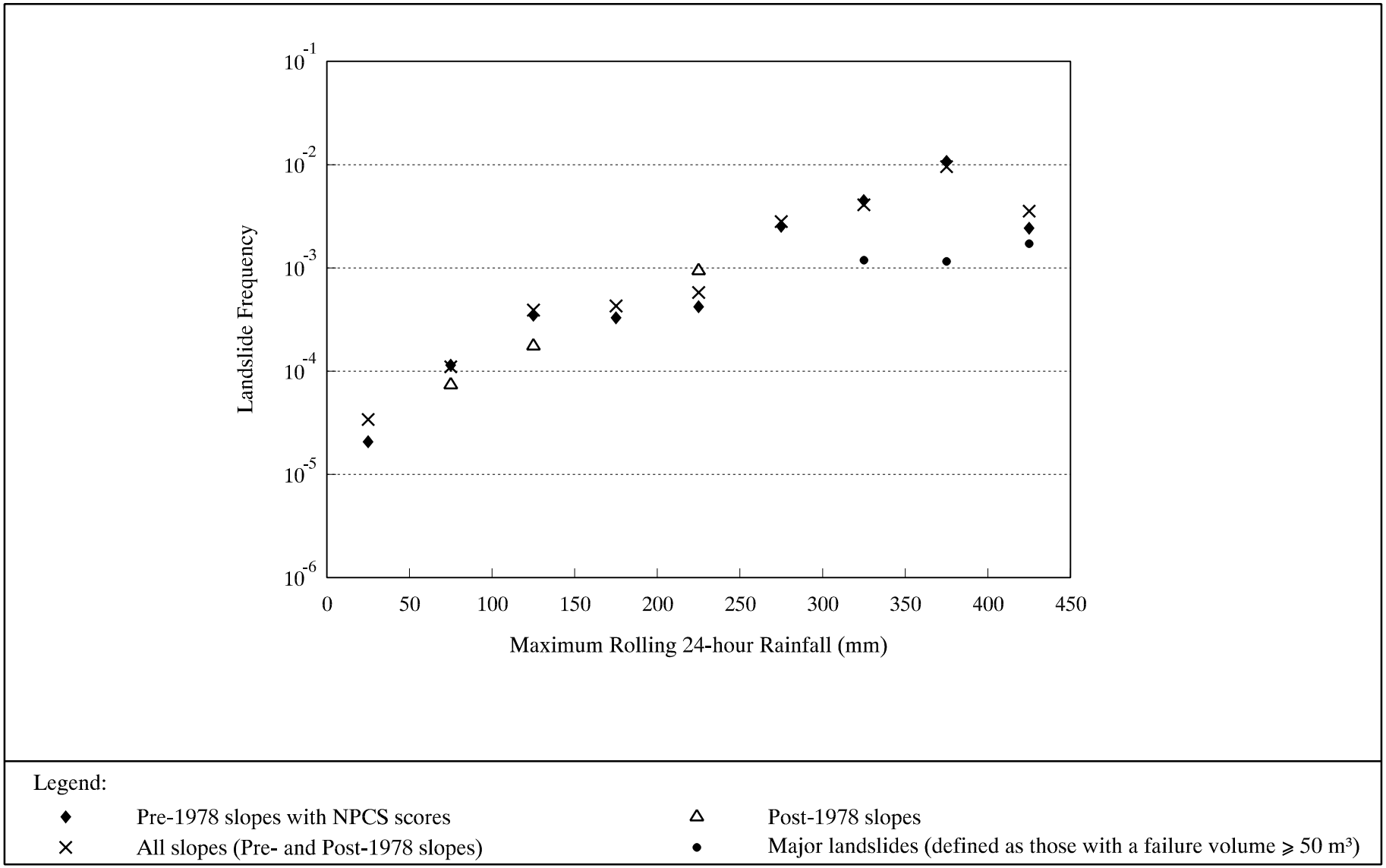


Figure 7b - Comparison of Rainfall Intensity/Landslide Frequency Correlation for Landslides at Different Types of Rock Cut Slopes

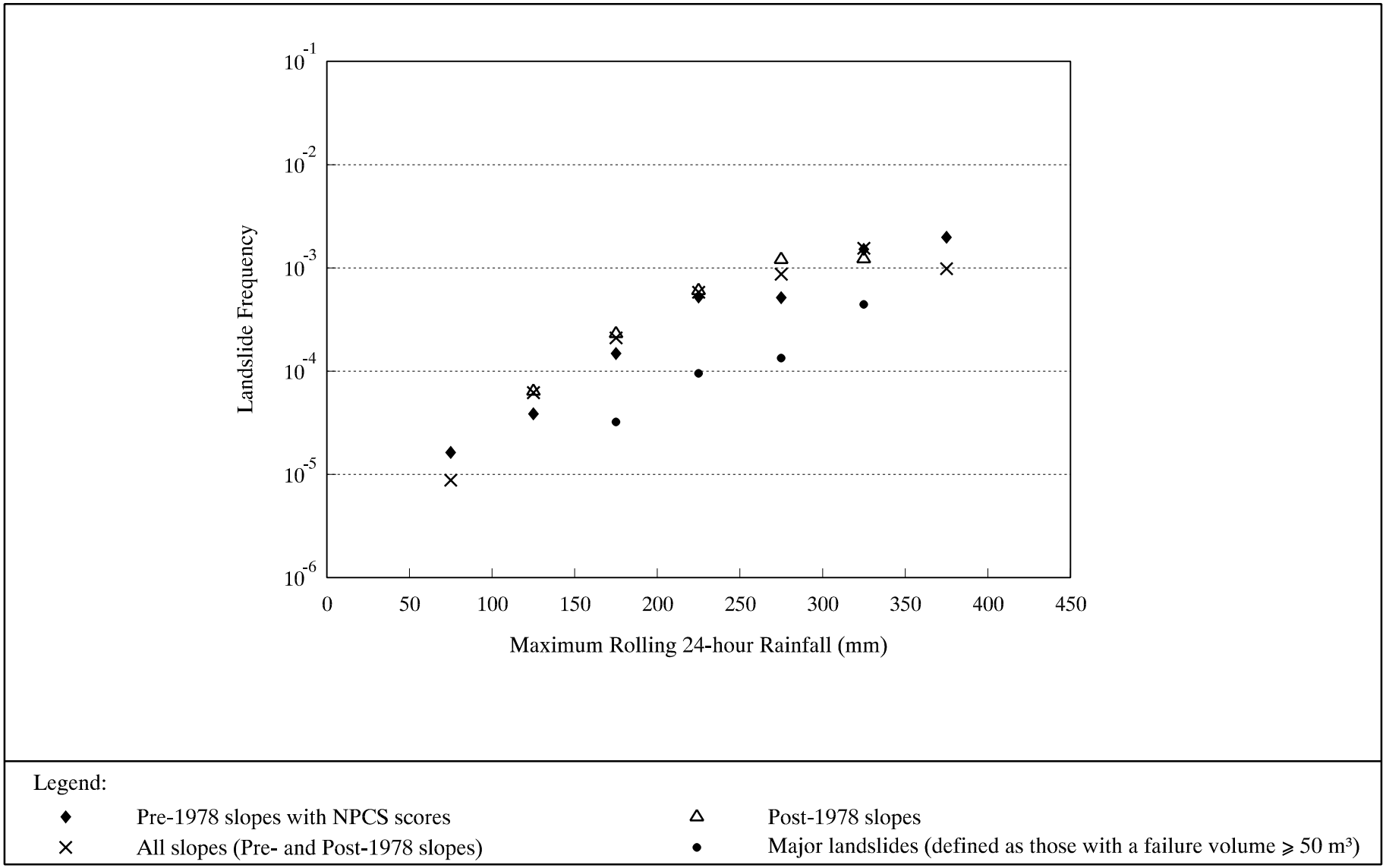


Figure 7c - Comparison of Rainfall Intensity/Landslide Frequency Correlation for Landslides at Different Types of Fill Slopes

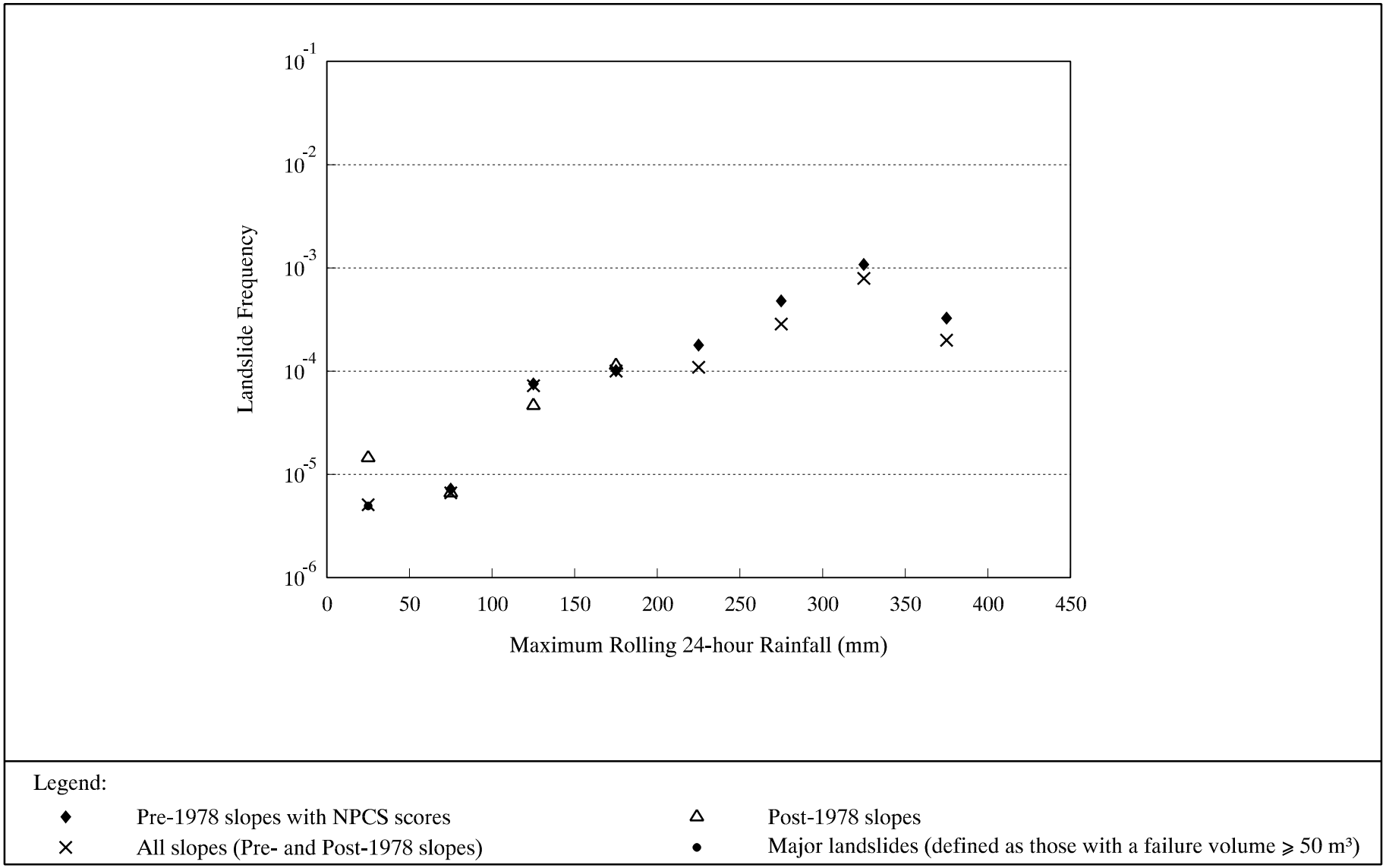


Figure 7d - Comparison of Rainfall Intensity/Landslide Frequency Correlation for Landslides at Different Types of Retaining Walls

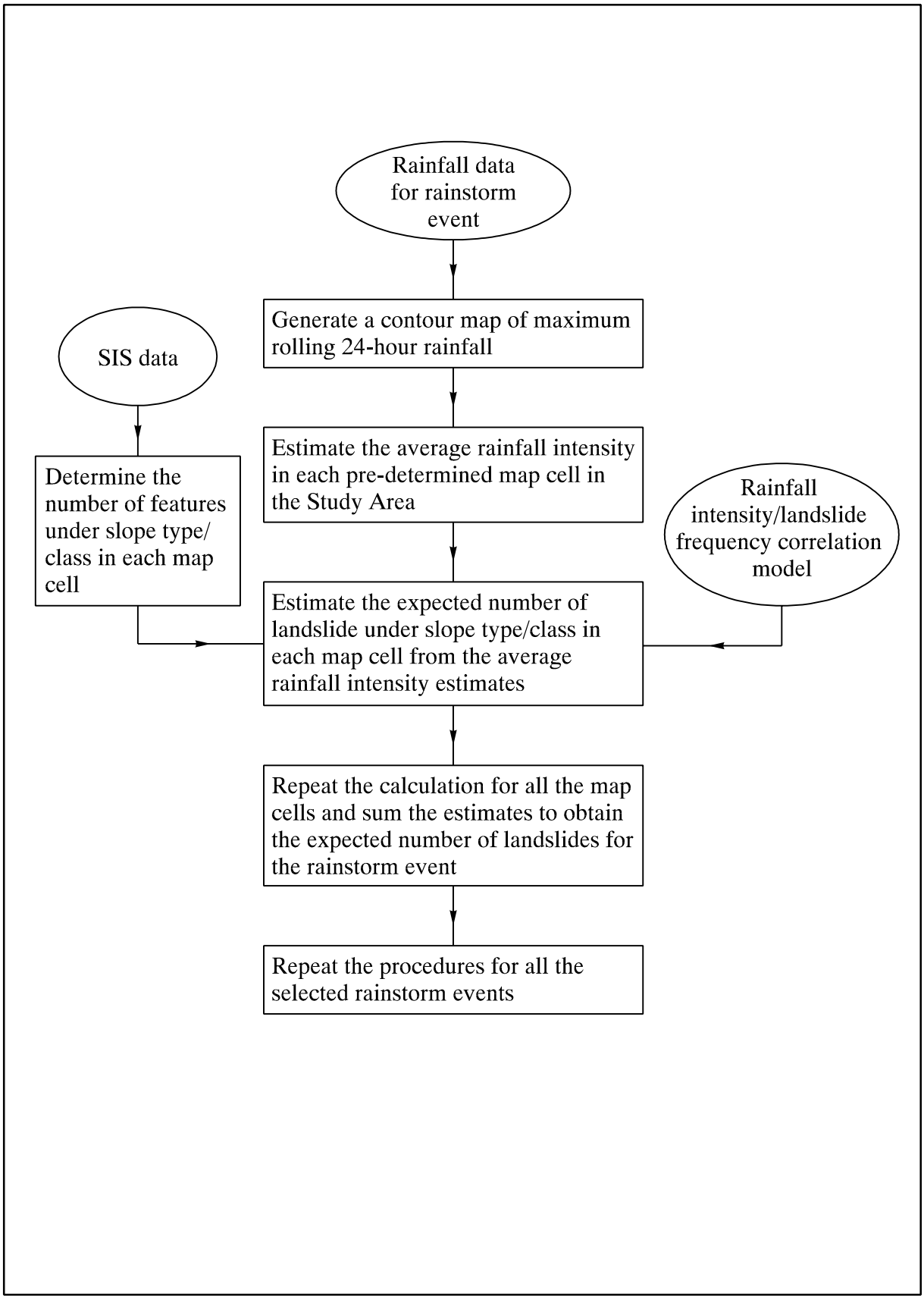
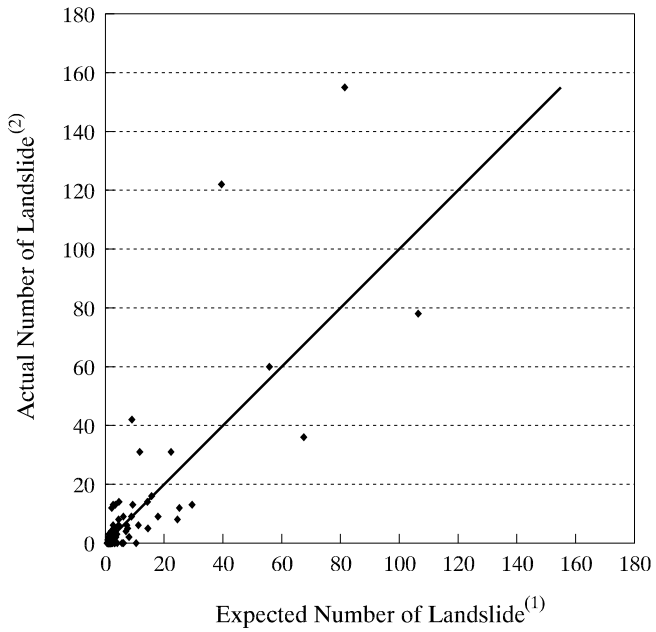
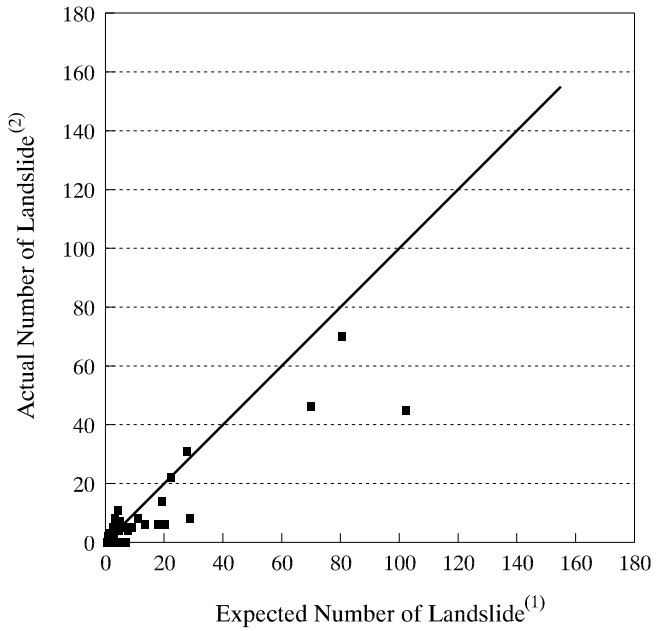


Figure 8 - Procedures for Estimating the Expected Number of Landslides in Rainstorm Events



(a) The Selected Rainstorms within 1984 and 1995



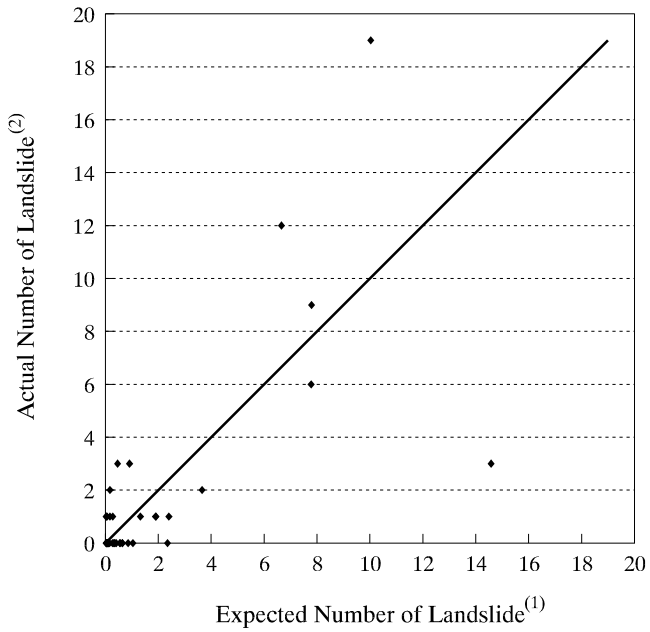
(b) The Selected Rainstorms within 1996 and 2000

Legend:

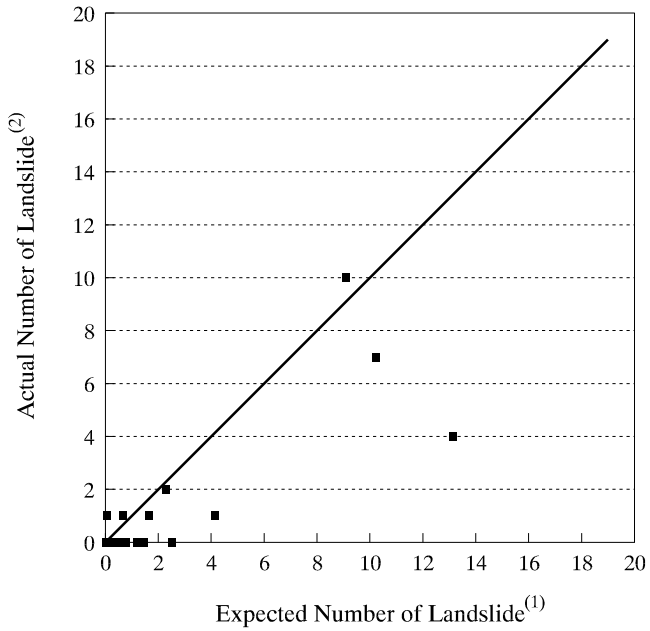
——— 45° line

Notes:
(1) Models stipulated in Figures C1, C2 and C3 in Appendix C have been used to calculate the expected number of landslides.
(2) These are genuine landslides in the Study Area within the rainstorm periods.

Figure 9 - Expected Against Actual Number of Landslides Involving Soil Cut Slopes (Geometry Class Model)



(a) The Selected Rainstorms within 1984 and 1995



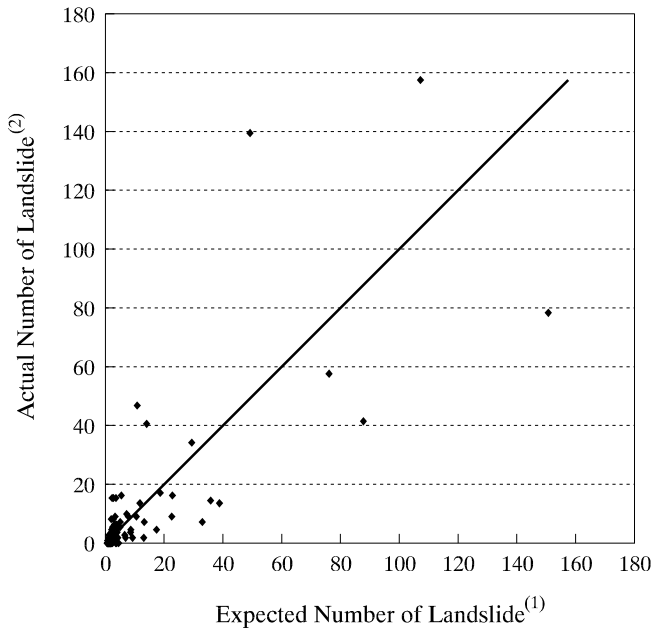
(b) The Selected Rainstorms within 1996 and 2000

Legend:

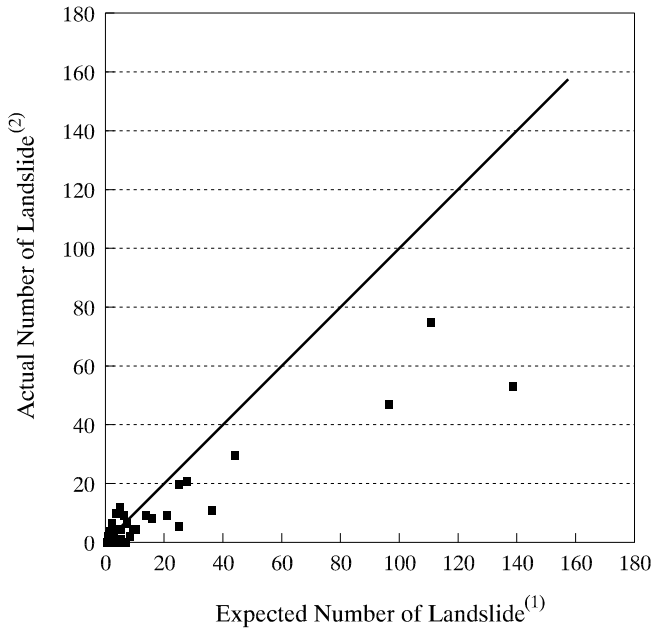
——— 45° line

Notes:
(1) Models stipulated in Figure C4 in Appendix C has been used to calculate the expected number of major landslides.
(2) These are the expected major landslides within the Study Area.

Figure 10 - Expected Against Actual Number of Major Landslides Involving Soil Cut Slopes (All Soil Cut Slope Model)



(a) The Selected Rainstorms within 1984 and 1995



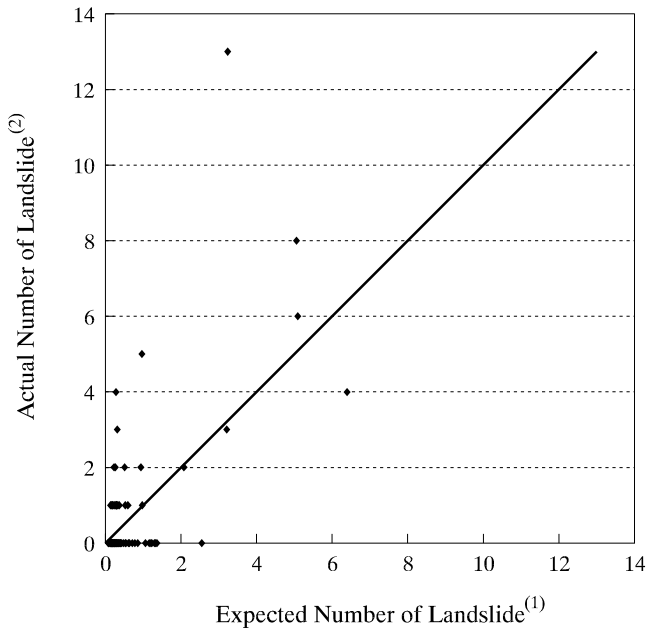
(b) The Selected Rainstorms within 1996 and 2000

Legend:

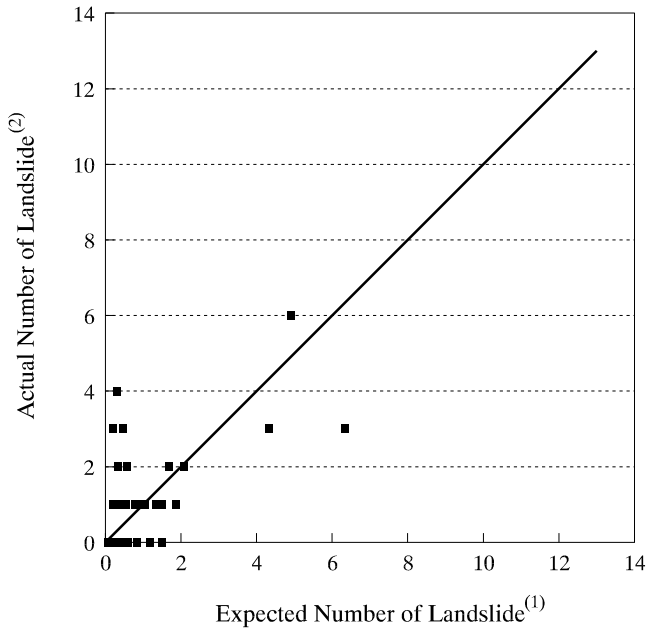
——— 45° line

Notes:
(1) Models stipulated in Figure C5 in Appendix C has been used to calculate the expected number of landslides.
(2) These are genuine landslides in the Study Area within the rainstorm periods.

Figure 11 - Expected Against Actual Number of Landslides Involving Soil Cut Slopes (All Soil Cut Slope Model)



(a) The Selected Rainstorms within 1984 and 1995



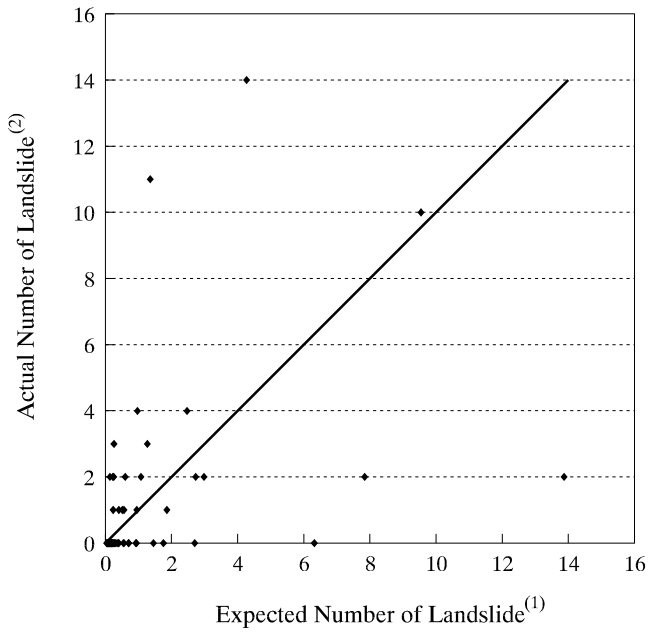
(b) The Selected Rainstorms within 1996 and 2000

Legend:

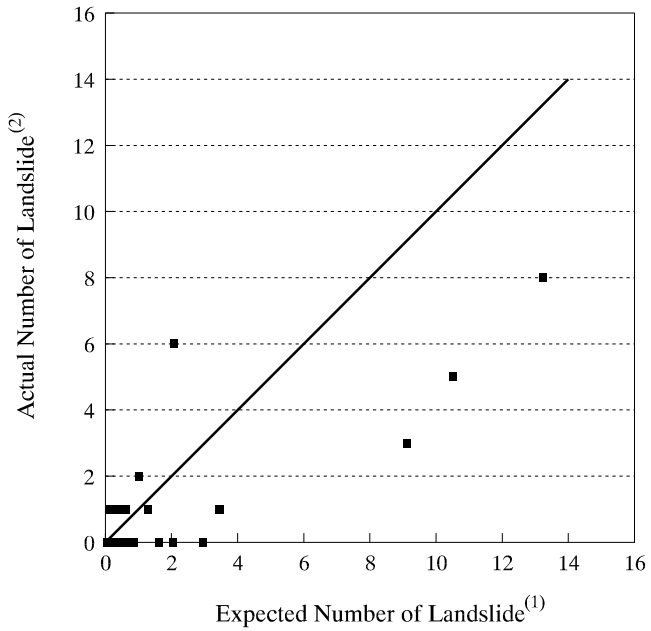
——— 45° line

Notes:
(1) Models stipulated in Figure C6 in Appendix C has been used to calculate the expected number of landslides.
(2) These are genuine landslides in the Study Area within the rainstorm periods.

Figure 12 - Expected Against Actual Number of Landslides Involving Rock Cut Slopes (All Rock Cut Slope Model)



(a) The Selected Rainstorms within 1984 and 1995



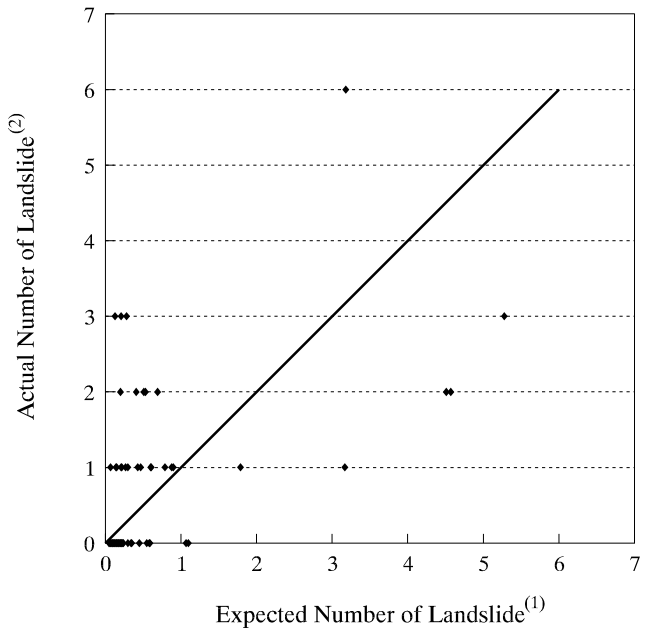
(b) The Selected Rainstorms within 1996 and 2000

Legend:

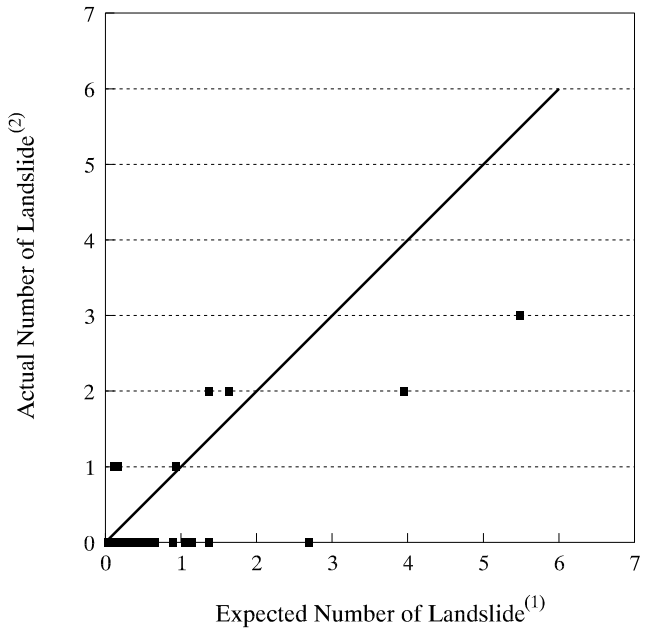
——— 45° line

Notes:
(1) Models stipulated in Figure C7 in Appendix C has been used to calculate the expected number of landslides.
(2) These are genuine landslides in the Study Area within the rainstorm periods.

Figure 13 - Expected Against Actual Number of Landslides Involving Fill Slopes (All Fill Slope Model)



(a) The Selected Rainstorms within 1984 and 1995



(b) The Selected Rainstorms within 1996 and 2000

Legend:

——— 45° line

Notes:
(1) Models stipulated in Figure C8 in Appendix C has been used to calculate the expected number of landslides.
(2) These are genuine landslides in the Study Area within the rainstorm periods.

Figure 14 - Expected Against Actual Number of Landslides Involving Retaining Walls (All Retaining Wall Model)

APPENDIX A

RAINFALL INTENSITY/LANDSLIDE FREQUENCY CORRELATION AND CLASSIFICATIONS OF SIS SLOPE FEATURES AND LANDSLIDES

LIST OF TABLES

Table A1a - Rainfall Intensity/Landslide Frequency Correlation Based on IS Score Class for NPCS Soil Cut Slopes

IS Score Class	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																													Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<100	5485	110	165185	2	0.001	287835	11	0.004	123013	10	0.008	49554	12	0.024	25810	15	0.058	12268	21	0.171	7683	31	0.403	2290	6	0.262	1156	2	0.173	845	0	0.000	1.67×10^{-3}
>=100 &- <150	6809	300	204323	2	0.001	355563	23	0.006	152115	32	0.021	63909	46	0.072	32686	34	0.104	15284	62	0.406	9194	74	0.805	3293	20	0.607	1384	4	0.289	1027	3	0.292	3.67×10^{-3}
>=150 &- <180	1123	94	34272	2	0.006	57758	7	0.012	24918	13	0.052	10701	6	0.056	5628	11	0.195	2574	17	0.660	1576	27	1.713	576	9	1.563	228	1	0.439	165	1	0.606	6.98×10^{-3}
>=180	382	35	12090	0	0.000	19510	3	0.015	8292	3	0.036	3561	5	0.140	1920	7	0.365	842	4	0.475	526	8	1.521	178	1	0.562	78	3	3.846	59	1	1.695	7.64×10^{-3}
Total	13799	539	415870	6	0.001	720666	44	0.006	308338	58	0.019	127725	69	0.054	66044	67	0.101	30968	104	0.336	18979	140	0.738	6337	36	0.568	2846	10	0.351	2096	5	0.239	3.26×10^{-3}

Notes:
(1) These are soil cut slopes in the Study Area with NPCS scores.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular IS score class subjected to the number of feature-hits indicated.

Table A1b - Rainfall Intensity/Major Landslide Frequency Correlation Based on IS Score Class for NPCS Soil Cut Slopes

IS Score Class	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																													Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<100	5485	4	165185	0	0.000	287835	0	0.000	123013	0	0.000	49554	0	0.000	25810	0	0.000	12268	1	0.008	7683	2	0.026	2290	1	0.044	1156	0	0.000	845	0	0.000	6.08×10^{-5}
>=100 &- <150	6809	14	204323	0	0.000	355563	0	0.000	152115	0	0.000	63909	0	0.000	32686	4	0.012	15284	5	0.033	9194	4	0.044	3293	0	0.000	1384	1	0.072	1027	0	0.000	1.71×10^{-4}
>=150 &- <180	1123	8	34272	0	0.000	57758	0	0.000	24918	0	0.000	10701	0	0.000	5628	0	0.000	2574	1	0.039	1576	5	0.317	576	1	0.174	228	0	0.000	165	1	0.606	5.94×10^{-4}
>=180	382	3	12090	0	0.000	19510	0	0.000	8292	0	0.000	3561	1	0.028	1920	0	0.000	842	1	0.119	526	1	0.190	178	0	0.000	78	0	0.000	59	0	0.000	6.54×10^{-4}
Total	13799	29	415870	0	0.000	720666	0	0.000	308338	0	0.000	127725	1	0.001	66044	4	0.006	30968	8	0.026	18979	12	0.063	6337	2	0.032	2846	1	0.035	2096	1	0.048	1.75×10^{-4}

Notes:
(1) These are soil cut slopes in the Study Area with NPCS scores.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular IS score class subjected to the number of feature-hits indicated.

Table A2a - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (with and without NPCS Scores)

Slope Geometry Class	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
S1	755	114	19201	3	0.016	41859	11	0.026	17573	15	0.085	7707	22	0.285	3407	10	0.294	1856	27	1.455	1165	17	1.459	371	5	1.348	161	2	1.242	78	2	2.564	1.26×10^{-2}
S2	3069	248	87655	1	0.001	162815	20	0.012	69209	39	0.056	30342	32	0.105	14881	32	0.215	6919	41	0.593	4227	60	1.419	1522	16	1.051	624	6	0.962	400	1	0.250	6.73×10^{-3}
S3	6536	220	195223	1	0.001	342529	14	0.004	146919	30	0.020	60805	30	0.049	30965	25	0.081	14340	33	0.230	9083	69	0.760	3026	15	0.496	1431	2	0.140	1047	1	0.096	2.80×10^{-3}
S4	4727	100	144160	3	0.002	247616	8	0.003	105537	9	0.009	42224	9	0.021	21566	16	0.074	10665	16	0.150	6466	28	0.433	2115	7	0.331	1067	3	0.281	696	1	0.144	1.76×10^{-3}
Total	15087	682	446239	8	0.002	794819	53	0.007	339238	93	0.027	141078	93	0.066	70819	83	0.117	33780	117	0.346	20941	174	0.831	7034	43	0.611	3283	13	0.396	2221	5	0.225	3.77×10^{-3}

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2b - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (with and without NPCS Scores)

Slope Geometry Class	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
S1	755	9	19201	0	0.000	41859	0	0.000	17573	0	0.000	7707	2	0.026	3407	1	0.029	1856	1	0.054	1165	2	0.172	371	2	0.539	161	0	0.000	78	1	1.282	9.93×10^{-4}
S2	3069	14	87655	0	0.000	162815	1	0.001	69209	0	0.000	30342	0	0.000	14881	1	0.007	6919	2	0.029	4227	7	0.166	1522	1	0.066	624	2	0.321	400	0	0.000	3.80×10^{-4}
S3	6536	13	195223	0	0.000	342529	1	0.000	146919	0	0.000	60805	0	0.000	30965	2	0.006	14340	3	0.021	9083	6	0.066	3026	1	0.033	1431	0	0.000	1047	0	0.000	1.66×10^{-4}
S4	4727	8	144160	1	0.001	247616	0	0.000	105537	0	0.000	42224	0	0.000	21566	0	0.000	10665	4	0.038	6466	1	0.015	2115	1	0.047	1067	1	0.094	696	0	0.000	1.41×10^{-4}
Total	15087	44	446239	1	0.000	794819	2	0.000	339238	0	0.000	141078	2	0.001	70819	4	0.006	33780	10	0.030	20941	16	0.076	7034	5	0.071	3283	3	0.091	2221	1	0.045	2.43×10^{-4}

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2c - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (with NPCS Scores)

Slope Geometry Class	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																												Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
S1	499	73	13482	2	0.015	26966	9	0.033	11322	9	0.079	5037	12	0.238	2453	7	0.285	1246	18	1.445	774	11	1.421	219	2	0.913	92	1	1.087	58	2	3.448	1.22×10^{-2}
S2	2672	183	78222	1	0.001	140178	15	0.011	59757	19	0.032	26270	23	0.088	13285	24	0.181	5964	37	0.620	3603	45	1.249	1305	13	0.996	518	5	0.965	350	1	0.286	5.71×10^{-3}
S3	6013	188	182169	1	0.001	312996	12	0.004	134537	23	0.017	55444	26	0.047	28875	18	0.062	13214	31	0.235	8371	62	0.741	2786	13	0.467	1239	1	0.081	993	1	0.101	2.61×10^{-3}
S4	4294	81	133805	2	0.001	222948	7	0.003	95125	8	0.008	37849	6	0.016	19890	11	0.055	9650	15	0.155	5786	23	0.398	1880	6	0.319	938	2	0.213	643	1	0.156	1.57×10^{-3}
Total	13478	525	407678	6	0.001	703088	43	0.006	300741	59	0.020	124600	67	0.054	64503	60	0.093	30074	101	0.336	18534	141	0.761	6190	34	0.549	2787	9	0.323	2044	5	0.245	3.25×10^{-3}

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2d - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (with NPCS Scores)

Slope Geometry Class	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																												Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
S1	499	4	13482	0	0.000	26966	0	0.000	11322	0	0.000	5037	1	0.020	2453	0	0.000	1246	0	0.000	774	2	0.258	219	0	0.000	92	0	0.000	58	1	1.724	6.68×10^{-4}
S2	2672	8	78222	0	0.000	140178	0	0.000	59757	0	0.000	26270	0	0.000	13285	1	0.008	5964	2	0.034	3603	4	0.111	1305	0	0.000	518	1	0.193	350	0	0.000	2.50×10^{-4}
S3	6013	12	182169	0	0.000	312996	0	0.000	134537	0	0.000	55444	0	0.000	28875	2	0.007	13214	3	0.023	8371	6	0.072	2786	1	0.036	1239	0	0.000	993	0	0.000	1.66×10^{-4}
S4	4294	4	133805	0	0.000	222948	0	0.000	95125	0	0.000	37849	0	0.000	19890	0	0.000	9650	3	0.031	5786	0	0.000	1880	1	0.053	938	0	0.000	643	0	0.000	7.76×10^{-5}
Total	13478	28	407678	0	0.000	703088	0	0.000	300741	0	0.000	124600	1	0.001	64503	3	0.005	30074	8	0.027	18534	12	0.065	6190	2	0.032	2787	1	0.036	2044	1	0.049	1.73×10^{-4}

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2e - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (without NPCS Scores)

Slope Geometry Class	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																												Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
S1	256	41	5719	1	0.017	14893	2	0.013	6251	6	0.096	2670	10	0.375	954	3	0.314	610	9	1.475	391	6	1.535	152	3	1.974	69	1	1.449	20	0	0.000	1.33×10^{-2}
S2	397	65	9433	0	0.000	22637	5	0.022	9452	20	0.212	4072	9	0.221	1596	8	0.501	955	4	0.419	624	15	2.404	217	3	1.382	106	1	0.943	50	0	0.000	1.36×10^{-2}
S3	523	32	13054	0	0.000	29533	2	0.007	12382	7	0.057	5361	4	0.075	2090	7	0.335	1126	2	0.178	712	7	0.983	240	2	0.833	192	1	0.521	54	0	0.000	5.10×10^{-3}
S4	433	19	10355	1	0.010	24668	1	0.004	10412	1	0.010	4375	3	0.069	1676	5	0.298	1015	1	0.099	680	5	0.735	235	1	0.426	129	1	0.775	53	0	0.000	3.66×10^{-3}
Total	1609	157	38561	2	0.005	91731	10	0.011	38497	34	0.088	16478	26	0.158	6316	23	0.364	3706	16	0.432	2407	33	1.371	844	9	1.066	496	4	0.806	177	0	0.000	8.13×10^{-3}

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2f - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (without NPCS Scores)

Slope Geometry Class	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																												Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
S1	256	5	5719	0	0.000	14893	0	0.000	6251	0	0.000	2670	1	0.037	954	1	0.105	610	1	0.164	391	0	0.000	152	2	1.316	69	0	0.000	20	0	0.000	1.63×10^{-3}
S2	397	6	9433	0	0.000	22637	1	0.004	9452	0	0.000	4072	0	0.000	1596	0	0.000	955	0	0.000	624	3	0.481	217	1	0.461	106	1	0.943	50	0	0.000	1.26×10^{-3}
S3	523	1	13054	0	0.000	29533	1	0.003	12382	0	0.000	5361	0	0.000	2090	0	0.000	1126	0	0.000	712	0	0.000	240	0	0.000	192	0	0.000	54	0	0.000	1.59×10^{-4}
S4	433	4	10355	1	0.010	24668	0	0.000	10412	0	0.000	4375	0	0.000	1676	0	0.000	1015	1	0.099	680	1	0.147	235	0	0.000	129	1	0.775	53	0	0.000	7.70×10^{-4}
Total	1609	16	38561	1	0.003	91731	2	0.002	38497	0	0.000	16478	1	0.006	6316	1	0.016	3706	2	0.054	2407	4	0.166	844	3	0.355	496	2	0.403	177	0	0.000	8.29×10^{-4}

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2g - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Rock Cut Slopes (with and without NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																												Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=10	1152	30	33955	1	0.003	62029	5	0.008	26048	8	0.031	10438	2	0.019	4863	1	0.021	2539	5	0.197	1341	4	0.298	486	4	0.823	274	0	0.000	99	0	0.000	2.17×10^{-3}
10-20	334	24	9887	0	0.000	17366	3	0.017	7723	3	0.039	3257	4	0.123	1554	2	0.129	717	6	0.837	439	4	0.911	121	2	1.653	94	0	0.000	17	0	0.000	5.99×10^{-3}
>20	153	20	4481	1	0.022	8040	3	0.037	3517	6	0.171	1540	2	0.130	704	1	0.142	301	1	0.332	226	2	0.885	43	2	4.651	44	2	4.545	5	0	0.000	1.09×10^{-2}
Total	1639	74	48323	2	0.004	87435	11	0.013	37288	17	0.046	15235	8	0.053	7121	4	0.056	3557	12	0.337	2006	10	0.499	650	8	1.231	412	2	0.485	121	0	0.000	3.76×10^{-3}

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2h - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Rock Cut Slopes (with and without NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																												Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=10	1152	1	33955	0	0.000	62029	0	0.000	26048	0	0.000	10438	0	0.000	4863	0	0.000	2539	0	0.000	1341	1	0.075	486	0	0.000	274	0	0.000	99	0	0.000	7.23×10^{-5}
10-20	334	2	9887	0	0.000	17366	0	0.000	7723	0	0.000	3257	0	0.000	1554	0	0.000	717	0	0.000	439	1	0.228	121	1	0.826	94	0	0.000	17	0	0.000	4.99×10^{-4}
>20	153	2	4481	0	0.000	8040	0	0.000	3517	0	0.000	1540	0	0.000	704	0	0.000	301	0	0.000	226	1	0.442	43	0	0.000	44	1	2.273	5	0	0.000	1.09×10^{-3}
Total	1639	5	48323	0	0.000	87435	0	0.000	37288	0	0.000	15235	0	0.000	7121	0	0.000	3557	0	0.000	2006	3	0.150	650	1	0.154	412	1	0.243	121	0	0.000	2.54×10^{-4}

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2i - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Rock Cut Slopes (with NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=10	1082	28	33955	1	0.003	62029	5	0.008	26048	7	0.027	10438	2	0.019	4863	1	0.021	2539	5	0.197	1341	4	0.298	486	3	0.617	274	0	0.000	99	0	0.000	2.16×10^{-3}
10-20	303	21	9887	0	0.000	17366	3	0.017	7723	3	0.039	3257	3	0.092	1554	2	0.129	717	4	0.558	439	4	0.911	121	2	1.653	94	0	0.000	17	0	0.000	5.78×10^{-3}
>20	117	9	4481	0	0.000	8040	2	0.025	3517	3	0.085	1540	0	0.000	704	0	0.000	301	0	0.000	226	1	0.442	43	2	4.651	44	1	2.273	5	0	0.000	6.41×10^{-3}
Total	1502	58	48323	1	0.002	87435	10	0.011	37288	13	0.035	15235	5	0.033	7121	3	0.042	3557	9	0.253	2006	9	0.449	650	7	1.077	412	1	0.243	121	0	0.000	3.22×10^{-3}

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2j - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Rock Cut Slopes (with NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=10	1082	1	33955	0	0.000	62029	0	0.000	26048	0	0.000	10438	0	0.000	4863	0	0.000	2539	0	0.000	1341	1	0.075	486	0	0.000	274	0	0.000	99	0	0.000	7.70×10^{-5}
10-20	303	2	9887	0	0.000	17366	0	0.000	7723	0	0.000	3257	0	0.000	1554	0	0.000	717	0	0.000	439	1	0.228	121	1	0.826	94	0	0.000	17	0	0.000	5.50×10^{-4}
>20	117	0	4481	0	0.000	8040	0	0.000	3517	0	0.000	1540	0	0.000	704	0	0.000	301	0	0.000	226	0	0.000	43	0	0.000	44	0	0.000	5	0	0.000	0
Total	1502	3	48323	0	0.000	87435	0	0.000	37288	0	0.000	15235	0	0.000	7121	0	0.000	3557	0	0.000	2006	2	0.100	650	1	0.154	412	0	0.000	121	0	0.000	1.66×10^{-4}

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2k - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Rock Cut Slopes (without NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=10	70	2	1580	0	0.000	4187	0	0.000	1702	1	0.059	659	0	0.000	254	0	0.000	152	0	0.000	78	0	0.000	33	1	3.030	29	0	0.000	1	0	0.000	2.38×10^{-3}
10-20	31	3	675	0	0.000	1814	0	0.000	806	0	0.000	296	1	0.338	121	0	0.000	60	2	3.333	45	0	0.000	8	0	0.000	17	0	0.000	0	0	0.000	8.06×10^{-3}
>20	36	11	867	1	0.115	2053	1	0.049	869	3	0.345	387	2	0.517	129	1	0.775	72	1	1.389	55	1	1.818	12	0	0.000	12	1	8.333	2	0	0.000	2.55×10^{-2}
Total	137	16	3122	1	0.032	8054	1	0.012	3377	4	0.118	1342	3	0.224	504	1	0.198	284	3	1.056	178	1	0.562	53	1	1.887	58	1	1.724	3	0	0.000	9.73×10^{-3}

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2l - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Rock Cut Slopes (without NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=10	70	0	1580	0	0.000	4187	0	0.000	1702	0	0.000	659	0	0.000	254	0	0.000	152	0	0.000	78	0	0.000	33	0	0.000	29	0	0.000	1	0	0.000	0
10-20	31	0	675	0	0.000	1814	0	0.000	806	0	0.000	296	0	0.000	121	0	0.000	60	0	0.000	45	0	0.000	8	0	0.000	17	0	0.000	0	0	0.000	0
>20	36	2	867	0	0.000	2053	0	0.000	869	0	0.000	387	0	0.000	129	0	0.000	72	0	0.000	55	1	1.818	12	0	0.000	12	1	8.333	2	0	0.000	4.63×10^{-3}
Total	137	2	3122	0	0.000	8054	0	0.000	3377	0	0.000	1342	0	0.000	504	0	0.000	284	0	0.000	178	1	0.562	53	0	0.000	58	1	1.724	3	0	0.000	1.22×10^{-3}

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2m - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Fill Slopes (with and without NPCS Scores)

Angle (°)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
>0 & <=25	217	0	6549	0	0.000	11278	0	0.000	4882	0	0.000	2124	0	0.000	1028	0	0.000	462	0	0.000	265	0	0.000	86	0	0.000	43	0	0.000	27	0	0.000	0
>25 & <=35	2113	22	60790	0	0.000	111656	0	0.000	47874	4	0.008	20841	5	0.024	10227	7	0.068	4862	2	0.041	2889	4	0.138	915	0	0.000	405	0	0.000	252	0	0.000	8.68×10^{-4}
>35 & <=50	1433	20	41135	0	0.000	76415	3	0.004	31903	1	0.003	13729	2	0.015	7310	3	0.041	3191	3	0.094	1915	5	0.261	690	3	0.435	323	0	0.000	191	0	0.000	1.16×10^{-3}
Total	3763	42	108474	0	0.000	199349	3	0.002	84659	5	0.006	36694	7	0.019	18565	10	0.054	8515	5	0.059	5069	9	0.178	1691	3	0.177	771	0	0.000	470	0	0.000	9.30×10^{-4}

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2n - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Fill Slopes (with and without NPCS Scores)

Angle (°)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
>0 & <=25	217	0	6549	0	0.000	11278	0	0.000	4882	0	0.000	2124	0	0.000	1028	0	0.000	462	0	0.000	265	0	0.000	86	0	0.000	43	0	0.000	27	0	0.000	0
>25 & <=35	2113	3	60790	0	0.000	111656	0	0.000	47874	0	0.000	20841	0	0.000	10227	0	0.000	4862	0	0.000	2889	3	0.104	915	0	0.000	405	0	0.000	252	0	0.000	1.18×10^{-4}
>35 & <=50	1433	6	41135	0	0.000	76415	0	0.000	31903	0	0.000	13729	2	0.015	7310	2	0.027	3191	2	0.063	1915	0	0.000	690	0	0.000	323	0	0.000	191	0	0.000	3.49×10^{-4}
Total	3763	9	108474	0	0.000	199349	0	0.000	84659	0	0.000	36694	2	0.005	18565	2	0.011	8515	2	0.023	5069	3	0.059	1691	0	0.000	771	0	0.000	470	0	0.000	1.99×10^{-4}

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2o - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Fill Slopes (with NPCS Scores)

Angle (°)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
>0 & <=25	202	0	6214	0	0.000	10368	0	0.000	4534	0	0.000	1982	0	0.000	975	0	0.000	426	0	0.000	240	0	0.000	81	0	0.000	40	0	0.000	26	0	0.000	0
>25 & <=35	1951	15	56750	0	0.000	102730	0	0.000	43956	2	0.005	19226	4	0.021	9499	6	0.063	4454	1	0.022	2647	2	0.076	822	0	0.000	370	0	0.000	222	0	0.000	6.41×10^{-4}
>35 & <=50	1325	19	38260	0	0.000	70644	3	0.004	29441	1	0.003	12611	1	0.008	6765	3	0.044	2882	3	0.104	1751	5	0.286	618	3	0.485	308	0	0.000	165	0	0.000	1.19×10^{-3}
Total	3478	34	101224	0	0.000	183742	3	0.002	77931	3	0.004	33819	5	0.015	17239	9	0.052	7762	4	0.052	4638	7	0.151	1521	3	0.197	718	0	0.000	413	0	0.000	8.15×10^{-4}

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2p - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Fill Slopes (with NPCS Scores)

Angle (°)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
>0 & <=25	202	0	6214	0	0.000	10368	0	0.000	4534	0	0.000	1982	0	0.000	975	0	0.000	426	0	0.000	240	0	0.000	81	0	0.000	40	0	0.000	26	0	0.000	0
>25 & <=35	1951	2	56750	0	0.000	102730	0	0.000	43956	0	0.000	19226	0	0.000	9499	0	0.000	4454	0	0.000	2647	2	0.076	822	0	0.000	370	0	0.000	222	0	0.000	8.54×10^{-5}
>35 & <=50	1325	5	38260	0	0.000	70644	0	0.000	29441	0	0.000	12611	1	0.008	6765	2	0.030	2882	2	0.069	1751	0	0.000	618	0	0.000	308	0	0.000	165	0	0.000	3.14×10^{-4}
Total	3478	7	101224	0	0.000	183742	0	0.000	77931	0	0.000	33819	1	0.003	17239	2	0.012	7762	2	0.026	4638	2	0.043	1521	0	0.000	718	0	0.000	413	0	0.000	1.68×10^{-4}

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2q - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Fill Slopes (without NPCS Scores)

Angle (°)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
>0 & <=25	15	0	335	0	0.000	910	0	0.000	348	0	0.000	142	0	0.000	53	0	0.000	36	0	0.000	25	0	0.000	5	0	0.000	3	0	0.000	1	0	0.000	0
>25 & <=35	162	7	4040	0	0.000	8926	0	0.000	3918	2	0.051	1615	1	0.062	728	1	0.137	408	1	0.245	242	2	0.826	93	0	0.000	35	0	0.000	30	0	0.000	3.60×10^{-3}
>35 & <=50	108	1	2875	0	0.000	5771	0	0.000	2462	0	0.000	1118	1	0.089	545	0	0.000	309	0	0.000	164	0	0.000	72	0	0.000	15	0	0.000	26	0	0.000	7.72×10^{-4}
Total	285	8	7250	0	0.000	15607	0	0.000	6728	2	0.030	2875	2	0.070	1326	1	0.075	753	1	0.133	431	2	0.464	170	0	0.000	53	0	0.000	57	0	0.000	2.34×10^{-3}

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2r - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Fill Slopes (without NPCS Scores)

Angle (°)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
>0 & <=25	15	0	335	0	0.000	910	0	0.000	348	0	0.000	142	0	0.000	53	0	0.000	36	0	0.000	25	0	0.000	5	0	0.000	3	0	0.000	1	0	0.000	0
>25 & <=35	162	1	4040	0	0.000	8926	0	0.000	3918	0	0.000	1615	0	0.000	728	0	0.000	408	0	0.000	242	1	0.413	93	0	0.000	35	0	0.000	30	0	0.000	5.14×10^{-4}
>35 & <=50	108	1	2875	0	0.000	5771	0	0.000	2462	0	0.000	1118	1	0.089	545	0	0.000	309	0	0.000	164	0	0.000	72	0	0.000	15	0	0.000	26	0	0.000	7.72×10^{-4}
Total	285	2	7250	0	0.000	15607	0	0.000	6728	0	0.000	2875	1	0.035	1326	0	0.000	753	0	0.000	431	1	0.232	170	0	0.000	53	0	0.000	57	0	0.000	5.85×10^{-4}

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A2s - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Retaining Walls (with and without NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=5	3700	29	91799	0	0.000	205742	1	0.000	88314	9	0.010	37110	5	0.013	17038	3	0.018	7753	4	0.052	6094	6	0.098	2238	0	0.000	782	0	0.000	481	1	0.208	6.53×10^{-4}
5-10	1570	11	34484	0	0.000	90851	1	0.001	39020	2	0.005	15629	0	0.000	6546	1	0.015	3225	1	0.031	2923	5	0.171	1110	1	0.090	433	0	0.000	143	0	0.000	5.84×10^{-4}
>10	153	0	3545	0	0.000	8522	0	0.000	3862	0	0.000	1507	0	0.000	602	0	0.000	351	0	0.000	289	0	0.000	139	0	0.000	54	0	0.000	39	0	0.000	0
Total	5423	40	129828	0	0.000	305115	2	0.001	131196	11	0.008	54246	5	0.009	24186	4	0.017	11329	5	0.044	9306	11	0.118	3487	1	0.029	1269	0	0.000	663	1	0.151	6.15×10^{-4}

Notes:
(1) These are retaining walls in the Study Area with height information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall geometry class subjected to the number of feature-hits indicated.

Table A2t - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Retaining Walls (with and without NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=5	3700	0	91799	0	0.000	205742	0	0.000	88314	0	0.000	37110	0	0.000	17038	0	0.000	7753	0	0.000	6094	0	0.000	2238	0	0.000	782	0	0.000	481	0	0.000	0
5-10	1570	0	34484	0	0.000	90851	0	0.000	39020	0	0.000	15629	0	0.000	6546	0	0.000	3225	0	0.000	2923	0	0.000	1110	0	0.000	433	0	0.000	143	0	0.000	0
>10	153	0	3545	0	0.000	8522	0	0.000	3862	0	0.000	1507	0	0.000	602	0	0.000	351	0	0.000	289	0	0.000	139	0	0.000	54	0	0.000	39	0	0.000	0
Total	5423	0	129828	0	0.000	305115	0	0.000	131196	0	0.000	54246	0	0.000	24186	0	0.000	11329	0	0.000	9306	0	0.000	3487	0	0.000	1269	0	0.000	663	0	0.000	0

Notes:
(1) These are retaining walls in the Study Area height information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall geometry class subjected to the number of feature-hits indicated.

Table A2u - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Retaining Walls (with NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=5	3444	26	86666	0	0.000	190684	1	0.001	81800	7	0.009	34416	5	0.015	16036	3	0.019	7232	4	0.055	5589	5	0.089	2021	0	0.000	730	0	0.000	457	1	0.219	6.29×10^{-4}
5-10	1381	10	31086	0	0.000	79435	1	0.001	34084	2	0.006	13688	0	0.000	5813	1	0.017	2888	1	0.035	2490	4	0.161	922	1	0.108	394	0	0.000	134	0	0.000	6.03×10^{-4}
>10	140	0	3325	0	0.000	7731	0	0.000	3525	0	0.000	1366	0	0.000	549	0	0.000	328	0	0.000	259	0	0.000	127	0	0.000	49	0	0.000	39	0	0.000	0
Total	4965	36	121077	0	0.000	277850	2	0.001	119409	9	0.008	49470	5	0.010	22398	4	0.018	10448	5	0.048	8338	9	0.108	3070	1	0.033	1173	0	0.000	630	1	0.159	6.04×10^{-4}

Notes:
(1) These are retaining walls in the Study Area with height information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall geometry class subjected to the number of feature-hits indicated.

Table A2v - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Retaining Walls (with NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=5	3444	0	86666	0	0.000	190684	0	0.000	81800	0	0.000	34416	0	0.000	16036	0	0.000	7232	0	0.000	5589	0	0.000	2021	0	0.000	730	0	0.000	457	0	0.000	0
5-10	1381	0	31086	0	0.000	79435	0	0.000	34084	0	0.000	13688	0	0.000	5813	0	0.000	2888	0	0.000	2490	0	0.000	922	0	0.000	394	0	0.000	134	0	0.000	0
>10	140	0	3325	0	0.000	7731	0	0.000	3525	0	0.000	1366	0	0.000	549	0	0.000	328	0	0.000	259	0	0.000	127	0	0.000	49	0	0.000	39	0	0.000	0
Total	4965	0	121077	0	0.000	277850	0	0.000	119409	0	0.000	49470	0	0.000	22398	0	0.000	10448	0	0.000	8338	0	0.000	3070	0	0.000	1173	0	0.000	630	0	0.000	0

Notes:
(1) These are retaining walls in the Study Area height information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall geometry class subjected to the number of feature-hits indicated.

Table A2w - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Retaining Walls (without NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=5	256	3	5133	0	0.000	15058	0	0.000	6514	2	0.031	2694	0	0.000	1002	0	0.000	521	0	0.000	505	1	0.198	217	0	0.000	52	0	0.000	24	0	0.000	9.77×10^{-4}
5-10	189	1	3398	0	0.000	11416	0	0.000	4936	0	0.000	1941	0	0.000	733	0	0.000	337	0	0.000	433	1	0.231	188	0	0.000	39	0	0.000	9	0	0.000	4.41×10^{-4}
>10	13	0	220	0	0.000	791	0	0.000	337	0	0.000	141	0	0.000	53	0	0.000	23	0	0.000	30	0	0.000	12	0	0.000	5	0	0.000	0	0	0.000	0
Total	458	4	8751	0	0.000	27265	0	0.000	11787	2	0.017	4776	0	0.000	1788	0	0.000	881	0	0.000	968	2	0.207	417	0	0.000	96	0	0.000	33	0	0.000	7.28×10^{-4}

Notes:
(1) These are retaining walls in the Study Area with height information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall geometry class subjected to the number of feature-hits indicated.

Table A2x - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Retaining Walls (without NPCS Scores)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=5	256	0	5133	0	0.000	15058	0	0.000	6514	0	0.000	2694	0	0.000	1002	0	0.000	521	0	0.000	505	0	0.000	217	0	0.000	52	0	0.000	24	0	0.000	0
5-10	189	0	3398	0	0.000	11416	0	0.000	4936	0	0.000	1941	0	0.000	733	0	0.000	337	0	0.000	433	0	0.000	188	0	0.000	39	0	0.000	9	0	0.000	0
>10	13	0	220	0	0.000	791	0	0.000	337	0	0.000	141	0	0.000	53	0	0.000	23	0	0.000	30	0	0.000	12	0	0.000	5	0	0.000	0	0	0.000	0
Total	458	0	8751	0	0.000	27265	0	0.000	11787	0	0.000	4776	0	0.000	1788	0	0.000	881	0	0.000	968	0	0.000	417	0	0.000	96	0	0.000	33	0	0.000	0

Notes:
(1) These are retaining walls in the Study Area height information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall geometry class subjected to the number of feature-hits indicated.

Table A3a - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Soil Cut Slopes

Slope Geometry Class	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
S1	352	34	8830	2	0.023	17643	1	0.006	7668	2	0.026	3247	4	0.123	1546	4	0.259	776	7	0.902	499	6	1.202	170	2	1.176	97	3	3.093	31	3	9.677	8.05×10^{-3}	
S2	548	46	14303	0	0.000	27088	5	0.018	11681	7	0.060	4567	8	0.175	2463	9	0.365	1125	3	0.267	699	10	1.431	288	2	0.694	133	2	1.504	84	0	0.000	7.00×10^{-3}	
S3	1291	54	34461	3	0.009	61532	3	0.005	27323	7	0.026	10844	5	0.046	5844	4	0.068	2799	13	0.464	1704	17	0.998	593	1	0.169	344	0	0.000	179	1	0.559	3.49×10^{-3}	
S4	3638	42	98108	1	0.001	163408	1	0.001	70599	7	0.010	28981	5	0.017	15810	9	0.057	7171	8	0.112	4328	9	0.208	1617	1	0.062	901	1	0.111	499	0	0.000	9.62×10^{-4}	
Total	5829	176	155702	6	0.004	269671	10	0.004	117271	23	0.020	47639	22	0.046	25663	26	0.101	11871	31	0.261	7230	42	0.581	2668	6	0.225	1475	6	0.407	793	4	0.504	2.52×10^{-3}	

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A3b - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Soil Cut Slopes

Slope Geometry Class	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
S1	352	7	8830	0	0.000	17643	0	0.000	7668	1	0.013	3247	1	0.031	1546	1	0.065	776	1	0.129	499	0	0.000	170	0	0.000	97	1	1.031	31	2	6.452	1.66×10^{-3}	
S2	548	4	14303	0	0.000	27088	0	0.000	11681	0	0.000	4567	1	0.022	2463	0	0.000	1125	0	0.000	699	1	0.143	288	0	0.000	133	2	1.504	84	0	0.000	6.08×10^{-4}	
S3	1291	3	34461	0	0.000	61532	0	0.000	27323	0	0.000	10844	1	0.009	5844	0	0.000	2799	1	0.036	1704	1	0.059	593	0	0.000	344	0	0.000	179	0	0.000	1.94×10^{-4}	
S4	3638	8	98108	0	0.000	163408	0	0.000	70599	1	0.001	28981	0	0.000	15810	2	0.013	7171	1	0.014	4328	3	0.069	1617	1	0.062	901	0	0.000	499	0	0.000	1.83×10^{-4}	
Total	5829	22	155702	0	0.000	269671	0	0.000	117271	2	0.002	47639	3	0.006	25663	3	0.012	11871	3	0.025	7230	5	0.069	2668	1	0.037	1475	3	0.203	793	2	0.252	3.15×10^{-4}	

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A3c - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Rock Cut Slopes

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=10	149	1	3790	0	0.000	7531	0	0.000	3189	1	0.031	1199	0	0.000	559	0	0.000	302	0	0.000	150	0	0.000	78	0	0.000	45	0	0.000	6	0	0.000	5.59×10^{-4}
10-20	55	2	1606	0	0.000	2922	1	0.034	1282	0	0.000	495	0	0.000	264	1	0.379	111	0	0.000	66	0	0.000	25	0	0.000	24	0	0.000	8	0	0.000	3.03×10^{-3}
>20	55	0	2007	0	0.000	2745	0	0.000	1073	0	0.000	445	0	0.000	211	0	0.000	97	0	0.000	55	0	0.000	31	0	0.000	25	0	0.000	18	0	0.000	0
Total	259	3	7403	0	0.000	13198	1	0.008	5544	1	0.018	2139	0	0.000	1034	1	0.097	510	0	0.000	271	0	0.000	134	0	0.000	94	0	0.000	32	0	0.000	9.65×10^{-4}

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A3d - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Rock Cut Slopes

Total Height (m)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=10	149	0	3790	0	0.000	7531	0	0.000	3189	0	0.000	1199	0	0.000	559	0	0.000	302	0	0.000	150	0	0.000	78	0	0.000	45	0	0.000	6	0	0.000	0
10-20	55	0	1606	0	0.000	2922	0	0.000	1282	0	0.000	495	0	0.000	264	0	0.000	111	0	0.000	66	0	0.000	25	0	0.000	24	0	0.000	8	0	0.000	0
>20	55	0	2007	0	0.000	2745	0	0.000	1073	0	0.000	445	0	0.000	211	0	0.000	97	0	0.000	55	0	0.000	31	0	0.000	25	0	0.000	18	0	0.000	0
Total	259	0	7403	0	0.000	13198	0	0.000	5544	0	0.000	2139	0	0.000	1034	0	0.000	510	0	0.000	271	0	0.000	134	0	0.000	94	0	0.000	32	0	0.000	0

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A3e - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Fill Slopes

Angle (°)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																													Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
>0 & <=25	297	2	7172	0	0.000	13206	0	0.000	5692	0	0.000	2387	1	0.042	1241	1	0.081	610	0	0.000	362	0	0.000	129	0	0.000	72	0	0.000	24	0	0.000	5.61×10^{-4}
>25 & <=35	1694	17	43690	0	0.000	79165	0	0.000	33813	3	0.009	14101	5	0.035	7101	4	0.056	3493	2	0.057	2177	3	0.138	732	0	0.000	363	0	0.000	208	0	0.000	8.36×10^{-4}
>35 & <=50	1068	12	27741	0	0.000	50286	0	0.000	21373	1	0.005	8853	0	0.000	4609	3	0.065	2351	6	0.255	1427	2	0.140	501	0	0.000	229	0	0.000	174	0	0.000	9.36×10^{-4}
Total	3059	31	78603	0	0.000	142657	0	0.000	60878	4	0.007	25341	6	0.024	12951	8	0.062	6454	8	0.124	3966	5	0.126	1362	0	0.000	664	0	0.000	406	0	0.000	8.45×10^{-4}

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A3f - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Fill Slopes

Angle (°)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																													Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
>0 & <=25	297	0	7172	0	0.000	13206	0	0.000	5692	0	0.000	2387	0	0.000	1241	0	0.000	610	0	0.000	362	0	0.000	129	0	0.000	72	0	0.000	24	0	0.000	0
>25 & <=35	1694	0	43690	0	0.000	79165	0	0.000	33813	0	0.000	14101	0	0.000	7101	0	0.000	3493	0	0.000	2177	0	0.000	732	0	0.000	363	0	0.000	208	0	0.000	0
>35 & <=50	1068	2	27741	0	0.000	50286	0	0.000	21373	0	0.000	8853	0	0.000	4609	1	0.022	2351	0	0.000	1427	1	0.070	501	0	0.000	229	0	0.000	174	0	0.000	1.56×10^{-4}
Total	3059	2	78603	0	0.000	142657	0	0.000	60878	0	0.000	25341	0	0.000	12951	1	0.008	6454	0	0.000	3966	1	0.025	1362	0	0.000	664	0	0.000	406	0	0.000	5.45×10^{-5}

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A3g - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Retaining Walls

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=5	1906	7	46508	0	0.000	96289	1	0.001	40978	3	0.007	16842	3	0.018	8661	0	0.000	4188	0	0.000	2857	0	0.000	908	0	0.000	427	0	0.000	224	0	0.000	3.06×10^{-4}
5-10	819	1	18895	1	0.005	46468	0	0.000	19647	0	0.000	8073	0	0.000	3587	0	0.000	1824	0	0.000	1593	0	0.000	570	0	0.000	213	0	0.000	56	0	0.000	1.02×10^{-4}
>10	73	0	1713	0	0.000	4222	0	0.000	1843	0	0.000	722	0	0.000	315	0	0.000	151	0	0.000	138	0	0.000	55	0	0.000	24	0	0.000	5	0	0.000	0
Total	2798	8	67116	1	0.001	146979	1	0.001	62468	3	0.005	25637	3	0.012	12563	0	0.000	6163	0	0.000	4588	0	0.000	1533	0	0.000	664	0	0.000	285	0	0.000	2.38×10^{-4}

Notes:
(1) These are retaining walls in the Study Area with height information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall geometry class subjected to the number of feature-hits indicated.

Table A3h - Rainfall Intensity/Major Landslide Frequency Correlation Based on Slope Geometry Class for Post-1978 Retaining Walls

Total Height (m)	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=5	1906	0	46508	0	0.000	96289	0	0.000	40978	0	0.000	16842	0	0.000	8661	0	0.000	4188	0	0.000	2857	0	0.000	908	0	0.000	427	0	0.000	224	0	0.000	0
5-10	819	1	18895	1	0.005	46468	0	0.000	19647	0	0.000	8073	0	0.000	3587	0	0.000	1824	0	0.000	1593	0	0.000	570	0	0.000	213	0	0.000	56	0	0.000	1.02×10^{-4}
>10	73	0	1713	0	0.000	4222	0	0.000	1843	0	0.000	722	0	0.000	315	0	0.000	151	0	0.000	138	0	0.000	55	0	0.000	24	0	0.000	5	0	0.000	0
Total	2798	1	67116	1	0.001	146979	0	0.000	62468	0	0.000	25637	0	0.000	12563	0	0.000	6163	0	0.000	4588	0	0.000	1533	0	0.000	664	0	0.000	285	0	0.000	2.98×10^{-5}

Notes:
(1) These are retaining walls in the Study Area with height information.
(2) These are genuine landslides with volume ≥ 50 m^3 reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall geometry class subjected to the number of feature-hits indicated.

Table A4a - Rainfall Intensity/Landslide Frequency Correlation on Geometry for All Soil Cut Slopes (Pre- and Post-1978)

Slope Geometry Class	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
S1	1107	148	28031	5	0.018	59502	12	0.020	25241	17	0.067	10954	26	0.237	4953	14	0.283	2632	34	1.292	1664	23	1.382	541	7	1.294	258	5	1.938	109	5	4.587	1.11×10^{-2}	
S2	3617	294	101958	1	0.001	189903	25	0.013	80890	46	0.057	34909	40	0.115	17344	41	0.236	8044	44	0.547	4926	70	1.421	1810	18	0.994	757	8	1.057	484	1	0.207	6.77×10^{-3}	
S3	7827	274	229684	4	0.002	404061	17	0.004	174242	37	0.021	71649	35	0.049	36809	29	0.079	17139	46	0.268	10787	86	0.797	3619	16	0.442	1775	2	0.113	1226	2	0.163	2.92×10^{-3}	
S4	8365	142	242268	4	0.002	411024	9	0.002	176136	16	0.009	71205	14	0.020	37376	25	0.067	17836	24	0.135	10794	37	0.343	3732	8	0.214	1968	4	0.203	1195	1	0.084	1.41×10^{-3}	
Total	20916	858	601941	14	0.002	1064490	63	0.006	456509	116	0.025	188717	115	0.061	96482	109	0.113	45651	148	0.324	28171	216	0.767	9702	49	0.505	4758	19	0.399	3014	9	0.299	3.42×10^{-3}	

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A4b - Rainfall Intensity/Landslide Frequency Correlation for Landslides at Different Types of Soil Cut Slopes

Slope Type	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
X	13478	525	407678	6	0.001	703088	43	0.006	300741	59	0.020	124600	67	0.054	64503	60	0.093	30074	101	0.336	18534	141	0.761	6190	34	0.549	2787	9	0.323	2044	5	0.245	3.25×10^{-3}	
Y	1609	157	38561	2	0.005	91731	10	0.011	38497	34	0.088	16478	26	0.158	6316	23	0.364	3706	16	0.432	2407	33	1.371	844	9	1.066	496	4	0.806	177	0	0.000	8.13×10^{-3}	
Z	5829	176	155702	6	0.004	269671	10	0.004	117271	23	0.020	47639	22	0.046	25663	26	0.101	11871	31	0.261	7230	42	0.581	2668	6	0.225	1475	6	0.407	793	4	0.504	2.52×10^{-3}	
Total	20916	858	601941	14	0.002	1064490	63	0.006	456509	116	0.025	188717	115	0.061	96482	109	0.113	45651	148	0.324	28171	216	0.767	9702	49	0.505	4758	19	0.399	3014	9	0.299	3.42×10^{-3}	

Legend:
X Pre-1978 slopes with NPCS scores Y Pre-1978 slopes without NPCS scores Z Post-1978 slopes

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope type subjected to the number of feature-hits indicated.

Table A4c - Rainfall Intensity/Major Landslide Frequency Correlation for Landslides at Different Types of Soil Cut Slopes

Slope Type	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
X	13478	28	407678	0	0.000	703088	0	0.000	300741	0	0.000	124600	1	0.001	64503	3	0.005	30074	8	0.027	18534	12	0.065	6190	2	0.032	2787	1	0.036	2044	1	0.049	1.73×10^{-4}
Y	1609	16	38561	1	0.003	91731	2	0.002	38497	0	0.000	16478	1	0.006	6316	1	0.016	3706	2	0.054	2407	4	0.166	844	3	0.355	496	2	0.403	177	0	0.000	8.29×10^{-4}
Z	5829	22	155702	0	0.000	269671	0	0.000	117271	2	0.002	47639	3	0.006	25663	3	0.012	11871	3	0.025	7230	5	0.069	2668	1	0.037	1475	3	0.203	793	2	0.252	3.15×10^{-4}
Total	20916	66	601941	1	0.000	1064490	2	0.000	456509	2	0.000	188717	5	0.003	96482	7	0.007	45651	13	0.028	28171	21	0.075	9702	6	0.062	4758	6	0.126	3014	3	0.100	2.63×10^{-4}

Legend:

X Pre-1978 slopes with NPCS scores Y Pre-1978 slopes without NPCS scores Z Post-1978 slopes

Notes:
(1) These are soil cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in soil cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope type subjected to the number of feature-hits indicated.

Table A4d - Rainfall Intensity/Landslide Frequency Correlation on Geometry for All Rock Cut Slopes (Pre- and Post-1978)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
<=10	1301	31	37745	1	0.003	69560	5	0.007	29237	9	0.031	11637	2	0.017	5422	1	0.018	2841	5	0.176	1491	4	0.268	564	4	0.709	319	0	0.000	105	0	0.000	1.99×10^{-3}
10-20	389	26	11493	0	0.000	20288	4	0.020	9005	3	0.033	3752	4	0.107	1818	3	0.165	828	6	0.725	505	4	0.792	146	2	1.370	118	0	0.000	25	0	0.000	5.57×10^{-3}
>20	208	20	6488	1	0.015	10785	3	0.028	4590	6	0.131	1985	2	0.101	915	1	0.109	398	1	0.251	281	2	0.712	74	2	2.703	69	2	2.899	23	0	0.000	8.01×10^{-3}
Total	1898	77	55726	2	0.004	100633	12	0.012	42832	18	0.042	17374	8	0.046	8155	5	0.061	4067	12	0.295	2277	10	0.439	784	8	1.020	506	2	0.395	153	0	0.000	3.38×10^{-3}

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A4e - Rainfall Intensity/Landslide Frequency Correlation for Landslides at Different Types of Rock Cut Slopes

Slope Type	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
X	1502	58	48323	1	0.002	87435	10	0.011	37288	13	0.035	15235	5	0.033	7121	3	0.042	3557	9	0.253	2006	9	0.449	650	7	1.077	412	1	0.243	121	0	0.000	3.22×10^{-3}
Y	137	16	3122	1	0.032	8054	1	0.012	3377	4	0.118	1342	3	0.224	504	1	0.198	284	3	1.056	178	1	0.562	53	1	1.887	58	1	1.724	3	0	0.000	9.73×10^{-3}
Z	259	3	7403	0	0.000	13198	1	0.008	5544	1	0.018	2139	0	0.000	1034	1	0.097	510	0	0.000	271	0	0.000	134	0	0.000	94	0	0.000	32	0	0.000	9.65×10^{-4}
Total	1898	77	58848	2	0.003	108687	12	0.011	46209	18	0.039	18716	8	0.043	8659	5	0.058	4351	12	0.276	2455	10	0.407	837	8	0.956	564	2	0.355	156	0	0.000	3.38×10^{-3}

Legend:

X Pre-1978 slopes with NPCS scores Y Pre-1978 slopes without NPCS scores Z Post-1978 slopes

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope type subjected to the number of feature-hits indicated.

Table A4f - Rainfall Intensity/Major Landslide Frequency Correlation for Landslides at Different Types of Rock Cut Slopes

Slope Type	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
X	1502	3	48323	0	0.000	87435	0	0.000	37288	0	0.000	15235	0	0.000	7121	0	0.000	3557	0	0.000	2006	2	0.100	650	1	0.154	412	0	0.000	121	0	0.000	1.66×10^{-4}
Y	137	2	3122	0	0.000	8054	0	0.000	3377	0	0.000	1342	0	0.000	504	0	0.000	284	0	0.000	178	1	0.562	53	0	0.000	58	1	1.724	3	0	0.000	1.22×10^{-3}
Z	259	0	7403	0	0.000	13198	0	0.000	5544	0	0.000	2139	0	0.000	1034	0	0.000	510	0	0.000	271	0	0.000	134	0	0.000	94	0	0.000	32	0	0.000	0
Total	1898	5	58848	0	0.000	108687	0	0.000	46209	0	0.000	18716	0	0.000	8659	0	0.000	4351	0	0.000	2455	3	0.122	837	1	0.119	564	1	0.177	156	0	0.000	2.20×10^{-4}

Legend:

X Pre-1978 slopes with NPCS scores Y Pre-1978 slopes without NPCS scores Z Post-1978 slopes

Notes:
(1) These are rock cut slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in rock cut slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope type subjected to the number of feature-hits indicated.

Table A4g - Rainfall Intensity/Landslide Frequency Correlation on Geometry for All Fill Slopes (Pre- and Post-1978)

Angle (°)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
>0 & <=25	514	2	13721	0	0.000	24484	0	0.000	10574	0	0.000	4511	1	0.022	2269	1	0.044	1072	0	0.000	627	0	0.000	215	0	0.000	115	0	0.000	51	0	0.000	3.24×10^{-4}
>25 & <=35	3807	39	104480	0	0.000	190821	0	0.000	81687	7	0.009	34942	10	0.029	17328	11	0.063	8355	4	0.048	5066	7	0.138	1647	0	0.000	768	0	0.000	460	0	0.000	8.54×10^{-4}
>35 & <=50	2501	32	68876	0	0.000	126701	3	0.002	53276	2	0.004	22582	2	0.009	11919	6	0.050	5542	9	0.162	3342	7	0.209	1191	3	0.252	552	0	0.000	365	0	0.000	1.07×10^{-3}
Total	6822	73	187077	0	0.000	342006	3	0.001	145537	9	0.006	62035	13	0.021	31516	18	0.057	14969	13	0.087	9035	14	0.155	3053	3	0.098	1435	0	0.000	876	0	0.000	8.92×10^{-4}

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope geometry class subjected to the number of feature-hits indicated.

Table A4h - Rainfall Intensity/Landslide Frequency Correlation for Landslides at Different Types of Fill Slopes

Slope Type	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																										Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)			
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	
X	3478	34	101224	0	0.000	183742	3	0.002	77931	3	0.004	33819	5	0.015	17239	9	0.052	7762	4	0.052	4638	7	0.151	1521	3	0.197	718	0	0.000	413	0	0.000	8.15×10^{-4}
Y	285	8	7250	0	0.000	15607	0	0.000	6728	2	0.030	2875	2	0.070	1326	1	0.075	753	1	0.133	431	2	0.464	170	0	0.000	53	0	0.000	57	0	0.000	2.34×10^{-3}
Z	3059	31	78603	0	0.000	142657	0	0.000	60878	4	0.007	25341	6	0.024	12951	8	0.062	6454	8	0.124	3966	5	0.126	1362	0	0.000	664	0	0.000	406	0	0.000	8.45×10^{-4}
Total	6822	73	187077	0	0.000	342006	3	0.001	145537	9	0.006	62035	13	0.021	31516	18	0.057	14969	13	0.087	9035	14	0.155	3053	3	0.098	1435	0	0.000	876	0	0.000	8.92×10^{-4}

Legend:
X Pre-1978 slopes with NPCS scores Y Pre-1978 slopes without NPCS scores Z Post-1978 slopes

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope type subjected to the number of feature-hits indicated.

Table A4i - Rainfall Intensity/Major Landslide Frequency Correlation for Landslides at Different Types of Fill Slopes

Slope Type	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
X	3478	7	101224	0	0.000	183742	0	0.000	77931	0	0.000	33819	1	0.003	17239	2	0.012	7762	2	0.026	4638	2	0.043	1521	0	0.000	718	0	0.000	413	0	0.000		1.68×10^{-4}
Y	285	2	7250	0	0.000	15607	0	0.000	6728	0	0.000	2875	1	0.035	1326	0	0.000	753	0	0.000	431	1	0.232	170	0	0.000	53	0	0.000	57	0	0.000		5.85×10^{-4}
Z	3059	2	78603	0	0.000	142657	0	0.000	60878	0	0.000	25341	0	0.000	12951	1	0.008	6454	0	0.000	3966	1	0.025	1362	0	0.000	664	0	0.000	406	0	0.000		5.45×10^{-5}
Total	6822	11	187077	0	0.000	342006	0	0.000	145537	0	0.000	62035	2	0.003	31516	3	0.010	14969	2	0.013	9035	4	0.044	3053	0	0.000	1435	0	0.000	876	0	0.000		1.34×10^{-4}

Legend:

X Pre-1978 slopes with NPCS scores Y Pre-1978 slopes without NPCS scores Z Post-1978 slopes

Notes:
(1) These are fill slopes in the Study Area with slope height and angle information.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in fill slopes (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the slopes in the particular slope class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the slopes in the particular slope type subjected to the number of feature-hits indicated.

Table A4j - Rainfall Intensity/Landslide Frequency Correlation on Geometry for All Retaining Walls (Pre- and Post-1978)

Total Height (m)	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
<=5	5606	36	138307	0	0.000	302031	2	0.001	129292	12	0.009	53952	8	0.015	25699	3	0.012	11941	4	0.033	8951	6	0.067	3146	0	0.000	1209	0	0.000	705	1	0.142		5.35×10^{-4}
5-10	2389	12	53379	1	0.002	137319	1	0.001	58667	2	0.003	23702	0	0.000	10133	1	0.010	5049	1	0.020	4516	5	0.111	1680	1	0.060	646	0	0.000	199	0	0.000		4.19×10^{-4}
>10	226	0	5258	0	0.000	12744	0	0.000	5705	0	0.000	2229	0	0.000	917	0	0.000	502	0	0.000	427	0	0.000	194	0	0.000	78	0	0.000	44	0	0.000		0
Total	8221	48	196944	1	0.001	452094	3	0.001	193664	14	0.007	79883	8	0.010	36749	4	0.011	17492	5	0.029	13894	11	0.079	5020	1	0.020	1933	0	0.000	948	1	0.105		4.87×10^{-4}

Notes:
(1) These are retaining walls in the Study Area with height information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall geometry class subjected to the number of feature-hits indicated.

Table A4k - Rainfall Intensity/Landslide Frequency Correlation for Landslides at Different Types of Retaining Walls

Slope Type	Total No. of Slope Features[1]	Total No. of Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
X	4965	36	121077	0	0.000	277850	2	0.001	119409	9	0.008	49470	5	0.010	22398	4	0.018	10448	5	0.048	8338	9	0.108	3070	1	0.033	1173	0	0.000	630	1	0.159	6.04×10^{-4}	
Y	458	4	8751	0	0.000	27265	0	0.000	11787	2	0.017	4776	0	0.000	1788	0	0.000	881	0	0.000	968	2	0.207	417	0	0.000	96	0	0.000	33	0	0.000	7.28×10^{-4}	
Z	2798	8	67116	1	0.001	146979	1	0.001	62468	3	0.005	25637	3	0.012	12563	0	0.000	6163	0	0.000	4588	0	0.000	1533	0	0.000	664	0	0.000	285	0	0.000	2.38×10^{-4}	
Total	8221	48	196944	1	0.001	452094	3	0.001	193664	14	0.007	79883	8	0.010	36749	4	0.011	17492	5	0.029	13894	11	0.079	5020	1	0.020	1933	0	0.000	948	1	0.105	4.87×10^{-4}	

Legend:

X Pre-1978 slopes with NPCS scores Y Pre-1978 slopes without NPCS scores Z Post-1978 slopes

Notes:
(1) These are retaining walls in the Study Area with height information.
(2) These are genuine landslides reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall type subjected to the number of feature-hits indicated.

Table A4l - Rainfall Intensity/Major Landslide Frequency Correlation for Landslides at Different Types of Retaining Walls

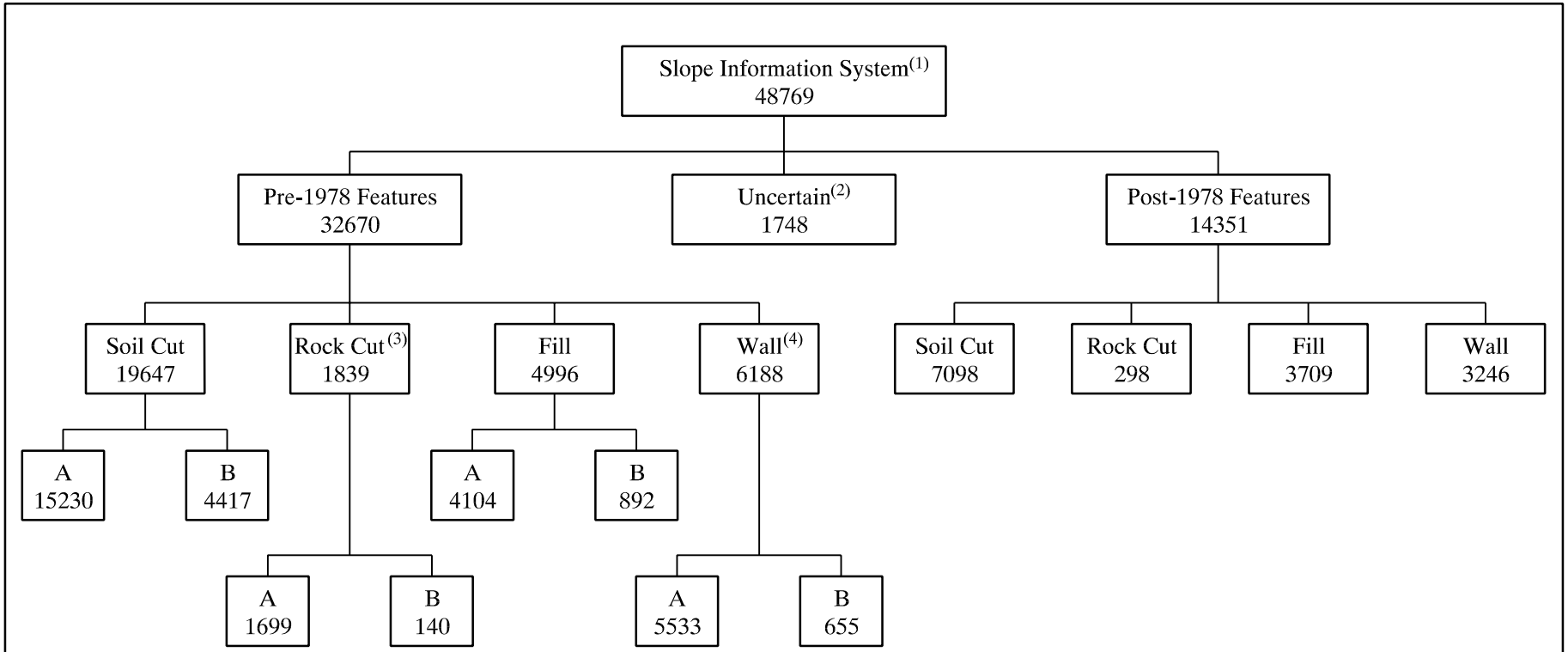
Slope Type	Total No. of Slope Features[1]	Total No. of Major Landslides[2]	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)																																Average Annual Failure Rate (per annum)
			0-50 (mm)			50-100 (mm)			100-150 (mm)			150-200 (mm)			200-250 (mm)			250-300 (mm)			300-350 (mm)			350-400 (mm)			400-450 (mm)			> 450 (mm)					
			A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)	A	B	B/A (%)		
X	4965	0	121077	0	0.000	277850	0	0.000	119409	0	0.000	49470	0	0.000	22398	0	0.000	10448	0	0.000	8338	0	0.000	3070	0	0.000	1173	0	0.000	630	0	0.000	0	
Y	458	0	8751	0	0.000	27265	0	0.000	11787	0	0.000	4776	0	0.000	1788	0	0.000	881	0	0.000	968	0	0.000	417	0	0.000	96	0	0.000	33	0	0.000	0	
Z	2798	1	67116	1	0.001	146979	0	0.000	62468	0	0.000	25637	0	0.000	12563	0	0.000	6163	0	0.000	4588	0	0.000	1533	0	0.000	664	0	0.000	285	0	0.000	2.98×10^{-5}	
Total	8221	1	196944	1	0.001	452094	0	0.000	193664	0	0.000	79883	0	0.000	36749	0	0.000	17492	0	0.000	13894	0	0.000	5020	0	0.000	1933	0	0.000	948	0	0.000	1.01×10^{-5}	

Legend:

X Pre-1978 slopes with NPCS scores Y Pre-1978 slopes without NPCS scores Z Post-1978 slopes

Notes:
(1) These are retaining walls in the Study Area with height information.
(2) These are genuine landslides with volume ≥ 50 m³ reported in the period 1984 to 1995, which are known to have occurred at the screened in retaining walls (see Note (1)) within the rainstorm periods.
(3) "A" denotes number of feature-hits at the retaining walls in the particular wall class subjected to rainfall in the particular rainfall class.
(4) "B" denotes number of failed features (landslides) amongst the retaining walls in the particular wall type subjected to the number of feature-hits indicated.

LIST OF FIGURES



Legend:

A Features with NPCS scores

B Features without NPCS scores

Notes:

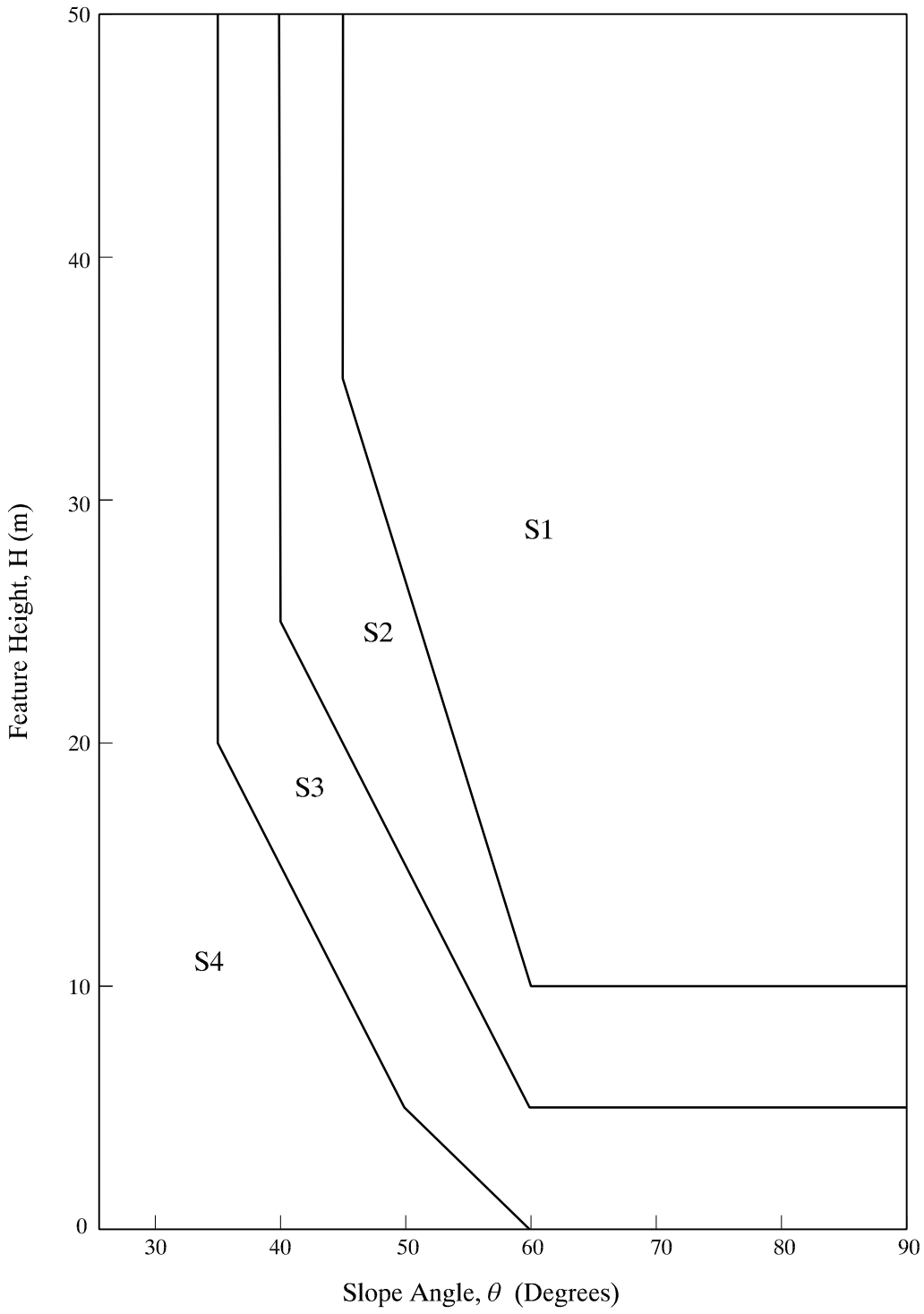
(1) The numbers in this Table correspond to those in the Slope Information System (SIS) as of January 2000. The total number of registered slope features has been reduced from 51754 in the SIS to 48769 after removing features without slope data, e.g., height and angle, due to access problem or being disturbed terrain.

(2) A feature is classified under the "uncertain" category if there is insufficient information available in the SIS to classify it as pre-1978 or post-1978.

(3) Rock cuts are those C and CR features which, according to the SIS, are comprised of rock materials only.

(4) CR and FR features with the retaining wall equal to or greater than 3 m and comprising over 50% of the total feature height are classified under the "Wall" category.

Figure A1 - Distribution of Slope Features in the Slope Information System



Note: Based on the geometry classification for soil cut slopes in the New Priority Classification System (Wong, 1998), with modifications of the boundaries so that the number of slopes in each class is roughly the same.

Figure A2 - Geometry Classification for Soil Cut Slopes

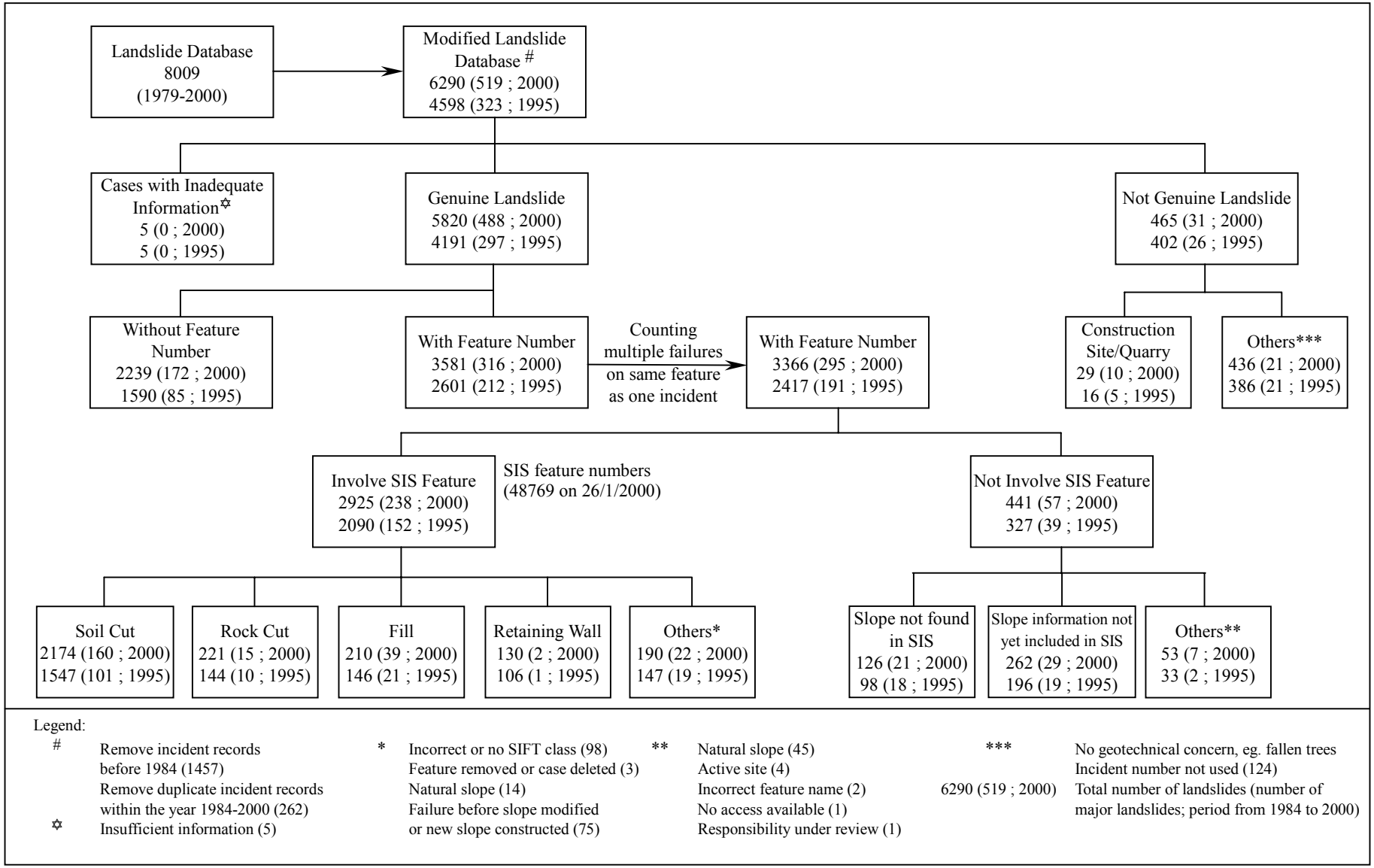
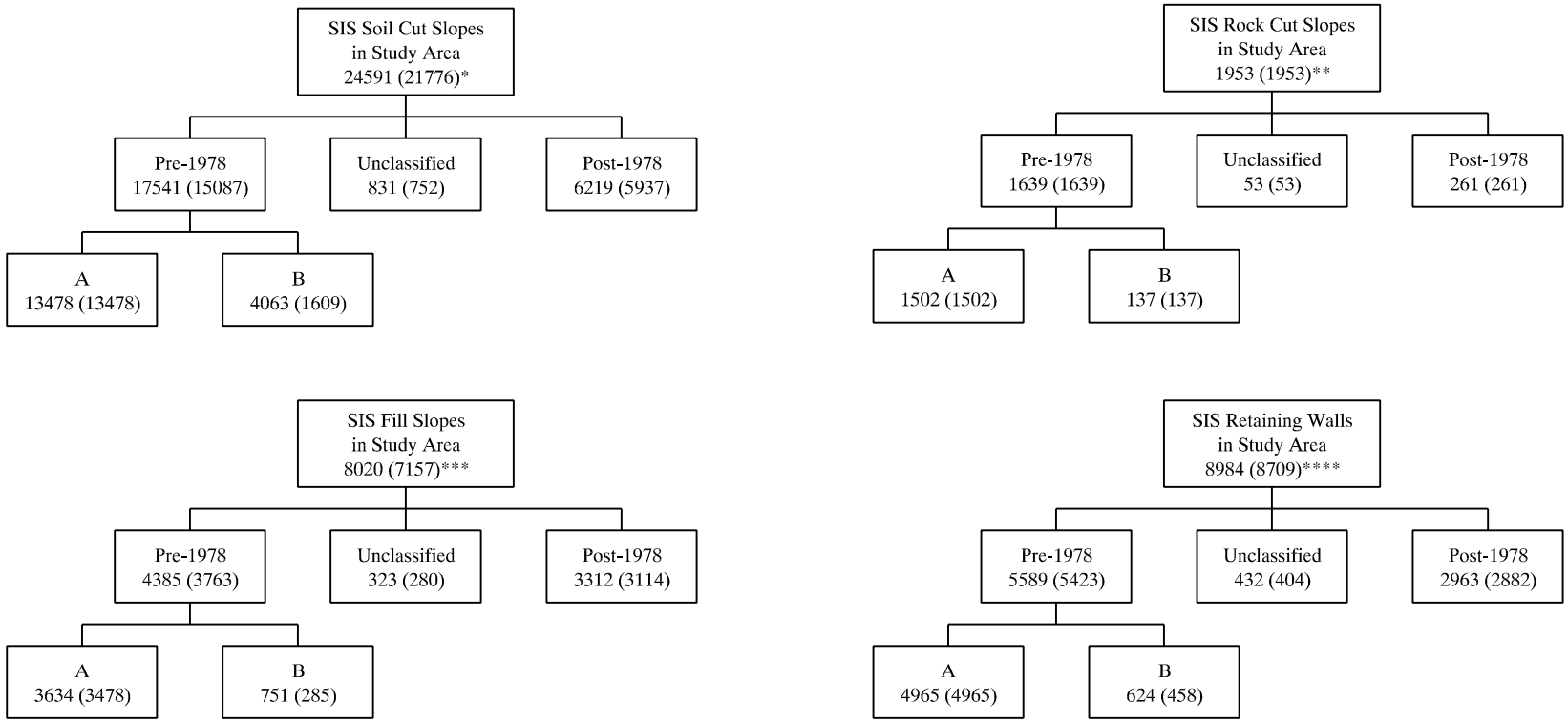


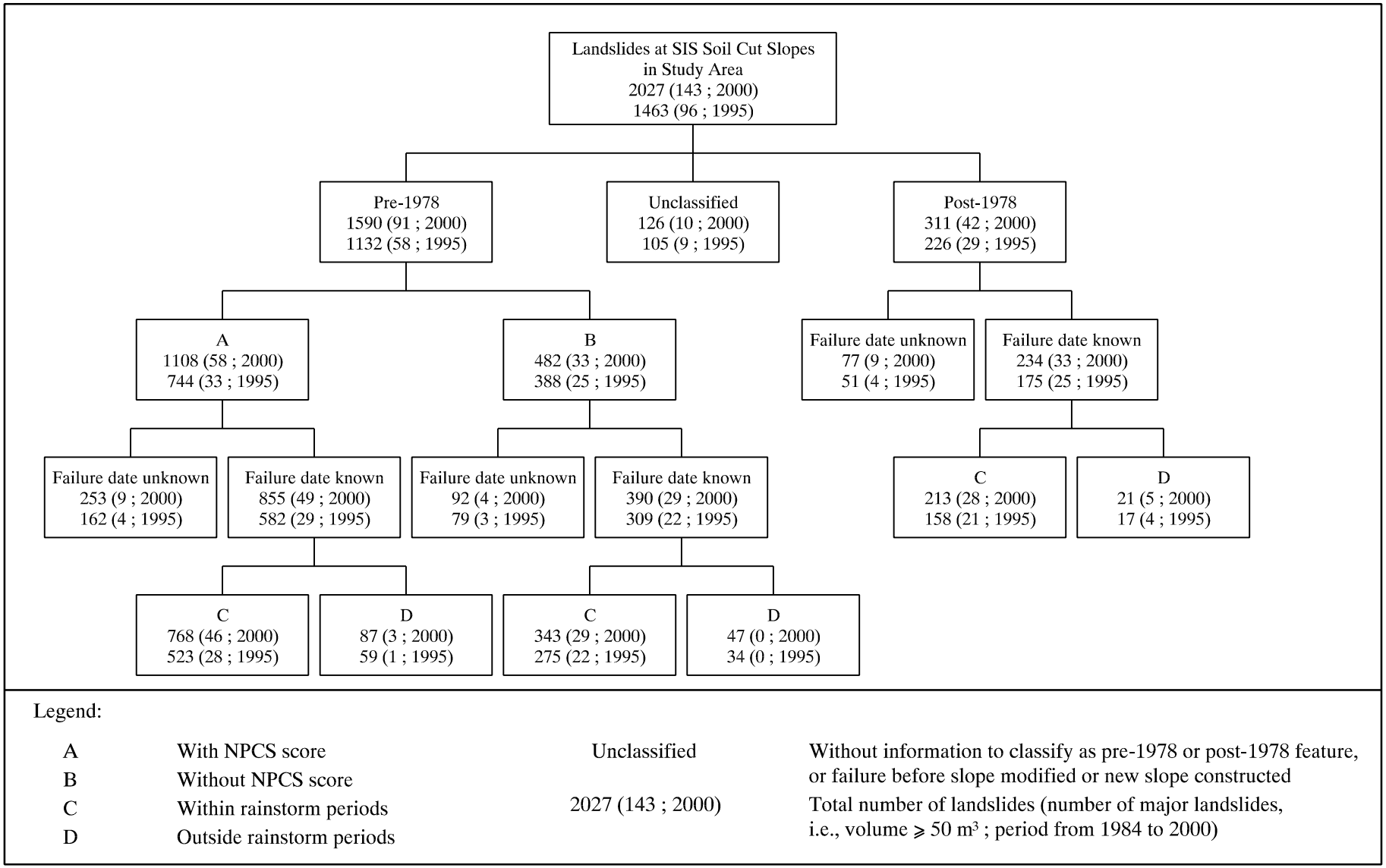
Figure A3 - Distribution of Landslide



Legend:

Unclassified	Without information to classify as pre-1978 or post-1978 feature	A	Features with NPCS scores
*	Total number of soil cut slopes (number with geometry class information)	B	Features without NPCS scores
**	Total number of rock cut slopes (number with feature height information)		
***	Total number of fill slopes (number with feature angle information)		
****	Total number of walls (number with wall height information)		

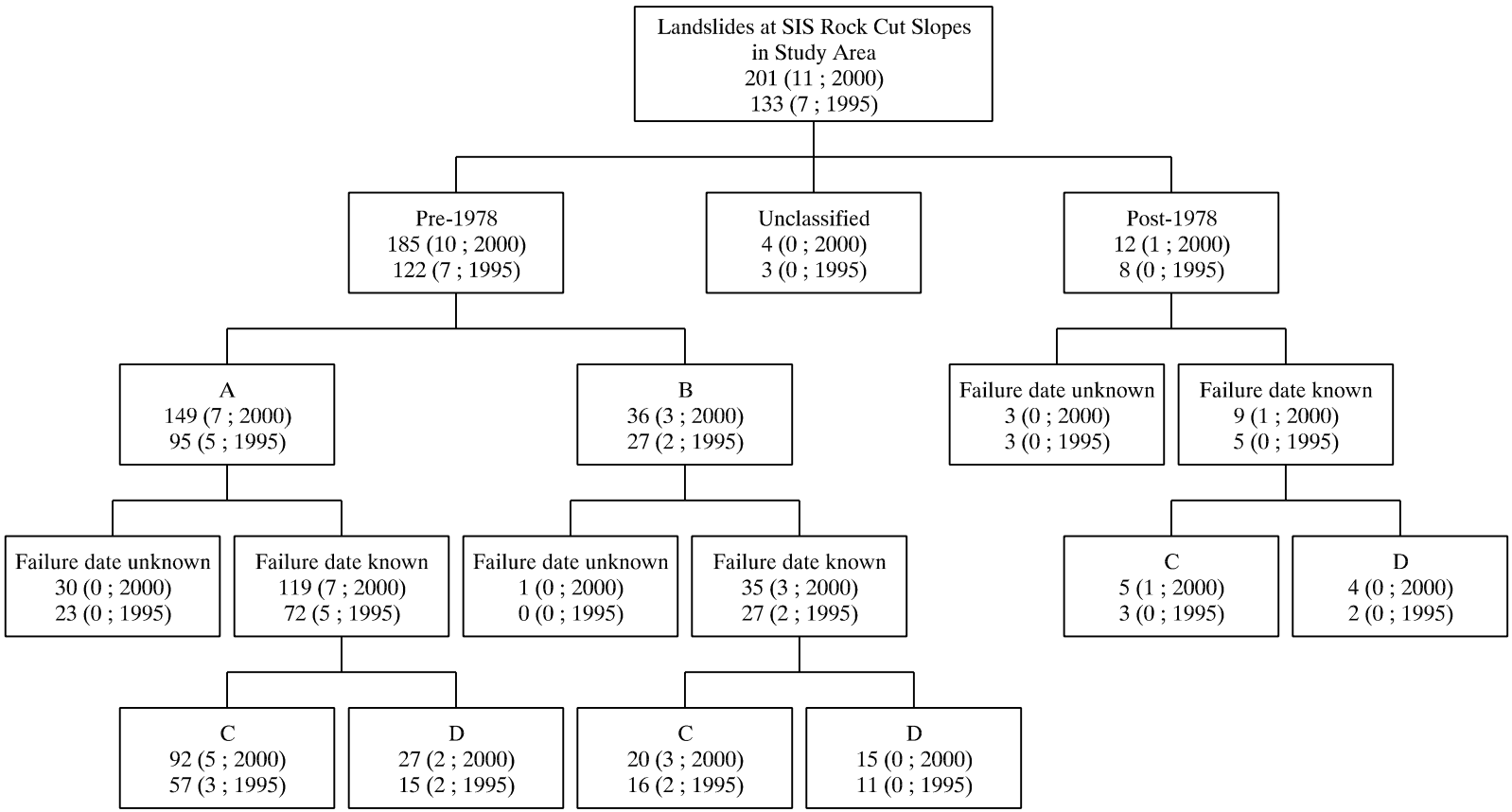
Figure A4 - Distribution of Soil Cut, Rock Cut and Fill Slopes, and Retaining Walls in the Study Area



Legend:

A	With NPCS score	Unclassified	Without information to classify as pre-1978 or post-1978 feature, or failure before slope modified or new slope constructed
B	Without NPCS score		
C	Within rainstorm periods	2027 (143 ; 2000)	Total number of landslides (number of major landslides, i.e., volume $\geqslant$ 50 m^3 ; period from 1984 to 2000)
D	Outside rainstorm periods		

Figure A5 - Distribution of Landslides at Different Types of Soil Cut Slopes in the Study Area



Legend:

A	With NPCS score	Unclassified	Without information to classify as pre-1978 or post-1978 feature, or failure before slope modified or new slope constructed
B	Without NPCS score		
C	Within rainstorm periods	201 (11 ; 2000)	Total number of landslides (number of major landslides, i.e., volume $\geqslant$ 50 m^3 ; period from 1984 to 2000)
D	Outside rainstorm periods		

Figure A6 - Distribution of Landslides at Different Types of Rock Cut Slopes in the Study Area

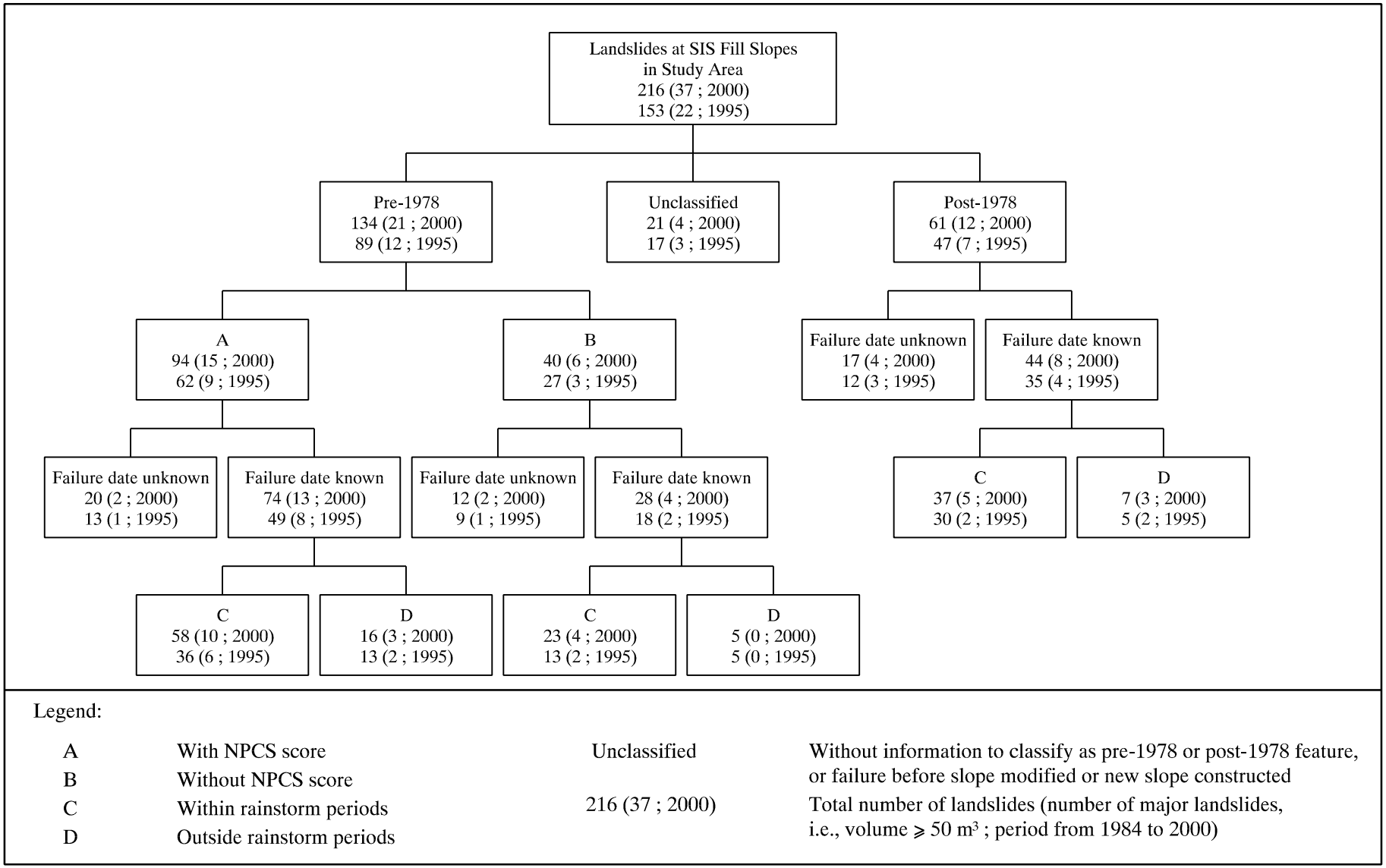
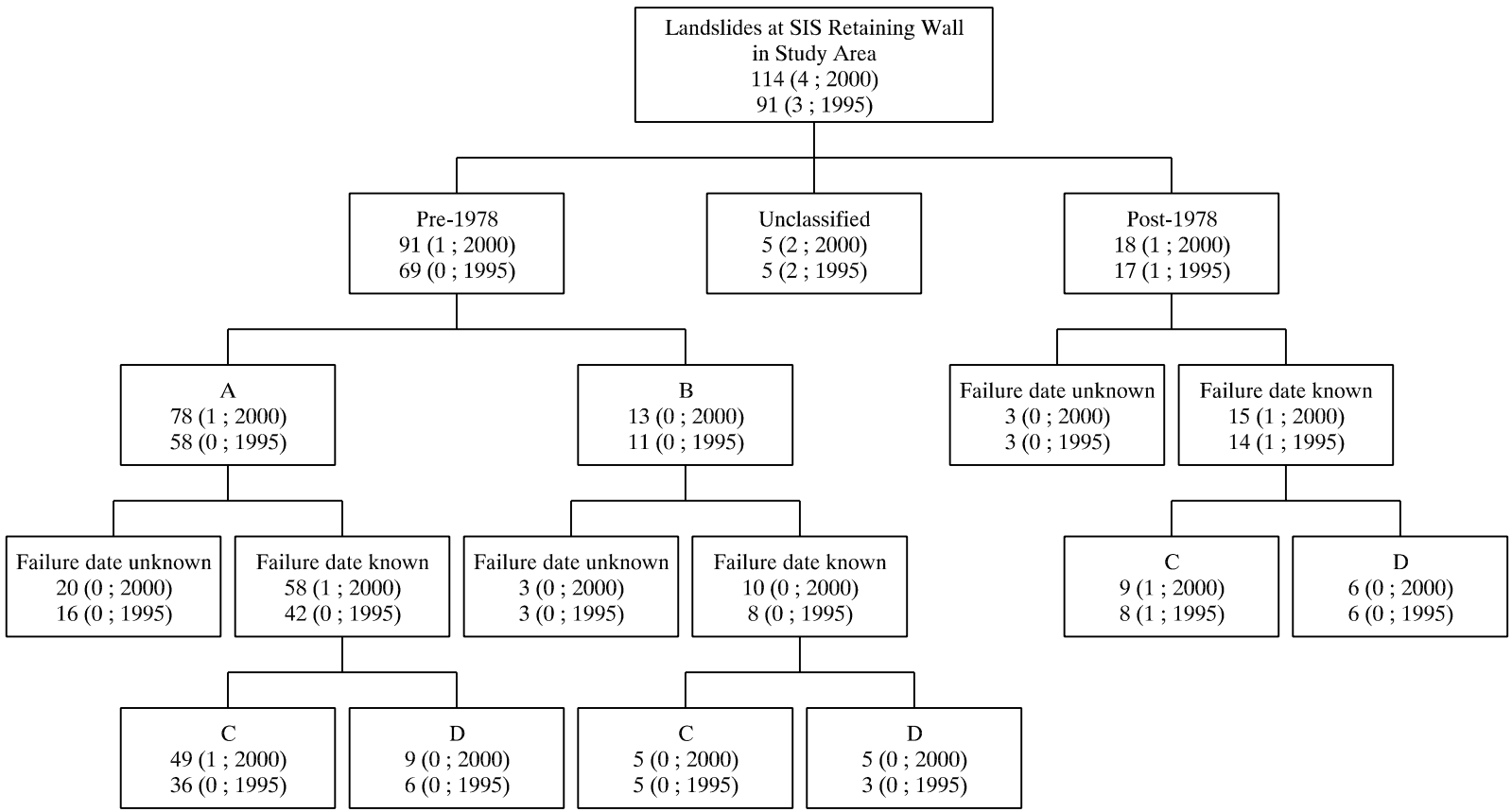


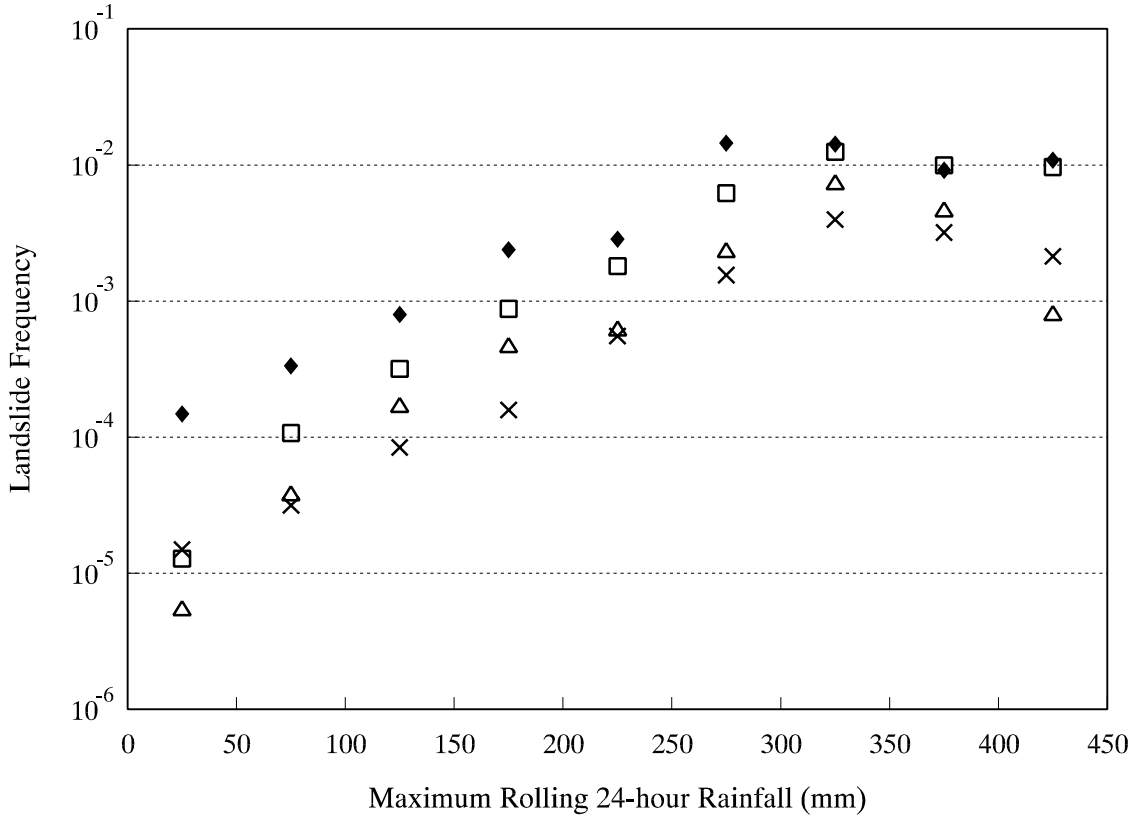
Figure A7 - Distribution of Landslides at Different Types of Fill Slopes in the Study Area



Legend:

A	With NPCS score	Unclassified	Without information to classify as pre-1978 or post-1978 feature, or failure before slope modified or new slope constructed
B	Without NPCS score		
C	Within rainstorm periods	114 (4 ; 2000)	Total number of landslides (number of major landslides, i.e., volume $\geqslant$ 50 m^3 ; period from 1984 to 2000)
D	Outside rainstorm periods		

Figure A8 - Distribution of Landslides at Different Types of Retaining Walls in the Study Area

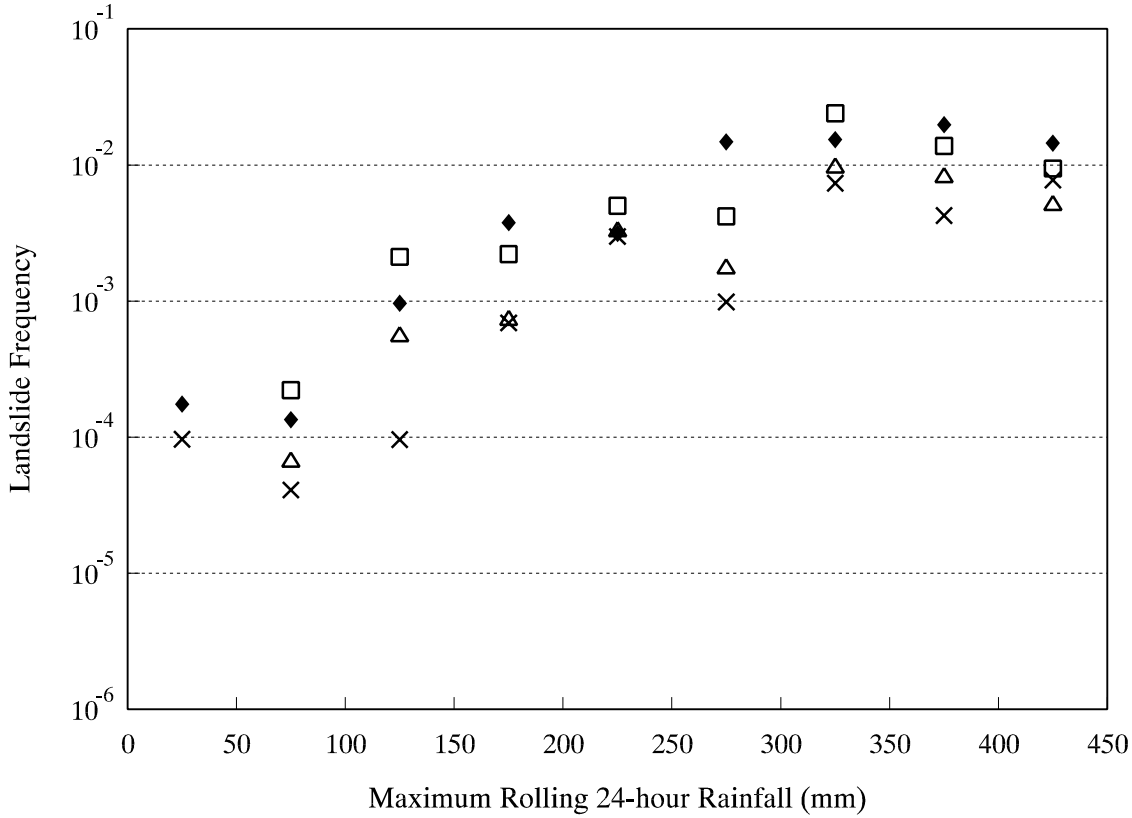


Legend:

♦	Slope Geometry Class S1	□	Slope Geometry Class S2
△	Slope Geometry Class S3	×	Slope Geometry Class S4

Note: For slope geometry classes S1 to S4, see Figure A2.

Figure A9 - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (with NPCS Scores)



Legend:

◆	Slope Geometry Class S1	□	Slope Geometry Class S2
△	Slope Geometry Class S3	×	Slope Geometry Class S4

Note: For slope geometry classes S1 to S4, see Figure A2.

Figure A10 - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (without NPCS Scores)

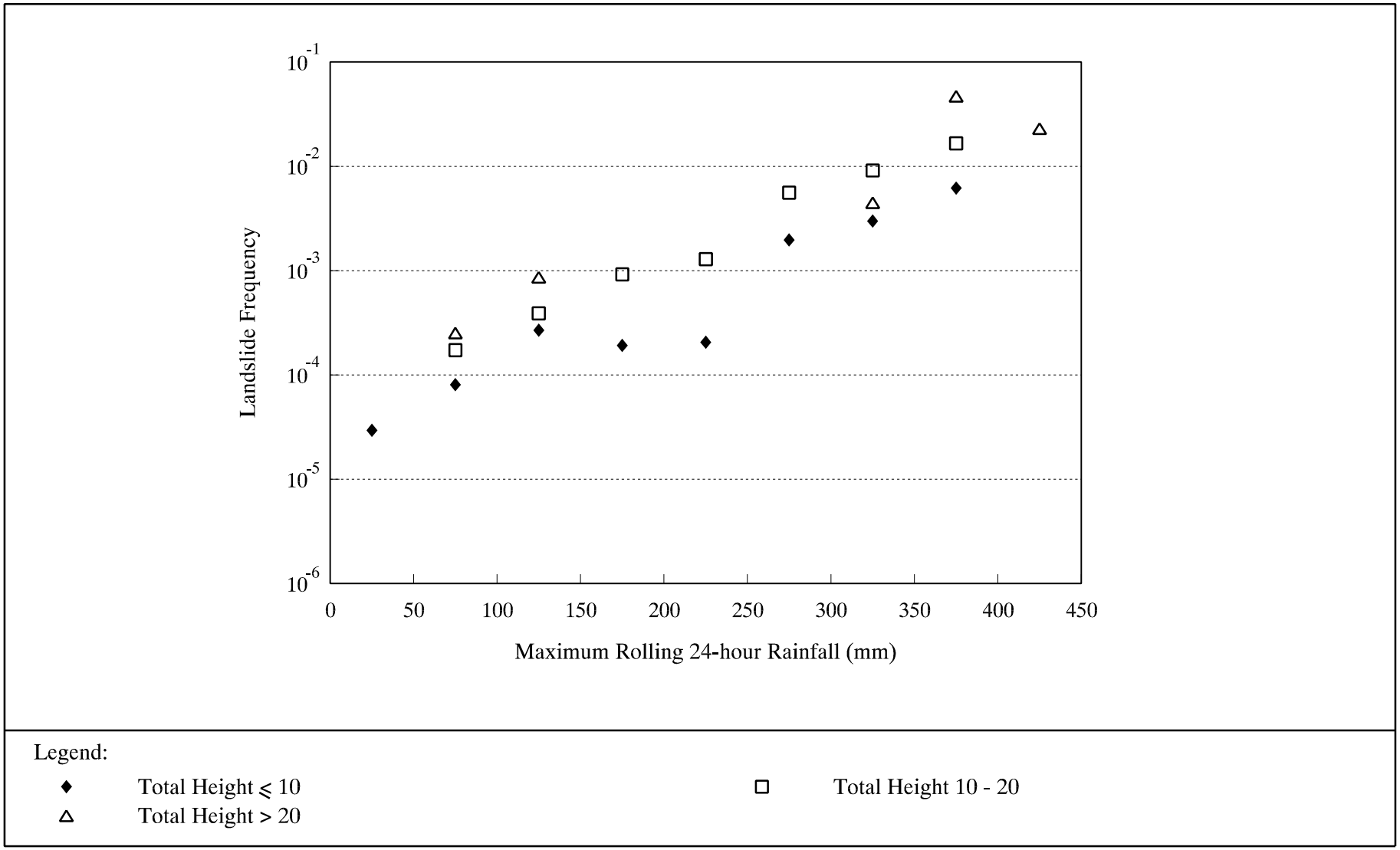


Figure A11 - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Rock Slopes (with NPCS Scores)

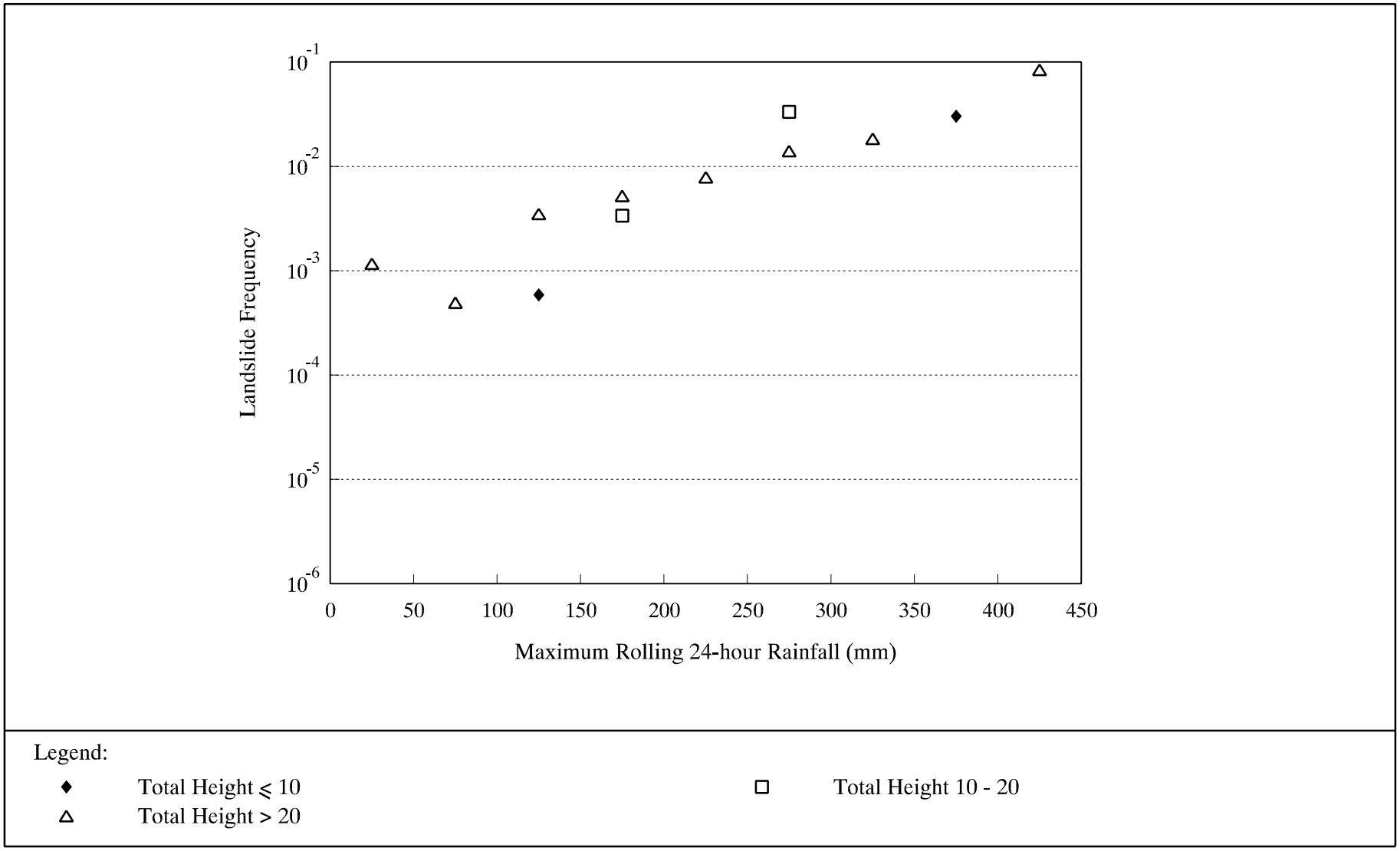


Figure A12 - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Rock Slopes (without NPCS Scores)

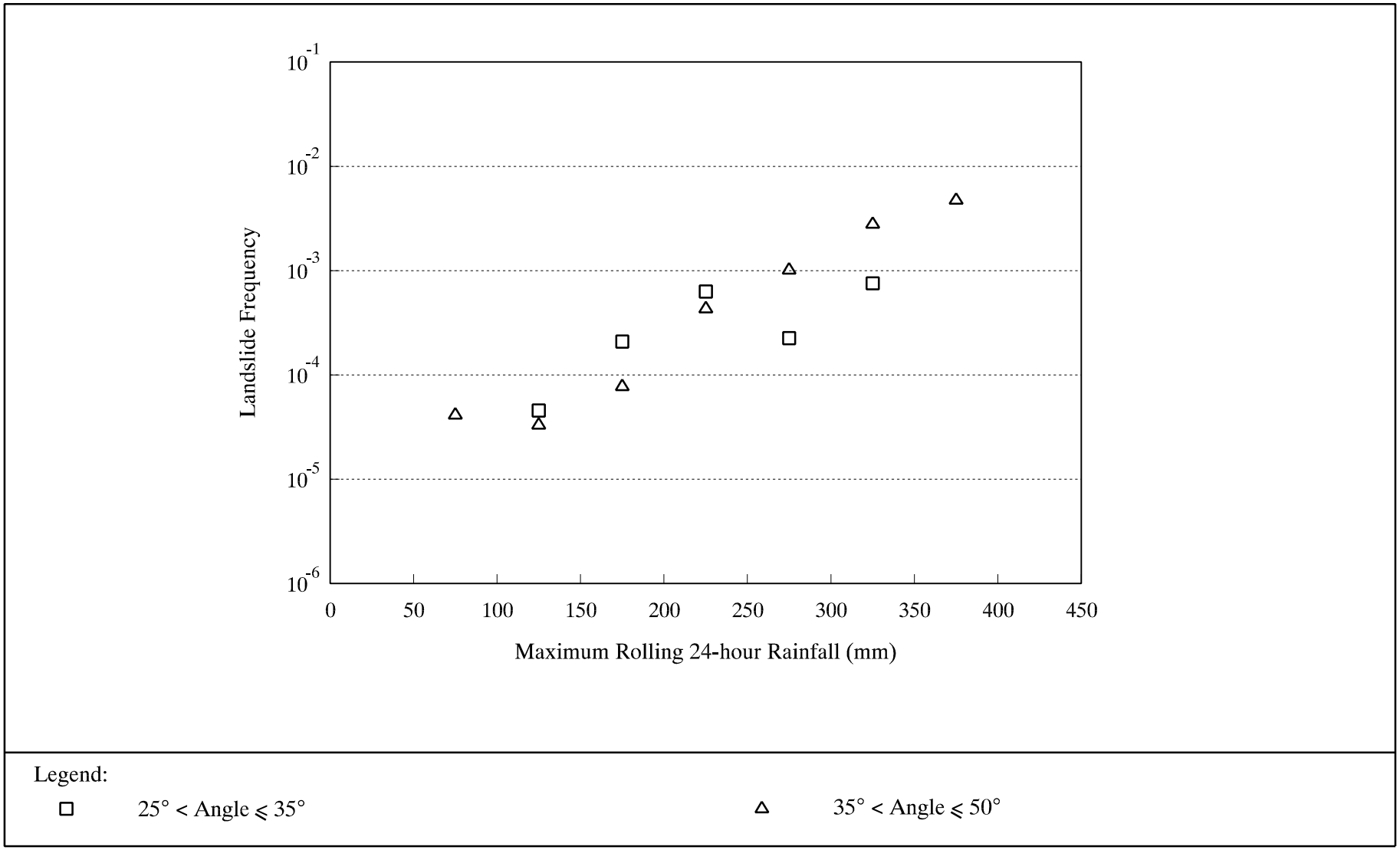


Figure A13 - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Fill Slopes (with NPCS Scores)

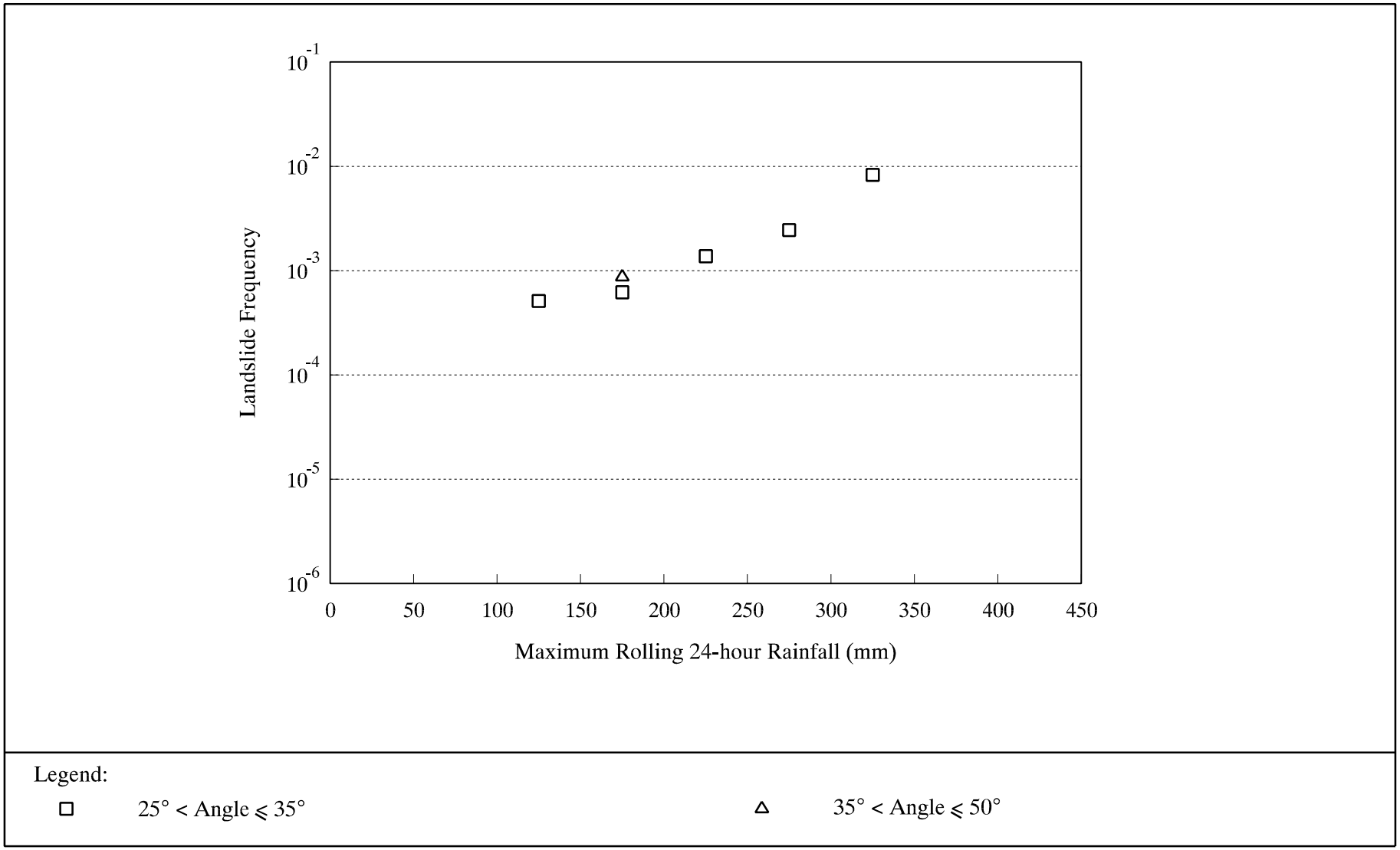


Figure A14 - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Fill Slopes (without NPCS Scores)

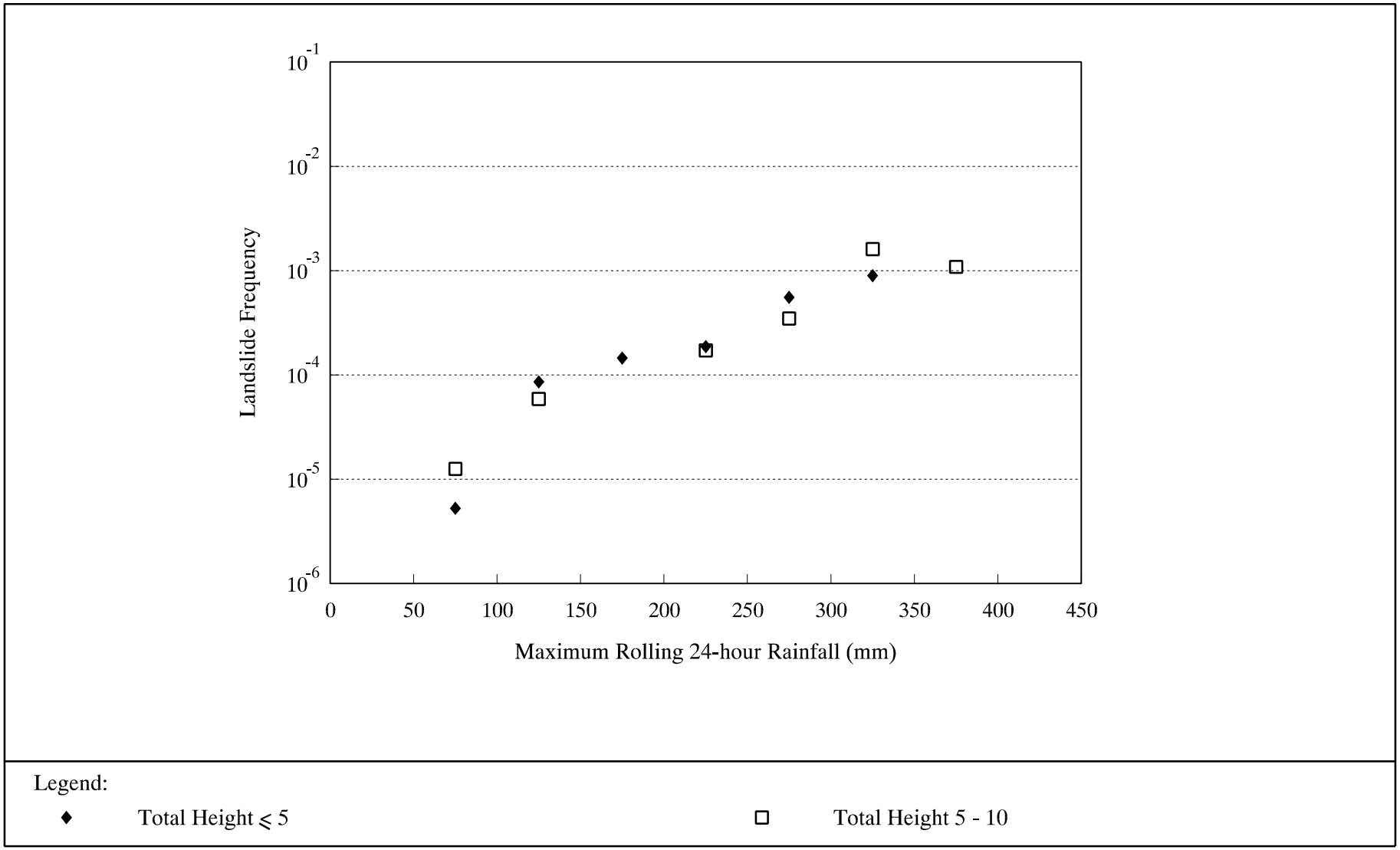


Figure A15 - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Retaining Walls (with NPCS Scores)

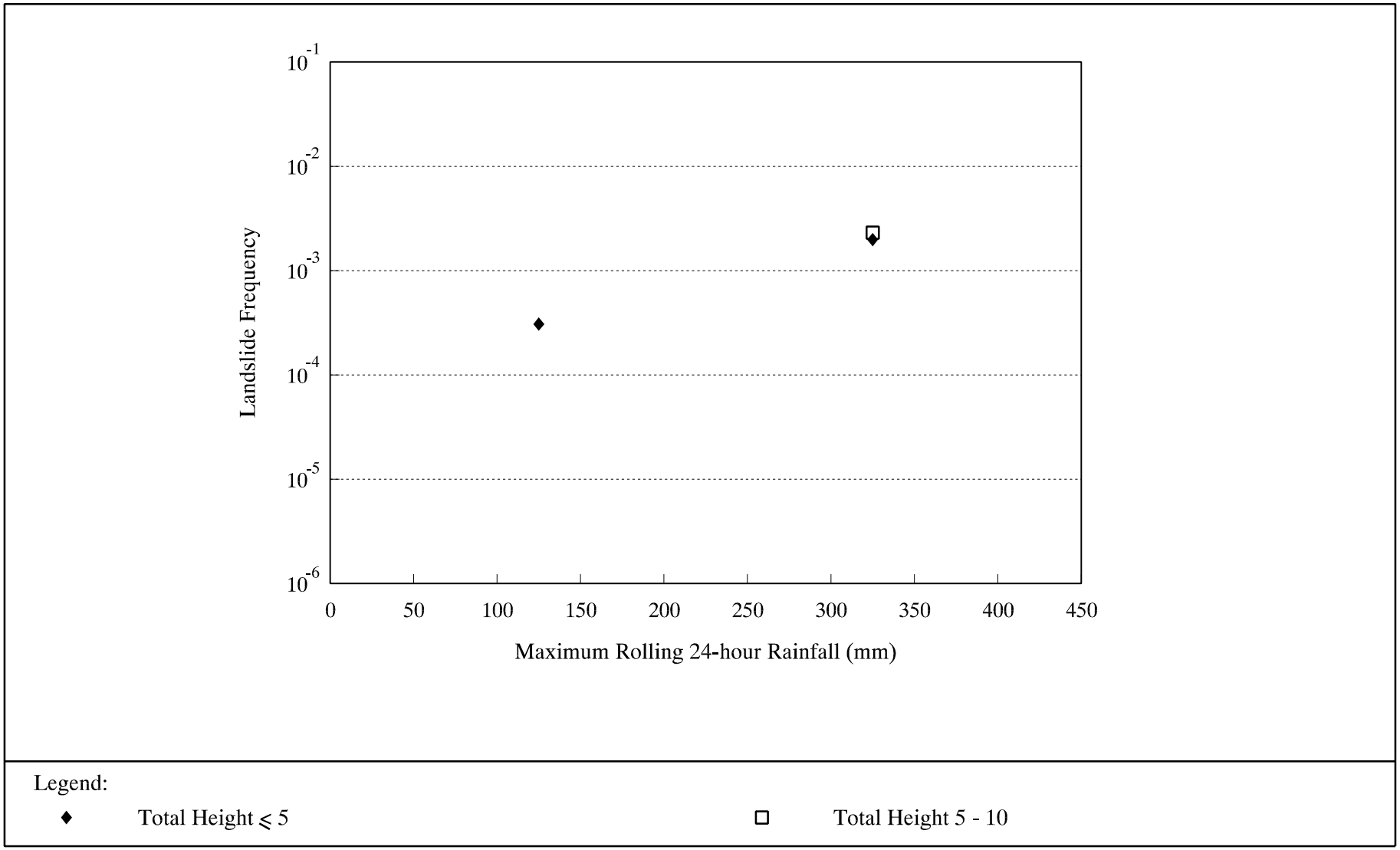


Figure A16 - Rainfall Intensity/Landslide Frequency Correlation Based on Slope Geometry Class for Pre-1978 Retaining Walls (without NPCS Scores)

APPENDIX B

RECORDS OF GENUINE LANDSLIDING AT SIS SLOPE FEATURES

LIST OF TABLES

Table B1 - Number of Genuine Landsliding at SIS Slope Features during Rainstorm Periods (1984-2000) (Sheet 1 of 5)

Rainstorms	No. of Landslide Incidents	Yearly Total	Yearly Total (Including those with known failure date but not within designated rainstorm and those that with unknown failure date)
17/4/1984		12	(39)
17-18/5/1984			
30/5/1984	6		
4/6/1984	1		
16/6/1984			
25/6/1984	1		
9/7/1984			
4-5/8/1984			
11/8/1984	1		
1-2/9/1984	3		
10-11/10/1984			
7-8/2/1985	2	42	(73)
29/3/1985			
9-13/4/1985	5		
25/6/1985	12		
18/7/1985			
16/8/1985	1		
21-22/8/1985			
26-27/8/1985	18		
5-6/9/1985	4		
20-21/9/1985			
21/4/1986	2	41	(77)
11-12/5/1986	10		
19-20/5/1986	1		
6/6/1986	10		
25-26/6/1986			
3-4/7/1986	2		
11-12/7/1986	10		
10-11/8/1986	3		
6-7/9/1986	2		
16/9/1986	1		
16-17/3/1987	9	78	(117)
5-6/4/1987	4		
12-13/4/1987	1		
7-8/5/1987	1		
16-17/5/1987	1		
22-23/5/1987	5		
27-28/5/1987	1		
4-5/6/1987	6		
18-19/6/1987			
22-23/7/1987	1		
25-26/7/1987			

Table B1 - Number of Genuine Landsliding at SIS Slope Features during Rainstorm Periods (1984-2000) (Sheet 2 of 5)

Rainstorms	No. of Landslide Incidents	Yearly Total	Yearly Total (Including those with known failure date but not within designated rainstorm and those that with unknown failure date)
28-30/7/1987	48		
21-22/9/1987			
28-29/10/1987	1		
23-24/6/1988		30	(58)
26/6/1988			
19-20/7/1988	25		
14-15/8/1988			
17-18/8/1988	5		
30-31/8/1988			
7-8/4/1989		253	(321)
1-2/5/1989	52		
20-21/5/1989	192		
21-22/6/1989			
18/7/1989	6		
28-29/7/1989	1		
22-23/8/1989	2		
6-7/9/1989			
16-17/9/1989			
22-23/2/1990	1	19	(42)
3-4/4/1990			
11-12/4/1990	1		
1/6/1990	3		
16-17/6/1990	1		
30/6-1/7/1990	8		
13-14/7/1990			
30/7-2/8/1990	1		
10-11/9/1990	2		
19/9/1990	2		
4-5/10/1990			
8-10/6/1991	9	18	(44)
23-24/7/1991	2		
31/7/1991	1		
14-16/8/1991	3		
14-15/9/1991	1		
14-16/10/1991	2		
3/3/1992	4	275	(383)
4-8/4/1992	15		
10-11/4/1992	21		
7-8/5/1992	188		
15/5/1992	1		
29-30/5/1992			
7/6/1992	1		

Table B1 - Number of Genuine Landsliding at SIS Slope Features during Rainstorm Periods (1984-2000) (Sheet 3 of 5)

Rainstorms	No. of Landslide Incidents	Yearly Total	Yearly Total (Including those with known failure date but not within designated rainstorm and those that with unknown failure date)
13-14/6/1992	24		
28/6/1992			
6-7/7/1992	3		
18/7/1992	18		
20-21/4/1993	1	280	(363)
1-2/5/1993	6		
9/5/1993			
24-25/5/1993	3		
10-11/6/1993	12		
15-16/6/1993	59		
22/7/1993			
13/9/1993			
17/9/1993	5		
23-26/9/1993	80		
13-14/10/1993	2		
4-5/11/1993	112		
3-4/5/1994		176	(255)
19-20/6/1994	8		
4-5/7/1994	1		
11-14/7/1994	10		
21-25/7/1994	113		
5-6/8/1994	19		
9-10/8/1994	6		
15-17/8/1994	13		
26-27/8/1994	1		
10-11/9/1994	2		
23-24/9/1994			
8-9/12/1994	3		
8-9/6/1995	2	115	(171)
17-18/6/1995	1		
2-5/7/1995	1		
12-16/7/1995	8		
24-27/7/1995	3		
2-3/8/1995	15		
5-6/8/1995	7		
11-15/8/1995	59		
26-27/8/1995			
31/8-1/9/1995	6		
2-3/10/1995	4		
5-6/10/1995	9		
28-29/3/1996		39	(87)
3-4/4/1996	2		

Table B1 - Number of Genuine Landsliding at SIS Slope Features during Rainstorm Periods (1984-2000) (Sheet 4 of 5)

Rainstorms	No. of Landslide Incidents	Yearly Total	Yearly Total (Including those with known failure date but not within designated rainstorm and those that with unknown failure date)
19-20/4/1996			
30/4-1/5/1996	1		
4-5/5/1996	5		
29-30/5/1996			
15-16/6/1996			
21-24/6/1996	13		
21-22/7/1996			
15-18/8/1996	2		
2-3/9/1996			
13-14/9/1996	11		
19-22/9/1996	5		
2-3/2/1997			
10/4/1997			
13-14/4/1997	2		
8-9/5/1997	7		
3-5/6/1997	27		
13-14/6/1997	3		
16-18/6/1997	6		
26/6/1997			
1-4/7/1997	59	152	(195)
9-10/7/1997	3		
15-19/7/1997	13		
2-3/8/1997	9		
7-8/8/1997			
11-12/8/1997	14		
21-22/8/1997	8		
24-25/8/1997	1		
7-8/9/1997			
17-18/10/1997			
17-18/2/1998	3		
26-27/4/1998	1		
2-3/5/1998	1		
23-24/5/1998	9		
3-4/6/1998	1		
8-11/6/1998	62	86	(137)
23-24/6/1998	1		
3-4/7/1998	4		
12-13/7/1998	1		
31/8-1/9/1998	2		
9-10/10/1998	1		

Table B1 - Number of Genuine Landsliding at SIS Slope Features during Rainstorm Periods (1984-2000) (Sheet 5 of 5)

Rainstorms	No. of Landslide Incidents	Yearly Total	Yearly Total (Including those with known failure date but not within designated rainstorm and those that with unknown failure date)
12-13/4/1999	1	186	(232)
29-30/4/1999	2		
7-8/6/1999			
22-26/8/1999	167		
16-17/9/1999	16		
3-4/4/2000	2	88	(141)
14-15/4/2000	35		
23-24/4/2000	1		
2-3/5/2000	9		
25/5/2000			
12-13/6/2000	3		
17-19/6/2000	4		
17-18/7/2000	2		
1-5/8/2000			
24-27/8/2000	29		
1-3/9/2000	2		
20-21/10/2000	1		
12/11/2000			

APPENDIX C

RAINFALL INTENSITY/LANDSLIDE FREQUENCY CORRELATION MODELS

LIST OF TABLES

Table C1 - Rainfall Intensity/Landslide Frequency Correlation Models Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (with NPCS Scores)

Slope Geometry Class	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)							
	0	>0 and <50 (mm)	>=50 and <100 (mm)	>=100 and <150 (mm)	>=150 and <200 (mm)	>=200 and <250 (mm)	>=250 and <300 (mm)	>=300 (mm)
	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)
S1	0	0.0162	0.0352	0.0764	0.1657	0.3597	0.7809	1.6949
S2	0	0.0043	0.0108	0.0273	0.0688	0.1734	0.4374	1.1030
S3	0	0.0018	0.0046	0.0120	0.0311	0.0809	0.2101	0.5461
S4	0	0.0011	0.0029	0.0075	0.0195	0.0503	0.1301	0.3364

Table C2 - Rainfall Intensity/Landslide Frequency Correlation Models Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes (without NPCS Scores)

Slope Geometry Class	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)							
	0	>0 and <50 (mm)	>=50 and <100 (mm)	>=100 and <150 (mm)	>=150 and <200 (mm)	>=200 and <250 (mm)	>=250 and <300 (mm)	>=300 (mm)
	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)
S1	0	0.0276	0.0570	0.1176	0.2428	0.5014	1.0353	2.1375
S2	0	0.0209	0.0437	0.0911	0.1899	0.3961	0.8260	1.7227
S3	0	0.0058	0.0136	0.0318	0.0744	0.1742	0.4075	0.9534
S4	0	0.0039	0.0090	0.0207	0.0475	0.1089	0.2498	0.5728

Table C3 - Rainfall Intensity/Landslide Frequency Correlation Models Based on Slope Geometry Class for Post-1978 Soil Cut Slopes

Slope Geometry Class	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)							
	0	>0 and <50 (mm)	>=50 and <100 (mm)	>=100 and <150 (mm)	>=150 and <200 (mm)	>=200 and <250 (mm)	>=250 and <300 (mm)	>=300 (mm)
	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)
S1	0	0.0080	0.0198	0.0490	0.1211	0.2994	0.7401	1.8294
S2	0	0.0067	0.0162	0.0393	0.0952	0.2307	0.5590	1.3544
S3	0	0.0021	0.0057	0.0153	0.0408	0.1094	0.2929	0.7844
S4	0	0.0012	0.0028	0.0064	0.0146	0.0335	0.0769	0.1762

Table C4 - Rainfall Intensity/Landslide Frequency Correlation Models for Different Slope Types

Types of Slope	Rainfall Class (Based on Maximum Rolling 24-hour Rainfall)							
	0	>0 and <50 (mm)	>=50 and <100 (mm)	>=100 and <150 (mm)	>=150 and <200 (mm)	>=200 and <250 (mm)	>=250 and <300 (mm)	>=300 (mm)
	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)	Landslide Frequency (%)
Soil Cut Slopes (Major)	0	0.0002	0.0002	0.0006	0.0021	0.0073	0.0259	0.0915
All Soil Cut Slopes	0	0.0027	0.0071	0.0184	0.0481	0.1258	0.3286	0.8586
All Rock Cut Slopes	0	0.0050	0.0107	0.0229	0.0488	0.1041	0.2221	0.4737
All Fill Slopes	0	0.0006	0.0018	0.0047	0.0128	0.0346	0.0936	0.2530
All Retaining Walls	0	0.0006	0.0013	0.0029	0.0067	0.0153	0.0348	0.0794

LIST OF FIGURES

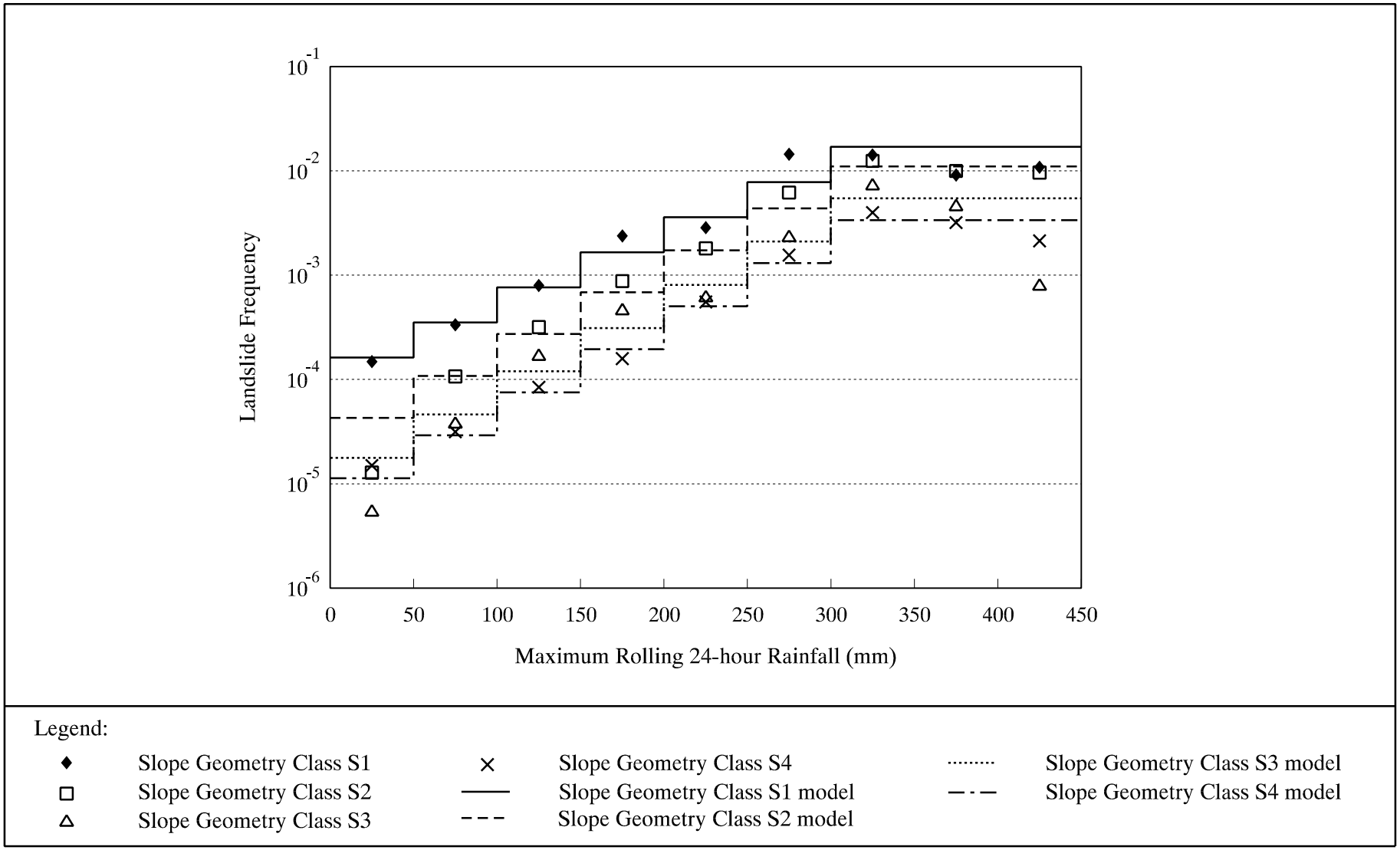


Figure C1 - Rainfall Intensity/Landslide Frequency Correlation Model Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes with NPCS Scores

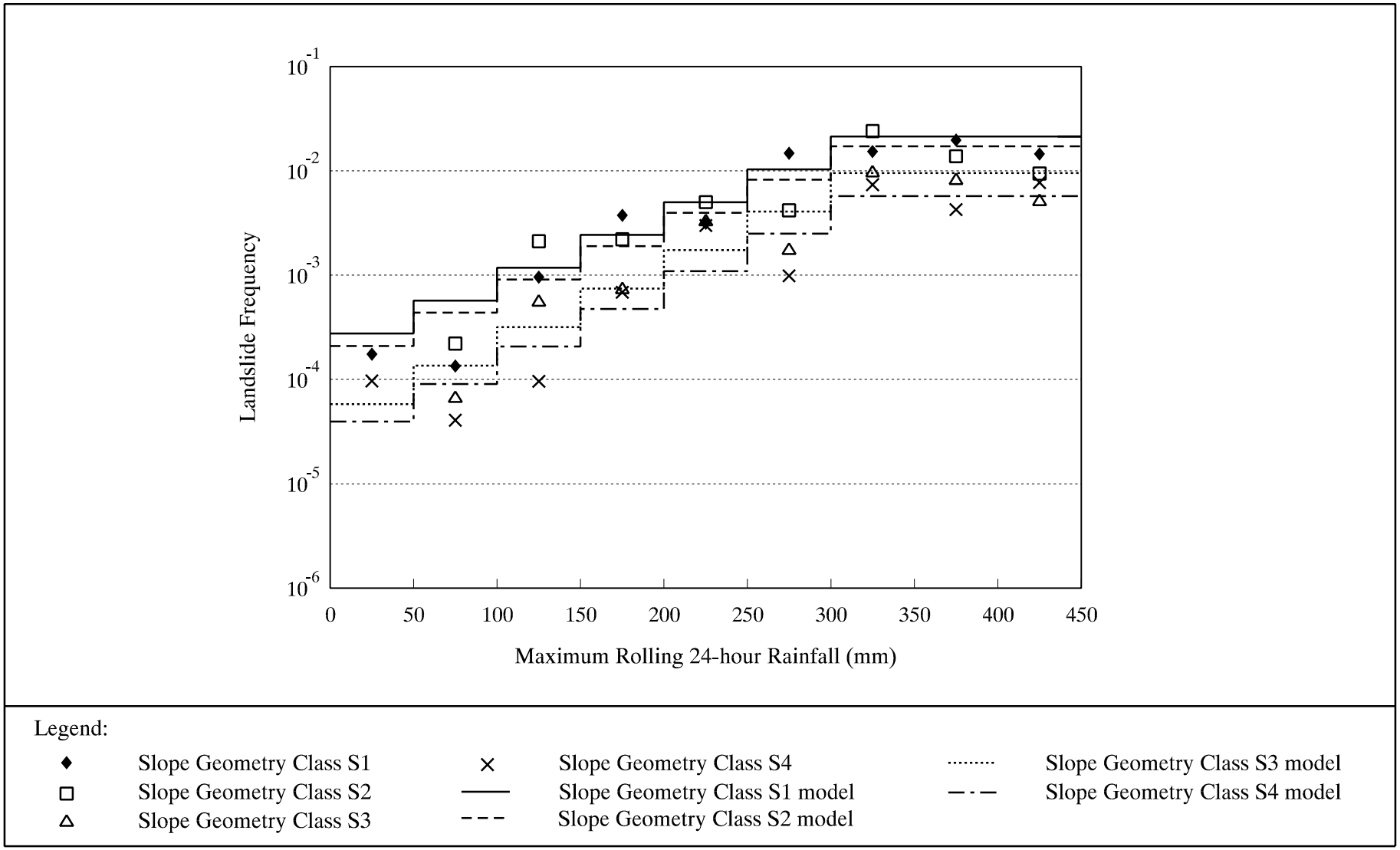


Figure C2 - Rainfall Intensity/Landslide Frequency Correlation Model Based on Slope Geometry Class for Pre-1978 Soil Cut Slopes without NPCS Scores

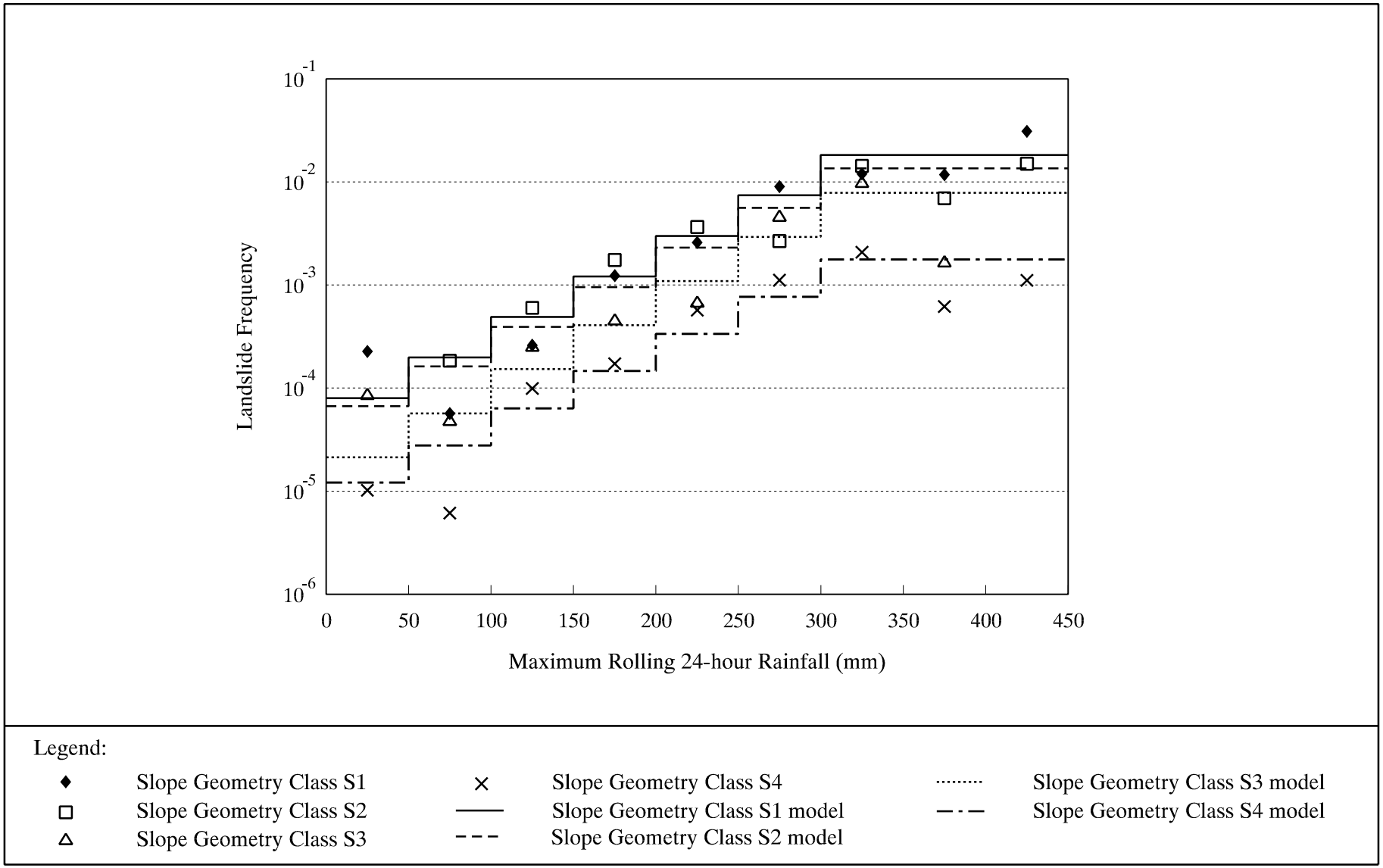


Figure C3 - Rainfall Intensity/Landslide Frequency Correlation Model Based on Slope Geometry Class for Post-1978 Soil Cut Slopes

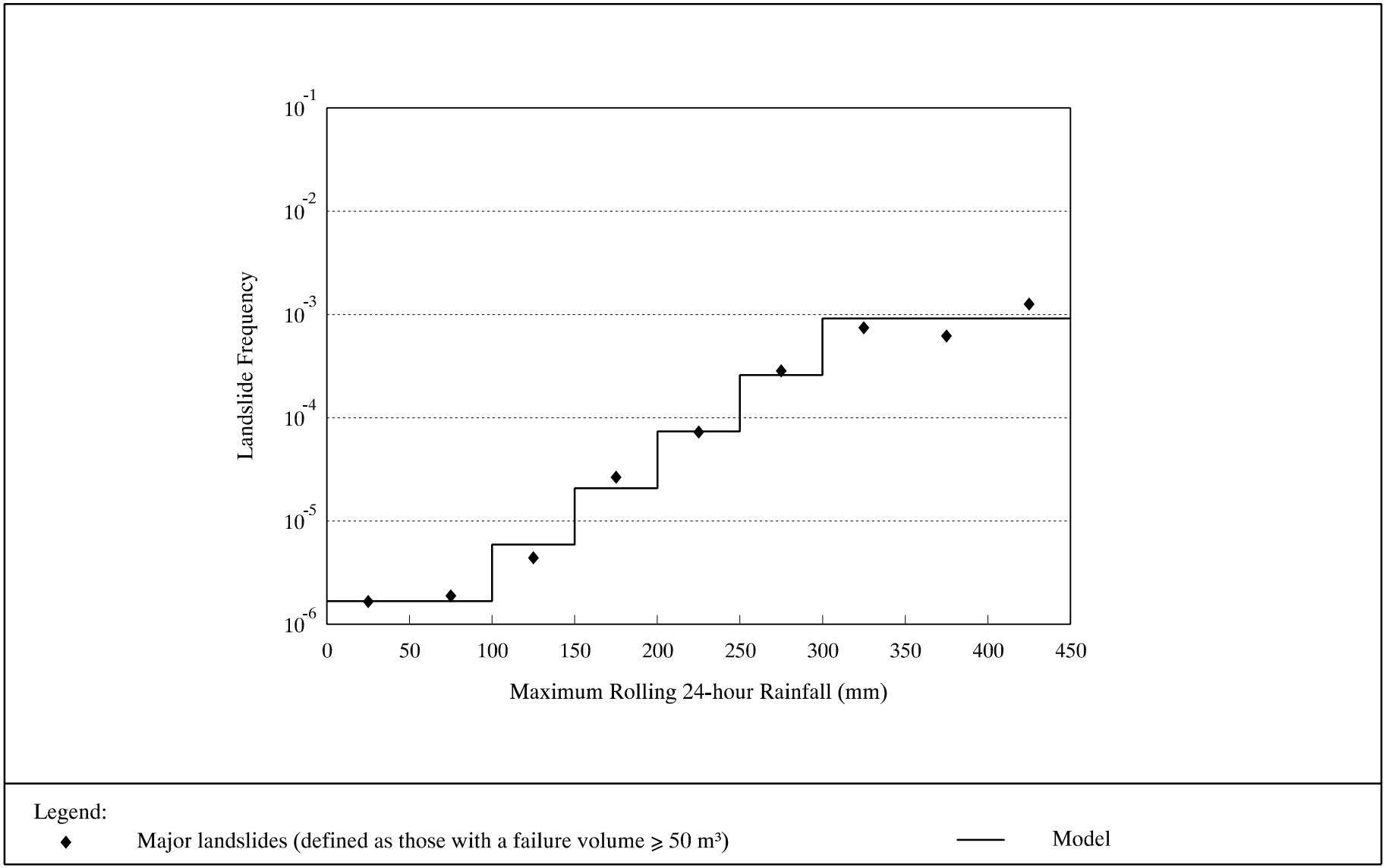


Figure C4 - Rainfall Intensity/Major Landslide Frequency Correlation Model for Soil Cut Slopes

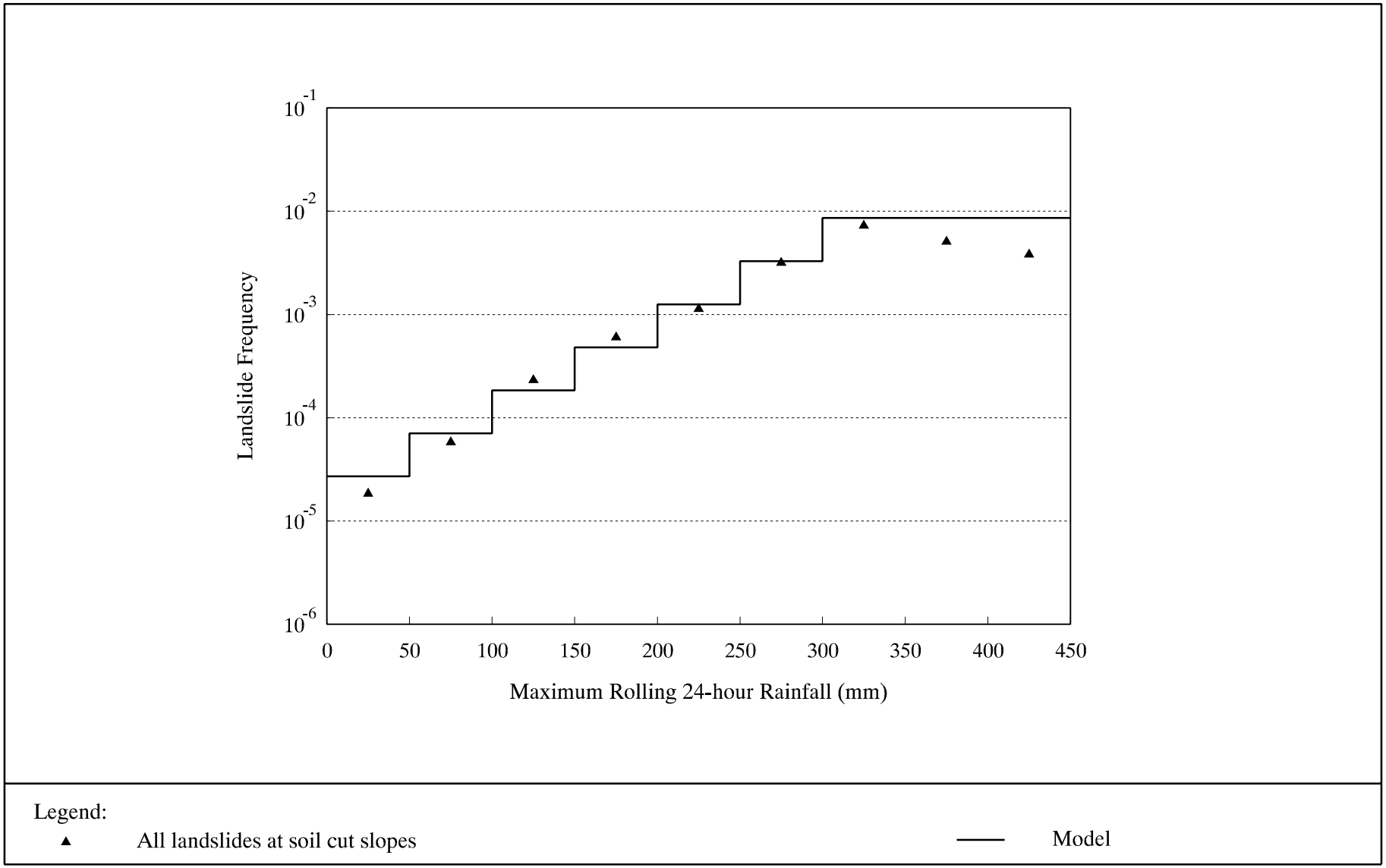


Figure C5 - Rainfall Intensity/Landslide Frequency Correlation Model for All Soil Cut Slopes (Pre- and Post-1978)

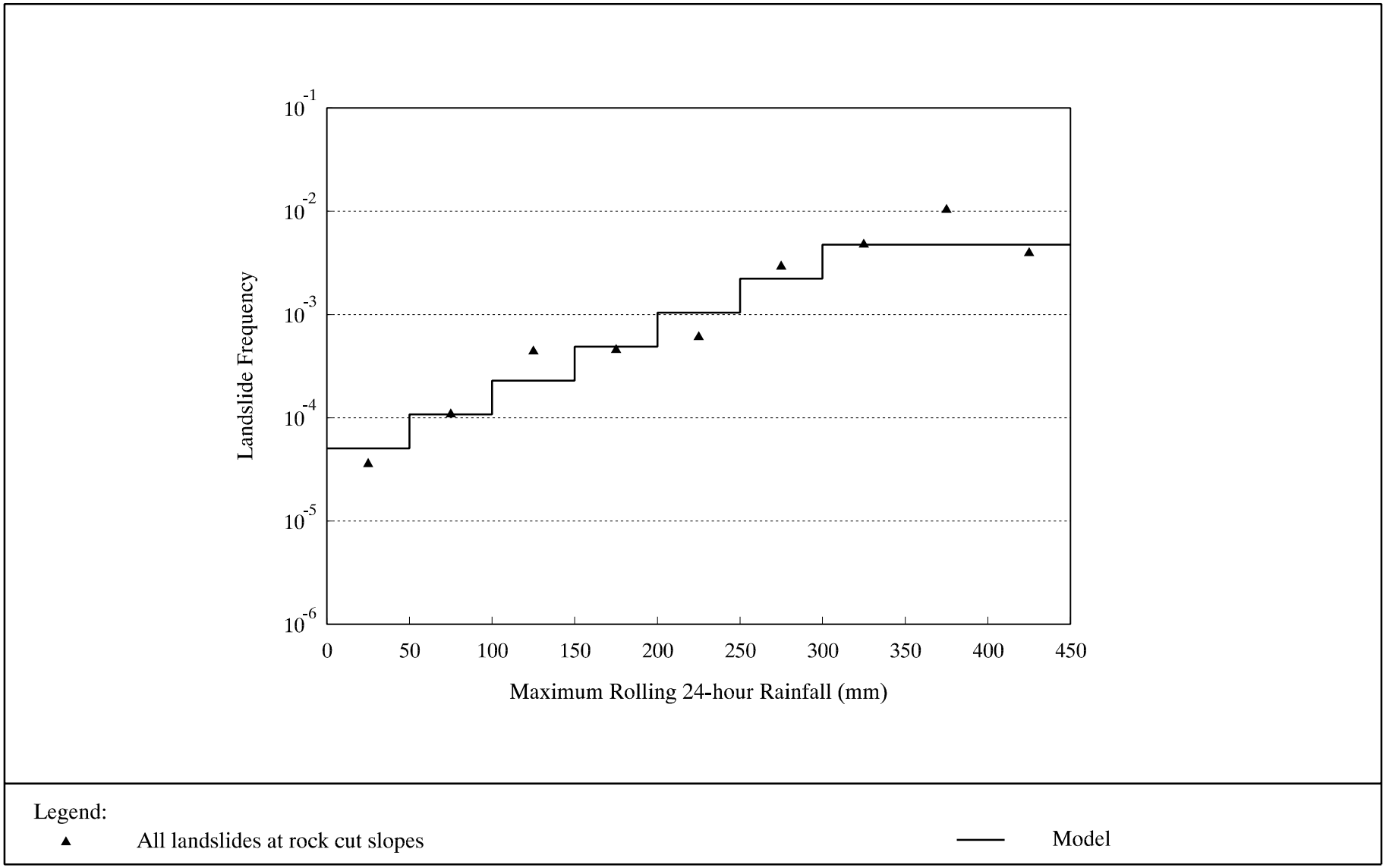


Figure C6 - Rainfall Intensity/Landslide Frequency Correlation Model for All Rock Cut Slopes (Pre- and Post-1978)

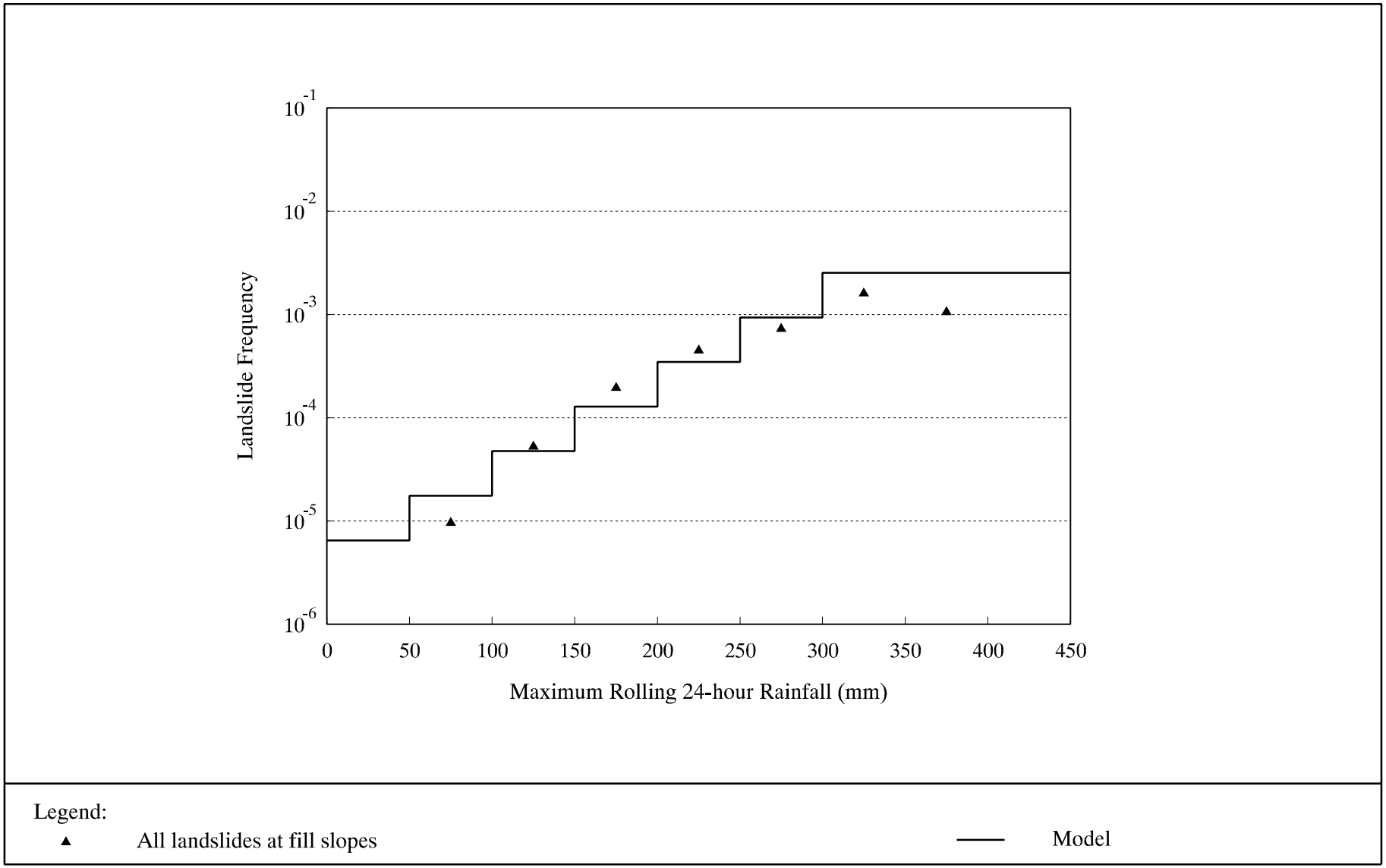


Figure C7 - Rainfall Intensity/Landslide Frequency Correlation Model for All Fill Slopes (Pre- and Post-1978)

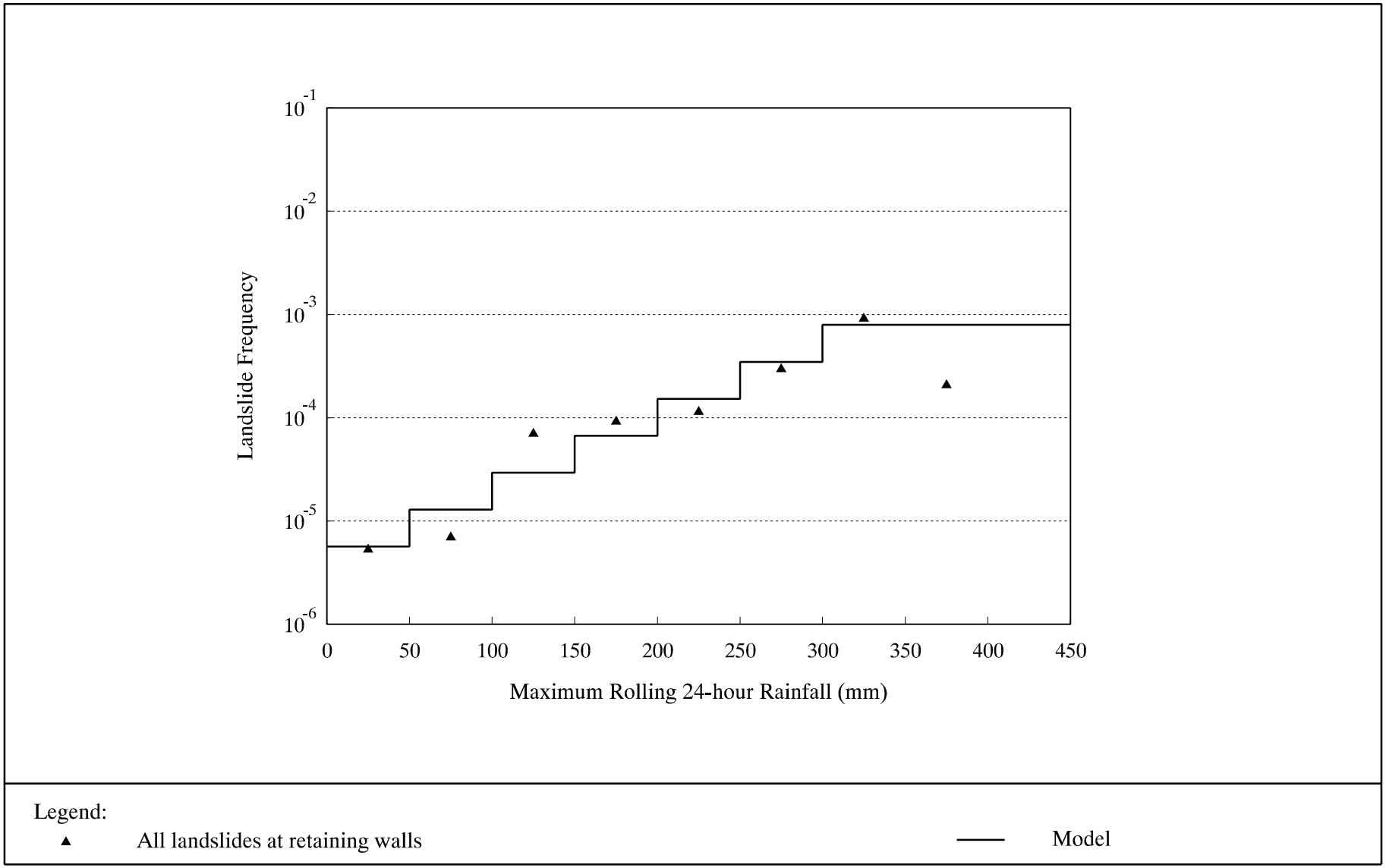


Figure C8 - Rainfall Intensity/Landslide Frequency Correlation Model for All Retaining Walls (Pre- and Post-1978)