APPENDIX A

AERIAL PHOTOGRAPH INTERPRETATION

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A.1 SUMMARY

The site was natural terrain (with minor footpaths) comprising a gently sloping concave landform in-between two small ridges prior to the commencement of the borrow area in 1976. A small cut slope, associated with the haul road to Kau To Shan borrow area, was formed in 1976 and was substantially extended, both laterally and vertically, between 1977 and 1978. The haul road, which was further southwest and straighter than Lai Ping Road is today, was moved in 1978 as part of the development of a cut and fill platform on which the salt water service reservoir was ultimately constructed. Two realignments of the road were constructed during 1978. One, which forms the present route of Lai Ping Road, was constructed in part on a ramp. An earlier realignment was constructed even closer to the cut slope, but by the end of 1978, only part of the road, on a section of ramp below the southeast part of the slope, remained intact. Its continuation to the northwest was probably damaged by a failure of the adjacent cut slope and had been removed by late 1978.

The earliest indications of possible slope instability are seen in 1977 on the western, uppermost part of the cut slope. However, the first substantial failure occurred in 1978 and affected the central part of the slope but the extent of this failure is hard to establish. By the end of 1979, failures had occurred at near the toe of the cut slope at its eastern end. Larger slips/erosional features are also seen in the western and central parts of the slope. Instability recurred on a number of occasions (together with extensive erosion), mainly on the central western side of the slope, with significant events noted in 1980, 1983, 1987 and 1993. The slope has not had any surface protection applied, although some chunam or grass was placed on the lower eastern side of the cut slope soon after its formation. Drainage channels were constructed on the berms on the eastern side. Vegetation has only ever grown over part of the slope so that the upper central and upper eastern parts of the slope have almost always been bare. There is no evidence that remedial works were carried out or surface protection applied following the various failures. Two major tension cracks on the upper eastern side of the cut slope, and subsidiary minor cracks on its lower eastern side, are clearly visible on aerial photographs taken from 1983 until 1996. From 1979 onwards, the possible locations of scarps on the natural slope above the cut slope can be inferred on the basis of disturbances of the vegetation.

A.2 SITE HISTORY

The following site history has been interpreted from the available aerial photographs, site visits also having been carried out. The main features are shown on Figure A1 :

(a) 6.11.1945 The area is natural terrain with occasional footpaths. Lai Ping Road has not yet been formed. Relict, very degraded, fully vegetated landslide scars lie adjacent to the ridgeline north-east of the future slope location. In the vicinity of the future cut slope, the landscape comprises a gently concave slope between two small ridges.

(b) 26.1.1963 No change from 1945 except that a low ridge is more clearly visible than on the 1945 photographs, and occurs between the two small ridges. The low ridge lies approximately where the centre/southeast of the cut slope is now.

(c) 16.12.1964 No significant change from 1963 but the quality of the photographs enables the geomorphology of the surrounding area to be clearly established (see Figure 11). Several grave sites can be identified.

(d) 28.2.1974 No change since 1974.

(e) 19.12.1975 No change from 1963.

(f) 23.11.1976 The borrow area has been commenced and the haul road (in part the future Lai Ping Road) cut through to Tai Po Road. A small cut slope has been formed approximately where the eastern end of the cut slope now is, and the road is aligned along the toe of this slope (Figure A1) but in a straighter alignment and to the southwest of the current alignment of Lai Ping Road at the landslide site.

(g) 9.12.1977 The present slope is being formed and has already been considerably extended northwest of the earlier cut slope as well as up slope to the northeast. The haul road remains in the same position as in 1976. A small scar that may indicate a minor failure is present at the top of the western end of the slope.

(h) 15.12.1978 The slope excavation has been completed. However, there appears to have been a large failure in its central portion although the northern and western limits of this failure are hard to establish precisely. A cut and fill platform has been constructed on the southwest side of the slope and the route of the haul road has been realigned to its present route. The road is constructed in part along a ramp, and is northeast of its previous alignment, thus avoiding the platform (Figure A1) and nearer the base of the slope. However, yet closer to the slope at its eastern end, there appear to be the remains of an earlier ramp suggesting an earlier road alignment. The ramp extends northwest as far as the approximate location of the slope failure, suggesting that the ramp may originally have continued further along the base of the slope but was damaged by the slope failure and abandoned and removed. The bottom half of the eastern side of the slope appears darker (some chunam or grass protection?) in tone, and three horizontal berms with drainage channels and batters have been formed (Figure A1). The possible failure scar seen on the 1977 photographs appears slightly larger.

(i) 29.11.1979 A small failure has occurred in the approximate centre of the bottom batter at the eastern side of the slope (Figure A1). A slip/erosion of the eastern slope face also appears to have occurred, cutting vertically through the berms and drainage channels. Large scars are evident in the central and western parts of the slope. Intact berms/batters on the western side of the slope help to identify the western limit of the failure. On the natural slope above the cut slope there are paths converging on a possible drill site in the east. In addition, there appear to be some areas of disturbance of the vegetation that could reflect the development of scarps.

(j) 18.6.1980 Failures across the central part of the slope face, seen on the 1979 aerial photographs, are more prominent. There is also evidence of severe erosion, probably increasing the depth of the failure scars. There does not appear to be much debris at the base of the slope (Figure A1). The upper eastern and lower eastern parts of the slope with berms and batters are distinctly separate now with further deepening of the previous year's erosion in-between. Some re-vegetation of the slope above the western slip is beginning to occur. Some erosion/instability has also occurred on the western edge of the slope across the partially formed berms. Further indications of disturbance of the vegetation on the natural slope above the cut slope could be interpreted as evidence of scarp development.

(k) 27.10.1981 No real change from 1980 apart from some re-vegetation of the original cut slope above the central western slip scar. No remedial works appear to have been carried out to the failed sections of the slope face.

(l) 10.10.1982 No change apart from some further re-vegetation, especially on the western part of the slope. Perhaps some localised further erosion of the central scars.

(m) 22.12.1983 The small failure on the eastern side has advanced up to the top of the second batter, but has not really increased in width. Two open fractures have developed across part of the top of the cut slope, above and further to the east of the central/eastern slip/erosion scar (Figure A1). These are interpreted as tension cracks. Some re-vegetation of the lower parts of the central slip/erosion scars is evident.

(n) 22.10.1984 More extensive re-vegetation of the lower and far western part of the slope and above the remains of the central western slip scar (which still has clearly defined edges. Erosion is still ongoing in-between the berms on the eastern side of the slope. The tension cracks previously seen at the top of the cut slope appear to have opened further and are more easily visible. In addition, further smaller tension cracks are visible in the lower eastern part of the cut slope. Vegetation disturbance on the natural slope above the main tension cracks may be related to the development of similarly-orientated tension cracks. Other obviously identifiable vegetation disturbance is now less evident.

(o) 28.4.1986 No real change apart from further re-vegetation of the slope and slip scars. The tension cracks are not as clearly defined as previously.

(p) 21.12.1986 No change from earlier in the year.

(q) 10.12.1987 Further movement/erosion? has occurred within the central western slip over the left hand side of the scar. There appears to be a slight regression of the scar up slope, with a slight widening on the western edge and some deepening as well (Figure A1). The tension cracks are still very well defined and the eastern and western parts of the slope are well re-vegetated now (the scar of the small slip in the berms on the eastern side is quite well re-vegetated). The central part of the slope has also got more vegetation. Some landslide debris has been washed along the base of the slope. On the natural slope above the cut slope, disturbance of the vegetation appears to be consistent with renewed development of arcuate and linear scarps, especially above the central portion of the cut slope.

(r) 4.11.1988 No change from the previous year apart from some minor vegetation growth on the scars. No remedial work appears to have been carried out. The tension cracks are still clearly visible. The old failure scar in the eastern berms is almost completely re-vegetated now.

(s) 17.1.1989 No change apart from further re-vegetation.

(t) 21.3.1990 Further instability/erosion? across the central western scar almost across the whole original (1980) width. The tension cracks appear to be wider apart, but there are no other signs of instability. There are suggestions of vegetation disturbance along linear trends on the natural slope above the cut slope, possibly associated with renewed scarp development.

(u) 19.9.1991 No change apart from some re-vegetation of the central western scar. Also some re-vegetation across the upper part of the slope.

(v) 15.4.1992 No change apart from further re-vegetation.

(w) 6.10.1992 Some further erosion in the central western scar and across the upper central part of the slope and the tension cracks are more visible than earlier in the year. On the natural slopes above the cut slope, there are suggestions of linear and arcuate features, including a laterally persistent feature in the approximate location of the present north-east flank of the main scarp.

(x) 30.5.1993 No change. Some evidence of possible seepage/runoff? from the central western scar with a lighter colour trail running down to the base of the slope. Also some further erosion over the middle of the western side of the slope

(y) 6.12.1993 Further instability/erosion? across the central western scar clearing away the vegetation. The eastern side erosion which had split the part of the slope with berms in 1979 (Figure A1) has also moved further up slope (another possible slip scar) to the edge of the original cut. The tension cracks are still visible. Construction of the service reservoir south of Lai Ping Road has commenced.

(z) 17.10.1994 No change apart from minor re-vegetation.

(aa) 30.8.1995 No change apart from further minor re-vegetation. Some vegetation along the tension cracks. On the natural slope above the cut slope, linear zones of disturbance in the vegetation are again evident. The service reservoir is fully complete (Figure A1).

(ab) 26.4.1996 No change except more re-vegetation (including the tension cracks).

(ac) 24.10.1996 No change, apart from further re-vegetation, especially on the slope around the tension cracks. Small channel observed (seepage/surface water?) down central west slip scar.

A.3 AERIAL PHOTOGRAPHS

Aerial photographs examined (black and white except where indicated*) :

Date	Altitude	Photograph Number
6.11.45	20,000'	Y00740 & 41
26.1.63	3,900'	Y08768 & 69
16.12.64	1,800'	Y12387 & 88
28.2.74	12,500'	8246 & 47
19.12.75	12,500'	11723& 24
23.11.76	12,500'	16482 & 83
9.12.77	12,500'	19895 & 96
15.12.78	12,500'	24560 & 61
29.11.79	10,000'	28204 & 05
18.6.80	4,000'	30757 & 58
27.10.81	10,000'	39217 & 18
10.10.82	10,000'	44627 & 28
22.12.83	10,000'	52215 & 16
22.10.84	4,000'	56843 & 44
28.4.86	4,000'	A04857 & 58
21.12.86	10,000'	A08097 & 98
10.12.87	4,000'	A11124 & 25
4.11.88	4,000'	A15393 & 94
17.1.89	4,000'	A16153 & 54
21.3.90	4,000'	A21029 & 30
19.9.91	4,000'	A27115 & 16
15.4.92	4,000'	A30135 & 36
6.10.92	4,000'	A31936 & 37
30.5.93	4,000'	A34655 & 56
6.12.93	10,000'	CN5602 & 03
17.10.94	4,000'	A39081 & 82
30.8.95	3,500'	CN10698 & 99*
26.4.96	3,500'	CN13340 & 41*
24.10.96	4,000'	CN14935 & 36*

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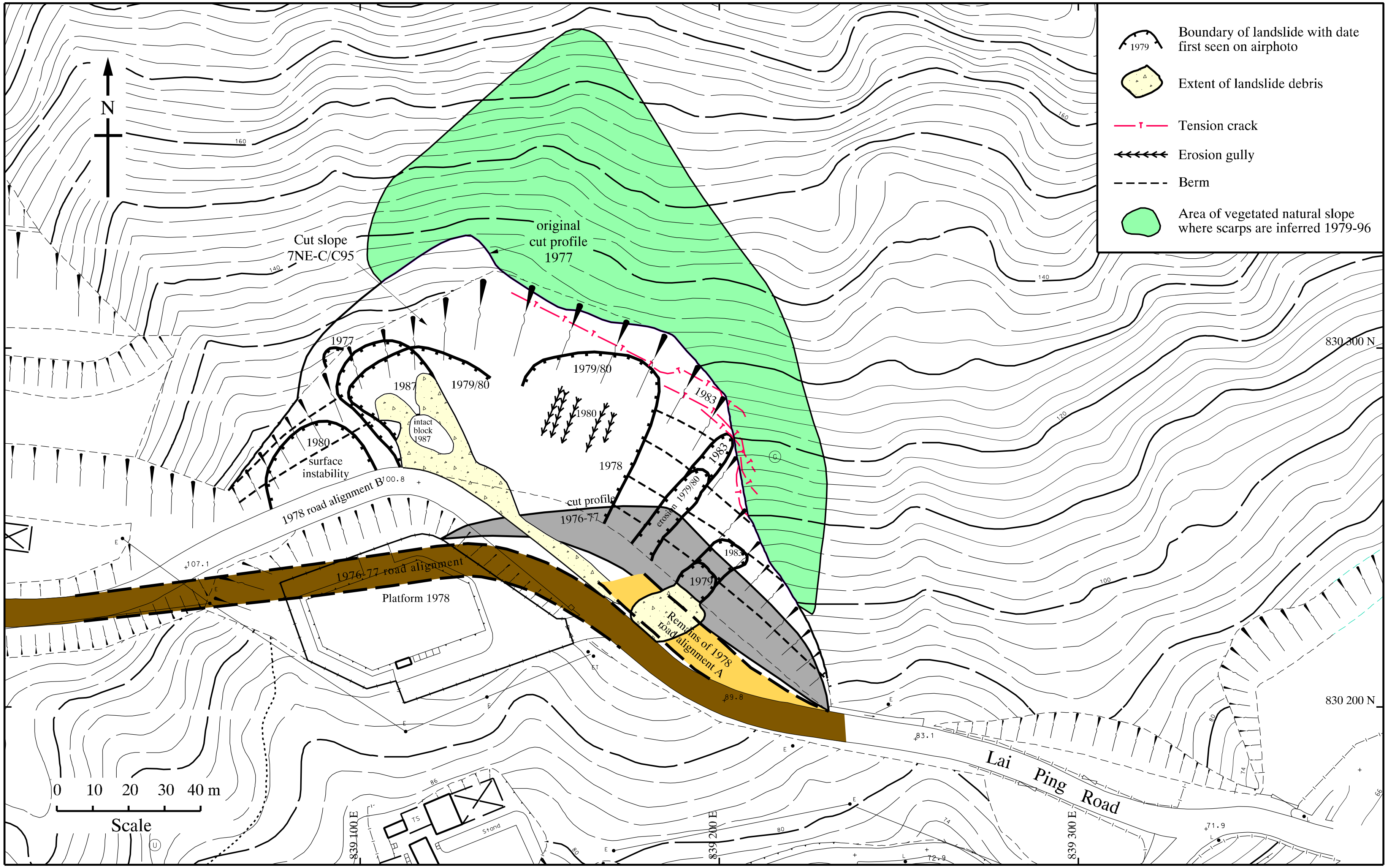

Figure A1 - Aerial Photograph Interpretation of Slope 7NE-C/C95

APPENDIX B

OBSERVATION FROM OLD REGIONAL TOPOGRAPHIC MAPS

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B.1 INTRODUCTION

Old regional topographic survey maps kept by the Lands Department were studied to assess the development history of the landslide site. A list of available maps that cover the landslide area in sufficient detail is given in Table B1, and the relevant parts of the selected maps are reproduced in Figures B1 to B8.

B.2 OBSERVATIONS FROM OLD REGIONAL TOPOGRAPHIC MAPS

The dates of the available maps, together with observations relevant to the site, are summarised in Table B2.

Little human activity at the site was evident prior to development of the Kau To Borrow Area in 1977 when an earth track was first shown on the map. The development of the borrow area may have diverted the water flow from a natural stream that ran downhill near where the western corner of the cut slope now is. The cut slope and the road in front were first shown in 1981. The road (now known as Lai Ping Road) along the cut slope was shifted away from the toe of the slope and the alignment of the track by about 20 m. This is consistent with the site history revealed by other file records in the GEO that indicate the road was realigned due to a landslide incident involving the cut slope in 1978.

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Table B1 - List of Old Regional Topographic Maps

Date of Map	Survey Sheet No	Scale
1958	C-129-NW-B	1:1 200
1958	C-129-NW-D	1:1 200
1966	C-129-NW-B	1:1 200
1966	C-129-NW-D	1:1 200
August 1969	C-129-NW-B	1:1 200
August 1969	C-129-NW-D	1:1 200
April 1970	C-129-NW-D	1:1 200
September 1970	C-129-NW-B	1:1 200
May 1972	C-129-NW-D	1:1 200
July 1972	C-129-NW-B	1:1 200
October 1974	C-129-NW-D	1:1 200
April 1975	C-129-NW-B	1:1 200
June 1975	C-129-NW-D	1:1 200
September 1976	7-NE-22-C	1:1 000
December 1977	7-NE-22-C	1:1 000
July 1981	7-NE-C	1:5 000
July 1981	7-NE-22-C	1:1 000
September 1984	7-NE-22-C	1:1 000
September 1986	7-NE-22-C	1:1 000
September 1986	7-NE-C	1:5 000
November 1989	7-NE-C	1:5 000
June 1990	7-NE-22-C	1:1 000
April 1992	7-NE-22-C	1:1 000
May 1992	7-NE-C	1:5 000
April 1997	7-NE-22-C	1:1 000

Table B2 - Observations from Old Regional Topographic Maps (Sheet 1 of 3)

Year	Figure No.	Observation
1958	B1	This, the earliest available map, is at a scale of 1:1 200. The site area was shown as woodland. A church building is shown north of a stream, which is called Kau To Hang. A footpath runs from east to west and leads to a church and Kau To Village further west of the site. From Kau To Village, a footpath is shown leading north to the hill. A grave is shown at north east of the site.
1966	Not Shown	There is practically no difference from the 1958 map.
1969	B2	The site of the church building was extended. This involved cutting into the hillside and filling in front. A school building, a latrine and a ruined building are shown in the church compound. The footpath, running east-west to the front of the church complex, appears to have been widened from the west until within about 60 m of the church complex. This footpath is marked 'Occupational Road' and a turning bay has been built at the end of it. The road has also been constructed with culverts where the road intercepts the valleys. The footpath leading uphill to the north, and the grave, appear as before.
1970	Not Shown	Occupational Road was further upgraded with a hard surface covering the full width of the road.
1972	Not Shown	The road name 'Occupational Road' has been removed, and its drainage facilities are no longer shown on the map. Otherwise, there is no difference from the 1970 map.
1975	Not Shown	A stream course is shown in the concave slope across the western part of the current landslide site. The stream appears to end near the northwest corner of the church complex. Construction work was in progress on the south side of Kau To Hang.
1976	B3	This is the first map presented at 1 : 1 000 and in metric scale. Otherwise, there is no difference from the maps in 1975.

Table B2 - Observations from Old Regional Topographic Maps (Sheet 2 of 3)

Year	Figure No.	Observation
1977	B4	A 10-m wide track is shown approximately along the current alignment of Lai Ping Road. In the area of the landslide site, the track is positioned about 20 m northeast of the current road. The footpath running uphill from Kau To Village was intercepted by the track. The stream course, previously shown in the small concave slope across the western part of the landslide site, and the footpath uphill of the track are no longer shown on the map. More earthworks and roadworks (associated with the Kau To Borrow Area for the Sha Tin Reclamation) are shown east and west of the current landslide site. The road running along the north bank of Kau To Hang merges with the new track. Part of the road in front of the church complex appears to have been widened. The inlet of a culvert (which possibly goes underneath the road) is shown at the toe of the fill platform of the church complex. A footpath and a footbridge are shown crossing Kau To Hang to the building site on the other side of the stream. Eight buildings are shown on the building site immediately opposite the church complex.
1981	B5	The cut slope of the current landslide site is shown. A road is drawn along the current alignment of Lai Ping Road (i.e. the road along the toe of the subject cut slope has shifted about 20 m from its previous alignment of the track in 1977). The footpath and stream uphill of the road are no longer shown. The grave northeast of the cut slope appears unaffected. A platform has been formed to the south of the road which occupies the same position as the current WSD salt water service reservoir. Along the western side of the platform, a drainage channel is shown to be fed by a culvert (which possibly runs underneath the road) and leading to an inspection chamber at the southwest corner of the platform. Large-scale cutting in the borrow area appears to have been completed. Part of the catchment feeding the stream course as shown in the pre-1977 maps has been removed by formation of the borrow area. Construction facilities for the borrow area are still shown. For the road in front of the church complex, a reinforced concrete pit is shown next to the culvert headwall.
1984	B6	The road in front of the cut slope is named Lai Ping Road and a facility has been built at the toe of the cut slope. An overhead electricity supply line has been brought to the east of the cut slope. Telephone poles have also been erected along the toe of the cut slope. The platform to the south is shown as fenced. The church complex has been further developed with an additional stand, sheds, etc.. The building development south of Kau To Hang is named Pine Villa.

Table B2 - Observations from Old Regional Topographic Maps (Sheet 3 of 3)

Year	Figure No.	Observation
1986	Not Shown	The toe lines for the cut slopes are drawn and the overhead electricity supply line has been further extended westwards across the current WSD platform. Further from the cut slope, construction facilities formerly shown at the Kau To Borrow Area have disappeared.
1989	Not Shown	The 1:5 000 survey sheet is updated, but with no apparent difference from the map in 1986.
1990	B7	A temporary building is shown in the northwest quarter of the current WSD platform. Otherwise, there is no difference from the last updated map.
1992	Not Shown	The electricity lines and telephone poles are no longer shown. The 1:5 000 survey sheet is updated to show the temporary structure on the current WSD platform. The road in front of the church complex is named Yung Ping Path.
1997	B8	The Kau To Salt Water Service Reservoir (covered) has been built on the WSD platform. The culvert and drainage channel along the west boundary of the platform are not shown. The overhead electricity line has been diverted to the bottom part of the cut slope. The telephone poles are still not drawn. More building developments are indicated on the south side of Kau To Hang.

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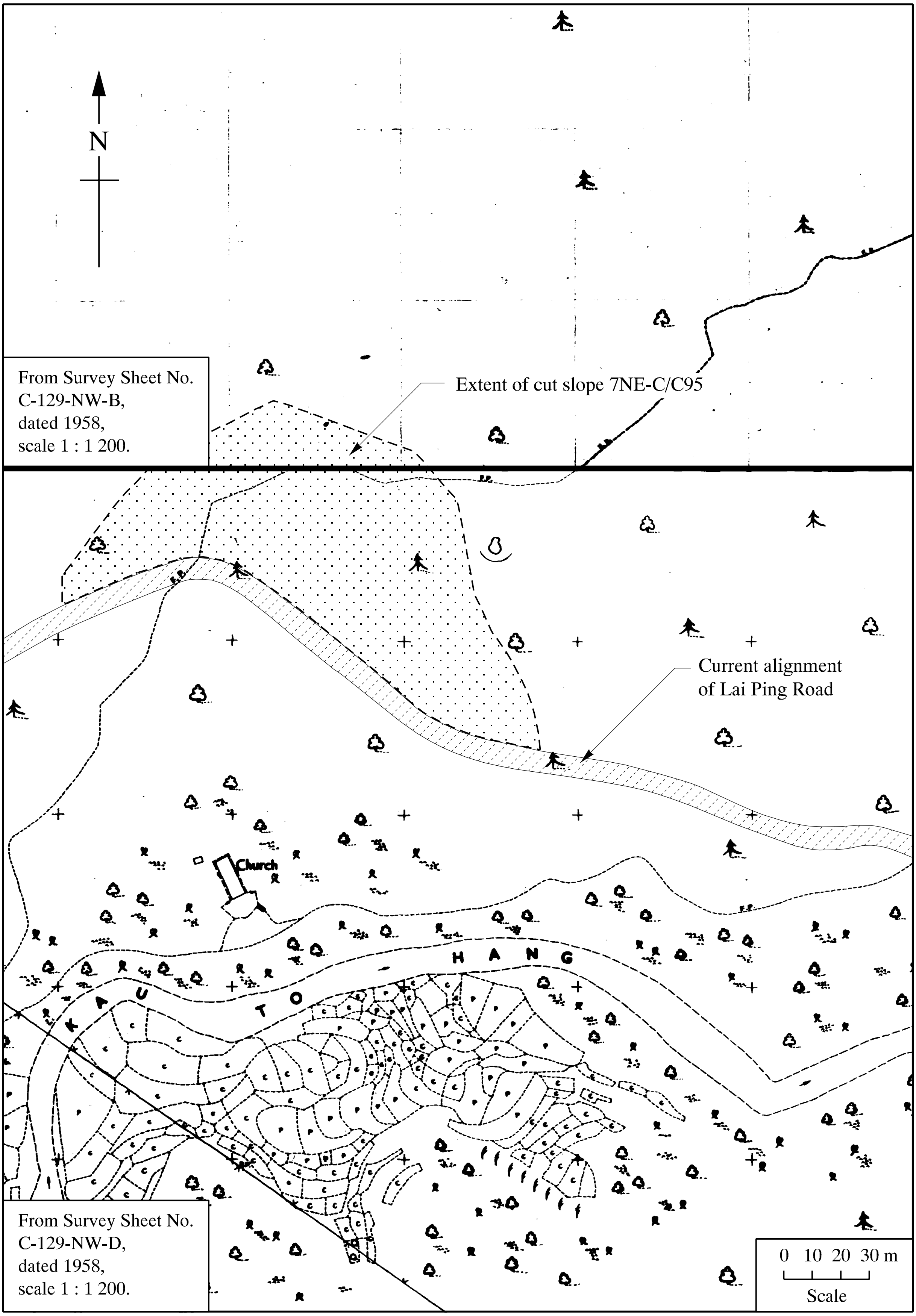

Figure B1 - Topographic Maps (1958)

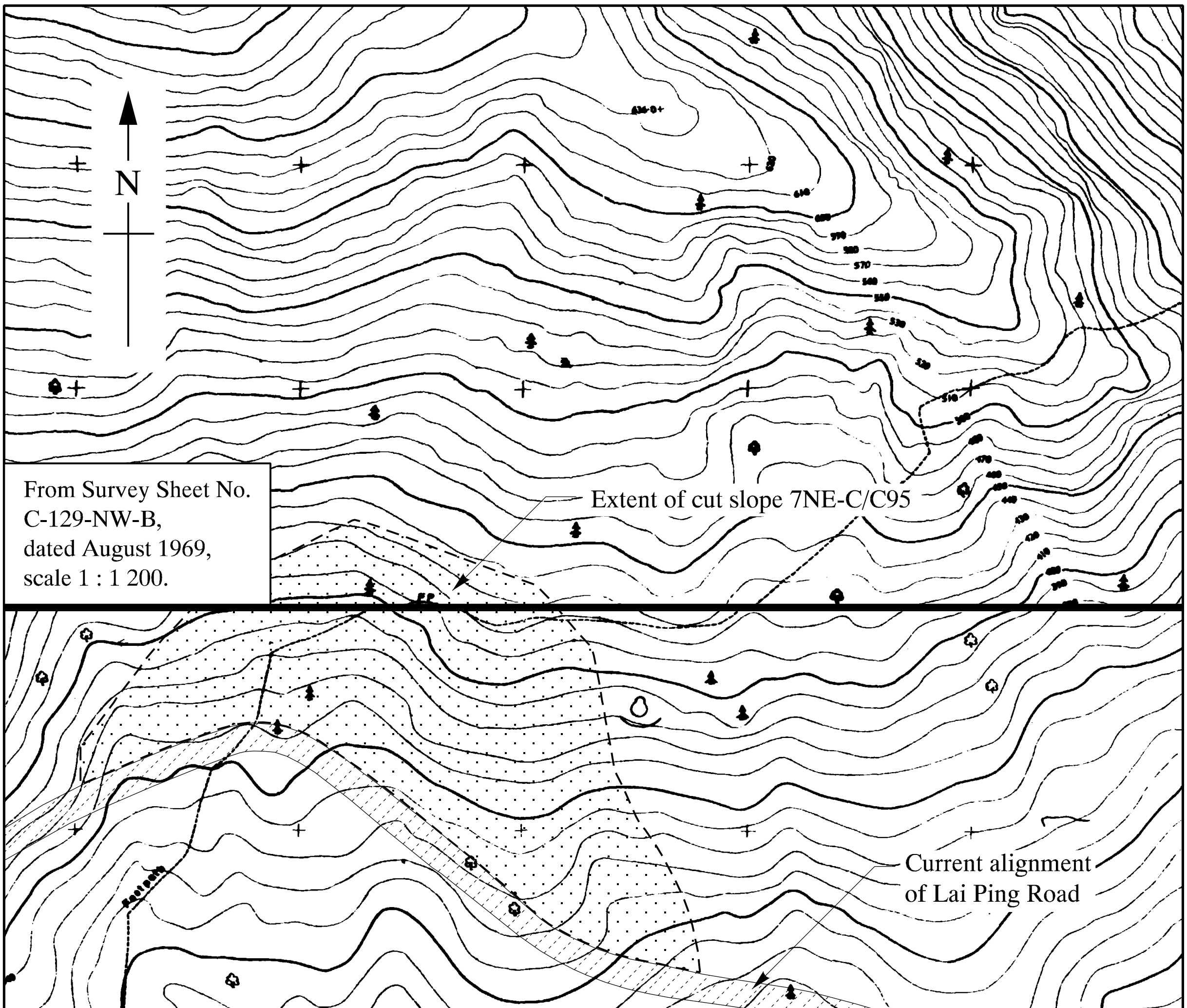

Figure B2 - Topographic Maps (August 1969)

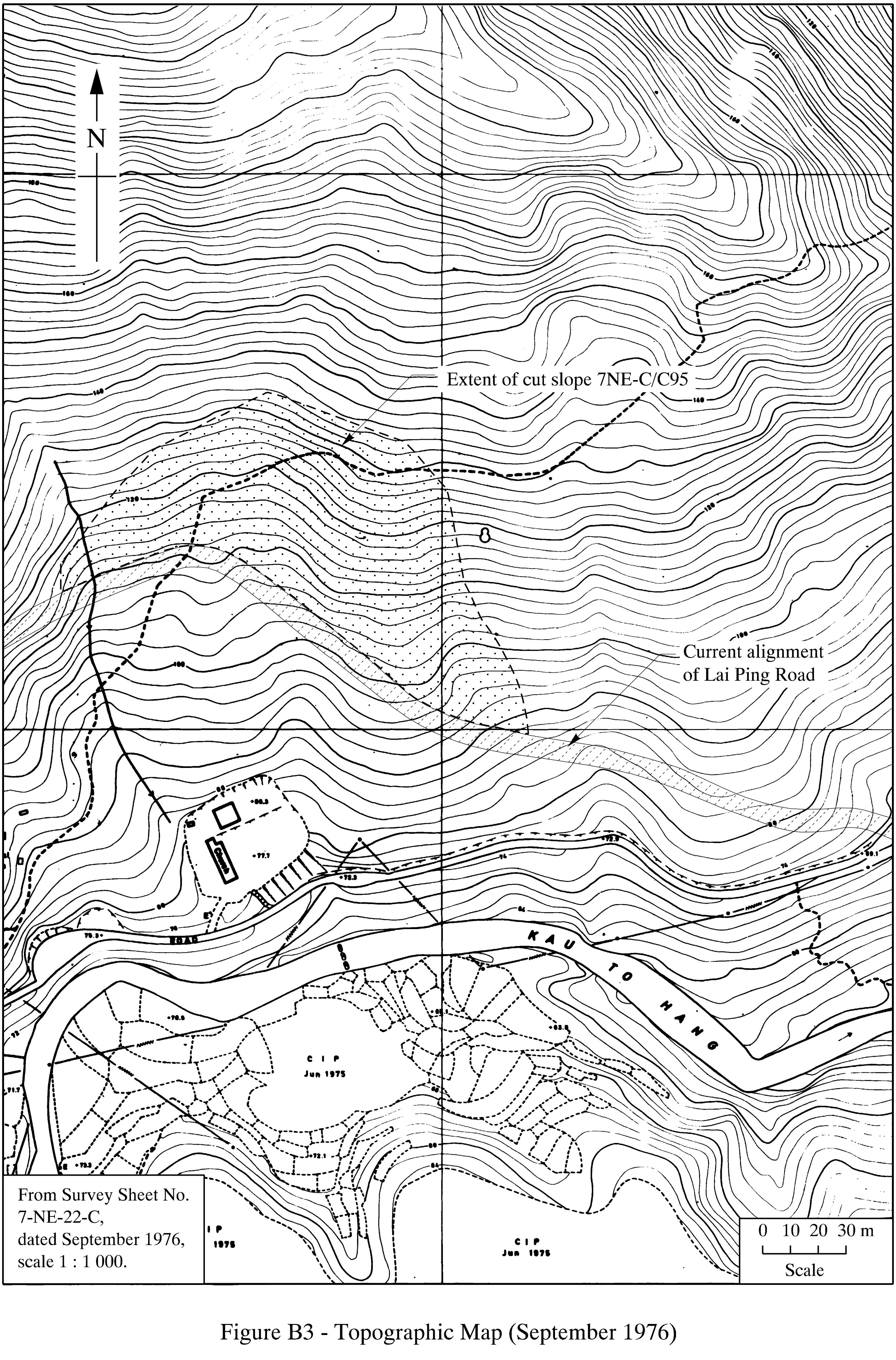

Figure B3 - Topographic Map (September 1976)

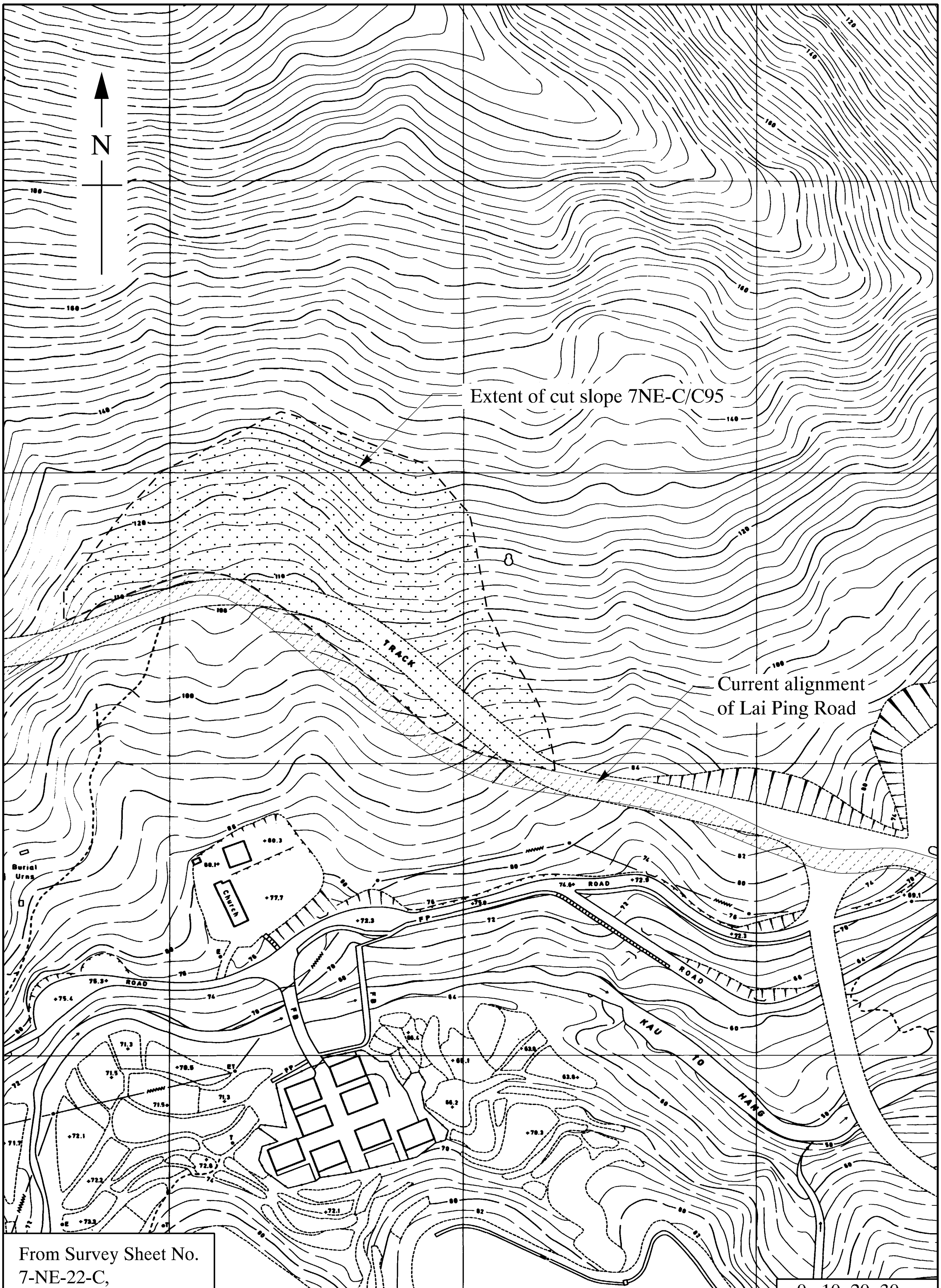

Figure B4 - Topographic Map (December 1977)

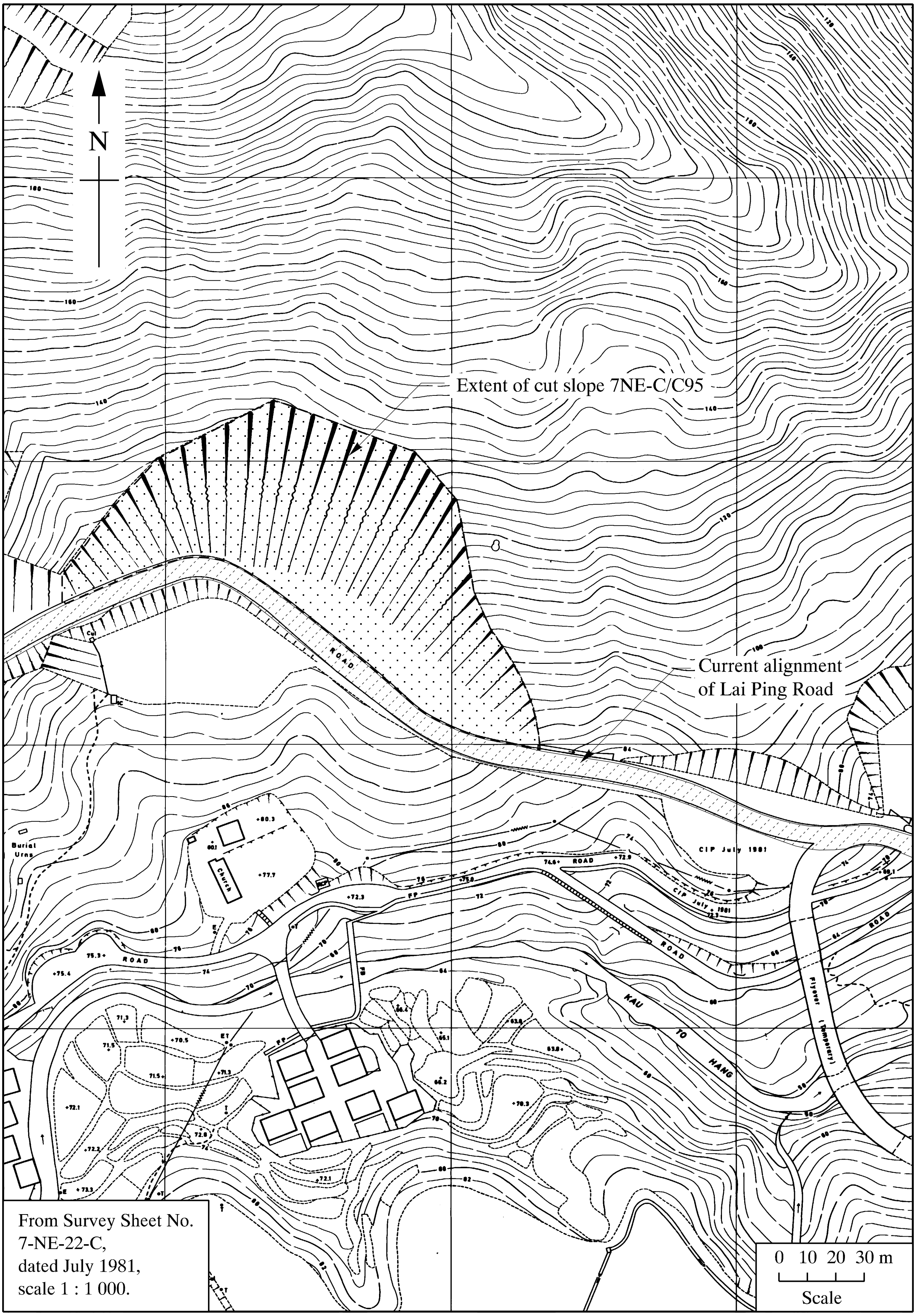

Figure B5 - Topographic Map (July 1981)

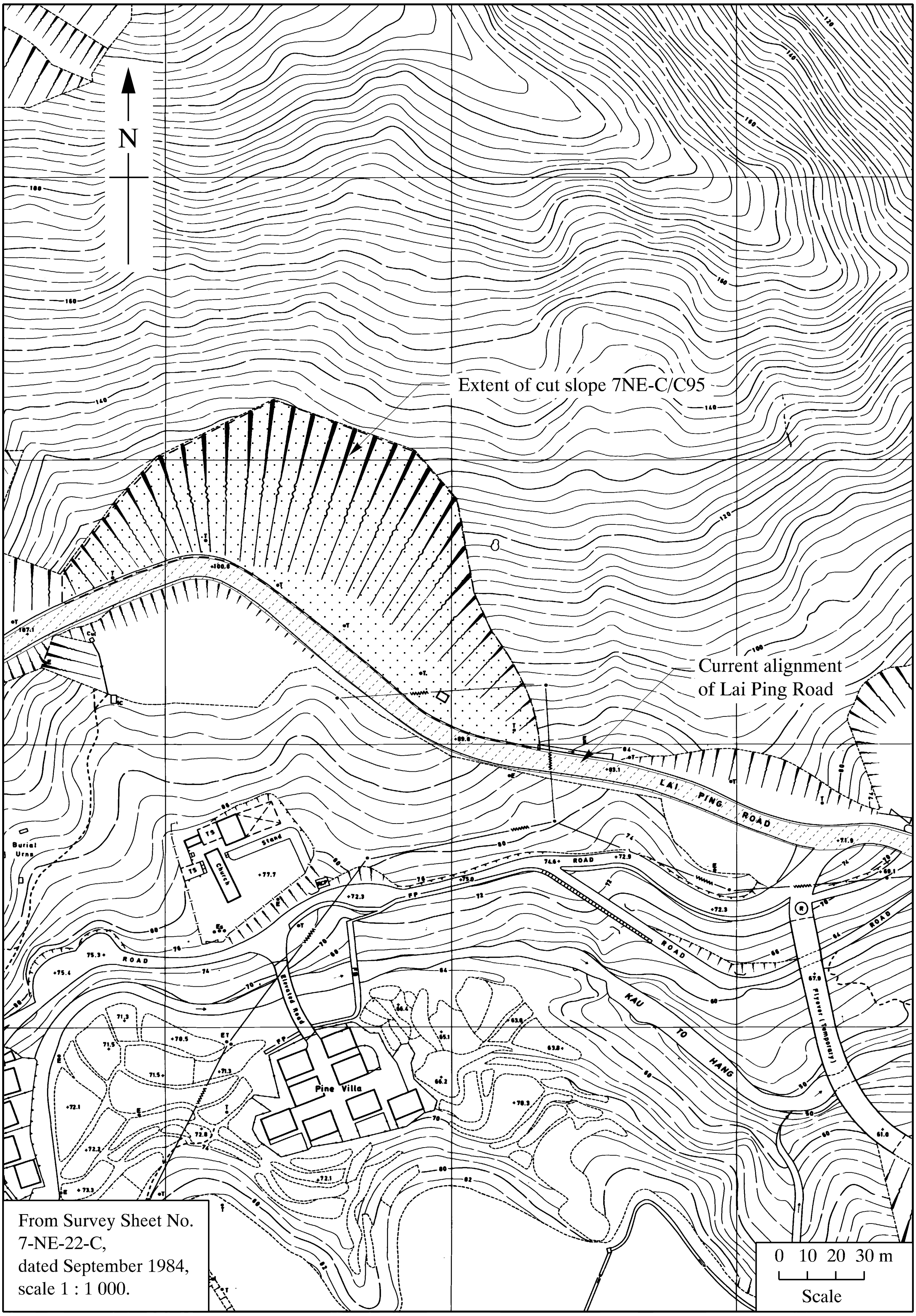

Figure B6 - Topographic Map (September 1984)

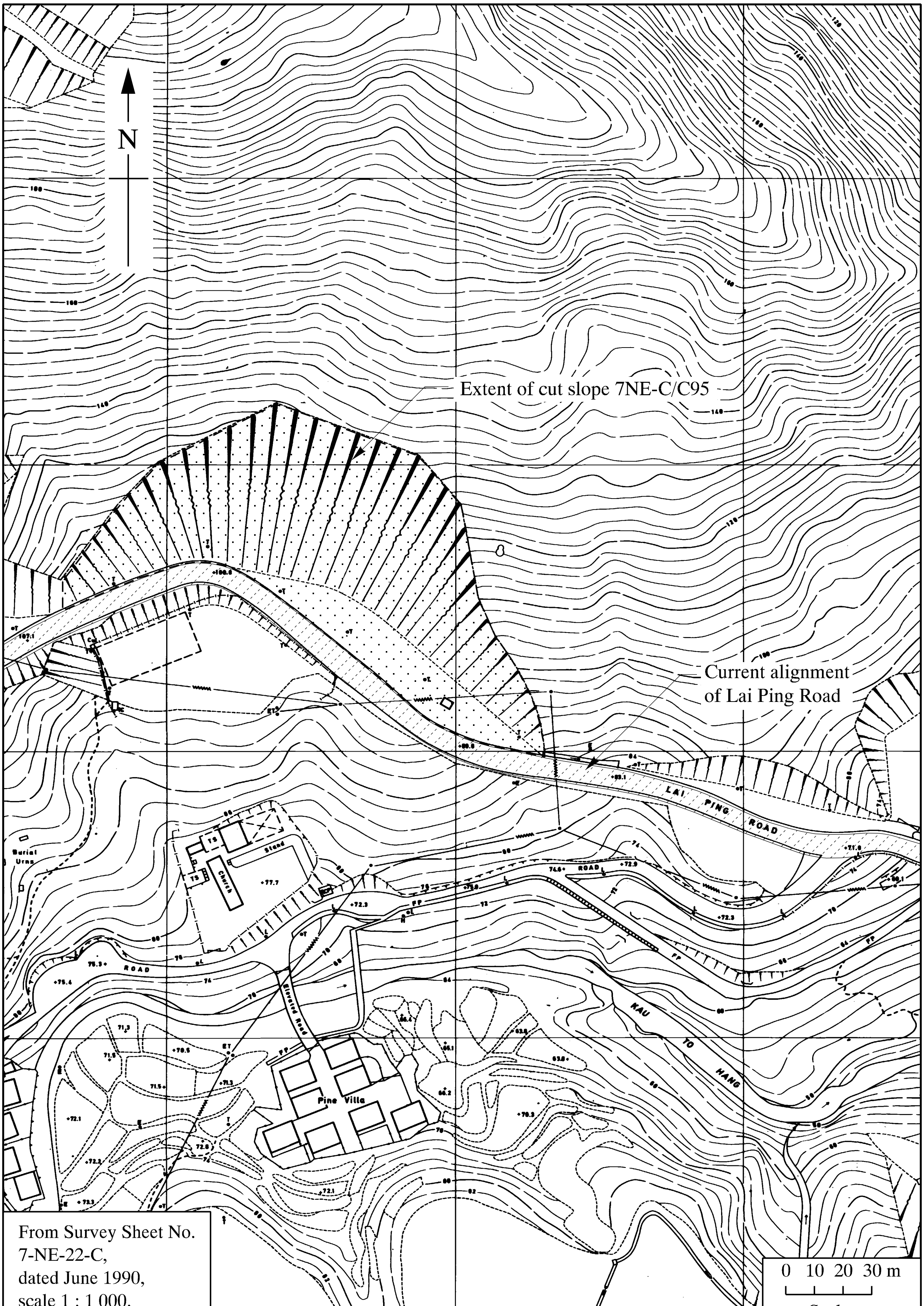

Figure B7 - Topographic Map (June 1990)

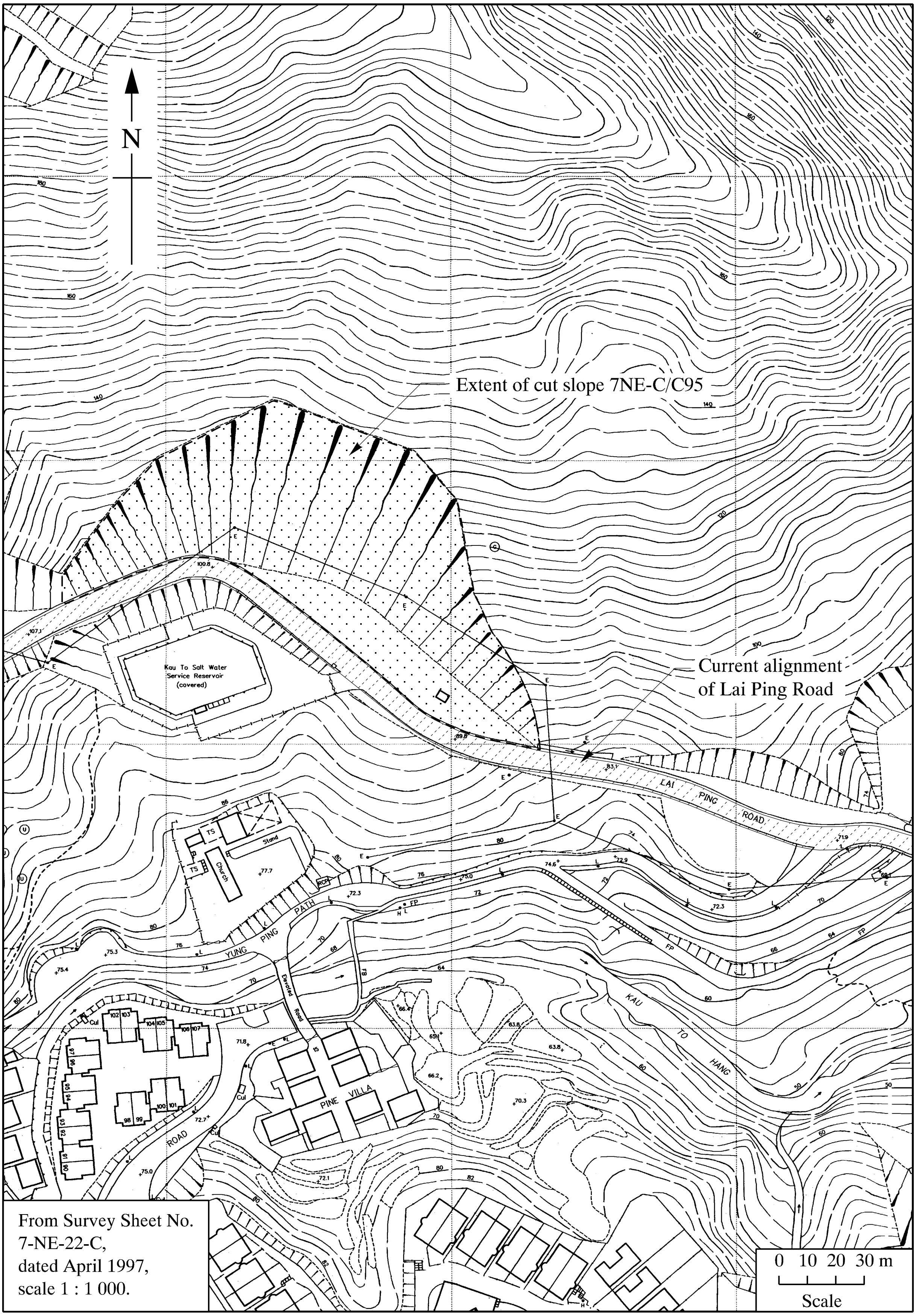

Figure B8 - Topographic Map (April 1997)

APPENDIX C

MATERIAL PROPERTIES

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C.1 INDEX PROPERTIES

Dry density values of undisturbed samples taken within and outside the landslide complex were obtained during different phases of the ground investigations. The data are plotted in Figure C1. Data for samples obtained in 1979 and 1982 investigations either have much lower values, or vary widely, possibly due to sample disturbance. Based on the 1995 and 1997 G.I. information, dry densities, close to the rockhead, do not vary significantly between areas within and outside the landslide complex.

Soon after the landslide, insitu density tests were carried out on the debris taken at various locations (Figure 12) using the sand replacement method (Table C1). Debris in the runout trails of landslide scars 1 and 4 appears looser than the material from the other scars. Average values of dry density are 1.16 Mg/m^3 and 1.2 Mg/m^3 for landslide scars 1 and 4 respectively (corresponding to relative compaction of 79 % and 75%). The average value for the other scars is 1.36 Mg/m^3 (corresponding to relative compaction of 87%). The higher relative compaction of the debris at SR7, compared with that taken from an overlying debris lobe (SR6), suggests that the lower lobe may be a remnant from an earlier phase of landsliding.

Particle size distribution curves (Figures C2 and C3), determined for samples from drillholes, indicate wide variability of the saprolite, but no systematic difference is observed within and outside the landslide area. It is noted however that particle size distribution curves for samples less than 2 m above rockhead are less variable than elsewhere and have a smaller proportion of fine particles.

Figures C4 to C7 show particle size distribution curves for block samples of insitu material taken from the landslide scars (except BS9, which is landslide debris) and bulk samples of landslide debris associated with the landslide in 1997. In general, grading of the landslide debris is similar to that of the corresponding landslide scars. Near-surface materials on the east side of the cut slope appear to be finer than those on the west side, but samples from drillholes vary as much with depth as location. Debris from landslide scar 4 appears to be coarser. Such differences may however be due to bias in selection of sample locations on site.

Figure C8 shows the plasticity indices with respect to height above rockhead. Samples taken a few metres above rockhead appear to have a lower plasticity. This is consistent with the variations in particle size distributions.

C.2 SHEAR STRENGTH

Shear strength tests were carried out in previous ground investigations. Consolidated drained tests were carried out on 74 mm diameter specimens prepared from Mazier samples in 1979 and 1982 and consolidated undrained tests, on specimens of the same size, were carried out in 1992 and 1995.

Figures C9 and C10 present the triaxial test results. The effective stress paths from stress-path controlled constant t tests are plotted on the Figure C9. Effective stress maximum shear strength parameters deduced from these tests, for completely decomposed material, taken within and outside the landslide area, are $c' = 0$ kPa and $\phi' = 38°$. The possible effects of changes in grading and plasticity near the rockhead on shear strength have been examined but no systematic variation can be observed (Figure C11). Post-peak dilative pore water pressure responses with reduction of principal stress ratio were observed in all undrained triaxial tests on undisturbed specimens. This indicates post-peak strain-softening behaviour of the material. Due to limited strain level in triaxial test specimens, the fully softened conditions were not usually attained at the end of the test.

Figure C12 summarises the results of the direct shear tests. Due to the limited length of travel, steady state shear strength might not be attained at the end of the test. The best estimate of the steady state ϕ' for BS9 (landslide debris from landslide scar 4) is 36°. This is similar to the kaolin infilled joint in BS3, which has a ϕ' of 37°, under a normal load of 80 kPa. For the relict joint in BS11, the ϕ' value is equal to 37.5°, under a normal load of 70 kPa. The end-of-test ϕ' values for BS1 and BS2 vary between 35.5° and 38°.

Ring shear tests were carried out on remoulded specimens from BS1 and BS3 in line with the requirements of BS1377 : Part 7 (BSI, 1990). As shown in Figure C13, the large strain ϕ' of the residual soil (BS1) was 34° and was 30° for a kaolinitic clay vein in BS3.

Figure C14 shows the stress paths of consolidated undrained triaxial tests on specimens of landslide debris prepared at dry densities similar to those measured on site. Samples SR5 and SR4, taken from landslide scars 3 and 4 respectively, were compacted by moist tamping and consolidated to different mean stresses prior to compression in an undrained condition. All stress paths indicate contractive behaviour. For dry density values of 1.2 to 1.3 Mg/m^3, as for the debris from landslide scars 1 and 4, the specimens exhibit near-collapse behaviour upon shearing similar to that of loose, completely decomposed granite fills (Law et al, 1998). A steady state ϕ' value of 37° was obtained from these tests.

C.3 REFERENCES

BSI (1990). BS1377:1990 Methods of Test for Soils for Civil Engineering Purposes, Part 7-Shear Strength Tests (Total Stress), British Standard Institution, London, 47p.

Law, K.T., Lee, C.F., Luan, M.T. & Zhai, Y. (1998). Laboratory Investigation of Fundamental Behaviour of Loose Fill Shear. Report prepared for the Geotechnical Engineering Office by the University of Hong Kong, 2 volumes.

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Table C1 - Insitu Density Measurement of Landslide Debris

Landslide Scar	Test No.	Bulk Density (Mg/m^3)	Moisture Content (%)	Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Relative Compaction (%)
1	SR8	1.74	32	1.31	1.57	83.4
	SR9	1.48	28	1.16	1.57	73.9
	SR10	1.62	33	1.22	1.51	80.8
2	SR6	1.72	33	1.29	1.49	86.6
	SR7	1.87	23	1.52	1.68	90.5
3	SR5	1.74	36	1.28	1.51	84.8
4	SR2	1.51	29	1.17	1.59	73.6
	SR3	1.59	33	1.2	1.61	74.5
	SR4	1.64	32	1.25	1.59	78.6

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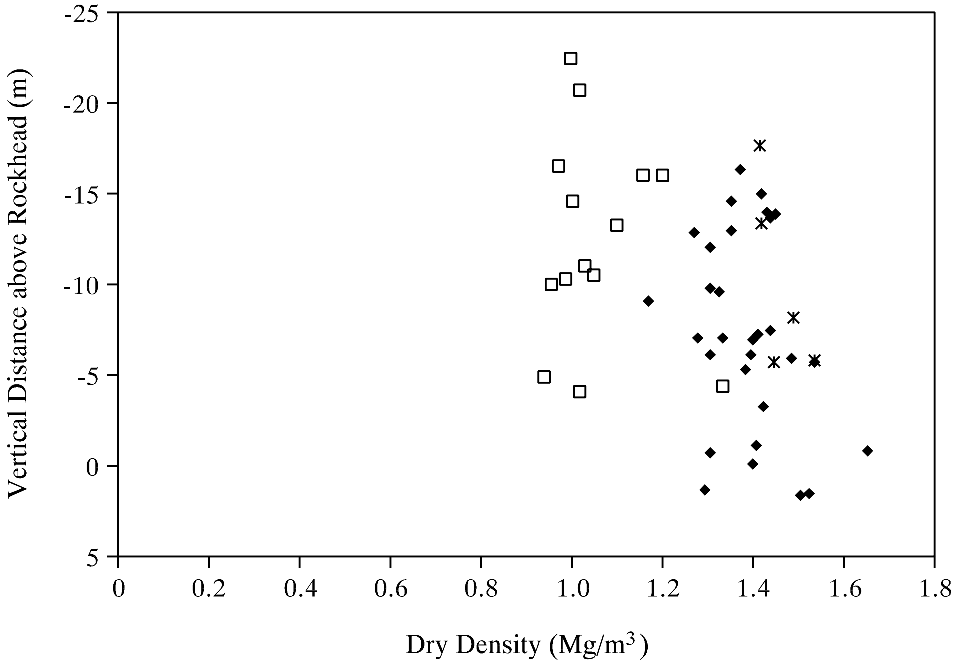
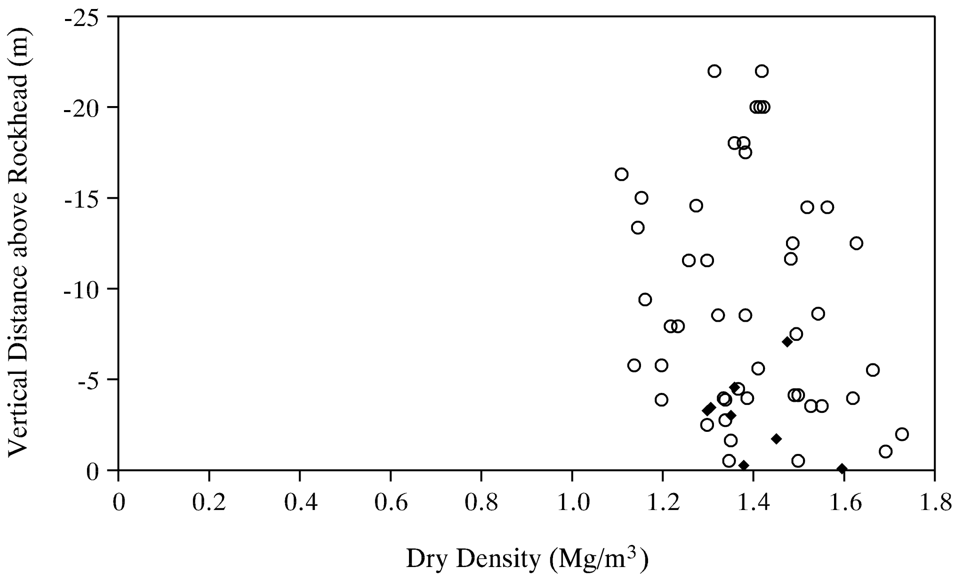


(a) Samples Obtained within the Slip Area

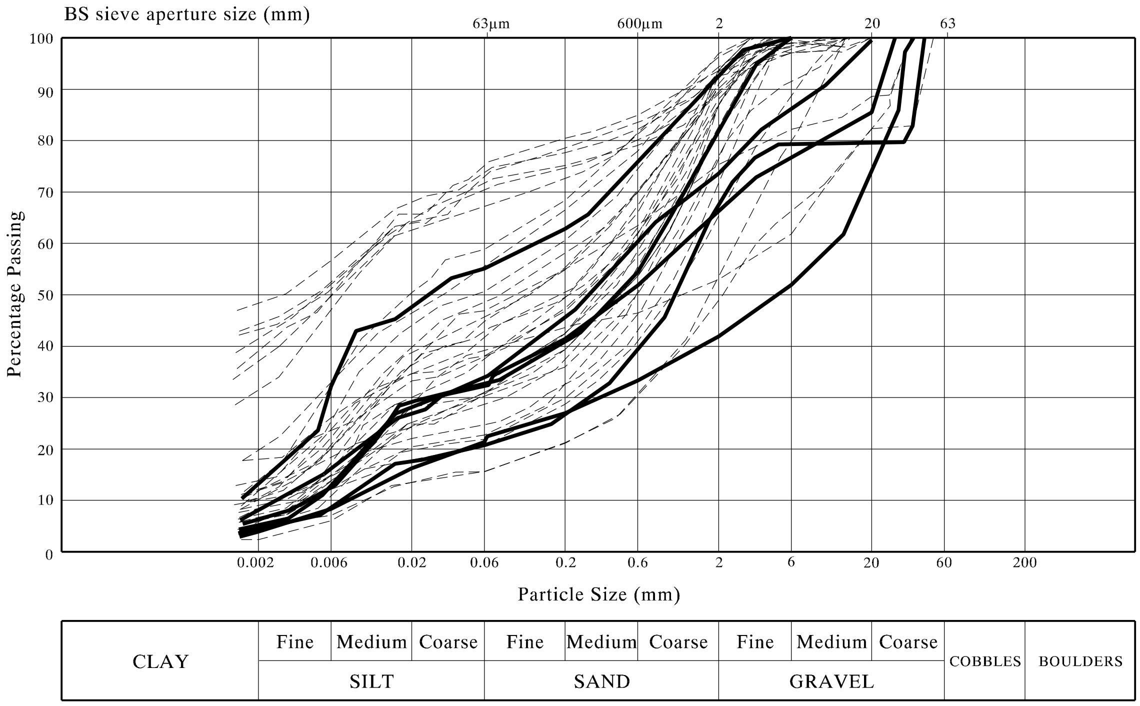


(b) Samples Obtained outside the Slip Area

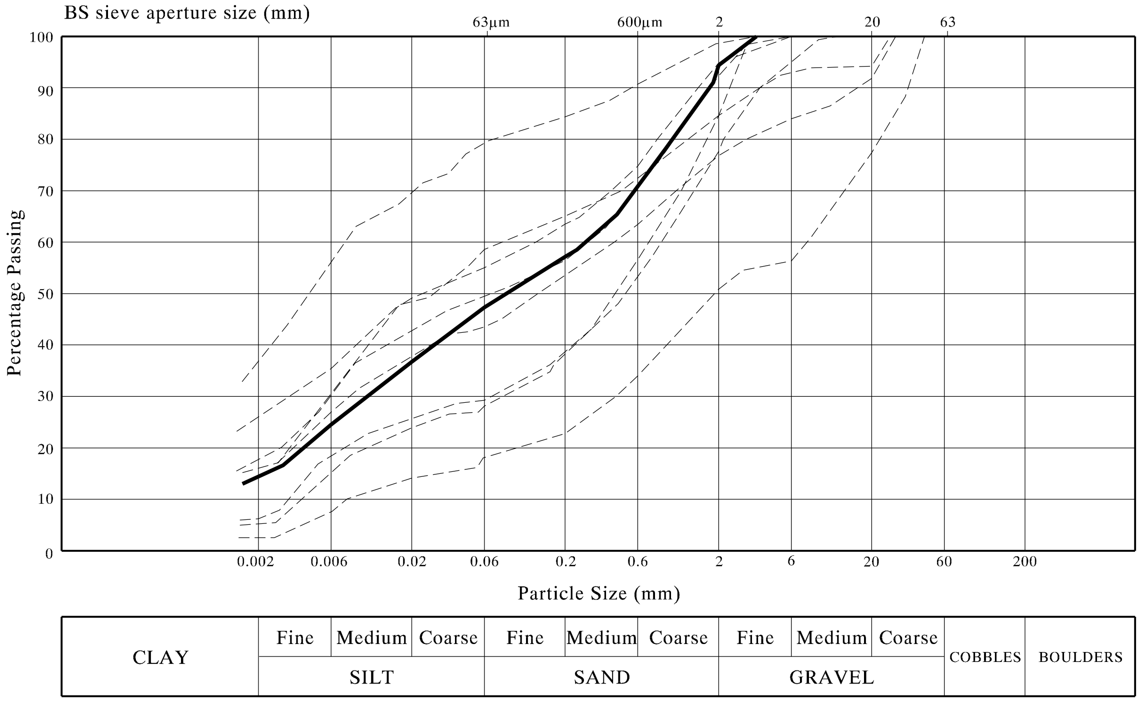
Legend :

□ 1979 G.I.	○ 1982 G.I.
⋇ 1995 G.I.	◆ 1997 G.I.

Figure C1 - Dry Density Values versus Distance above Rockhead for Drillhole Samples



(a) Drillholes DH97/7, 9, 10, 12, 14 and 17 (within the slip area)



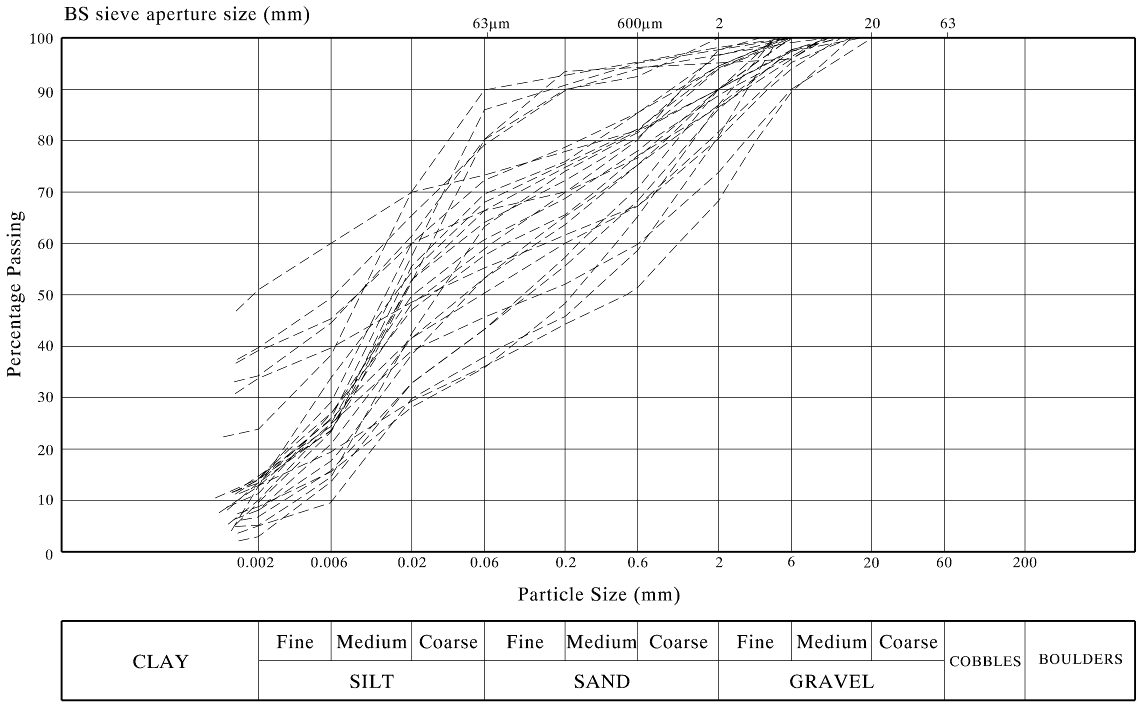
(b) Drillholes DH97/13 and 15 (outside the slip area)

Legend :

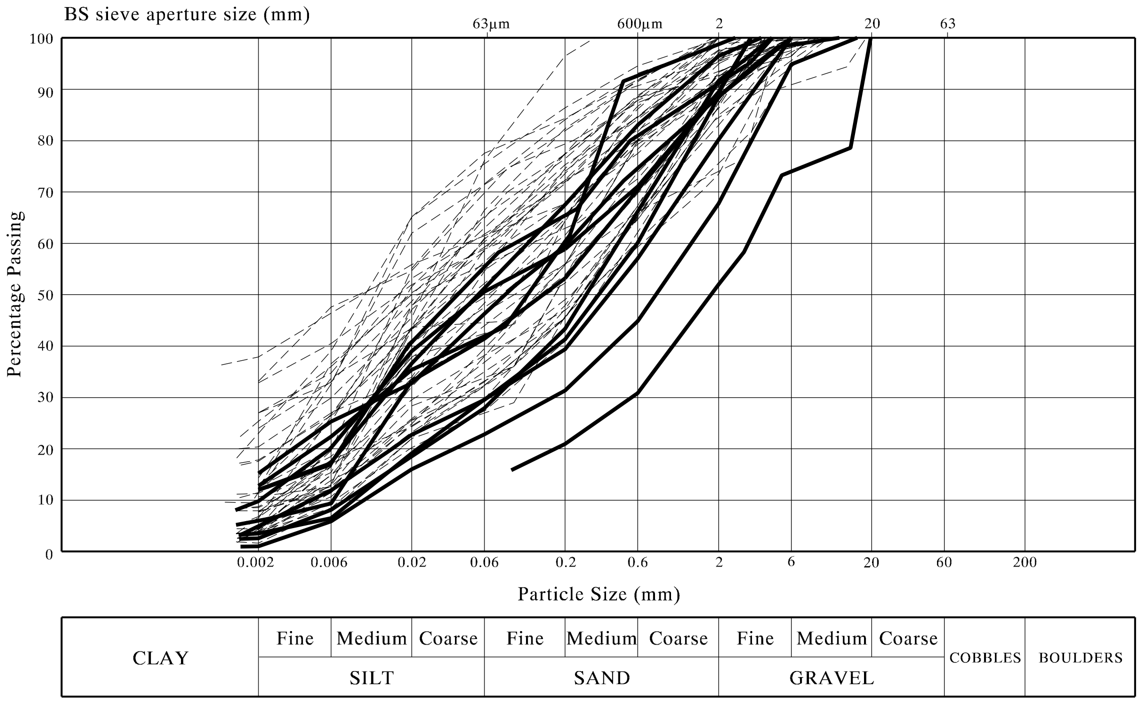
——— Grading of sample obtained from within 2 m above rockhead

– – – – – Grading of sample obtained from elsewhere

Figure C2 - Particle Size Distribution Curves of Drillhole Samples Obtained in 1997 Ground Investigation



(a) Drillholes BH302, 303, 304, 305, 56A/BH3, 5, 6, 7, 8 and TP6 (within the slip area)



(b) Drillholes KT2A, (2), 3, (3), 5, (5), 7, 8, (8), (9), (10), (11), (12), 13, 14, (14), 15, (15), 18 and 19 (outside the slip area)

Legend :

—— Grading of sample obtained from within 2 m above rockhead

– – – Grading of sample obtained from elsewhere

Figure C3 - Particle Size Distribution Curves of Drillhole Samples Obtained in Previous Ground Investigation

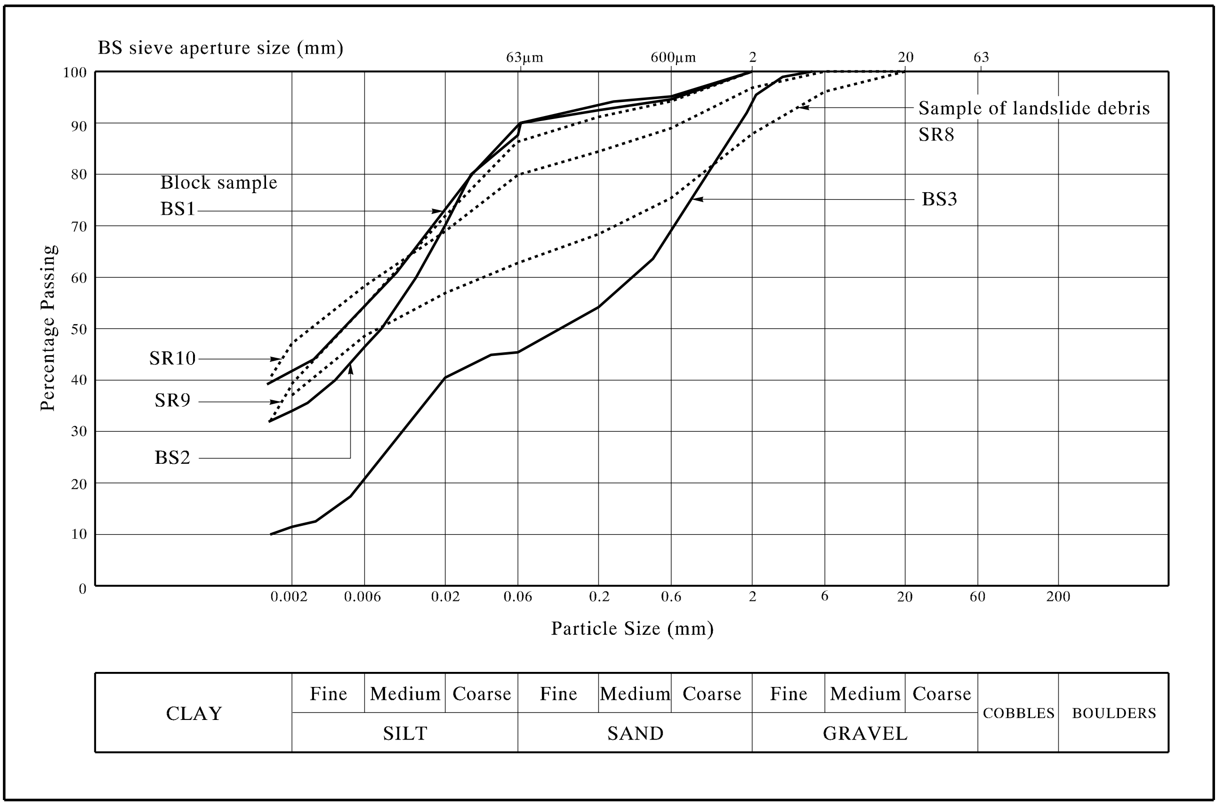


Figure C4 - Particle Size Distribution Curves of Samples Obtained from Landslide Scar 1

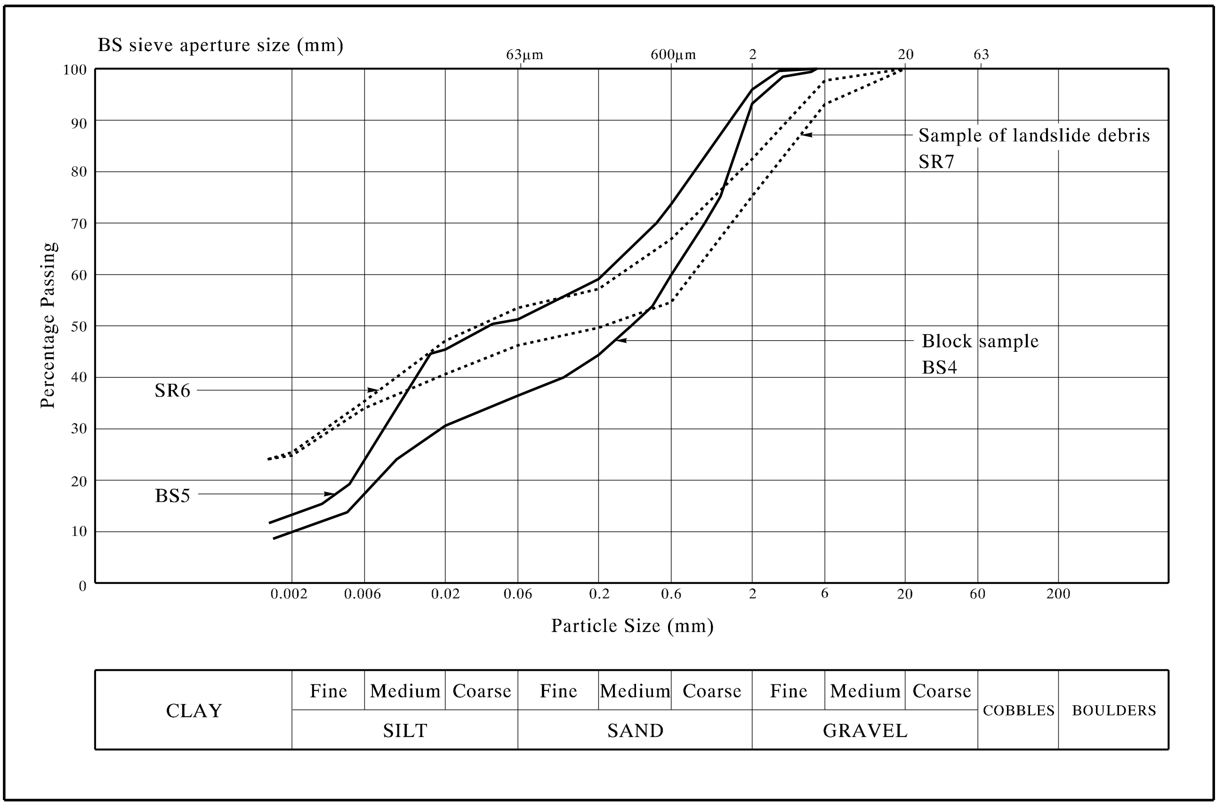


Figure C5 - Particle Size Distribution Curves of Samples Obtained from Landslide Scar 2

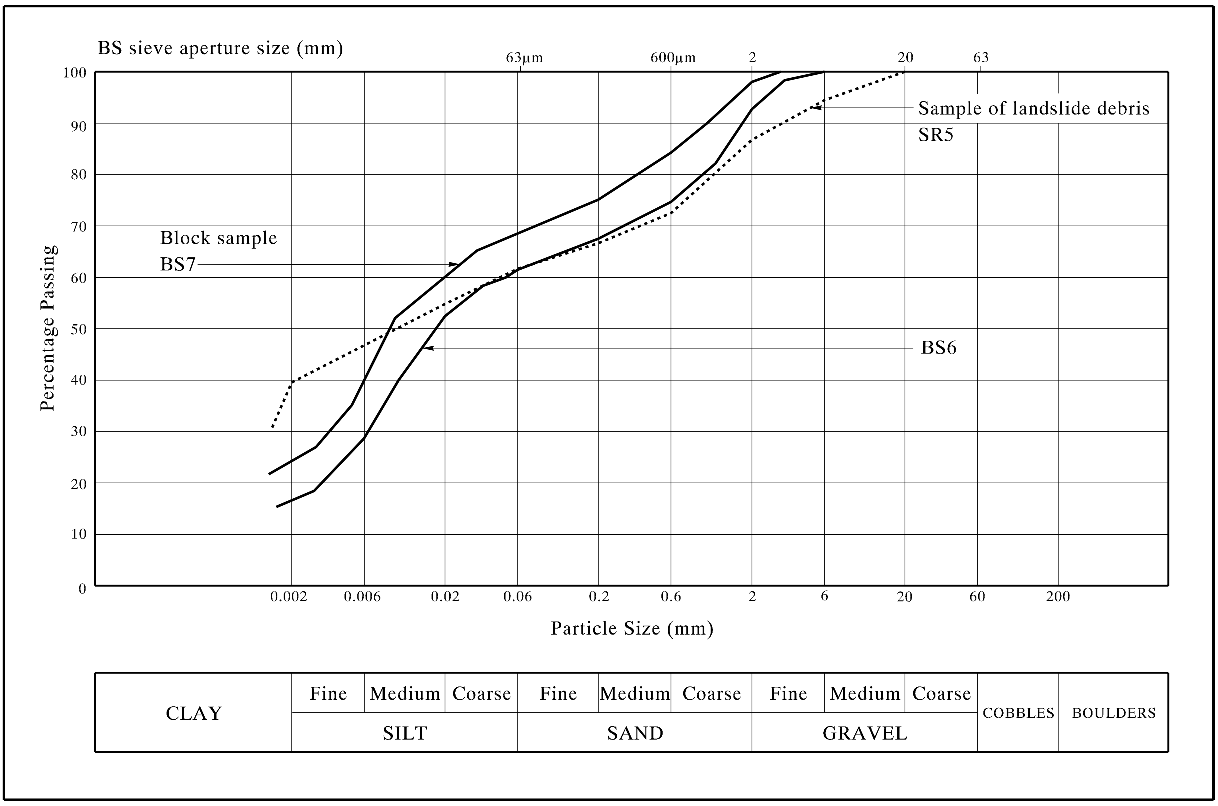


Figure C6 - Particle Size Distribution Curves of Samples Obtained from Landslide Scar 3

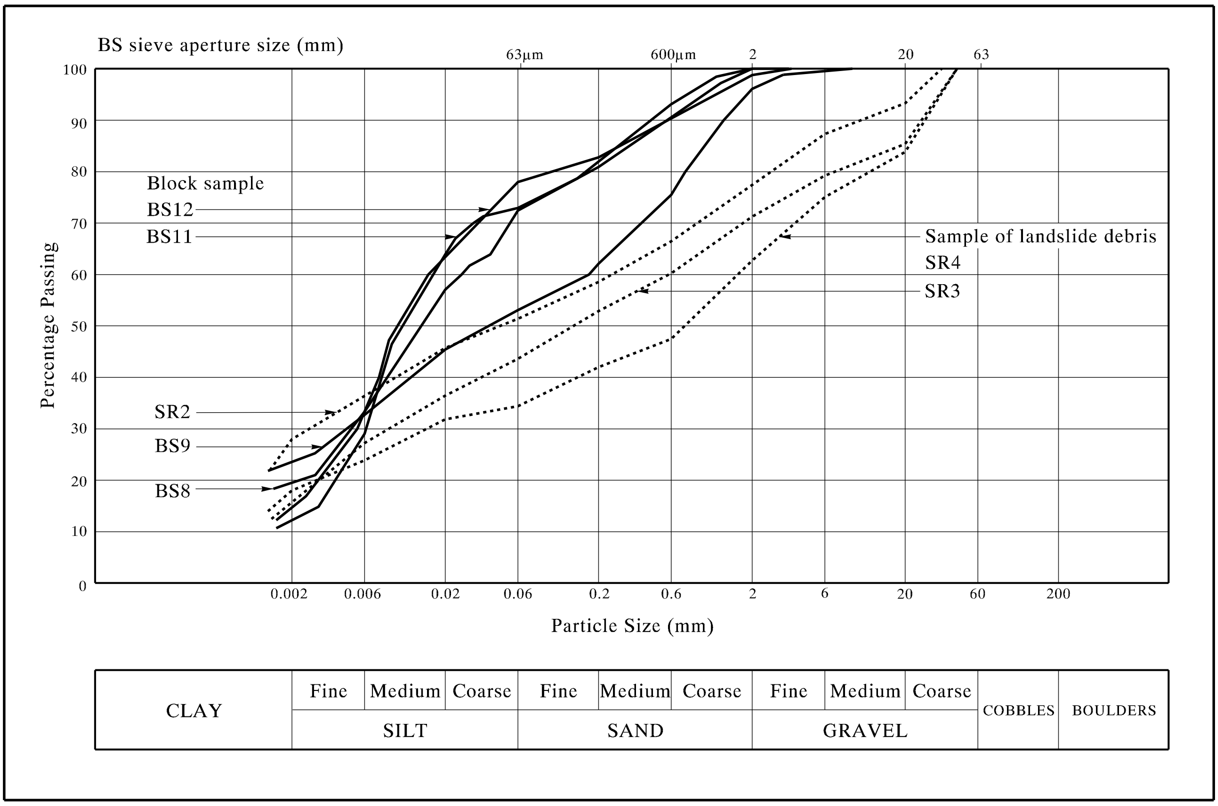


Figure C7 - Particle Size Distribution Curves of Samples Obtained from Landslide Scar 4

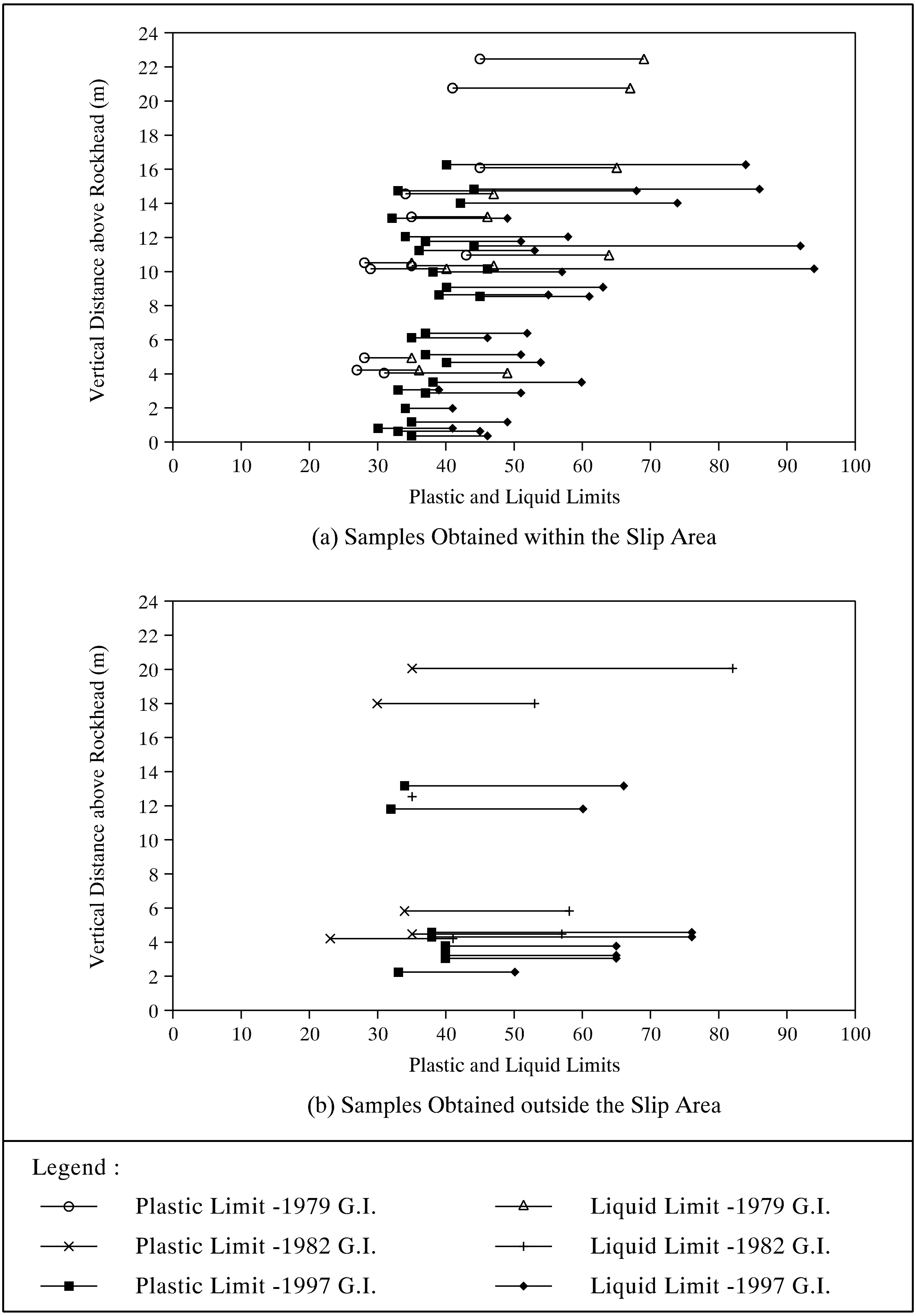
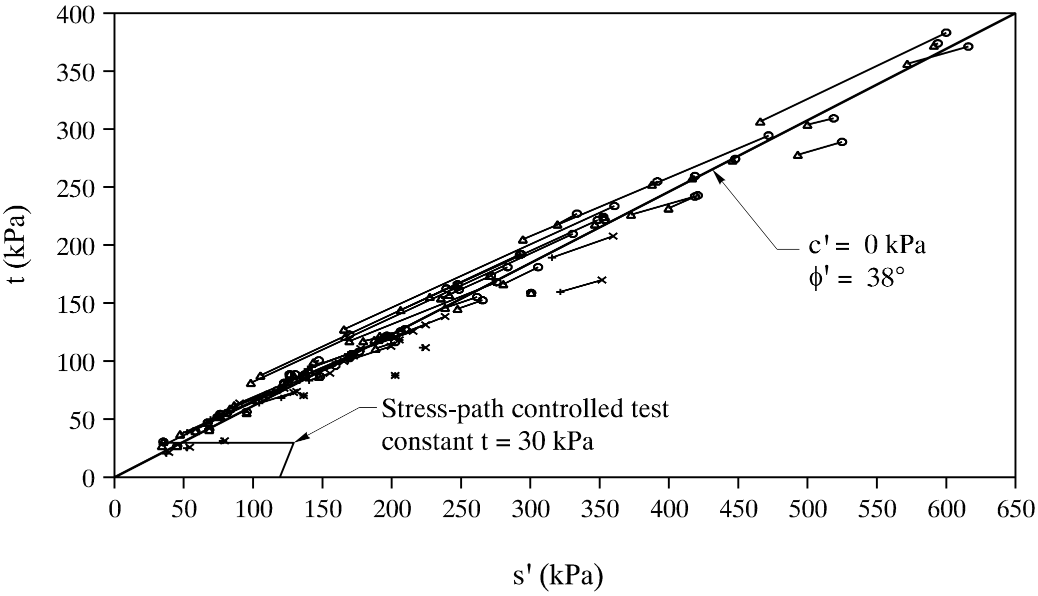
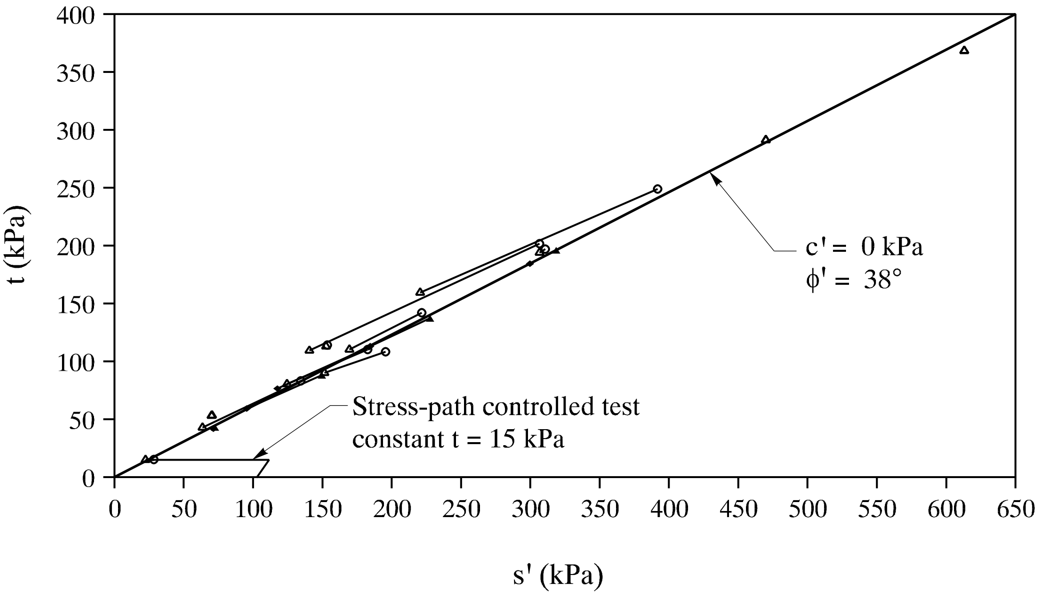


Figure C8 - Plasticity versus Distance above Rockhead for Drillhole Samples



(a) Samples Obtained within the Slip Area (CUS)

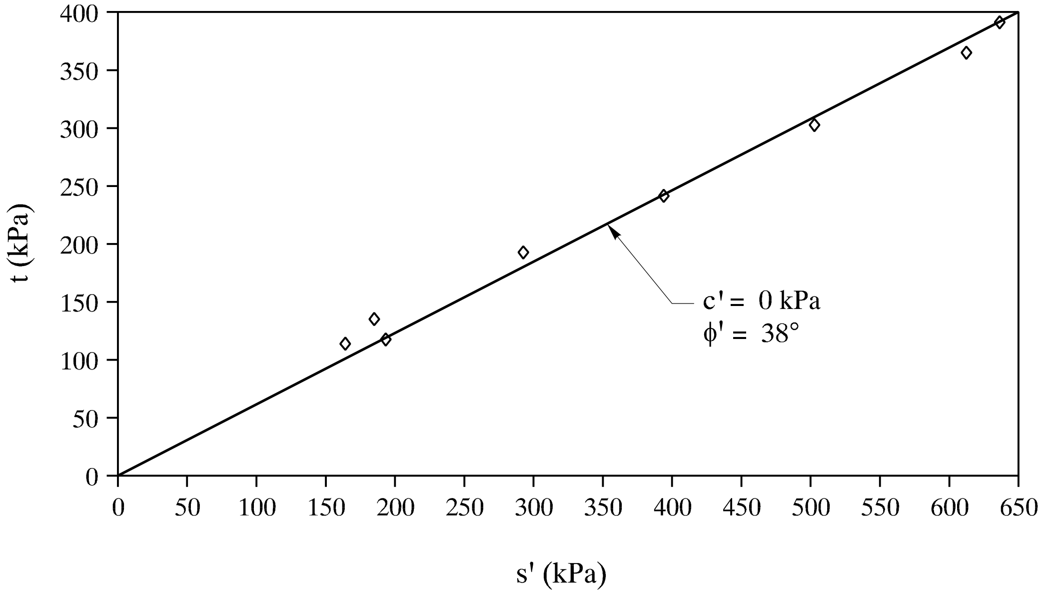


(b) Samples Obtained outside the Slip Area (CUS)

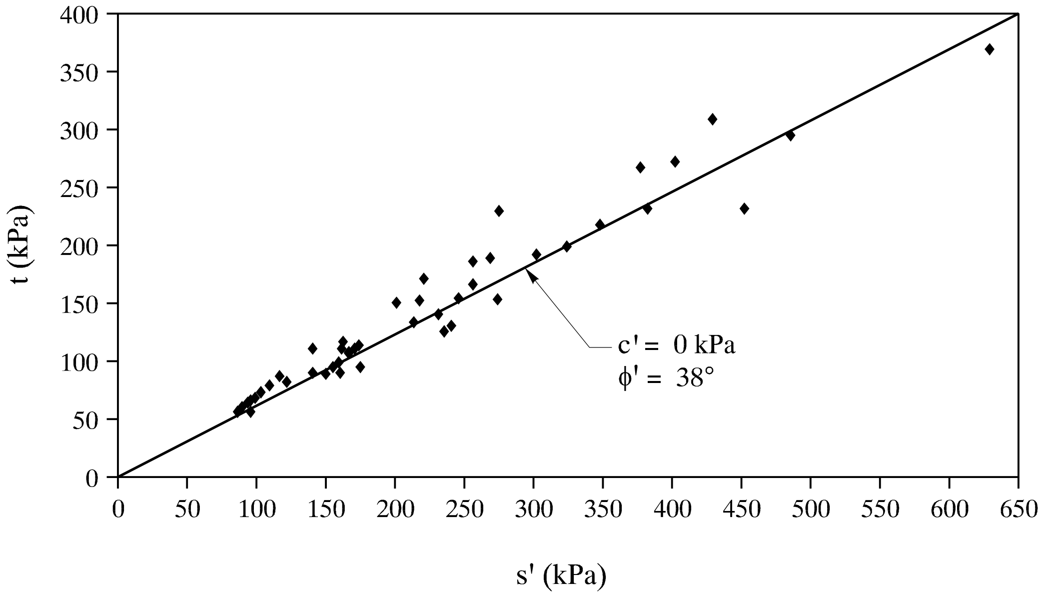
Legend :

—◆—	1992 G.I. max N	—▲—	1992 G.I. max t
—+—	1995 G.I. max N	—×—	1995 G.I. max t
—△—	1997 G.I. max N	—○—	1997 G.I. max t
s'	$(\sigma_1' + \sigma_3')/2$	t	$(\sigma_1' - \sigma_3')/2$
σ_1'	Major principal effective stress	σ_3'	Minor principal effective stress
N	σ_1'/σ_3'		

Figure C9 - Summary of Consolidated Undrained Triaxial Test Results



(a) Samples Obtained within the Slip Area (CDS)

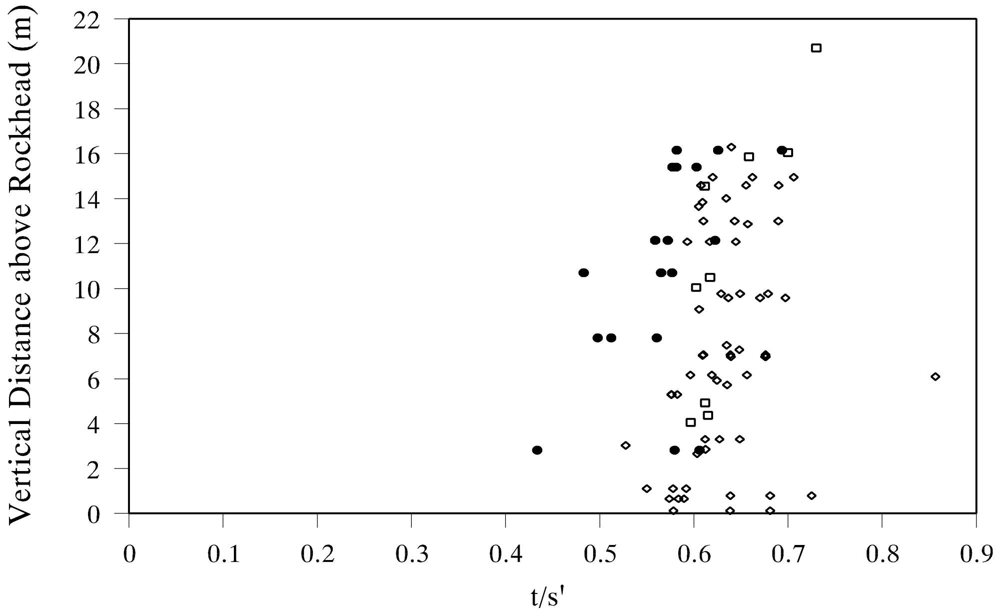


(b) Samples Obtained outside the Slip Area (CDS)

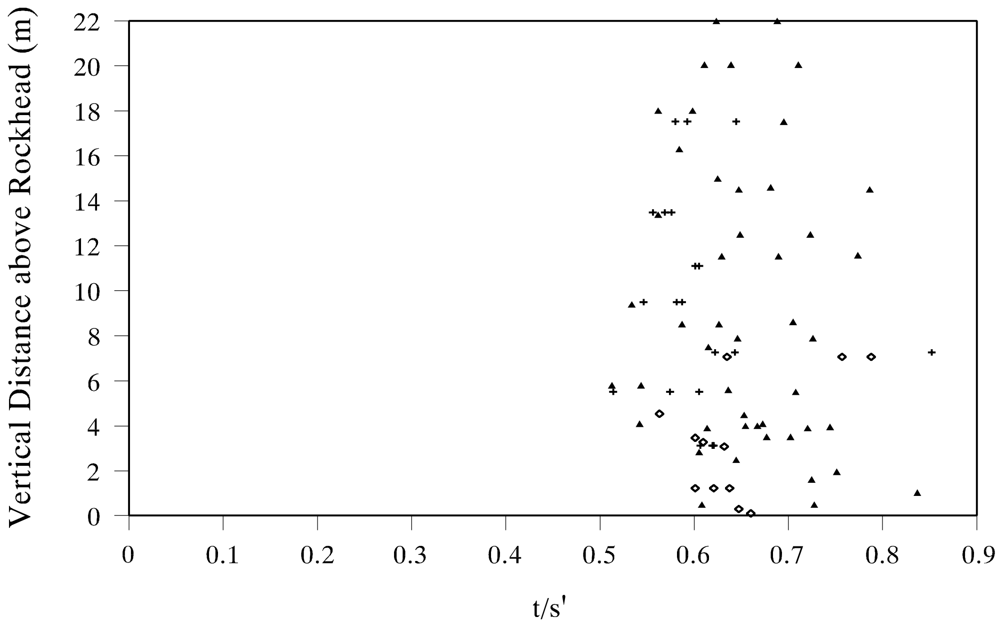
Legend :

◇	1979 G.I. max t	◆	1982 G.I. max t
s'	$(\sigma_1' + \sigma_3')/2$	t	$(\sigma_1' - \sigma_3')/2$
σ_1'	Major principal effective stress	σ_3'	Minor principal effective stress

Figure C10 - Summary of Consolidated Drained Triaxial Test Results



(a) Samples Obtained within the Slip Area



(b) Samples Obtained outside the Slip Area

Legend :

□	1979 G.I. max t	s'	$(\sigma_1' + \sigma_3')/2$
▲	1982 G.I. max t	t	$(\sigma_1' - \sigma_3')/2$
+	1992 G.I. max t	σ_1'	Major principal effective stress
●	1995 G.I. max t	σ_3'	Minor principal effective stress
◇	1997 G.I. max t		

Figure C11 - Stress Ratio Values at Maximum Deviator Stress versus Distance above Rockhead for Drillhole Samples

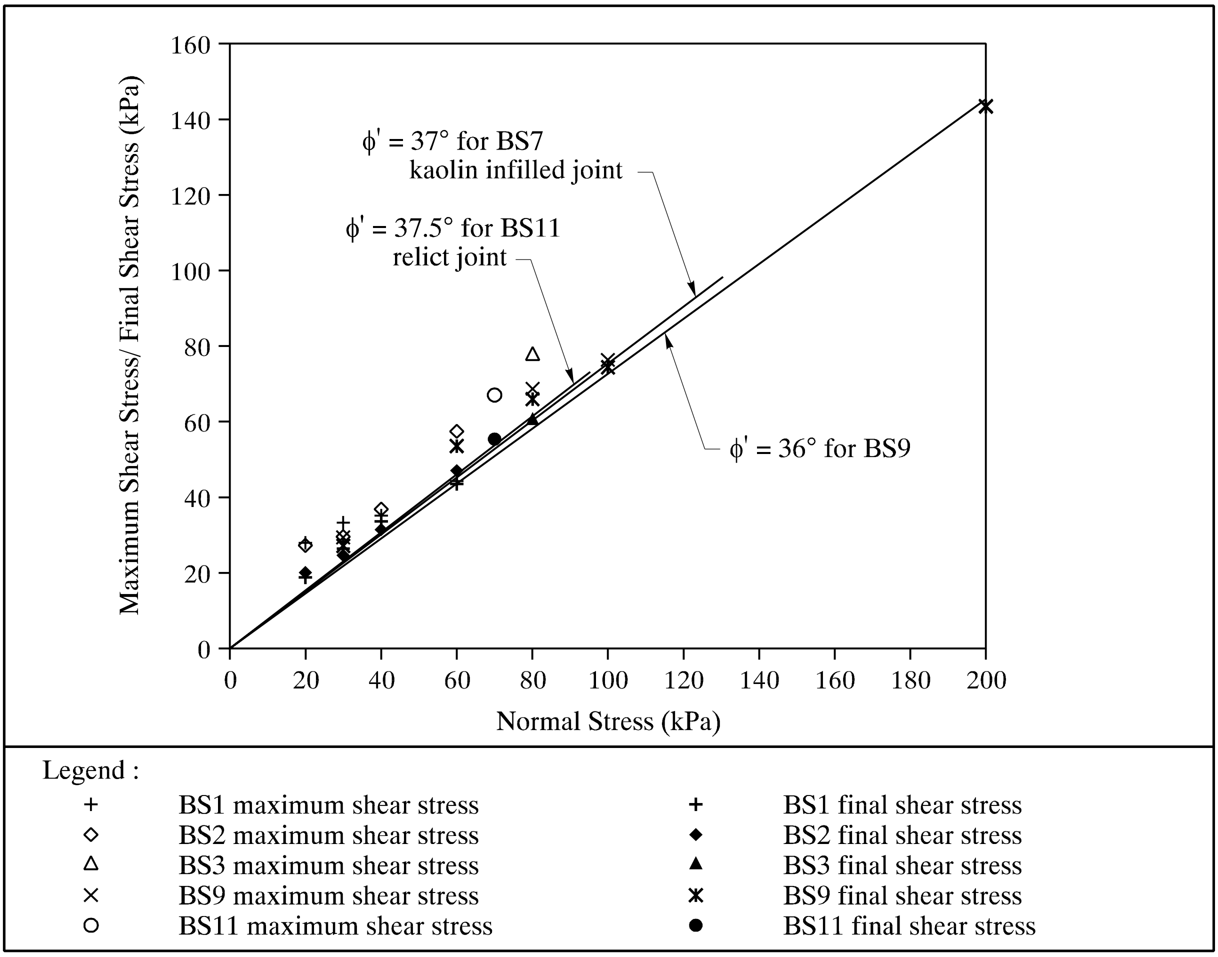


Figure C12 - Summary of Direct Shear Test Results

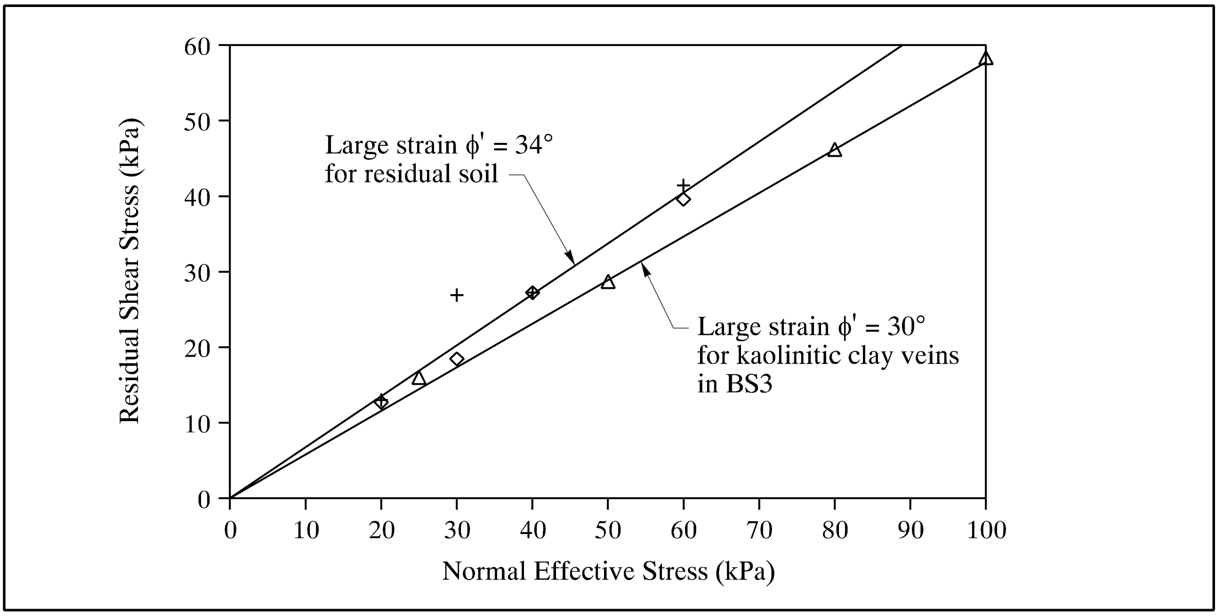
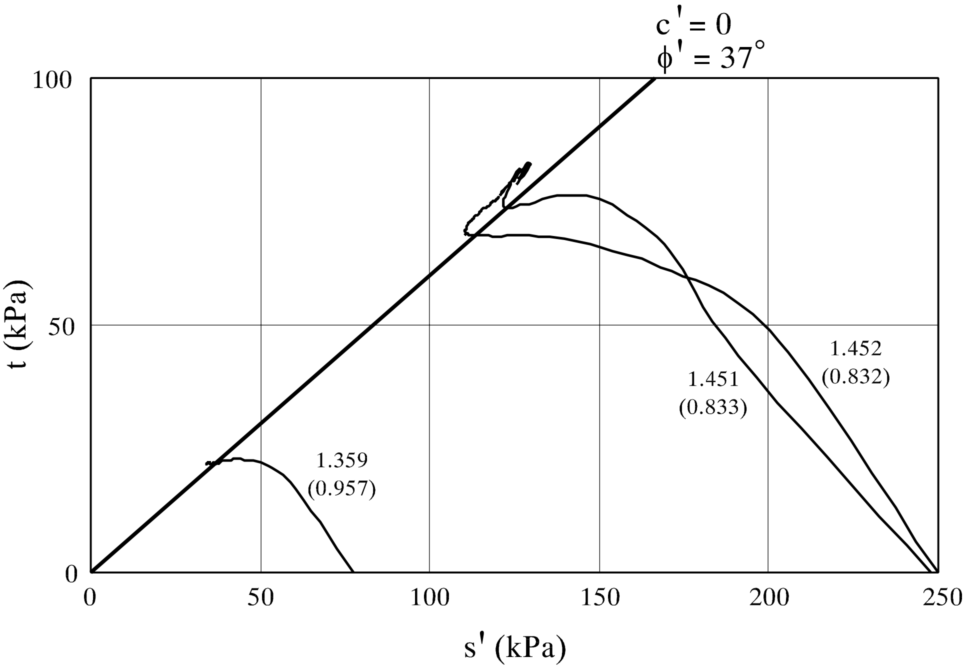
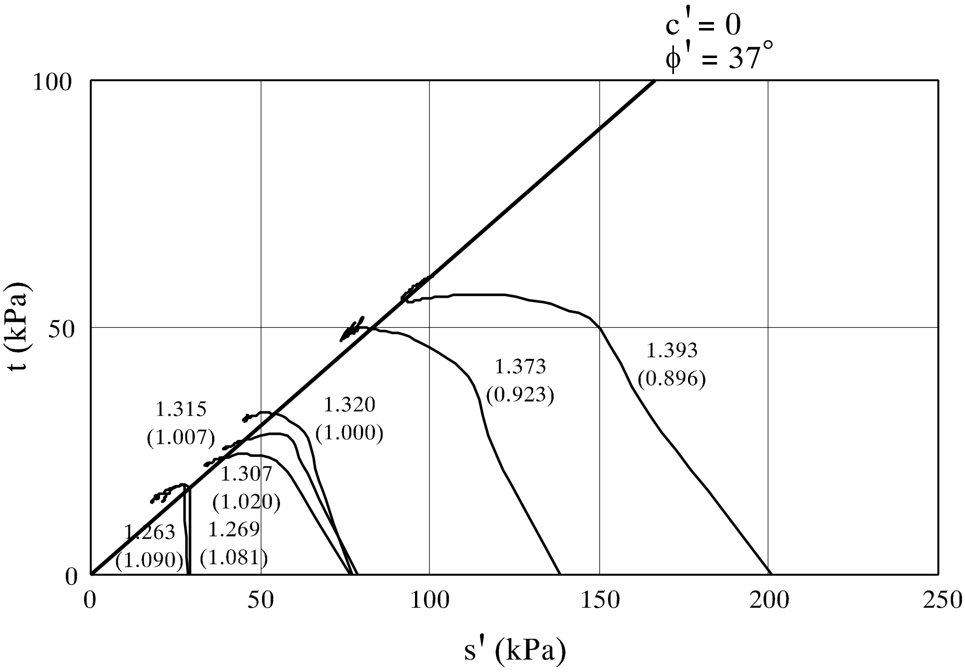


Figure C13 - Summary of Ring Shear Test Results



(a) Debris Obtained from Location SR4



(b) Debris Obtained from Location SR5

Legend :

1.393	Dry density in Mg/m^3	s'	$(\sigma_1' + \sigma_3')/2$
(0.896)	Void ratio	t	$(\sigma_1' - \sigma_3')/2$
σ_1'	Major principal effective stress	σ_3'	Minor principal effective stress

Figure C14 - Shearing Behaviour of Loose Specimens of Landslide Debris

LIST OF DRAWINGS

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EG503	Features of the Composite Landslide and Ground Investigation Locations
EG508	Geological Cross-Section 6-6'