*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/100) ***

NAME	ES	EE	DZ	SS	SE	SQS	SQO	C	SQB	SVB	SVO	VDAM
	(EL.M)	(EL.M)	(M)			(M3)	(M3)	(%)	(M3)	(M3)	(M3)	(M3)
BS.BANG 58	1200.000	1085.291	-114.709	0.1725	0.0851	0.434E+07	0.993E+07	43.7	0.000E+00	-0.789E+07	0.000E+00	0.000
BS.BANG 57	936.120	955.048	18.928	0.1157	0.0751	0.388E+07	0.105E+08	37.1	0.000E+00	0.836E+06	0.000E+00	0.000
BS.BANG 53	886.370	922.735	36.365	0.0539	0.0762	0.334E+07	0.982E+07	34.1	0.000E+00	0.975E+06	0.000E+00	0.000
BS.BANG 47	861.410	887.449	26.039	0.0988	0.0736	0.297E+07	0.956E+07	31.0	0.000E+00	0.685E+06	0.000E+00	0.000
BS.BANG 44	826.050	861.111	35.062	0.0423	0.0721	0.180E+07	0.776E+07	23.1	0.000E+00	0.213E+07	0.000E+00	0.000
BS.BANG 37	801.630	819.507	17.877	0.0465	0.0576	0.160E+07	0.792E+07	20.2	0.000E+00	0.348E+06	0.000E+00	0.000
BS.BANG 31	783.620	798.128	14.508	0.1522	0.0554	0.140E+07	0.789E+07	17.8	0.000E+00	0.368E+06	0.000E+00	0.000
BS.BANG 29	758.970	789.149	30.179	0.0084	0.0496	0.102E+07	0.737E+07	13.8	0.000E+00	0.696E+06	0.000E+00	0.000
BS.BANG 25	751.750	746.351	-5.399	0.0389	0.0436	0.110E+07	0.828E+07	13.3	0.000E+00	-0.150E+06	0.000E+00	0.000
BS.BANG 19	726.570	718.172	-8.398	0.0469	0.0439	0.131E+07	0.916E+07	14.3	0.000E+00	-0.377E+06	0.000E+00	0.000
BS.BANG 12	692.910	686.660	-6.250	0.0506	0.0424	0.151E+07	0.102E+08	14.8	0.000E+00	-0.363E+06	0.000E+00	0.000
BS.BANG 4	650.480	651.112	0.632	0.0531	0.0404	0.149E+07	0.109E+08	13.6	0.000E+00	0.347E+05	0.000E+00	0.000
BS.BANG 1	634.590	639.042	4.453	0.0000	0.0398	0.144E+07	0.111E+08	12.9	0.000E+00	0.960E+05	0.000E+00	0.000
K.LENG 240	767.000	767.000	0.000	0.0246	0.0249	0.000E+00	0.000E+00	12.9	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 238	739.500	739.102	-0.398	0.0259	0.0243	0.615E+04	0.679E+06	0.9	0.000E+00	-0.112E+05	0.000E+00	0.000
K.LENG 237	727.240	727.604	0.364	0.0080	0.0084	0.184E+04	0.974E+06	0.2	0.000E+00	0.783E+04	0.000E+00	0.000
K.LENG 236	721.860	721.911	0.051	0.0045	0.0045	0.141E+04	0.142E+07	0.1	0.000E+00	0.794E+03	0.000E+00	0.000
K.LENG 235	719.220	719.318	0.098	0.0023	0.0023	0.598E+03	0.180E+07	0.0	0.000E+00	0.147E+04	0.000E+00	0.000
K.LENG 234	717.990	718.072	0.082	0.0001	0.0003	0.000E+00	0.217E+07	0.0	0.000E+00	0.109E+04	0.000E+00	0.000
K.LENG 231	717.910	717.903	-0.007	0.0021	0.0024	0.242E+03	0.254E+07	0.0	0.000E+00	-0.440E+03	0.000E+00	0.000
K.LENG 220	715.910	715.633	-0.276	0.0107	0.0104	0.103E+05	0.315E+07	0.3	0.000E+00	-0.182E+05	0.000E+00	0.000
K.LENG 206	704.410	704.464	0.074	0.0052	0.0053	0.408E+04	0.382E+07	0.1	0.000E+00	0.112E+05	0.000E+00	0.000
K.LENG 186	695.630	695.571	-0.059	0.0044	0.0043	0.570E+04	0.487E+07	0.1	0.000E+00	-0.294E+04	0.000E+00	0.000
K.LENG 171	689.680	689.760	0.081	-0.0057	-0.0055	0.000E+00	0.576E+07	0.0	0.000E+00	0.104E+05	0.000E+00	0.000
K.LENG 161	694.660	694.603	-0.057	0.0059	0.0077	0.790E+04	0.629E+07	0.1	0.000E+00	-0.144E+05	0.000E+00	0.000
K.LENG 151	688.700	686.803	-1.897	0.0303	0.0285	0.933E+05	0.134E+08	0.7	0.000E+00	-0.155E+06	0.000E+00	0.000
K.LENG 147	674.680	673.654	-1.026	0.0375	0.0350	0.111E+06	0.137E+08	0.8	0.000E+00	-0.319E+05	0.000E+00	0.000
K.LENG 144	662.600	662.381	-0.219	0.0483	0.0454	0.112E+06	0.141E+08	0.8	0.000E+00	-0.208E+04	0.000E+00	0.000
K.LENG 143	658.830	658.836	0.006	0.0478	0.0478	0.111E+06	0.759E+07	1.5	0.000E+00	0.108E+04	0.000E+00	0.000
K.LENG 138 *	634.590	634.590	0.000	0.0669	0.0669	0.155E+07	0.176E+08	8.8	0.144E+07	0.000E+00	0.000E+00	0.000
K.LENG 131	593.470	593.470	0.000	0.9785	0.9785	0.155E+07	0.176E+08	8.8	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 129	466.260	466.260	0.000	0.0689	0.0681	0.155E+07	0.176E+08	8.8	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 124	425.860	426.351	0.491	0.0565	0.0553	0.154E+07	0.152E+08	10.1	0.000E+00	0.181E+05	0.000E+00	0.000
K.LENG 119	390.920	392.164	1.244	0.0246	0.0262	0.152E+07	0.176E+08	8.6	0.000E+00	0.326E+05	0.000E+00	0.000
K.LENG 113	372.440	372.469	0.029	0.0437	0.0438	0.152E+07	0.182E+08	8.4	0.000E+00	0.817E+03	0.000E+00	0.000
K.LENG 109	355.870	355.870	0.000	0.0332	0.0332	0.152E+07	0.190E+08	8.0	0.000E+00	0.916E+02	0.000E+00	0.000
K.LENG 104	339.280	339.280	0.000	0.0325	0.0647	0.152E+07	0.203E+08	7.5	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 98	318.970	298.871	-20.099	0.0340	0.0265	0.218E+07	0.241E+08	9.1	0.000E+00	-0.121E+07	0.000E+00	0.000
K.LENG 87	270.710	261.316	-9.394	0.0284	0.0241	0.260E+07	0.281E+08	9.2	0.000E+00	-0.756E+06	0.000E+00	0.000
K.LENG 85	262.270	254.159	-8.111	0.0222	0.0339	0.266E+07	0.288E+08	9.2	0.000E+00	-0.107E+06	0.000E+00	0.000
K.LENG 83	255.530	243.841	-11.689	0.0422	0.0278	0.296E+07	0.301E+08	9.8	0.000E+00	-0.538E+06	0.000E+00	0.000
K.LENG 78	223.690	222.855	-0.835	0.0368	0.0287	0.302E+07	0.319E+08	9.5	0.000E+00	-0.124E+06	0.000E+00	0.000
K.LENG 74	209.320	211.662	2.342	0.0276	0.0280	0.269E+07	0.321E+08	8.4	0.000E+00	0.326E+06	0.279E+06	0.000
K.GLIDIK 65	183.250	185.138	1.888	0.0106	0.0215	0.200E+07	0.438E+08	4.6	0.000E+00	0.395E+06	0.860E+06	0.000
K.GLIDIK 64	178.330	175.193	-3.137	0.0166	0.0214	0.219E+07	0.446E+08	4.9	0.000E+00	-0.344E+06	0.000E+00	0.000
K.GLIDIK 62	173.680	169.195	-4.485	0.0277	0.0226	0.271E+07	0.455E+08	6.0	0.000E+00	-0.941E+06	0.000E+00	0.000
K.GLIDIK 54	148.660	148.728	0.068	0.0271	0.0227	0.270E+07	0.463E+08	5.8	0.000E+00	0.169E+05	0.000E+00	0.000
K.GLIDIK 51	136.760	138.752	1.992	0.0174	0.0210	0.223E+07	0.455E+08	4.9	0.000E+00	0.297E+06	0.546E+06	0.000
K.GLIDIK 44	123.350	122.557	-0.793	0.0231	0.0199	0.231E+07	0.461E+08	5.0	0.000E+00	-0.138E+06	0.000E+00	0.000
K.GLIDIK 40	113.100	113.736	0.636	0.0191	0.0204	0.226E+07	0.464E+08	4.9	0.000E+00	0.697E+05	0.239E+05	0.000

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*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/100) ***

NAME	ES	EE	DZ	SS	SE	SQS	SQD	C	SQB	SVB	SVO	VDAM
	(EL.M)	(EL.M)	(M)			(M3)	(M3)	(%)	(M3)	(M3)	(M3)	(M3)
K.GLIDIK 34	101.480	101.287	-0.193	0.0213	0.0202	0.227E+07	0.469E+08	4.8	0.000E+00	-0.239E+05	0.000E+00	0.000
K.GLIDIK 30	90.340	90.732	0.392	0.0161	0.0168	0.188E+07	0.466E+08	4.0	0.000E+00	0.707E+05	0.643E+06	0.000
K.GLIDIK 24	80.750	80.693	-0.057	0.0185	0.0172	0.188E+07	0.466E+08	4.0	0.000E+00	-0.879E+04	0.000E+00	0.000
K.GLIDIK 14	59.540	60.940	1.400	0.0099	0.0113	0.174E+06	0.434E+08	0.4	0.000E+00	0.408E+06	0.270E+07	0.000
K.GLIDIK 4	48.880	48.676	-0.204	0.0112	0.0112	0.235E+06	0.560E+08	0.4	0.000E+00	-0.110E+06	0.000E+00	0.000
K.GLIDIK 0	21.920	21.910	-0.010	0.0112	0.0112	0.238E+06	0.560E+08	0.4	0.000E+00	-0.564E+04	0.000E+00	0.000

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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
 1)     ###  K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/40) D-1 ###
 2)    1   24    5    0    2
 3)7
 4) 5000
 5)    2
 6)2
 7)     0.243       3.0       1.3 20.  20.        1.0       2.8      0.55      0.44
 8)     0.040       8.0     0.047   1.E-10        2.0       0.45       10      1.56
 9)4  56
10) RS.BANG 56   2 1200.0    500.  50. 0.241530.       45.                     -900
11) RS.BANG 57   2  956.12   500.  50. 0.40 430.       45.
12) RS.BANG 53   2  886.37   500.  50. 0.44 463.       60.
13) RS.BANG 47   2  861.41   500.  50. 0.49 358.       64.
14) RS.BANG 44   2  826.05   500.  50. 0.53 577.      130.
15) RS.BANG 37   2  801.63   500.  50. 0.59 371.       41.
16) RS.BANG 31   2  783.62   500.  50.  .63 162.       95.
17) RS.BANG 29   2  758.97   500.  50. 0.65 862.       45.
18) RS.BANG 25   2  751.75   500.  50. 0.74 647.       37.
19) RS.BANG 19   2  726.57   500. 11.0 0.80 717.       66.
20) RS.BANG 12   2  692.91   500.  8.6 0.88 838.       75.
21) RS.BANG  4   2  650.48   500. 14.0 0.97 299.       93.
22) RS.BANG  1   2  634.59     0. 11.5  1.0 112.      104.                       30
23) K.LENG 240   1  767.0    500.  15.  0.0 1120.      36.                     -900
24) K.LENG 238   1  739.5    500.  10. 0.09 473.
25) K.LENG 237   1  727.24   500.  10. 0.13676.2
26) K.LENG 236   1  721.86   500.   7. 0.19581.3       23.
27) K.LENG 235   1  719.22   500.   6. 0.24538.1       25.
28) K.LENG 234   1  717.99   500.  2.8 0.29594.4       22.
29) K.LENG 231   1  717.91   500.  1.5 0.34 964.       94.
30) K.LENG 220   1  715.91   500.  3.3 0.421073.       67.
31) K.LENG 206   1  704.41   500.  3.5 0.511686.       95.
32) K.LENG 186   1  695.63   500.  0.9 0.651343.       37.
33) K.LENG 171   1  689.68   500.  4.5 0.77 875.      104.
34) K.LENG 161   1  694.66   500.  3.4 0.841016.      289.
35) K.LENG 151   2  688.70   500.  2.6 1.56 462.      113.
36) K.LENG 147   2  674.68   500.  3.3 1.60 322.       82.
37) K.LENG 144   2  662.60    20.  4.5 1.64  78.       56.
38) K.LENG 143   1  658.83    10.  8.2  1.0 507.       94.
39) K.LENG 138   3  634.59     0. 11.5  1.0 615.      104.
40) K.LENG 131   3  593.47     0. 100.  1.0 130.       50.
41) K.LENG 129   3  466.26     0. 100.  1.0 586.
42) K.LENG 124   4  425.86     0. 100. 0.50 618.       60.
43) K.LENG 119   4  390.92     0. 100. 0.55 751.       38.
44) K.LENG 113   4  372.44     0. 100. 0.61 379.       40.
45) K.LENG 109   4  355.87     0. 100. 0.64 500.       41.
46) K.LENG 104   4  339.28     0. 100. 0.69 625.       38.
47) K.LENG  98   4  318.97   500. 100. 0.741418.       59.
48) K.LENG  87   4  270.71   500. 100. 0.86 297.       94.
49) K.LENG  85   4  262.27   500. 100. 0.88 304.       44.
50) K.LENG  83   4  255.53 500.0 100. 0.91 754.        87.
LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
  51) K.LENG  78   4  223.69   500. 100. 0.97 390.      262.
  52) K.LENG  74   4  209.32   500.  2.4 1.00 946.      208.
  53) K.GLIDIK 65  6  183.25   500.  1.9 0.93 462.      296.
  54) K.GLIDIK 64  6  178.33   500.  1.9 0.94 280.      296.
  55) K.GLIDIK 62  6  173.68   500.  3.8 0.94 904.      355.
  56) K.GLIDIK 54  6  148.66   500.  2.6 0.96 439.      336.
  57) K.GLIDIK 51  6  136.76   500.  2.0 0.96 772.      246.
  58) K.GLIDIK 44  6  123.35   500.  0.8 0.97 443.      289.
  59) K.GLIDIK 40  6  113.10   500.  0.8 0.98 609.      207.
  60) K.GLIDIK 34  6  101.48   500.  1.0 0.99 522.      223.
  61) K.GLIDIK 30  6   90.34   500.  0.4 1.00 597.      319.
  62) K.GLIDIK 24  6   80.75   500.  1.4  1.01149.      191.
  63) K.GLIDIK 14  6   59.54   500.  1.4  1.01082.      261.
  64) K.GLIDIK  4  8   48.88   500.  2.0  1.02400.      313.
  65) K.GLIDIK  0  8   21.92   500.  1.9  1.02400.      267.
  66)5   8
  67)  60   18
  68)   1         1.0       1.9       3.1       4.8       9.4     279.8     641.6
  69)           255.0     114.3      65.9      49.0      39.4      33.1      28.6
  70)            25.3      22.7      20.7      18.9
  71)   2        23.0      27.2      33.3      44.0      72.0     842.2     551.3
  72)           120.2      60.7      42.8      33.6      27.9      24.1      21.1
  73)            18.7      16.9      15.5      14.2
  74)   3        24.1      29.1      36.4      48.8      81.4    1122.0    1192.9
  75)           375.2     175.0     108.7      82.6      67.3      57.2      49.7
  76)            44.0      39.6      36.1
  77)   4        53.4      63.2      77.9     102.7     185.5    2090.3    2005.0
  78)           620.0     282.2     177.7     134.8     109.6      93.1      81.2
  79)            71.8      64.4      58.6      53.9
  80)   5        84.9     100.1     123.3     162.6     300.1    3218.7    2834.3
  81)           797.8     368.5     238.7     182.7     149.3     127.1     110.9
  82)            98.3      88.2      80.3      73.8
  83)   6        82.4      97.0     119.1     156.0     254.2    3090.1    3418.1
  84)          1040.7     450.6     285.9     215.7     175.2     148.5     129.4
  85)           114.6     102.6      93.2      85.7
  86)   7        82.4      97.0     119.3     156.3     255.3    3166.9    4113.9
  87)          1705.9     796.9     487.7     348.4     273.0     228.1     192.0
  88)           173.7     155.2     140.6     129.0
  89)   8        74.6      87.9     106.1     135.5     193.2    2164.7    4526.3
  90)          2131.3     961.9     564.1     391.3     298.8     245.4     210.0
  91)           184.1     163.9     147.7     134.9
  92)6
  93)   17
  94) 730.0     107.0
  95)   26
  96) 692.0     100.0
  97)   30
  98) 660.0     355.0
  99)   40
 100) 280.0     125.0
LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0

101)   42
102)  235.0     290.0
103)   44
104)  194.0     418.0
105)   48
106)  147.0     585.0
107)  -10
108)9

LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
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*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/40) D-1 ***

NAME	ES	EE	DZ	SS	SE	SQS	SQD	C	SQB	SVB	SVD	VDAM
	(EL.M)	(EL.M)	(M)			(M3)	(M3)	(%)	(M3)	(M3)	(M3)	(M3)
BS.BANG 58	1200.000	1100.098	-99.902	0.1725	0.0948	0.378E+07	0.859E+07	44.0	0.000E+00	-0.687E+07	0.000E+00	0.000
BS.BANG 57	936.120	955.073	18.953	0.1157	0.0777	0.332E+07	0.890E+07	37.3	0.000E+00	0.837E+06	0.000E+00	0.000
BS.BANG 53	886.370	921.664	35.294	0.0539	0.0798	0.280E+07	0.824E+07	34.0	0.000E+00	0.946E+06	0.000E+00	0.000
BS.BANG 47	861.410	884.695	23.285	0.0988	0.0761	0.246E+07	0.798E+07	30.9	0.000E+00	0.613E+06	0.000E+00	0.000
BS.BANG 44	826.050	857.464	31.415	0.0423	0.0718	0.141E+07	0.634E+07	22.2	0.000E+00	0.191E+07	0.000E+00	0.000
BS.BANG 37	801.630	816.025	14.395	0.0485	0.0562	0.126E+07	0.649E+07	19.4	0.000E+00	0.280E+06	0.000E+00	0.000
BS.BANG 31	783.620	795.171	11.551	0.1522	0.0510	0.110E+07	0.648E+07	16.9	0.000E+00	0.293E+06	0.000E+00	0.000
BS.BANG 29	758.970	786.904	27.934	0.0084	0.0454	0.741E+06	0.599E+07	12.4	0.000E+00	0.644E+06	0.000E+00	0.000
BS.BANG 25	751.750	747.788	-3.962	0.0389	0.0385	0.801E+06	0.674E+07	11.9	0.000E+00	-0.110E+06	0.000E+00	0.000
BS.BANG 19	726.570	722.867	-3.703	0.0469	0.0348	0.892E+06	0.733E+07	12.2	0.000E+00	-0.165E+06	0.000E+00	0.000
BS.BANG 12	692.910	697.882	4.972	0.0393	0.0321	0.732E+06	0.761E+07	9.6	0.000E+00	0.292E+06	0.000E+00	0.000
BS.BANG 4 C	660.000	671.007	11.007	0.0000	0.0270	0.411E+06	0.768E+07	5.3	0.000E+00	0.584E+06	0.000E+00	660.000
BS.BANG 1 C	660.000	662.944	2.944	0.0000	0.0263	0.376E+06	0.783E+07	4.8	0.000E+00	0.635E+05	0.000E+00	660.000
K.LENG 240	767.000	767.000	0.000	0.0246	0.0247	0.000E+00	0.000E+00	4.8	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 238	739.500	739.297	-0.203	0.0201	0.0191	0.306E+04	0.526E+06	0.6	0.000E+00	-0.556E+04	0.000E+00	0.000
K.LENG 237 C	730.000	730.260	0.260	0.0000	0.0004	0.000E+00	0.756E+06	0.0	0.000E+00	0.556E+04	0.000E+00	730.000
K.LENG 236 B	730.000	730.000	0.000	0.0185	0.0186	0.000E+00	0.110E+07	0.0	0.000E+00	0.000E+00	0.000E+00	730.000
K.LENG 235	719.220	719.172	-0.048	0.0023	0.0021	0.328E+03	0.140E+07	0.0	0.000E+00	-0.597E+03	0.000E+00	0.000
K.LENG 234	717.990	718.033	0.043	0.0001	0.0002	0.000E+00	0.169E+07	0.0	0.000E+00	0.597E+03	0.000E+00	0.000
K.LENG 231	717.910	717.906	-0.004	0.0021	0.0023	0.959E+02	0.198E+07	0.0	0.000E+00	-0.174E+03	0.000E+00	0.000
K.LENG 220	715.910	715.708	-0.201	0.0107	0.0105	0.741E+04	0.245E+07	0.3	0.000E+00	-0.133E+05	0.000E+00	0.000
K.LENG 206	704.410	704.469	0.059	0.0052	0.0053	0.265E+04	0.297E+07	0.1	0.000E+00	0.866E+04	0.000E+00	0.000
K.LENG 186	695.630	695.573	-0.057	0.0044	0.0043	0.411E+04	0.378E+07	0.1	0.000E+00	-0.265E+04	0.000E+00	0.000
K.LENG 171	689.680	689.735	0.055	-0.0057	-0.0056	0.000E+00	0.448E+07	0.0	0.000E+00	0.747E+04	0.000E+00	0.000
K.LENG 161	694.660	694.656	-0.004	0.0026	0.0026	0.293E+03	0.488E+07	0.0	0.000E+00	-0.533E+03	0.000E+00	0.000
K.LENG 151 B	692.000	692.000	0.000	0.0375	0.0461	0.293E+03	0.112E+08	0.0	0.000E+00	0.000E+00	0.000E+00	692.000
K.LENG 147	674.680	670.715	-3.965	0.0375	0.0192	0.698E+05	0.115E+08	0.6	0.000E+00	-0.126E+06	0.000E+00	0.000
K.LENG 144	662.600	664.544	1.944	0.0333	0.0147	0.577E+05	0.118E+08	0.5	0.000E+00	0.222E+05	0.000E+00	0.000
K.LENG 143 C	660.000	663.399	3.399	0.0000	0.0067	0.577E+04	0.582E+07	0.1	0.000E+00	0.943E+05	0.000E+00	660.000
K.LENG 138 *	660.000	660.000	0.000	0.1082	0.1082	0.382E+06	0.132E+08	2.9	0.376E+06	0.000E+00	0.000E+00	660.000
K.LENG 131	593.470	593.481	0.011	0.9785	0.9786	0.382E+06	0.132E+08	2.9	0.000E+00	0.255E+03	0.000E+00	0.000
K.LENG 129	466.260	466.260	0.000	0.0689	0.0689	0.382E+06	0.132E+08	2.9	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 124	425.860	425.860	0.000	0.0565	0.0565	0.382E+06	0.118E+08	3.2	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 119	390.920	390.920	0.000	0.0246	0.0246	0.381E+06	0.129E+08	3.0	0.000E+00	0.789E+02	0.000E+00	0.000
K.LENG 113	372.440	372.440	0.000	0.0437	0.0437	0.381E+06	0.143E+08	2.7	0.000E+00	0.212E+02	0.000E+00	0.000
K.LENG 109	355.870	355.870	0.000	0.0332	0.0332	0.381E+06	0.150E+08	2.6	0.000E+00	0.460E+02	0.000E+00	0.000
K.LENG 104	339.280	339.280	0.000	0.0325	0.0513	0.381E+06	0.161E+08	2.4	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 98	318.970	307.210	-11.760	0.0275	0.0161	0.771E+06	0.182E+08	4.2	0.000E+00	-0.708E+06	0.000E+00	0.000
K.LENG 87 C	280.000	284.315	4.315	0.0000	0.0145	0.579E+06	0.206E+08	2.8	0.000E+00	0.349E+06	0.000E+00	280.000
K.LENG 85 B	280.000	280.000	0.000	0.0805	0.1074	0.579E+06	0.206E+08	2.8	0.000E+00	0.000E+00	0.000E+00	280.000
K.LENG 83	255.530	247.337	-8.193	0.0272	0.0164	0.786E+06	0.221E+08	3.6	0.000E+00	-0.377E+06	0.000E+00	0.000
K.LENG 78 B	235.000	235.000	0.000	0.0658	0.0642	0.786E+06	0.229E+08	3.4	0.000E+00	0.000E+00	0.000E+00	235.000
K.LENG 74	209.320	209.964	0.644	0.0162	0.0169	0.736E+06	0.241E+08	3.1	0.000E+00	0.909E+05	0.000E+00	0.000
K.GLIDIK 65 B	194.000	194.000	0.000	0.0339	0.0310	0.736E+06	0.344E+08	2.1	0.000E+00	0.000E+00	0.000E+00	194.000
K.GLIDIK 64	178.330	179.667	1.337	0.0166	0.0229	0.134E+06	0.342E+08	0.4	0.000E+00	0.148E+06	0.948E+06	0.000
K.GLIDIK 62	173.680	173.249	-0.431	0.0277	0.0260	0.182E+06	0.342E+08	0.5	0.000E+00	-0.889E+05	0.000E+00	0.000
K.GLIDIK 54	148.660	149.777	1.117	0.0038	0.0063	0.427E+05	0.348E+08	0.1	0.000E+00	0.254E+06	0.000E+00	0.000
K.GLIDIK 51 B	147.000	147.000	0.000	0.0306	0.0321	0.427E+05	0.348E+08	0.1	0.000E+00	0.000E+00	0.000E+00	147.000
K.GLIDIK 44	123.450	122.184	-1.166	0.0231	0.0193	0.155E+06	0.353E+08	0.4	0.000E+00	-0.204E+06	0.000E+00	0.000
K.GLIDIK 40	113.100	113.646	0.546	0.0191	0.0202	0.122E+06	0.356E+08	0.3	0.000E+00	0.599E+05	0.000E+00	0.000

*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/40) D-1 ***

NAME	ES	EE	DZ	SS	SE	SQS	SQO	C	SQB	SVB	SVO	VDAM
	(EL.M)	(EL.M)	(M)			(M3)	(M3)	(%)	(M3)	(M3)	(M3)	(M3)
K.GLIDIK 34	101.480	101.318	-0.162	0.0213	0.0204	0.133E+06	0.360E+08	0.4	0.000E+00	-0.199E+05	0.000E+00	0.000
K.GLIDIK 30	90.340	90.644	0.304	0.0161	0.0168	0.103E+06	0.363E+08	0.3	0.000E+00	0.550E+05	0.000E+00	0.000
K.GLIDIK 24	80.750	80.639	-0.111	0.0185	0.0184	0.112E+06	0.363E+08	0.3	0.000E+00	-0.177E+05	0.000E+00	0.000
K.GLIDIK 14	59.540	59.469	-0.071	0.0099	0.0100	0.124E+06	0.363E+08	0.3	0.000E+00	-0.202E+05	0.000E+00	0.000
K.GLIDIK 4	48.880	48.659	-0.221	0.0112	0.0111	0.189E+06	0.460E+08	0.4	0.000E+00	-0.119E+06	0.000E+00	0.000
K.GLIDIK 0	21.920	21.910	-0.010	0.0112	0.0111	0.192E+06	0.460E+08	0.4	0.000E+00	-0.586E+04	0.000E+00	0.000

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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0

  1)     ***  K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/40) D-2 ***
  2)    1   24    5    0    2
  3)7
  4) 5000
  5)    2
  6)2
  7)     0.243        3.0        1.3 20.  20.       1.0        2.8       0.55       0.44
  8)     0.040        8.0      0.047    1.E-10        2.0       0.45         10       1.56
  9)4  56
 10) RS.BANG 58   2 1200.0     500.  50. 0.241550.        45.                         -900
 11) RS.BANG 57   2  936.12    500.  50. 0.40 430.        45.
 12) RS.BANG 53   2  886.37    500.  50. 0.44 463.        60.
 13) RS.BANG 47   2  861.41    500.  50. 0.49 358.        64.
 14) RS.BANG 44   2  826.05    500.  50. 0.53 577.       130.
 15) RS.BANG 37   2  801.63    500.  50. 0.59 371.        41.
 16) RS.BANG 31   2  783.62    500.  50.  .63 162.        95.
 17) RS.BANG 29   2  758.97    500.  50. 0.65 862.        45.
 18) RS.BANG 25   2  751.75    500.  50. 0.74 647.        37.
 19) RS.BANG 19   2  726.57    500. 11.0 0.80 717.        66.
 20) RS.BANG 12   2  692.91    500.  8.6 0.88 838.        75.
 21) RS.BANG  4   2  650.48    500. 14.0 0.97 299.        93.
 22) RS.BANG  1   2  634.59      0. 11.5  1.0 112.       104.                           30
 23) K.LENG 240   1  767.0     500.  15. 0.0 1120.        36.                         -900
 24) K.LENG 238   1  739.5     500.  10. 0.09 473.
 25) K.LENG 237   1  727.24    500.  10. 0.13676.2
 26) K.LENG 236   1  721.86    500.   7. 0.19581.3        23.
 27) K.LENG 235   1  719.22    500.   6. 0.24538.1        25.
 28) K.LENG 234   1  717.99    500.  2.8 0.29594.4        22.
 29) K.LENG 231   1  717.91    500.  1.5 0.34 964.        94.
 30) K.LENG 220   1  715.91    500.  3.3 0.421073.        67.
 31) K.LENG 206   1  704.41    500.  3.5 0.511686.        95.
 32) K.LENG 186   1  695.63    500.  0.9 0.651343.        37.
 33) K.LENG 171   1  689.68    500.  4.5 0.77 875.       104.
 34) K.LENG 161   1  694.66    500.  3.4 0.841016.       289.
 35) K.LENG 151   2  688.70    500.  2.6 1.56 462.       113.
 36) K.LENG 147   2  674.68    500.  3.3 1.60 322.        82.
 37) K.LENG 144   2  662.60     20.  4.5 1.64  78.        56.
 38) K.LENG 143   1  659.83     10.  8.2  1.0 507.        94.
 39) K.LENG 138   3  634.59      0. 11.5  1.0 615.       104.
 40) K.LENG 131   3  593.47      0. 100.  1.0 130.        50.
 41) K.LENG 129   3  466.26      0. 100.  1.0 586.
 42) K.LENG 124   4  425.86      0. 100. 0.50 618.        60.
 43) K.LENG 119   4  390.92      0. 100. 0.55 751.        38.
 44) K.LENG 113   4  372.44      0. 100. 0.61 379.        40.
 45) K.LENG 109   4  355.87      0. 100. 0.64 500.        41.
 46) K.LENG 104   4  339.28      0. 100. 0.69 625.        38.
 47) K.LENG  98   4  318.97    500. 100. 0.741418.        59.
 48) K.LENG  87   4  270.71    500. 100. 0.86 297.        94.
 49) K.LENG  85   4  262.27    500. 100. 0.88 304.        44.
 50) K.LENG  83   4  255.53    500.0 100. 0.91 754.       87.

LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
 51) K.LENG  78   4  223.69   500. 100. 0.97 390.      262.
 52) K.LENG  74   4  209.32   500.  2.4 1.00 946.      208.
 53) K.GLIDIK 65  6  183.25   500.  1.9 0.93 462.      296.
 54) K.GLIDIK 64  6  178.33   500.  1.9 0.94 280.      296.
 55) K.GLIDIK 62  6  173.68   500.  3.8 0.94 904.      355.
 56) K.GLIDIK 54  6  148.66   500.  2.6 0.96 439.      336.
 57) K.GLIDIK 51  6  136.76   500.  2.0 0.96 772.      246.
 58) K.GLIDIK 44  6  123.35   500.  0.8 0.97 443.      289.
 59) K.GLIDIK 40  6  113.10   500.  0.8 0.98 609.      207.
 60) K.GLIDIK 34  6  101.48   500.  1.0 0.99 522.      223.
 61) K.GLIDIK 30  6   90.34   500.  0.4 1.00 597.      319.
 62) K.GLIDIK 24  6   80.75   500.  1.4  1.01149.      191.
 63) K.GLIDIK 14  6   59.54   500.  1.4  1.01082.      261.
 64) K.GLIDIK  4  8   48.88   500.  2.0  1.02400.      313.
 65) K.GLIDIK  0  8   21.92   500.  1.9  1.02400.      267.
 66)6
 67)   17
 68)  730.0    107.0
 69)   26
 70)  692.0    100.0
 71)   27
 72)  679.0     58.0
 73)   28
 74)  668.0     56.0
 75)   30
 76)  640.0     81.0
 77)   40
 78)  280.0    125.0
 79)   42
 80)  235.0    290.0
 81)   44
 82)  194.0    418.0
 83)   48
 84)  147.0    585.0
 85)  -10
 86)5   8
 87)   60   18
 88)    1        1.0      1.9      3.1      4.8      9.4    279.8    641.6
 89)           255.0    114.3     65.9     49.0     39.4     33.1     28.6
 90)            25.3     22.7     20.7     18.9
 91)    2       23.0     27.2     33.3     44.0     72.0    842.2    551.3
 92)           120.2     60.7     42.8     33.6     27.9     24.1     21.1
 93)            18.7     16.9     15.5     14.2
 94)    3       24.1     29.1     36.4     48.8     81.4   1122.0   1192.9
 95)           375.2    175.0    108.7     82.6     67.3     57.2     49.7
 96)            44.0     39.6     36.1
 97)    4       53.4     63.2     77.9    102.7    185.5   2090.3   2005.0
 98)           620.0    282.2    177.7    134.8    109.6     93.1     81.2
 99)            71.8     64.4     58.6     53.9
100)    5       84.9    100.1    123.3    162.6    300.1   3218.7   2834.3

LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0

101)		797.8	368.5	238.7	182.7	149.3	127.1	110.9
102)		98.3	88.2	80.3	73.8			
103)	6	82.4	97.0	119.1	156.0	254.2	3090.1	3418.1
104)		1040.7	450.6	285.9	215.7	175.2	148.5	129.4
105)		114.6	102.6	93.2	85.7			
106)	7	82.4	97.0	119.3	156.3	255.3	3166.9	4113.9
107)		1705.9	796.9	487.7	348.4	273.0	228.1	192.0
108)		173.7	155.2	140.6	129.0			
109)	8	74.6	87.9	106.1	135.5	193.2	2164.7	4526.3
110)		2131.3	961.9	564.1	391.3	298.8	245.4	210.0
111)		184.1	163.9	147.7	134.9			
112)9								

LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0

*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/40) D=2 ***

NAME	ES (EL.M)	FE (EL.M)	DZ (M)	SS	SE	SQS (M3)	SQD (M3)	C (%)	SQB (M3)	SVB (M3)	SVD (M3)	VDAM (M3)
BS.BANG 58	1200.000	1100.098	-99.902	0.1725	0.0948	0.378E+07	0.859E+07	44.0	0.000E+00	-0.687E+07	0.000E+00	0.000
BS.BANG 57	934.120	955.007	18.887	0.1157	0.0776	0.332E+07	0.890E+07	37.3	0.000E+00	0.834E+06	0.000E+00	0.000
BS.BANG 53	886.370	921.628	35.258	0.0539	0.0799	0.280E+07	0.824E+07	34.0	0.000E+00	0.945E+06	0.000E+00	0.000
BS.BANG 47	861.410	884.643	23.234	0.0988	0.0760	0.246E+07	0.798E+07	30.9	0.000E+00	0.611E+06	0.000E+00	0.000
BS.BANG 44	826.050	857.422	31.372	0.0423	0.0721	0.142E+07	0.635E+07	22.3	0.000E+00	0.191E+07	0.000E+00	0.000
BS.BANG 37	801.630	815.811	14.181	0.0485	0.0570	0.126E+07	0.650E+07	19.4	0.000E+00	0.276E+06	0.000E+00	0.000
BS.BANG 31	783.620	794.653	11.033	0.1522	0.0519	0.111E+07	0.651E+07	17.0	0.000E+00	0.280E+06	0.000E+00	0.000
BS.BANG 29	758.970	786.250	27.280	0.0084	0.0471	0.763E+06	0.603E+07	12.7	0.000E+00	0.629E+06	0.000E+00	0.000
BS.BANG 25	751.750	745.673	-6.077	0.0389	0.0423	0.856E+06	0.684E+07	12.5	0.000E+00	-0.169E+06	0.000E+00	0.000
BS.BANG 19	726.570	718.335	-8.235	0.0469	0.0408	0.106E+07	0.763E+07	13.9	0.000E+00	-0.369E+06	0.000E+00	0.000
BS.BANG 12	692.910	689.088	-3.822	0.0506	0.0398	0.118E+07	0.843E+07	14.0	0.000E+00	-0.222E+06	0.000E+00	0.000
BS.BANG 4	650.480	655.737	5.257	0.0351	0.0379	0.103E+07	0.879E+07	11.7	0.000E+00	0.279E+06	0.000E+00	0.000
BS.BANG 1 C	640.000	644.399	4.399	0.0000	0.0390	0.975E+06	0.892E+07	10.9	0.000E+00	0.946E+05	0.000E+00	640.000
K.LENG 240	767.000	767.000	0.000	0.0246	0.0247	0.000E+00	0.000E+00	10.9	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 238	739.500	739.297	-0.203	0.0201	0.0191	0.306E+04	0.526E+06	0.6	0.000E+00	-0.556E+04	0.000E+00	0.000
K.LENG 237 C	730.000	730.260	0.260	0.0000	0.0004	0.000E+00	0.756E+06	0.0	0.000E+00	0.556E+04	0.000E+00	730.000
K.LENG 236 B	730.000	730.000	0.000	0.0185	0.0186	0.000E+00	0.110E+07	0.0	0.000E+00	0.000E+00	0.000E+00	730.000
K.LENG 235	719.220	719.172	-0.048	0.0023	0.0021	0.328E+03	0.140E+07	0.0	0.000E+00	-0.597E+03	0.000E+00	0.000
K.LENG 234	717.990	718.033	0.043	0.0001	0.0002	0.000E+00	0.169E+07	0.0	0.000E+00	0.597E+03	0.000E+00	0.000
K.LENG 231	717.910	717.906	-0.004	0.0021	0.0023	0.959E+02	0.198E+07	0.0	0.000E+00	-0.174E+03	0.000E+00	0.000
K.LENG 220	715.910	715.708	-0.201	0.0107	0.0105	0.741E+04	0.245E+07	0.3	0.000E+00	-0.133E+05	0.000E+00	0.000
K.LENG 206	704.410	704.469	0.059	0.0052	0.0053	0.265E+04	0.297E+07	0.1	0.000E+00	0.866E+04	0.000E+00	0.000
K.LENG 186	695.630	695.573	-0.057	0.0044	0.0043	0.411E+04	0.378E+07	0.1	0.000E+00	-0.265E+04	0.000E+00	0.000
K.LENG 171	689.680	689.735	0.055	-0.0057	-0.0056	0.000E+00	0.448E+07	0.0	0.000E+00	0.747E+04	0.000E+00	0.000
K.LENG 161	694.660	694.656	-0.004	0.0026	0.0026	0.293E+03	0.488E+07	0.0	0.000E+00	-0.533E+03	0.000E+00	0.000
K.LENG 151 B	692.000	692.000	0.000	0.0281	0.0281	0.293E+03	0.112E+08	0.0	0.000E+00	0.000E+00	0.000E+00	692.000
K.LENG 147 B	679.000	679.000	0.000	0.0342	0.0342	0.293E+03	0.115E+08	0.0	0.000E+00	0.000E+00	0.000E+00	679.000
K.LENG 144 B	668.000	668.000	0.000	0.1176	0.1586	0.293E+03	0.117E+08	0.0	0.000E+00	0.000E+00	0.000E+00	668.000
K.LENG 143	658.830	655.630	-3.200	0.0371	0.0308	0.482E+05	0.586E+07	0.8	0.000E+00	-0.872E+05	0.000E+00	0.000
K.LENG 138 *	640.000	640.037	0.037	0.0757	0.0757	0.102E+07	0.139E+08	7.4	0.975E+06	0.180E+04	0.000E+00	640.000
K.LENG 131	593.470	593.470	0.000	0.9785	0.9785	0.102E+07	0.139E+08	7.4	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 129	466.260	466.260	0.000	0.0689	0.0689	0.102E+07	0.139E+08	7.4	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 124	425.860	425.860	0.000	0.0565	0.0552	0.102E+07	0.124E+08	8.2	0.000E+00	0.261E+03	0.000E+00	0.000
K.LENG 119	390.920	391.725	0.805	0.0246	0.0257	0.101E+07	0.140E+08	7.2	0.000E+00	0.212E+05	0.000E+00	0.000
K.LENG 113	372.440	372.440	0.000	0.0437	0.0437	0.101E+07	0.149E+08	6.8	0.000E+00	0.154E+03	0.000E+00	0.000
K.LENG 109	355.870	355.870	0.000	0.0332	0.0329	0.101E+07	0.156E+08	6.5	0.000E+00	0.999E+02	0.000E+00	0.000
K.LENG 104	339.280	339.431	0.151	0.0325	0.0410	0.101E+07	0.167E+08	6.0	0.000E+00	0.328E+04	0.000E+00	0.000
K.LENG 98	318.970	313.832	-5.138	0.0275	0.0200	0.118E+07	0.190E+08	6.2	0.000E+00	-0.309E+06	0.000E+00	0.000
K.LENG 87 C	280.000	285.473	5.473	0.0000	0.0184	0.935E+06	0.213E+08	4.4	0.000E+00	0.442E+06	0.000E+00	280.000
K.LENG 85 B	280.000	280.000	0.000	0.0805	0.0899	0.935E+06	0.210E+08	4.5	0.000E+00	0.000E+00	0.000E+00	280.000
K.LENG 83	255.530	252.672	-2.858	0.0272	0.0234	0.101E+07	0.225E+08	4.5	0.000E+00	-0.131E+06	0.000E+00	0.000
K.LENG 78 B	235.000	235.000	0.000	0.0658	0.0629	0.101E+07	0.231E+08	4.4	0.000E+00	0.000E+00	0.000E+00	235.000
K.LENG 74	209.320	210.486	1.166	0.0162	0.0174	0.918E+06	0.244E+08	3.8	0.000E+00	0.163E+06	0.000E+00	0.000
K.GLIDIK 65 B	194.000	194.000	0.000	0.0339	0.0310	0.918E+06	0.346E+08	2.7	0.000E+00	0.000E+00	0.000E+00	194.000
K.GLIDIK 64	178.330	179.688	1.358	0.0166	0.0229	0.138E+06	0.342E+08	0.4	0.000E+00	0.150E+06	0.127E+07	0.000
K.GLIDIK 62	173.680	173.285	-0.395	0.0277	0.0260	0.183E+06	0.342E+08	0.5	0.000E+00	-0.813E+05	0.000E+00	0.000
K.GLIDIK 54	148.660	149.781	1.121	0.0038	0.0063	0.428E+05	0.348E+08	0.1	0.000E+00	0.255E+06	0.000E+00	0.000
K.GLIDIK 51 B	147.000	147.000	0.000	0.0306	0.0321	0.428E+05	0.348E+08	0.1	0.000E+00	0.000E+00	0.000E+00	147.000
K.GLIDIK 44	123.350	122.184	-1.166	0.0231	0.0193	0.155E+06	0.353E+08	0.4	0.000E+00	-0.204E+06	0.000E+00	0.000
K.GLIDIK 40	113.100	113.646	0.546	0.0191	0.0202	0.122E+06	0.356E+08	0.3	0.000E+00	0.599E+05	0.000E+00	0.000

*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/40) D-2 ***

NAME	ES	EE	DZ	SS	SE	SQS	SQO	C	SQB	SVB	SVO	VDAM
	(EL.M)	(EL.M)	(M)			(M3)	(M3)	(%)	(M3)	(M3)	(M3)	(M3)
K.GLIDIK 34	101.480	101.318	-0.162	0.0213	0.0204	0.133E+06	0.360E+08	0.4	0.000E+00	-0.199E+05	0.000E+00	0.000
K.GLIDIK 30	90.340	90.644	0.304	0.0161	0.0168	0.103E+06	0.363E+08	0.3	0.000E+00	0.550E+05	0.000E+00	0.000
K.GLIDIK 24	80.750	80.639	-0.111	0.0185	0.0184	0.112E+06	0.363E+08	0.3	0.000E+00	-0.177E+05	0.000E+00	0.000
K.GLIDIK 14	59.540	59.469	-0.071	0.0099	0.0100	0.124E+06	0.363E+08	0.3	0.000E+00	-0.202E+05	0.000E+00	0.000
K.GLIDIK 4	48.880	48.659	-0.221	0.0112	0.0111	0.189E+06	0.460E+08	0.4	0.000E+00	-0.119E+06	0.000E+00	0.000
K.GLIDIK 0	21.920	21.910	-0.010	0.0112	0.0111	0.192E+06	0.460E+08	0.4	0.000E+00	-0.586E+04	0.000E+00	0.000

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187)9
188)     ***  K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/100) D-1 ***
189)    1   24    5    0    2
190)7
191) 5000
192)    2
193)2
194)     0.243       3.0       1.3 20.  20.       1.0       2.8      0.55      0.44
195)     0.040       8.0     0.047    1.E-10       2.0      0.45        10      1.56
196)4  56
197) BS.BANG 58   2 1200.0    500.  50. 0.241530.       45.                    -900
198) BS.BANG 57   2  936.12   500.  50. 0.40 430.       45.
199) BS.BANG 53   2  886.37   500.  50. 0.44 463.       60.
200) BS.BANG 47   2  861.41   500.  50. 0.49 358.       64.

LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0

201) BS.BANG 44   2  826.05   500.  50. 0.53 577.      130.
202) BS.BANG 37   2  801.63   500.  50. 0.59 371.       41.
203) BS.BANG 31   2  783.62   500.  50.  .63 162.       95.
204) BS.BANG 29   2  758.97   500.  50. 0.65 862.       45.
205) BS.BANG 25   2  751.75   500.  50. 0.74 647.       37.
206) BS.BANG 19   2  726.57   500. 11.0 0.80 717.       66.
207) BS.BANG 12   2  692.91   500.  8.6 0.88 838.       75.
208) BS.BANG  4   2  650.48   500. 14.0 0.97 299.       93.
209) BS.BANG  1   2  634.59     0. 11.5  1.0 112.      104.                    30
210) K.LENG 240   1  767.0    500.  15. 0.0 1120.       36.                  -900
211) K.LENG 238   1  739.5    500.  10. 0.09 473.
212) K.LENG 237   1  727.24   500.  10. 0.13676.2
213) K.LENG 236   1  721.86   500.   7. 0.19581.3       23.
214) K.LENG 235   1  719.22   500.   6. 0.24538.1       25.
215) K.LENG 234   1  717.99   500.  2.8 0.29594.4       22.
216) K.LENG 231   1  717.91   500.  1.5 0.34 964.       94.
217) K.LENG 220   1  715.91   500.  3.3 0.421073.       67.
218) K.LENG 206   1  704.41   500.  3.5 0.511686.       95.
219) K.LENG 186   1  695.63   500.  0.9 0.651343.       37.
220) K.LENG 171   1  689.68   500.  4.5 0.77 875.      104.
221) K.LENG 161   1  694.66   500.  3.4 0.841016.      289.
222) K.LENG 151   2  688.70   500.  2.6 1.56 462.      113.
223) K.LENG 147   2  674.68   500.  3.3 1.60 322.       82.
224) K.LENG 144   2  662.60    20.  4.5 1.64  78.       56.
225) K.LENG 143   1  658.83    10.  8.2  1.0 507.       94.
226) K.LENG 138   3  634.59     0. 11.5  1.0 615.      104.
227) K.LENG 131   3  593.47     0. 100.  1.0 130.       50.
228) K.LENG 129   3  466.26     0. 100.  1.0 586.
229) K.LENG 124   4  425.86     0. 100. 0.50 618.       60.
230) K.LENG 119   4  390.92     0. 100. 0.55 751.       38.
231) K.LENG 113   4  372.44     0. 100. 0.61 379.       40.
232) K.LENG 109   4  355.87     0. 100. 0.64 500.       41.
233) K.LENG 104   4  339.28     0. 100. 0.69 625.       38.
234) K.LENG  98   4  318.97   500. 100. 0.741418.       59.
235) K.LENG  87   4  270.71   500. 100. 0.86 297.       94.
236) K.LENG  85   4  262.27   500. 100. 0.88 304.       44.
237) K.LENG  83   4  255.53  500.0 100. 0.91 754.       87.
238) K.LENG  78   4  223.69   500. 100. 0.97 390.      262.
239) K.LENG  74   4  209.32   500.  2.4 1.00 946.      208.
240) K.GLIDIK 65  6  183.25   500.  1.9 0.93 462.      296.
241) K.GLIDIK 64  6  178.33   500.  1.9 0.94 280.      296.
242) K.GLIDIK 62  6  173.68   500.  3.8 0.94 904.      355.
243) K.GLIDIK 54  6  148.66   500.  2.6 0.96 439.      336.
244) K.GLIDIK 51  6  136.76   500.  2.0 0.96 772.      246.
245) K.GLIDIK 44  6  123.35   500.  0.8 0.97 443.      289.
246) K.GLIDIK 40  6  113.10   500.  0.8 0.98 609.      207.
247) K.GLIDIK 34  6  101.48   500.  1.0 0.99 522.      223.
248) K.GLIDIK 30  6   90.34   500.  0.4 1.00 597.      319.
249) K.GLIDIK 24  6   80.75   500.  1.4  1.01149.      191.
250) K.GLIDIK 14  6   59.54   500.  1.4  1.01082.      261.

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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0

251) K.GLIDIK  4  8   48.88   500.  2.0  1.02400.      313.
252) K.GLIDIK  0  8   21.92   500.  1.9  1.02400.      267.
253)6
254)   17
255)  730.0     107.0
256)   26
257)  692.0     100.0
258)   30
259)  660.0     355.0
260)   40
261)  280.0     125.0
262)   42
263)  235.0     290.0
264)   44
265)  194.0     418.0
266)   48
267)  147.0     585.0
268)  -10
269)5   8
270)   60   18
271)    1         1.6       2.8       4.3       6.7      12.4    433.2    842.1
272)            292.6     127.5      76.5      57.1      46.0     38.7     33.5
273)             29.6      26.5      24.1      22.1
274)    2        27.1      32.0      39.3      52.1     108.0   1023.5    629.0
275)            133.9      70.2      49.7      39.0      32.4     27.7     24.2
276)             21.7      19.7      17.8      16.6
277)    3        28.7      34.8      43.6      58.9     120.4   1456.7   1470.5
278)            426.5     197.7     126.1      96.1      78.3     66.5     57.8
279)             51.3      55.2      42.1      38.6
280)    4        62.8      74.7      92.1     122.2     235.6   2594.0   2402.9
281)            696.7     318.1     204.2     155.5     126.6    107.4     93.5
282)             82.7      74.5      67.9      62.5
283)    5        99.9     118.3     145.4     193.3     382.8   3949.1   2349.2
284)            894.1     415.9     274.2     210.4     172.0    146.3    127.3
285)            113.0     102.0      93.1      85.8
286)    6        97.1     115.2     141.2     186.5     319.9   3863.8   4050.6
287)           1169.3     509.2     328.6     249.8     203.0    172.2    149.5
288)            132.4     119.3     108.8     100.3
289)    7        97.1     115.3     141.5     187.2     322.0   4002.5   5099.2
290)           1994.1     911.2     563.4     405.2     322.1    270.3    233.4
291)            205.8     184.8     168.1     154.7
292)    8        88.7     104.5     126.6     162.7     235.3   2832.9   5590.5
293)           2513.3    1090.8     646.4     451.2     349.6    289.6    248.2
294)            217.4     194.2     175.8     161.2
295)9
296)      ***  K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/100) D-2 ***
297)    1   24    5    0    2
298)7
299) 5000
300)    2

LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
301)2
302)     0.243       3.0       1.3 20.  20.        1.0       2.8       0.55       0.44
303)     0.040       8.0     0.047    1.E-10        2.0      0.45        10       1.56
304)4  56
305) BS.BANG 58   2 1200.0    500.  50. 0.241530.      45.                          -900
306) BS.BANG 57   2  936.12   500.  50. 0.40 430.      45.
307) BS.BANG 53   2  886.37   500.  50. 0.44 463.      60.
308) BS.BANG 47   2  861.41   500.  50. 0.49 358.      64.
309) BS.BANG 44   2  826.05   500.  50. 0.53 577.     130.
310) BS.BANG 37   2  801.63   500.  50. 0.59 371.      41.
311) BS.BANG 31   2  783.62   500.  50.  .63 162.      95.
312) BS.BANG 29   2  758.97   500.  50. 0.65 862.      45.
313) BS.BANG 25   2  751.75   500.  50. 0.74 647.      37.
314) BS.BANG 19   2  726.57   500. 11.0 0.80 717.      66.
315) BS.BANG 12   2  692.91   500.  8.6 0.88 838.      75.
316) BS.BANG  4   2  650.48   500. 14.0 0.97 299.      93.
317) BS.BANG  1   2  634.59     0. 11.5  1.0 112.     104.                            30
318) K.LENG 240   1  767.0    500.  15. 0.0 1120.      36.                          -900
319) K.LENG 238   1  739.5    500.  10. 0.09 473.
320) K.LENG 237   1  727.24   500.  10. 0.13676.2
321) K.LENG 236   1  721.86   500.   7. 0.19581.3      23.
322) K.LENG 235   1  719.22   500.   6. 0.24538.1      25.
323) K.LENG 234   1  717.99   500.  2.8 0.29594.4      22.
324) K.LENG 231   1  717.91   500.  1.5 0.34 964.      94.
325) K.LENG 220   1  715.91   500.  3.3 0.421073.      67.
326) K.LENG 206   1  704.41   500.  3.5 0.511686.      95.
327) K.LENG 186   1  695.63   500.  0.9 0.651343.      37.
328) K.LENG 171   1  689.68   500.  4.5 0.77 875.     104.
329) K.LENG 161   1  694.66   500.  3.4 0.841016.     289.
330) K.LENG 151   2  688.70   500.  2.6 1.56 462.     113.
331) K.LENG 147   2  674.68   500.  3.3 1.60 322.      82.
332) K.LENG 144   2  662.60    20.  4.5 1.64  78.      56.
333) K.LENG 143   1  658.83    10.  8.2  1.0 507.      94.
334) K.LENG 138   3  634.59     0. 11.5  1.0 615.     104.
335) K.LENG 131   3  593.47     0. 100.  1.0 130.      50.
336) K.LENG 129   3  466.26     0. 100.  1.0 586.
337) K.LENG 124   4  425.86     0. 100. 0.50 618.      60.
338) K.LENG 119   4  390.92     0. 100. 0.55 751.      38.
339) K.LENG 113   4  372.44     0. 100. 0.61 379.      40.
340) K.LENG 109   4  355.87     0. 100. 0.64 500.      41.
341) K.LENG 104   4  339.28     0. 100. 0.69 625.      38.
342) K.LENG  98   4  318.97   500. 100. 0.741418.      59.
343) K.LENG  87   4  270.71   500. 100. 0.86 297.      94.
344) K.LENG  85   4  262.27   500. 100. 0.88 304.      44.
345) K.LENG  83   4  255.53  500.0 100. 0.91 754.      87.
346) K.LENG  78   4  223.69   500. 100. 0.97 390.     262.
347) K.LENG  74   4  209.32   500.  2.4 1.00 946.     208.
348) K.GLIDIK 65  6  183.25   500.  1.9 0.93 462.     296.
349) K.GLIDIK 64  6  178.33   500.  1.9 0.94 280.     296.
350) K.GLIDIK 62  6  173.68   500.  3.8 0.94 904.     355.

LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0
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LINE....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5....0

351) K.GLIDIK 54  6  148.66   500.  2.6 0.96 439.       336.
352) K.GLIDIK 51  6  136.76   500.  2.0 0.96 772.       246.
353) K.GLIDIK 44  6  123.35   500.  0.8 0.97 443.       289.
354) K.GLIDIK 40  6  113.10   500.  0.8 0.98 609.       207.
355) K.GLIDIK 34  6  101.48   500.  1.0 0.99 522.       223.
356) K.GLIDIK 30  6   90.34   500.  0.4 1.00 597.       319.
357) K.GLIDIK 24  6   80.75   500.  1.4  1.01149.       191.
358) K.GLIDIK 14  6   59.54   500.  1.4  1.01082.       261.
359) K.GLIDIK  4  8   48.88   500.  2.0  1.02400.       313.
360) K.GLIDIK  0  8   21.92   500.  1.9  1.02400.       267.
361)6
362)   17
363)  730.0     107.0
364)   26
365)  692.0     100.0
366)   27
367)  679.0      58.0
368)   28
369)  668.0      56.0
370)   30
371)  640.0      81.0
372)   40
373)  280.0     125.0
374)   42
375)  235.0     290.0
376)   44
377)  194.0     418.0
378)   48
379)  147.0     585.0
380)  -10
381)9
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*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/100) D-1 *** (H=70 m)

NAME		ES	EE	DZ	SS	SE	SQS	SQO	C	SQB	SVB	SVO	VDAM
		(EL.M)	(EL.M)	(M)			(M3)	(M3)	(%)	(M3)	(M3)	(M3)	(M3)
BS.BANG 58		1200.000	1085.324	-114.676	0.1725	0.0850	0.434E+07	0.993E+07	43.7	0.000E+00	-0.789E+07	0.000E+00	0.000
BS.BANG 57		936.120	955.226	19.106	0.1157	0.0751	0.388E+07	0.104E+08	37.1	0.000E+00	0.844E+06	0.000E+00	0.000
BS.BANG 53		886.370	922.931	36.561	0.0539	0.0761	0.334E+07	0.981E+07	34.0	0.000E+00	0.980E+06	0.000E+00	0.000
BS.BANG 47		861.410	887.712	26.302	0.0988	0.0734	0.296E+07	0.954E+07	31.0	0.000E+00	0.692E+06	0.000E+00	0.000
BS.BANG 44		826.050	861.443	35.393	0.0423	0.0718	0.177E+07	0.772E+07	23.0	0.000E+00	0.215E+07	0.000E+00	0.000
BS.BANG 37		801.630	820.039	18.409	0.0485	0.0563	0.157E+07	0.787E+07	20.0	0.000E+00	0.358E+06	0.000E+00	0.000
BS.BANG 31		783.620	799.151	15.531	0.1522	0.0547	0.136E+07	0.781E+07	17.4	0.000E+00	0.394E+06	0.000E+00	0.000
BS.BANG 29		758.970	790.295	31.325	0.0084	0.0473	0.961E+06	0.726E+07	13.2	0.000E+00	0.722E+06	0.000E+00	0.000
BS.BANG 25		751.750	749.493	-2.257	0.0389	0.0396	0.995E+06	0.809E+07	12.3	0.000E+00	-0.621E+05	0.000E+00	0.000
BS.BANG 19		726.570	723.899	-2.671	0.0469	0.0345	0.106E+07	0.871E+07	12.2	0.000E+00	-0.119E+06	0.000E+00	0.000
BS.BANG 12		692.910	699.150	6.240	0.0393	0.0331	0.860E+06	0.903E+07	9.5	0.000E+00	0.365E+06	0.000E+00	0.000
BS.BANG 4	C	660.000	671.373	11.373	0.0000	0.0278	0.528E+06	0.920E+07	5.7	0.000E+00	0.603E+06	0.000E+00	660.000
BS.BANG 1	C	660.000	663.047	3.047	0.0000	0.0272	0.492E+06	0.939E+07	5.2	0.000E+00	0.657E+05	0.000E+00	660.000
K.LENG 240		767.000	767.000	0.000	0.0246	0.0248	0.000E+00	0.000E+00	5.2	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 238		739.500	739.224	-0.276	0.0201	0.0187	0.425E+04	0.677E+06	0.6	0.000E+00	-0.773E+04	0.000E+00	0.000
K.LENG 237	C	730.000	730.361	0.361	0.0000	0.0005	0.000E+00	0.972E+06	0.0	0.000E+00	0.773E+04	0.000E+00	730.000
K.LENG 236	B	730.000	730.000	0.000	0.0185	0.0187	0.000E+00	0.142E+07	0.0	0.000E+00	0.000E+00	0.000E+00	730.000
K.LENG 235		719.220	719.146	-0.073	0.0023	0.0020	0.525E+03	0.180E+07	0.0	0.000E+00	-0.954E+03	0.000E+00	0.000
K.LENG 234		717.990	718.062	0.072	0.0001	0.0003	0.000E+00	0.217E+07	0.0	0.000E+00	0.954E+03	0.000E+00	0.000
K.LENG 231		717.910	717.903	-0.007	0.0021	0.0024	0.242E+03	0.254E+07	0.0	0.000E+00	-0.440E+03	0.000E+00	0.000
K.LENG 220		715.910	715.633	-0.276	0.0107	0.0104	0.103E+05	0.315E+07	0.3	0.000E+00	-0.182E+05	0.000E+00	0.000
K.LENG 206		704.410	704.484	0.074	0.0052	0.0053	0.408E+04	0.382E+07	0.1	0.000E+00	0.112E+05	0.000E+00	0.000
K.LENG 186		695.630	695.571	-0.059	0.0044	0.0043	0.570E+04	0.487E+07	0.1	0.000E+00	-0.294E+04	0.000E+00	0.000
K.LENG 171		689.680	689.760	0.081	-0.0057	-0.0056	0.000E+00	0.576E+07	0.0	0.000E+00	0.104E+05	0.000E+00	0.000
K.LENG 161		694.660	694.653	-0.007	0.0026	0.0026	0.702E+03	0.628E+07	0.0	0.000E+00	-0.128E+04	0.000E+00	0.000
K.LENG 151	B	692.000	692.000	0.000	0.0375	0.0467	0.702E+03	0.133E+08	0.0	0.000E+00	0.000E+00	0.000E+00	692.000
K.LENG 147		674.680	670.447	-4.233	0.0375	0.0181	0.749E+05	0.137E+08	0.5	0.000E+00	-0.135E+06	0.000E+00	0.000
K.LENG 144		662.600	664.634	2.034	0.0333	0.0143	0.622E+05	0.140E+08	0.4	0.000E+00	0.231E+05	0.000E+00	0.000
K.LENG 143	C	660.000	663.520	3.520	0.0000	0.0069	0.844E+04	0.749E+07	0.1	0.000E+00	0.977E+05	0.000E+00	660.000
K.LENG 138	*	660.000	660.000	0.000	0.1082	0.1082	0.500E+06	0.165E+08	3.0	0.492E+06	0.000E+00	0.000E+00	660.000
K.LENG 131		593.470	593.470	0.000	0.9785	0.9785	0.500E+06	0.165E+08	3.0	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 129		466.260	466.260	0.000	0.0689	0.0689	0.500E+06	0.165E+08	3.0	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 124		425.860	425.860	0.000	0.0565	0.0565	0.500E+06	0.141E+08	3.5	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 119		390.920	390.920	0.000	0.0246	0.0246	0.500E+06	0.155E+08	3.2	0.000E+00	0.111E+03	0.000E+00	0.000
K.LENG 113		372.440	372.440	0.000	0.0437	0.0437	0.500E+06	0.171E+08	2.9	0.000E+00	0.160E+02	0.000E+00	0.000
K.LENG 109		355.870	355.870	0.000	0.0332	0.0332	0.500E+06	0.179E+08	2.8	0.000E+00	0.579E+02	0.000E+00	0.000
K.LENG 104		339.280	339.280	0.000	0.0325	0.0529	0.500E+06	0.193E+08	2.6	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 98		318.970	306.234	-12.736	0.0275	0.0156	0.922E+06	0.218E+08	4.2	0.000E+00	-0.766E+06	0.000E+00	0.000
K.LENG 87	C	280.000	284.122	4.122	0.0000	0.0139	0.738E+06	0.248E+08	3.0	0.000E+00	0.334E+06	0.000E+00	280.000
K.LENG 85	B	280.000	280.000	0.000	0.0805	0.1096	0.738E+06	0.247E+08	3.0	0.000E+00	0.000E+00	0.000E+00	280.000
K.LENG 83		255.530	246.688	-8.842	0.0272	0.0155	0.962E+06	0.265E+08	3.6	0.000E+00	-0.407E+06	0.000E+00	0.000
K.LENG 78	B	235.000	235.000	0.000	0.0658	0.0654	0.962E+06	0.274E+08	3.5	0.000E+00	0.000E+00	0.000E+00	235.000
K.LENG 74		209.320	209.510	0.190	0.0162	0.0164	0.947E+06	0.289E+08	3.3	0.000E+00	0.275E+05	0.000E+00	0.000
K.GLIDIK 65	B	194.000	194.000	0.000	0.0339	0.0313	0.947E+06	0.412E+08	2.3	0.000E+00	0.000E+00	0.000E+00	194.000
K.GLIDIK 64		178.330	179.549	1.219	0.0166	0.0227	0.165E+06	0.408E+08	0.4	0.000E+00	0.135E+06	0.129E+07	0.000
K.GLIDIK 62		173.680	173.199	-0.481	0.0277	0.0257	0.220E+06	0.409E+08	0.5	0.000E+00	-0.995E+05	0.000E+00	0.000
K.GLIDIK 54		148.660	149.967	1.308	0.0038	0.0068	0.566E+05	0.416E+08	0.1	0.000E+00	0.297E+06	0.000E+00	0.000
K.GLIDIK 51	B	147.000	147.000	0.000	0.0306	0.0322	0.566E+05	0.416E+08	0.1	0.000E+00	0.000E+00	0.000E+00	147.000
K.GLIDIK 44		123.350	122.138	-1.212	0.0231	0.0194	0.173E+06	0.421E+08	0.4	0.000E+00	-0.212E+06	0.000E+00	0.000
K.GLIDIK 40		113.100	113.530	0.430	0.0191	0.0201	0.147E+06	0.425E+08	0.3	0.000E+00	0.473E+05	0.000E+00	0.000

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*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/100) D-1 ***

NAME	ES	EE	DZ	SS	SE	SQS	SQO	C	SQB	SVB	SVO	VDAM
	(EL.M)	(EL.M)	(M)			(M3)	(M3)	(%)	(M3)	(M3)	(M3)	(M3)
K.GLIDIK 34	101.480	101.294	-0.186	0.0213	0.0203	0.160E+06	0.430E+08	0.4	0.000E+00	-0.231E+05	0.000E+00	0.000
K.GLIDIK 30	90.340	90.685	0.345	0.0161	0.0168	0.126E+06	0.434E+08	0.3	0.000E+00	0.622E+05	0.000E+00	0.000
K.GLIDIK 24	80.750	80.631	-0.119	0.0185	0.0184	0.136E+06	0.434E+08	0.3	0.000E+00	-0.192E+05	0.000E+00	0.000
K.GLIDIK 14	59.540	59.447	-0.093	0.0099	0.0100	0.151E+06	0.434E+08	0.3	0.000E+00	-0.266E+05	0.000E+00	0.000
K.GLIDIK 4	48.880	48.600	-0.280	0.0112	0.0111	0.234E+06	0.560E+08	0.4	0.000E+00	-0.152E+06	0.000E+00	0.000
K.GLIDIK 0	21.920	21.910	-0.010	0.0112	0.0111	0.237E+06	0.560E+08	0.4	0.000E+00	-0.564E+04	0.000E+00	0.000

*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/100) D-2 *** Hanom

NAME	ES	EE	DZ	SS	SE	SQS	SQO	C	SQB	SVB	SVO	VDAM
	(EL.M)	(EL.M)	(M)			(M3)	(M3)	(%)	(M3)	(M3)	(M3)	(M3)
BS.BANG 58	1200.000	1085.297	-114.703	0.1725	0.0851	0.434E+07	0.993E+07	43.7	0.000E+00	-0.789E+07	0.000E+00	0.000
BS.BANG 57	936.120	955.069	18.949	0.1157	0.0751	0.388E+07	0.105E+08	37.1	0.000E+00	0.837E+06	0.000E+00	0.000
BS.BANG 53	886.370	922.759	36.389	0.0539	0.0762	0.334E+07	0.982E+07	34.0	0.000E+00	0.976E+06	0.000E+00	0.000
BS.BANG 47	861.410	887.494	26.084	0.0988	0.0735	0.297E+07	0.956E+07	31.0	0.000E+00	0.686E+06	0.000E+00	0.000
BS.BANG 44	826.050	861.185	35.135	0.0423	0.0720	0.179E+07	0.775E+07	23.1	0.000E+00	0.214E+07	0.000E+00	0.000
BS.BANG 37	801.630	819.641	18.011	0.0485	0.0576	0.160E+07	0.791E+07	20.2	0.000E+00	0.351E+06	0.000E+00	0.000
BS.BANG 31	783.620	798.290	14.670	0.1522	0.0548	0.139E+07	0.788E+07	17.7	0.000E+00	0.372E+06	0.000E+00	0.000
BS.BANG 29	758.970	789.410	30.440	0.0084	0.0491	0.101E+07	0.735E+07	13.7	0.000E+00	0.702E+06	0.000E+00	0.000
BS.BANG 25	751.750	747.075	-4.675	0.0389	0.0425	0.108E+07	0.824E+07	13.1	0.000E+00	-0.130E+06	0.000E+00	0.000
BS.BANG 19	726.570	719.561	-7.009	0.0469	0.0427	0.125E+07	0.906E+07	13.8	0.000E+00	-0.314E+06	0.000E+00	0.000
BS.BANG 12	692.910	688.963	-3.947	0.0506	0.0400	0.138E+07	0.997E+07	13.8	0.000E+00	-0.229E+06	0.000E+00	0.000
BS.BANG 4	650.480	655.483	5.003	0.0351	0.0378	0.123E+07	0.105E+08	11.8	0.000E+00	0.266E+06	0.000E+00	0.000
BS.BANG 1 C	640.000	644.173	4.173	0.0000	0.0373	0.118E+07	0.106E+08	11.1	0.000E+00	0.900E+05	0.000E+00	640.000
K.LENG 240	767.000	767.000	0.000	0.0246	0.0248	0.000E+00	0.000E+00	11.1	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 238	739.500	739.224	-0.276	0.0201	0.0187	0.425E+04	0.677E+06	0.6	0.000E+00	-0.773E+04	0.000E+00	0.000
K.LENG 237 C	730.000	730.361	0.361	0.0000	0.0005	0.000E+00	0.972E+06	0.0	0.000E+00	0.773E+04	0.000E+00	730.000
K.LENG 236 B	730.000	730.000	0.000	0.0185	0.0187	0.000E+00	0.142E+07	0.0	0.000E+00	0.000E+00	0.000E+00	730.000
K.LENG 235	719.220	719.146	-0.073	0.0023	0.0020	0.525E+03	0.180E+07	0.0	0.000E+00	-0.954E+03	0.000E+00	0.000
K.LENG 234	717.990	718.062	0.072	0.0001	0.0003	0.000E+00	0.217E+07	0.0	0.000E+00	0.954E+03	0.000E+00	0.000
K.LENG 231	717.910	717.903	-0.007	0.0021	0.0024	0.242E+03	0.254E+07	0.0	0.000E+00	-0.440E+03	0.000E+00	0.000
K.LENG 220	715.910	715.633	-0.276	0.0107	0.0104	0.103E+05	0.315E+07	0.3	0.000E+00	-0.182E+05	0.000E+00	0.000
K.LENG 206	704.410	704.484	0.074	0.0052	0.0053	0.408E+04	0.382E+07	0.1	0.000E+00	0.112E+05	0.000E+00	0.000
K.LENG 186	695.630	695.571	-0.059	0.0044	0.0043	0.570E+04	0.487E+07	0.1	0.000E+00	-0.294E+04	0.000E+00	0.000
K.LENG 171	689.680	689.760	0.081	-0.0057	-0.0056	0.000E+00	0.576E+07	0.0	0.000E+00	0.104E+05	0.000E+00	0.000
K.LENG 161	694.660	694.653	-0.007	0.0026	0.0026	0.702E+03	0.628E+07	0.0	0.000E+00	-0.128E+04	0.000E+00	0.000
K.LENG 151 B	692.000	692.000	0.000	0.0281	0.0281	0.702E+03	0.133E+08	0.0	0.000E+00	0.000E+00	0.000E+00	692.000
K.LENG 147 B	679.000	679.000	0.000	0.0342	0.0342	0.702E+03	0.136E+08	0.0	0.000E+00	0.000E+00	0.000E+00	679.000
K.LENG 144 B	668.000	668.000	0.000	0.1176	0.1676	0.702E+03	0.140E+08	0.0	0.000E+00	0.000E+00	0.000E+00	668.000
K.LENG 143	658.830	654.929	-3.901	0.0371	0.0294	0.593E+05	0.754E+07	0.8	0.000E+00	-0.107E+06	0.000E+00	0.000
K.LENG 138 *	640.000	640.000	0.000	0.0757	0.0757	0.124E+07	0.173E+08	7.2	0.118E+07	0.000E+00	0.000E+00	640.000
K.LENG 131	593.470	593.470	0.000	0.9785	0.9785	0.124E+07	0.173E+08	7.2	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 129	466.260	466.260	0.000	0.0689	0.0689	0.124E+07	0.173E+08	7.2	0.000E+00	0.000E+00	0.000E+00	0.000
K.LENG 124	425.860	425.860	0.000	0.0565	0.0547	0.124E+07	0.149E+08	8.3	0.000E+00	0.286E+03	0.000E+00	0.000
K.LENG 119	390.920	392.044	1.124	0.0246	0.0261	0.122E+07	0.168E+08	7.3	0.000E+00	0.295E+05	0.000E+00	0.000
K.LENG 113	372.440	372.467	0.027	0.0437	0.0438	0.122E+07	0.179E+08	6.9	0.000E+00	0.790E+03	0.000E+00	0.000
K.LENG 109	355.870	355.870	0.000	0.0332	0.0328	0.122E+07	0.187E+08	6.6	0.000E+00	0.926E+02	0.000E+00	0.000
K.LENG 104	339.280	339.467	0.187	0.0325	0.0432	0.122E+07	0.200E+08	6.1	0.000E+00	0.408E+04	0.000E+00	0.000
K.LENG 98	318.970	312.450	-6.520	0.0275	0.0191	0.144E+07	0.228E+08	6.3	0.000E+00	-0.392E+06	0.000E+00	0.000
K.LENG 87 C	280.000	285.314	5.314	0.0000	0.0179	0.120E+07	0.256E+08	4.7	0.000E+00	0.429E+06	0.000E+00	280.000
K.LENG 85 B	280.000	280.000	0.000	0.0805	0.0962	0.120E+07	0.252E+08	4.8	0.000E+00	0.000E+00	0.000E+00	280.000
K.LENG 83	255.530	250.770	-4.760	0.0272	0.0209	0.132E+07	0.272E+08	4.9	0.000E+00	-0.219E+06	0.000E+00	0.000
K.LENG 78 B	235.000	235.000	0.000	0.0658	0.0604	0.132E+07	0.278E+08	4.8	0.000E+00	0.000E+00	0.000E+00	235.000
K.LENG 74	209.320	211.431	2.111	0.0162	0.0184	0.116E+07	0.293E+08	4.0	0.000E+00	0.294E+06	0.000E+00	0.000
K.GLIDIK 65 B	194.000	194.000	0.000	0.0339	0.0314	0.116E+07	0.414E+08	2.8	0.000E+00	0.123E+03	0.000E+00	194.000
K.GLIDIK 64	178.330	179.501	1.171	0.0166	0.0244	0.491E+06	0.414E+08	1.2	0.000E+00	0.129E+06	0.109E+07	0.000
K.GLIDIK 62	173.680	172.662	-1.018	0.0277	0.0237	0.608E+06	0.416E+08	1.5	0.000E+00	-0.212E+06	0.000E+00	0.000
K.GLIDIK 54	148.660	151.260	2.600	0.0038	0.0097	0.107E+06	0.416E+08	0.3	0.000E+00	0.587E+06	0.323E+06	0.000
K.GLIDIK 51 B	147.000	147.000	0.000	0.0306	0.0314	0.107E+06	0.416E+08	0.3	0.000E+00	0.000E+00	0.000E+00	147.000
K.GLIDIK 44	123.350	122.724	-0.626	0.0231	0.0210	0.167E+06	0.421E+08	0.4	0.000E+00	-0.109E+06	0.000E+00	0.000
K.GLIDIK 40	113.100	113.439	0.339	0.0191	0.0200	0.146E+06	0.425E+08	0.3	0.000E+00	0.373E+05	0.000E+00	0.000

*** K.GLIDIK SEDIMENT RUNOFF ANALYSIS (1/100) D-2 ***

NAME	ES	EE	DZ	SS	SE	SQS	SQO	C	SQB	SVB	SVO	VDAM
	(EL.M)	(EL.M)	(M)			(M3)	(M3)	(%)	(M3)	(M3)	(M3)	(M3)
K.GLIDIK 34	101.480	101.280	-0.200	0.0213	0.0203	0.160E+06	0.430E+08	0.4	0.000E+00	-0.248E+05	0.000E+00	0.000
K.GLIDIK 30	90.340	90.684	0.344	0.0161	0.0168	0.126E+06	0.434E+08	0.3	0.000E+00	0.621E+05	0.000E+00	0.000
K.GLIDIK 24	80.750	80.631	-0.119	0.0185	0.0184	0.136E+06	0.434E+08	0.3	0.000E+00	-0.192E+05	0.000E+00	0.000
K.GLIDIK 14	59.540	59.447	-0.093	0.0099	0.0100	0.151E+06	0.434E+08	0.3	0.000E+00	-0.266E+05	0.000E+00	0.000
K.GLIDIK 4	48.880	48.600	-0.280	0.0112	0.0111	0.234E+06	0.560E+08	0.4	0.000E+00	-0.152E+06	0.000E+00	0.000
K.GLIDIK 0	21.920	21.910	-0.010	0.0112	0.0111	0.237E+06	0.560E+08	0.4	0.000E+00	-0.564E+04	0.000E+00	0.000

THE REPUBLIC OF INDONESIA

THE FEASIBILITY STUDY ON THE VOLCANIC DEBRIS CONTROL AND WATER CONSERVATION PROJECT IN THE SOUTHEASTERN SLOPE OF MT. SEMERU

SUPPORTING REPORT (5)

PART - H
TOPOGRAPHY AND NATURAL DISASTER

FEBRUARY, 1984

JAPAN INTERNATIONAL COOPERATION AGENCY

H. TOPOGRAPHY AND NATURAL DISASTER

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TOPOGRAPHY AND NATURAL DISASTER

1. INTRODUCTION

1.1 OUTLINE OF TOPOGRAPHY

Mt. Semeru is located about 100 km southeast of Surabaya and about 30 km west of Lumajang (long. 113 E, lat. 8 S); the study area covers the southern and southeastern slopes of the mountain with an area of about 730 km (Figs.-1.1 and 1.2).

Mt. Semeru, one of the most active volcanoes in Indonesia, is a very young stratovolcano of the Quaternary period and stands at the southern end of a series of volcanoes stretching north and south. This range of volcanoes is generally divided into three topographical units (A. Sakai and I. Suruyo, 1980) referred to, from north to south as follows:

Tenggat mountains
Jambangan complex volcano
Mt. Semeru

Mt. Semeru is the yougest of these volcanoes and is being formed on the southern slope of the Jambangan complex volcano, which is the oldest. Among these volcanoes, the Semeru volcano and the Bromo volcano, found inside the Tenggat caldera, are still active.

Mt. Semeru has been inactive for the last ten years and the active crater of the volcano is gradually shifting southwards. The old crater, considered to have been active in the past, is called the Mahameru crater and remains on the north of the Joggring Seloko Crater, which is still active.

Mt. Semeru is considered to be covering a mass of bedrock composed of ejecta from the Jambangan volcano, and the bedrock remains as planeze on slopes on the east and south of Mt. Semeru and exists as a dissected volcanic piedmont on the left bank of the B. Tompe and K. Lateng.

On the other hand, a range of mountains is found on the south of Mt. Semeru, consisting of Tertiary rocks with an elevation of 200 m to 1,000 m. The piedmont of Mt. Semeru develops extensively from east to southeast and reaches as far as Lumajang; however, its development towards the south is interrupted by the Tertiary mountains. The slopes of Mt. Semeru extending towards the north are formed covering a length of 2,600 m over the Jambangan volcano.

A great number of valleys are conspicuously developed on the southern and southeastern slopes of Mt. Semeru. These valleys can be classified into three river systems flowing into the Indian ocean; i.e., K. Mujur, K. Rejali and K. Glidik systems. The K. Mujur flows southeast in the piedmont of Mt. Semeru and the B. Sat and B. Tunggeng are tributaries of the K. Mujur. The K. Rejali deeply erodes the Tertiary mountains (Koboan valley) and forms an alluvial fan at its lower reaches once again. The K. Glidik collects water from valleys on the southern slope of Mt. Semeru and flows down deeply eroding a valley in the Tertiary mountains; the river forms no plain of appreciable size, but several alluvial fans are formed by the B. Sarat and B. Kembar, along the way, which join the K. Lengkong.

The topography of Mt. Semeru can be divided into three units according to their features as indicated in Fig.-1.3. The following are the descriptions of each of these units in terms of their topographical features.

(1) Main Part of the Volcanic Cone

The area covers the volcanic slope between a point with an elevation of 1,500 m and the summit, with a slope of 27 . The slope is further divided into the upper slope (EL. 2,500 m to summit), which is subjected constantly to the present volcanic activity without vegegation, and the lower slope (EL. 2,500 m below), which is covered with forests. The upper slope has an average slope of 33 or greater and is subject to considerably gully and valley head erosion, which provides an important source of debris. The lower slope has an average slope of 22 and has many well-developed gullies and deep valleys cutting into the slope.

(2) Volcanic Fan

The volcanic fan consists of ladu and lahar fans covering a wide area 150 m to 1,500 m in elevation.

The area is considerably subject to disasters brought about by lahar; and the fans are divided into three areas longitudinally and into six or seven areas laterally, according to the breaks in the slope and irregularities in the contour line.

The ladu fans are found at elevations between 800 m and 1,500 m and most of them are covered with lava; they are further characterized by the presence of parastic volcanoes.

(3) Volcanic Piedmont Periphery

The area is formed outside the volcanic fan and has flat topography with a gentle slope. The K. Mujur and K. Rejali flow over the area with a depth of 5 m to 10 m. Aluvial plain of the K. Bondoyudo and coastal plains are found further outside the area.

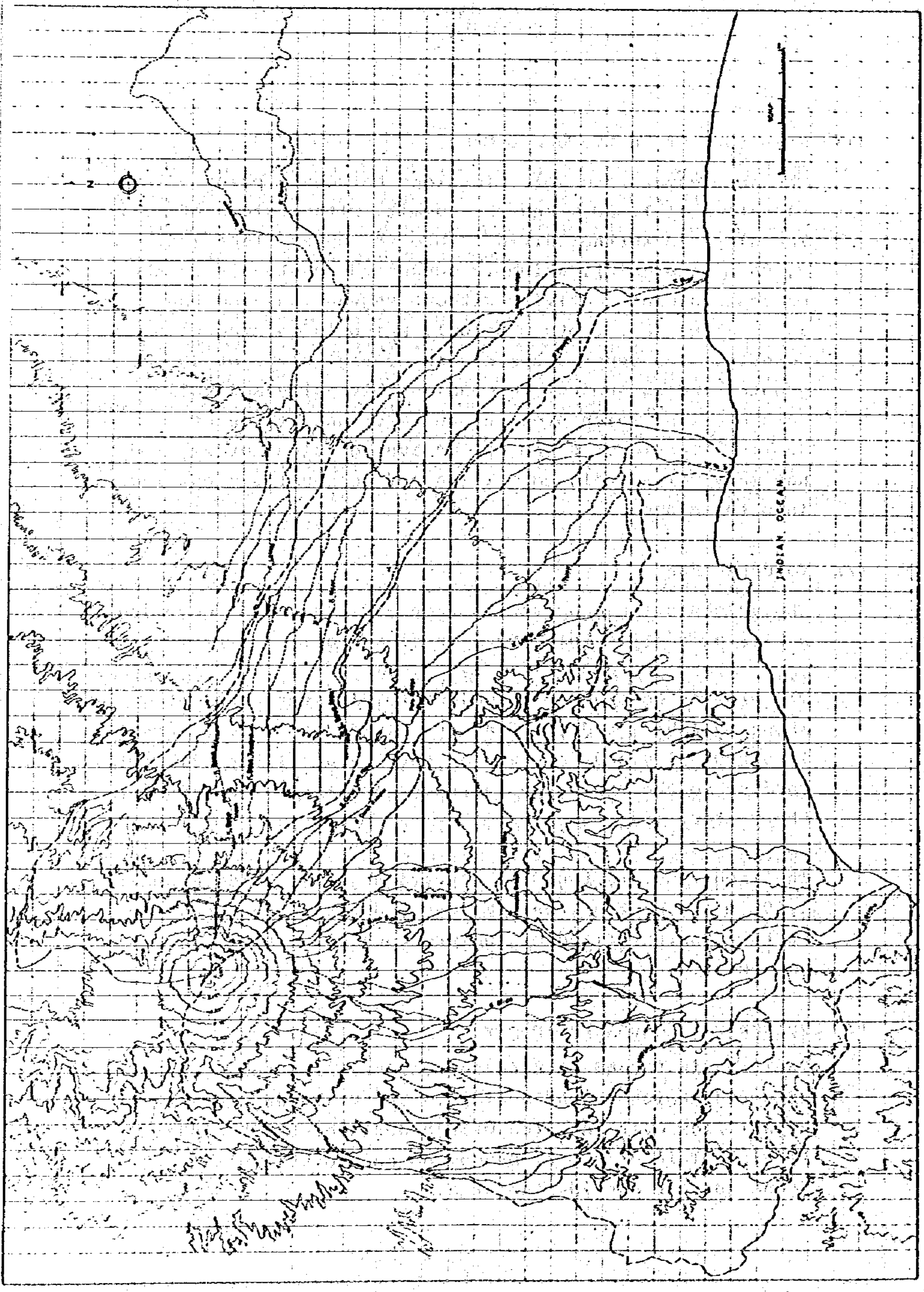

Fig.-1.1 Study Location Map

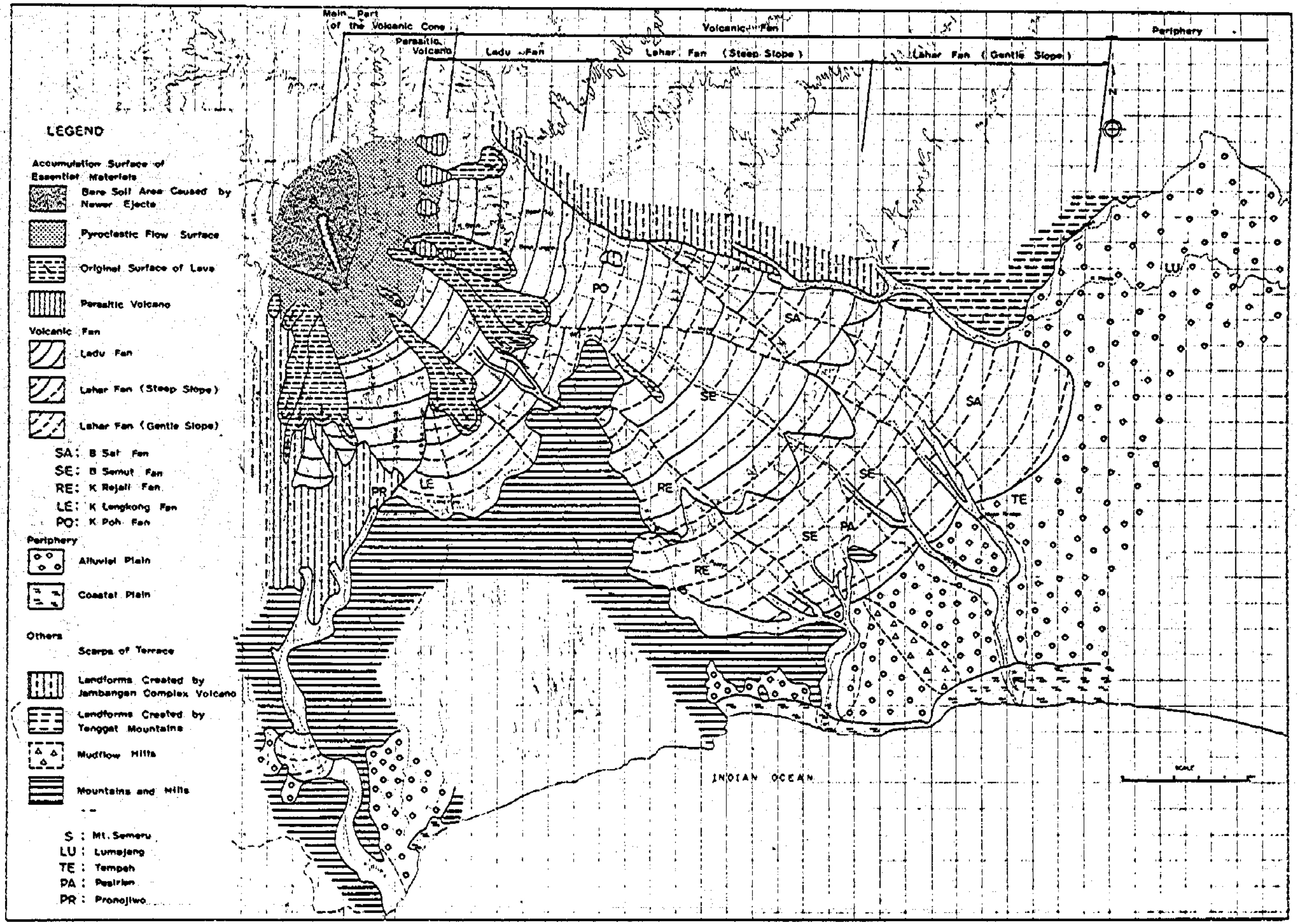

Fig.-1.2 Outline of Topography

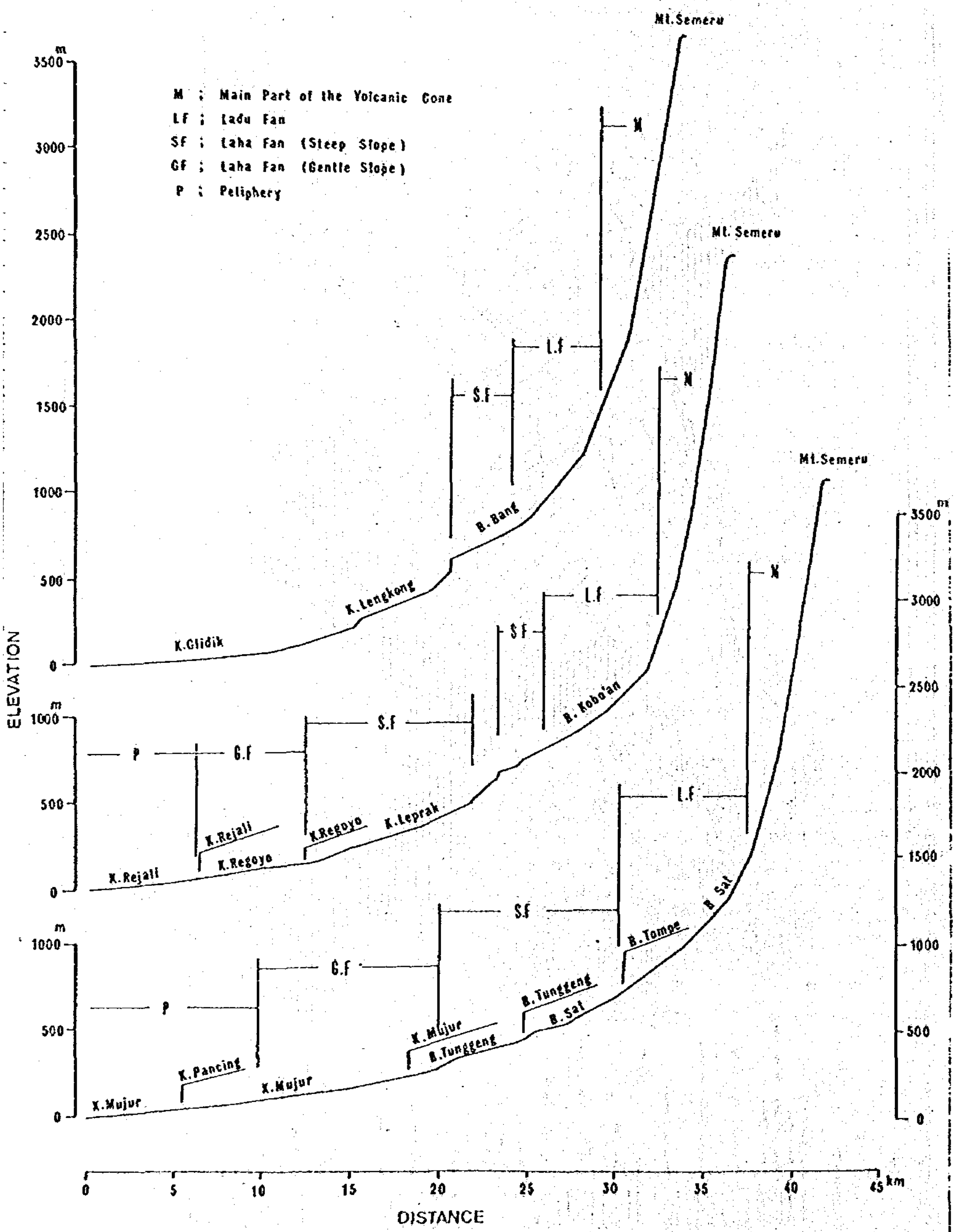

Fig.-1.3 Concept of Longitudinal Cross Sections (along Main Rivers)

1.2 PROBLEMS

The study area is subject to natural disasters to an extensive degree due to several types of volcanic activity and mudflow. In general, Indonesians classify such disasters caused by volcanic activity and mudflow into two types; one is referred to as "nue ardante" and the other, "lahar". Nue ardante occurs as a direct result of an eruption and its deposits are called "ladu", while disasters referred to as lahar or "banjir" result from destruction caused by heavy rainfalls.

Generally speaking, lahar is a flow of water and earth containing relatively more gravel and boulders compared with banjir, but this does not mean the presence of a clear distinction between the two terms. Ejecta flowing down with water before they are cooled are called hot lahar and ejecta sufficiently cooled before flowing down the slope are called cold lahar.

1.3 PURPOSE OF STUDIES

The studies under discussion are carried out with a view to determining land conditions in respect to disasters by understanding the topographical characteristics and the nature of disasters of the areas subject to damage by volcanic mudflow. The results of the studies will be used as basic data on topography for the determination of areas subject to possible disasters and formation of programs for erosion control.

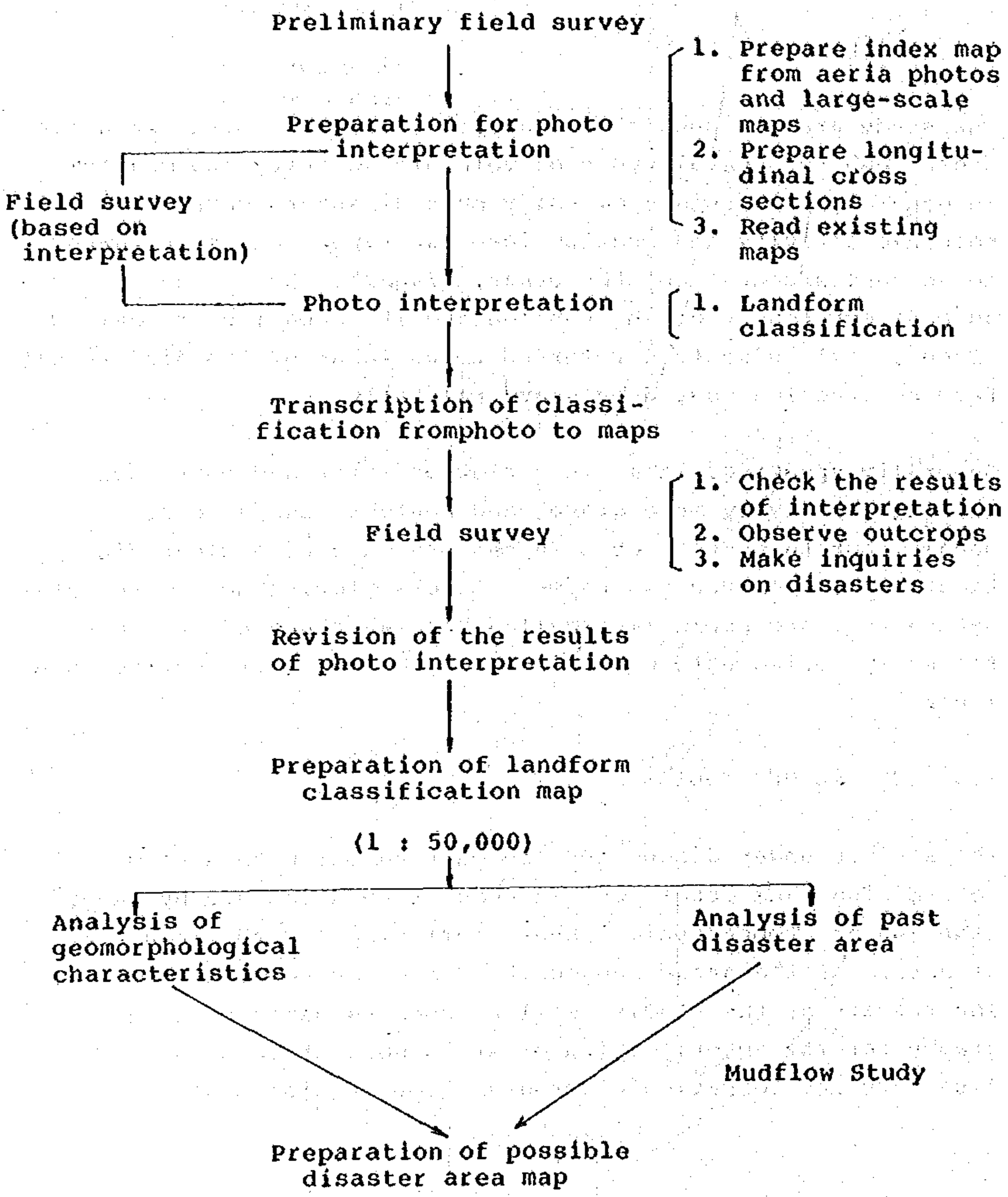

Fig.-1.4 Work Flow

1.4 STUDY METHOD AND WORK FLOW

In order to clarify the topographical features of the study area and the relationship between topography and disaster areas, interpretation of aerial photographs and field investigations were conducted.

Photographs taken by a public works firm in July, 1981, i.e., after the disaster of May, 1981, were used; interpretation of topography through aerial photographs was undertaken simultaneously with preliminary field investigations.

During the topography field investigation, observations on topography and outcrop were made. Topographical maps, water system maps and relief maps were prepared.

The investigation of disasters was started by conducting preliminary interpretation so as to confirm the topography subjected to disasters in the past. An inquiry was made in the field about past disasters with reference to existing disaster area maps and the results of the interpretation. Partial corrections were made on the disaster area maps based upon the inquiry. Further, the relationship between the disaster areas and topography was scrutinized and probable disaster area maps were prepared based upon the results of the scrutiny.

2. TOPOGRAPHICAL STUDY

2.1 CLASSIFICATION OF TOPOGRAPHY

A topographical classification map was prepared based upon a map drawn on a scale of 1/50,000; the items used for the classification are as indicated below.

(1) Items Used For Topographical Classification

- Tertiary mountains and Hills
- Landforms created by the Jambangan complex volcano
  - i) Dissected volcanic piedmont
  - ii) Mudflow hills
- Tenggat mountains
  - i) Dissected volcanic piedmont
- Landforms created by Mt. Semeru
  - i) Deposits of primary ejecta
    - 1) Lava flow deposits
    - 2) Slopes consisting of volcanic debris
    - 3) Parasitic volcano
    - 4) Bare slope consisting of new ejecta and made by erosion of qullies
  - ii) Landforms created by other volcanic activity
    - 1) Crater walls (Jonggring Seloko crater)
    - 2) Old crater walls
    - 3) Crater walls of parasitic volcano
  - iii) Landforms created by epigenetic processes
    - 1) Eroded valleys
      - a) Valleys directly connected to the active crater (always transport new materials of eruption)
      - b) Valleys reaching points near summit (volcanic materials flow down them where eruptions are appreciable)
      - c) Valleys originating in the midway slope

2) Valleys which no longer function as channels due to deposits of lava or pyroclastic flow

3) Volcanic fan

a) Ladu fan
b) Lahar fan with steep slope
c) Lahar with gentle slope
d) Former river course
e) Point of change in river course channel shifting point

4) Landslide

a) Large-scale landslide at valley head or large-scale qullies
b) Landslide in May, 1981
c) Slumps caused by lateral erosion

5) Periphery of volcanic piedmont

- Others

i) Alluvial plain

1) Alluvial plain and valley-bottom plain

2) Coastal plain

a) Back marsh and lowland
b) Sand bars

3) River terraces

4) Steep scarps

a) Steep scarps (more than 50 m in relative height)
b) Steep scarps (less than 50 m)

5) Taluses and alluvial cones

2.2 DESCRIPTION OF ITEMS USED FOR TOPOGRAPHICAL CLASSIFICATION

(1) Tertiary Mountains and Hills

Accidented mountains in their prime of life are found to west of the K. Leprak and to the south of the K. Lengkong. The mountains have an elevation of 200 m and 1,000 m in the south and north, respectively, and prevent the development of the piedmont of Mt. Semeru towards the south. The mountains consist of Tertiary rock and their slopes are steep and dissected by small valleys at narrow intervals. The K. Glidik flows by deeply cutting through the mountains. Isolated hills consisting of Tertiary rock are also seen standing inside fans on the east of the K. Leprak.

(2) Jambangan Complex Volcano

This topographical unit inside the study area exists on the north of the B. Sat fan, i.e., on the north of K. Lateng; it is also found on the west of Mt. Semeru and its southern slope and piedmont. The volcano is the oldest of the series of volcanoes found in the area. The volcanic slopes of the Jambangan volcano are dissected by many valleys and, as a result, form relatively large accidented topography (25 - 100 m in the 250 m mesh) which appears as planeze.

A great number of small hills (EL. 10 m and under) consisting of volcanic breccia are found on the periphery of Mt. Semeru, south of Pasirian. From their composition and topographical features, these hills are considered to have been formed by the deposits of considerably large-scale volcanic mudflow hills. The condition of wethering suggests that the deposits were brought about at an earlier time than those brought about by Mt. Semeru; however, there is no data which clearly indicates the origin of these hills.

(3) Tenggat Mountains

The piedmont of the Tenggat mountains lies in the north-east of the Lumajang plain; the piedmont consists of plateaus which undulate gently.

(4) Topography Formed by Mt. Semeru

Topographical classification of Mt. Semeru is essential for the present studies. Suzuki showed the relationship between the topography of a large-scale stratovolcano in Japan and the composition of the volcanic mountain as in Fig.-2.3 (1982); similarly, Shumitt drew a model like the one given in Fig.-2.4 (1933).

Suzuki further pointed out that the lines which longitudinally cut a large-scale stratovolcano, if drawn as a semi-logarithmic graph with the elevations representing the logarithms, will result in broken lines consisting of several segments; assuming that these irregularly continuing points in the longitudinal cross section represent the difference in the slopes of deposits peculiar to the various ejecta and secondary deposits which form a volcanic mountain, the following formulas were prepared for each of the segments:

$$Y = Yo \exp(-\alpha x)$$

where,

- Y : Elevation (m) of any given point on each segment
- Yo: Elevation (m) of top end of each segment
- x : Horizontal distance between Yo and Y

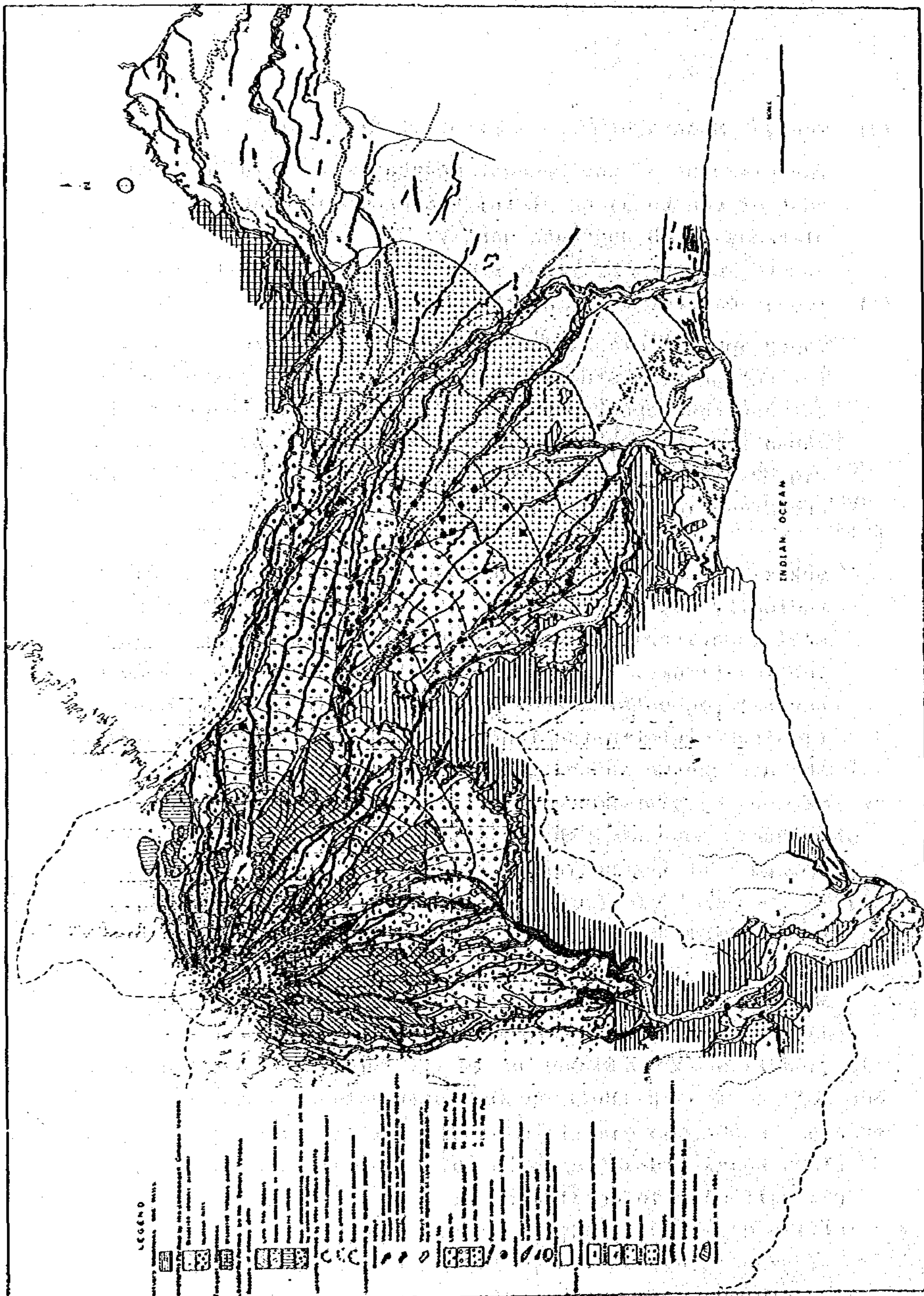

Fig.-2.1 Topographical Classification Map

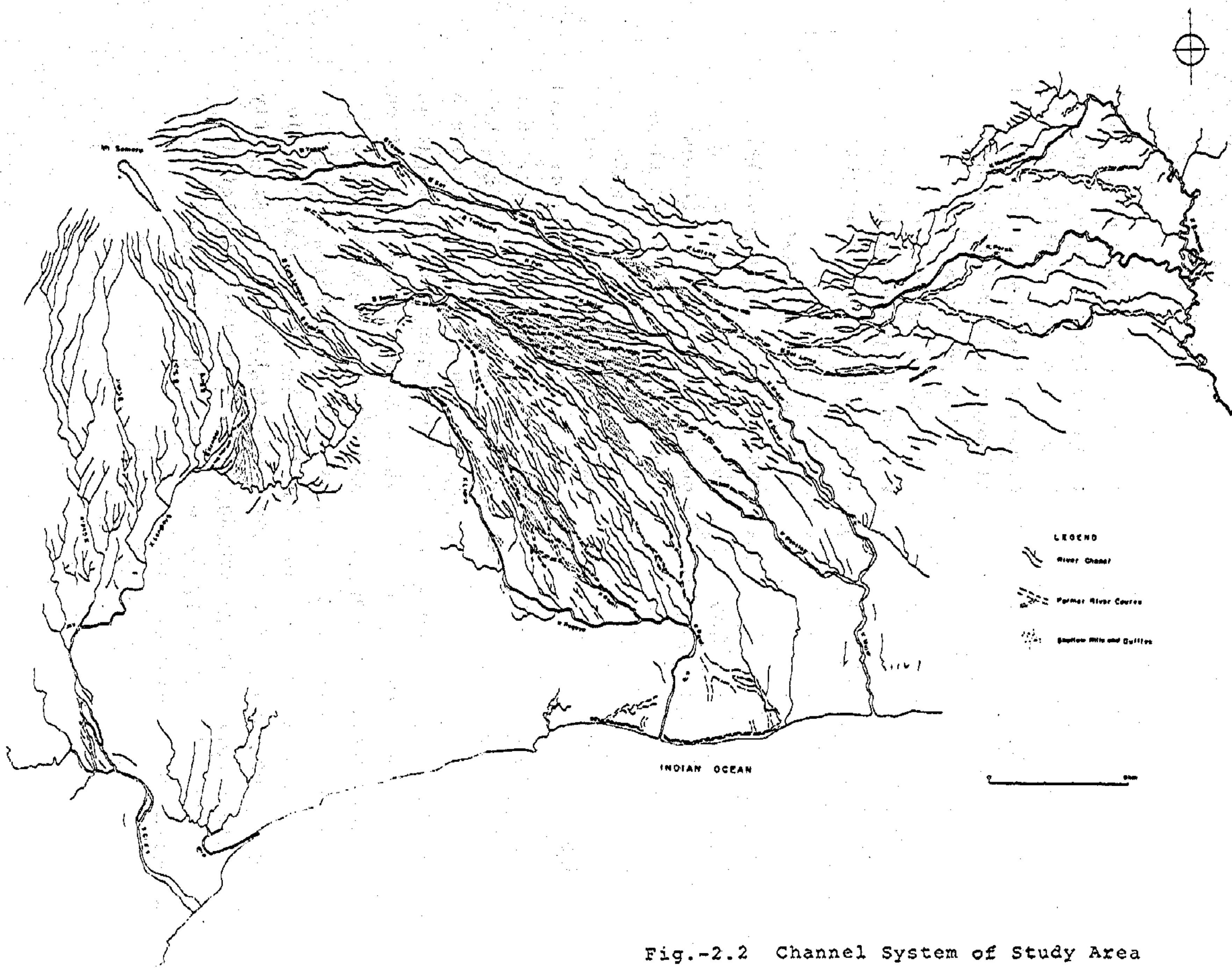

Fig.-2.2 Channel System of Study Area

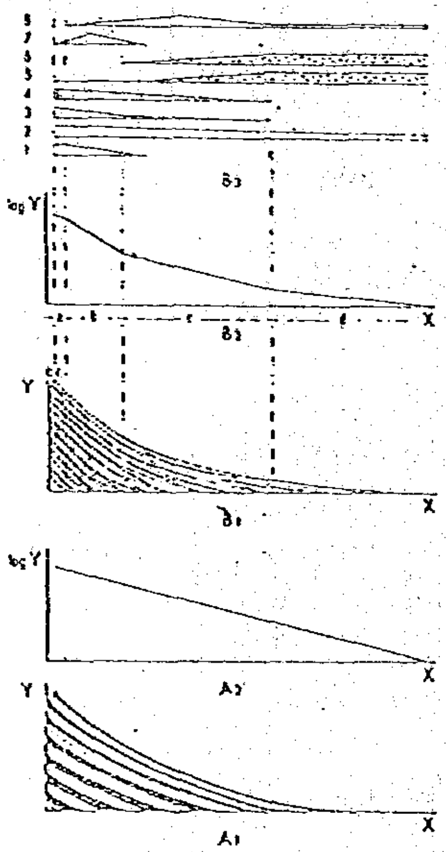

Fig.-2.3 Schematic Profile and Structure of Strato-volcanoes
(Source: Suzuki, 1982)

A : Those commonly drawn in previous texts. Note that, as shown in A the profile is commonly taken as a straight or slightly curved line without any nick-points on semi-logarithmic graph.
B : Those proposed in the present paper for andesitic stratovolcanoes.
B : Semi-logarithmic expression of B 's profile. The profile is divided generally into four straight segments with different slope decrements; a: summit part slightly gentler than b, b: main part of the cone, c: skirt part, d: peripheral part. B : Schematic diagram showing the variation of total thickness of various materials constituting the volcano with distance from the source. 1: explosion breccia deposits distributed ballistically, 2: pyroclastic airfall deposits transported by wind, 3: lava flows, 4: poorly-vesiculated pyroclastic flow deposits, 5: well-vesiculated pyroclastic flow deposits, 6: mudflow deposits, 7: talus deposits, 8: fluvial deposits.

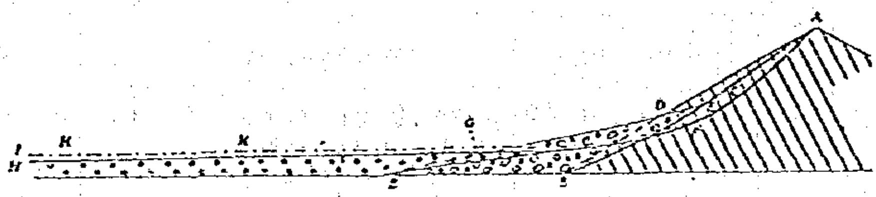

Fig.-2.4 Ideal Scheme of the Profile of a Tropical Volcano (From Schmidt, 1933, Fig. 27)

AB = Ideal section of dry accumulations of cinders and ashes.

ACE = Idem of lahar deposits.

AFH = Idem of river flood deposits ("bandjirs").

when differentiated,

$$Y' = - \exp(-\alpha X)$$

The value of α was then assumed to be the slope at the top end of the respective segment, and the value of a great number of large-scale stratovolcanoes was obtained.

The combination of the three types of deposition (dry accumulations, wet lahars, river deposits) causes two discontinuities in the profile of tropical volcanoes at D and G. This renders the profile to be not a continuous mathematical curve, as is often thought, but to consist often of three more or less straight sections.

The results are as tabulated below:

Table-2.1

Substance	Value	Topography	Value
Trajectory fall deposits	Approx. 0.42	Summit of large-scale stratovolcano	0.70 - 0.48
Lava	0.58 - 0.019	Mountainside of large-scale stratovolcano	1.09 - 0.39
Small-scale pyroclastic flow	0.56 - 0.09	Skirt of large-scale stratovolcano	0.34 - 0.06
Large-scale pyroclastic flow	0.08 - 0.01	Periphery of large-scale stratovolcano	0.05 - 0.00
Volcanic mudflow	0.15 - 0.00		
Talus	0.33 - 0.20		
Volcanic fan	0.27 - 0.05		

Source: Takasuke Suzuki (1982)

When the longitudinal cross section is expressed on a semi-logarithmic graph according to the method suggested by Suzuki, the result will be as show in Fig.-2.5.

Fig.-2.6 is a location map for longitudinal survey lines; black dots indicate lava and + indicates the presence of mudflow hills, and it is noted that a single longitudinal cross section consists of several broken lines. Clear irregularly continuing points on each survey line are found in the vicinity of elevations 3,300 m, 1,500 m, 750 m - 800 m and 150 m. With respect to values, their corresponding sections of the volcano are:

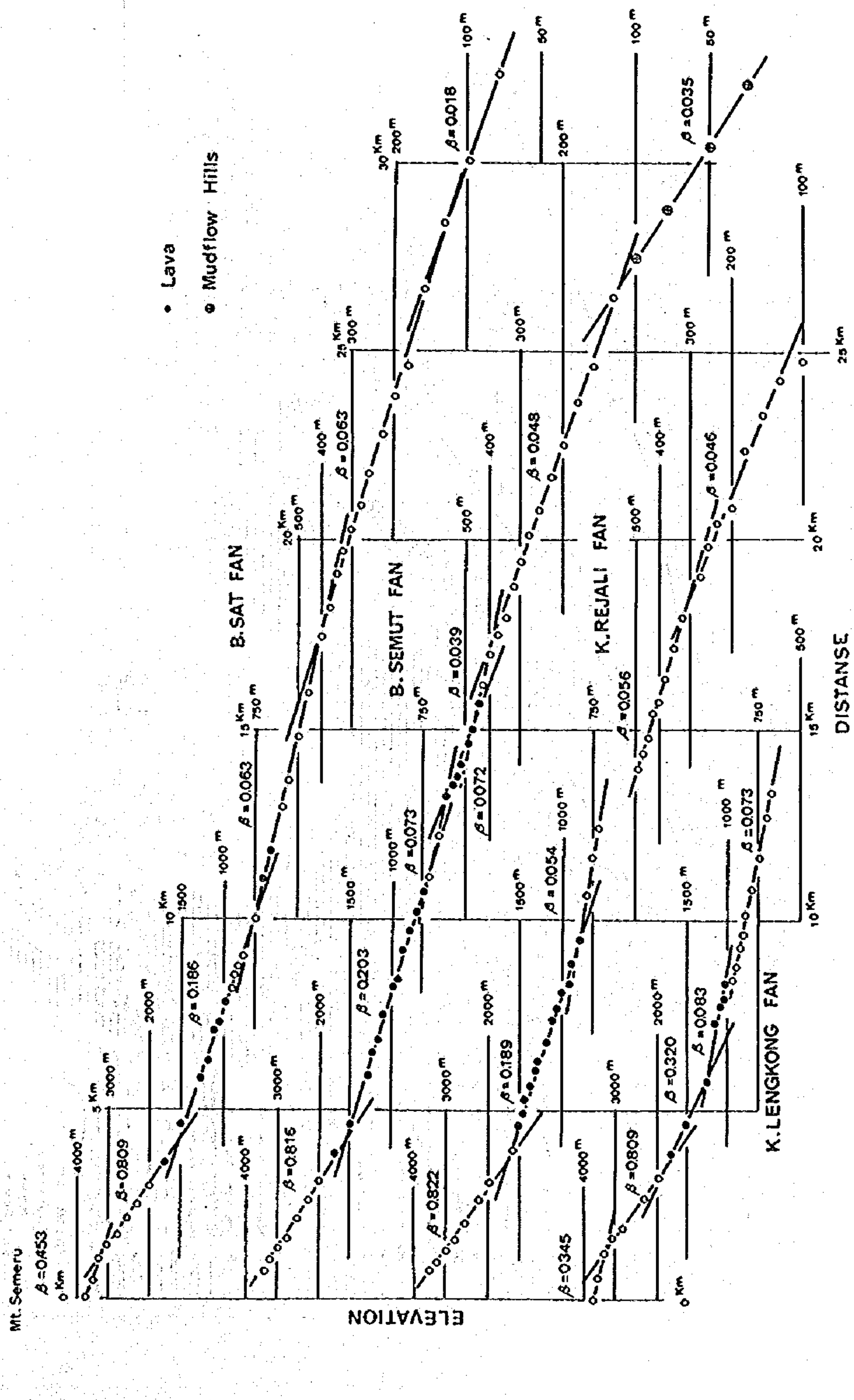

Fig.-2.5 Profile of the Semeru Volcano

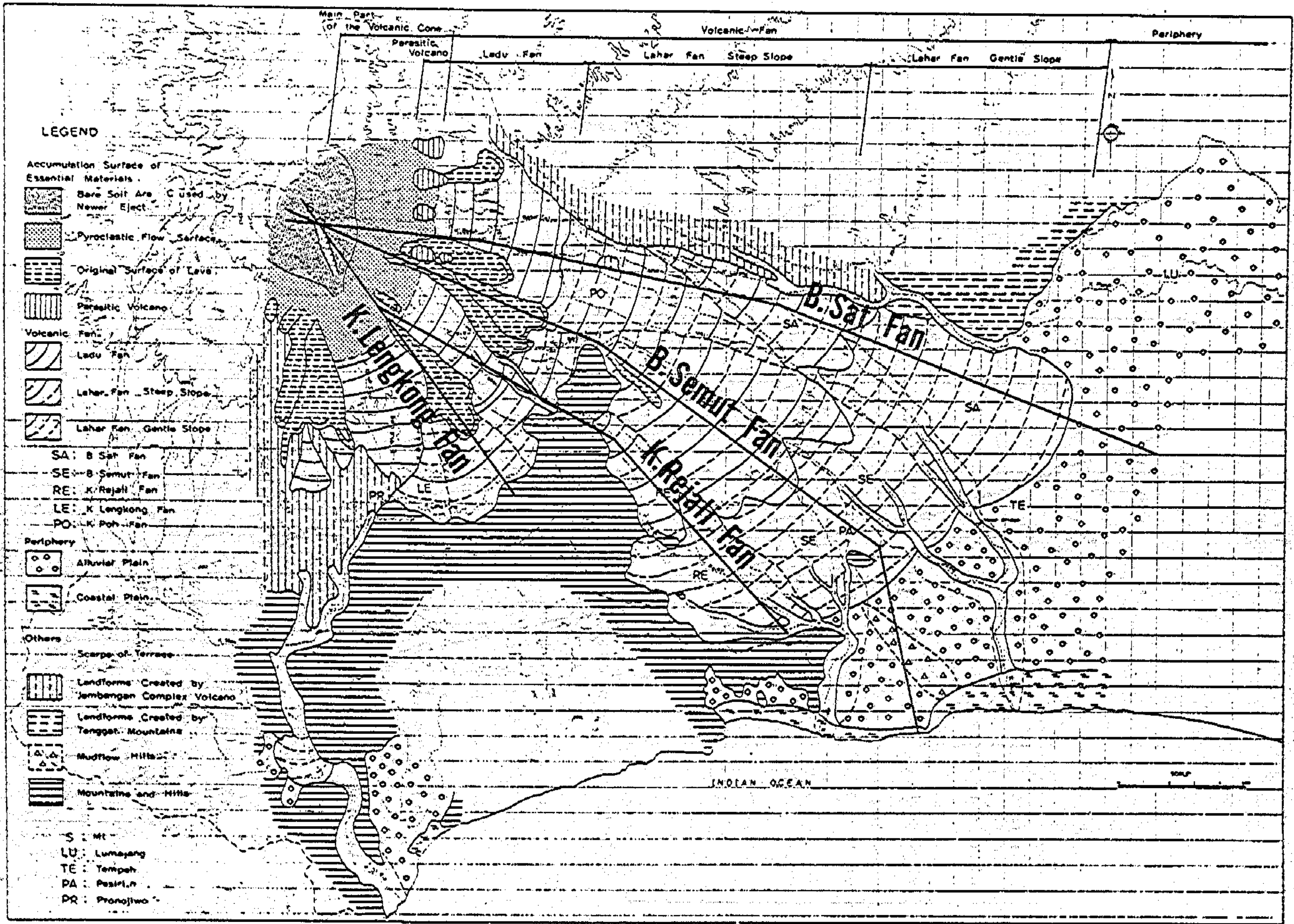

Fig.-2.6 Location of Profile

Elevation	Corresponding Section
3300 m or over	Summit
1500 m - 3300 m	Mountainside
150 m - 1500 m	Volcanic skirt
150 m or under	Periphery

Further, the surface of the summit is assumed to consist of deposits of trajectory fall deposits from its α value. The volcanic skirt is composed of pyroclastic flow, volcanic mudflow and volcanic fan deposits; the substance and the agent forming the surface can sometimes be learned through the results of observations collected for outcrops of the area and its topographical features. The topography brought into existence by Mt. Semeru volcano is as follows:

(i) Deposits of Primary Ejecta

The area between EL. 1,500 m and the summit mainly consists of primary ejecta. The gullies developing aroung the main part of the volcanic cone (EL. 1,500 m and over) are recognized to possess alternating layers of lava and various types of debris from aerial photographs; in the rivers, lava is likely to be found forming waterfalls.

The main part of the volcanic cone is divided into an area covered with forests (EL. 1,500 - 2,500 m) and a bare area (EL. 2,500 m and over); the former is characterized by the presence of deep gullies, while the latter is characterized by the presence of narrow gullies and large-scale landslides, which prove to be a principal source of debris.

Lava flows are formed in the volcanic skirt (EL. 1,500 m and under); these lava flows reach as high as EL.

750 m - 800 m, and in the case of areas along the B. Semut, they reach as high as EL. 450 m. The surface of the lava flows are marked with such topographical features as steep cliffs on the front periphery, volcanic levees, lava wrinkles and others, all of which can be clearly confirmed by aerial photographs.

On the other hand, the deposits of pyroclastic flow and mudflow do not necessarily possess clear topographical features and, therefore, their distinction from secondary deposits is difficult. Areas considered to consist of deposits of pyroclastic flow or large-scale mudflow include the area under which an old valley, assumed to be an old valley of the B. Kobo'an, is buried. The area is found on the right bank of the B Kobo'an and in the neighborhood of the village of Sumber Sari; the topography of the area resembles that of the area upstream of the K. Batang of the Merapi volcano in Central Java and possesses a periphery with a steep slope on the front of the deposits.

Areas with topography consisting of primary ejecta also include parasitic volcanoes found at EL. 1,000 m - 1,500 m. These parasitic volcanoes exist as pyroclastic cones or lava domes and possess craters from which, in some cases, lava poured. The degree of relief diminishes from the top of Mt. Semeru towards its piedmont. The unusual rise in relief around EL 1,000 m - EL 1,500 m is due to the existance of the parasitic volcano.

(ii) Landforms created by epigenetic processes

(a) Eroded valleys

A considerable number of vallys are found eroding the volcanic mountain in all directions. In general, these valleys have a relative height of 30 m - 50 m and their walls are nearly perpendicular and continue onto the large-scale landslide found at the valley head in the neighborhood of EL. 2,500 m. Normally, lava flow, pyroclastic flow and lahar move down these valleys.

Clarification of the features of these valleys is of great importance in terms of debris control because such features are considered likely to determine the type and frequency of disasters occurring at the lower reaches of the rivers. In particular,the volumeo of ejecta directly brought about from the present crater and the size of the source of debris at the vallley head greatly affect consideration of debris control; and, therefore, the valleys were classified into three types according to such standards.

- Active Valley (1)

  The valley is significantly subject to inflow of ejecta and provides a large source of debris.

- Active Valley (2)

  The valley continues onto large-scale landslide areas of the valley head and, therefore, provides a large source of debris.

- Stable Valley

  The source of debris is limited and the valley is not subject to the direct inflow of ejecta from the main crater.

Each of the valleys under discussion can be classified as shown in Table-1.2 according to these standards.

Table-2.2 Classification of Principal Valleys

River System	K. Mujur	K. Rejali	K. Glidik
Active valley (1)	-	B. Kobo'an	B. Bang B. Kembar B. Sarat
Active valley (2)	B. Tompe B. Sat B. Tengah	K. Curah Lengkong	B. Supit B. Cukit B. Glidik
Stable valley	B. Tunggeng K. Poh K. Mujur (upper reaches) K. Pancing B. Semut	-	K. Bening K. Lengkong

The present main crater opens to the south and is directly connected to the B. Sarat, which is a tributary of the K. Glidik and originates in the K. Lengkong.

In terms of geomorphology, the position of the crater is likely to shift and, as a result, the classification shown in Table-1.2 has to be changed accordingly. It should be also noted that large-scale eruptions will create a possibility that stable valleys will be subject to inflow of their ejecta.

(b) Volcanic fan

As mentioned previously, the section of the Mt. Semeru volcano at EL 150 m - EL 1,500 m is a natural volcanic skirt and the degree of relief is under 50 in the 250 m mesh. It is considered to be composed of pyroclastic flow, volcanic mudflow, volcanic fan deposits and lava flow; however, distingusihing between primary and secondary pyroclastic flow with special features, is very difficult. The difficulty is due to the similarity among the substances and the presence of deposits in transit.

As indicated in Fig.-2.5, the volcanic skirt can be divided into two segments with reference to elevation; one being at EL. 150 m - 800 m and the other, EL. 800 m - 1,500 m.

All outcrops along the principal valleys consist of several gravel layers of different sedimentary facies. In general, each layer tends to be thick and there is an accumulation of layers which contain angular boulders or cobbles and which lack sorting, laminas, and imbrications at the upper reaches of the valleys (Fig.-2.7). Toward the lower reaches of the valleys, the gravel tends to be round and the particle diameter tends to be small; moreover, the thickness of each layer decreases. Further downstream, i.e., in the vicinity of Tempe, the diameter decreases considerably and the topography consists of alternating layers of granuler, pebbles and sand with laminas.

In addition, the presence of several layers, yellowish to grayish brown in color in general and whose matrix is silt and sand with relatively smaller particle diameter, when compared with that of particles found in gravel layers at the same point, is recognized in between sand gravel layers throughout the course of the valleys; such layers are likely to be highly compacted.

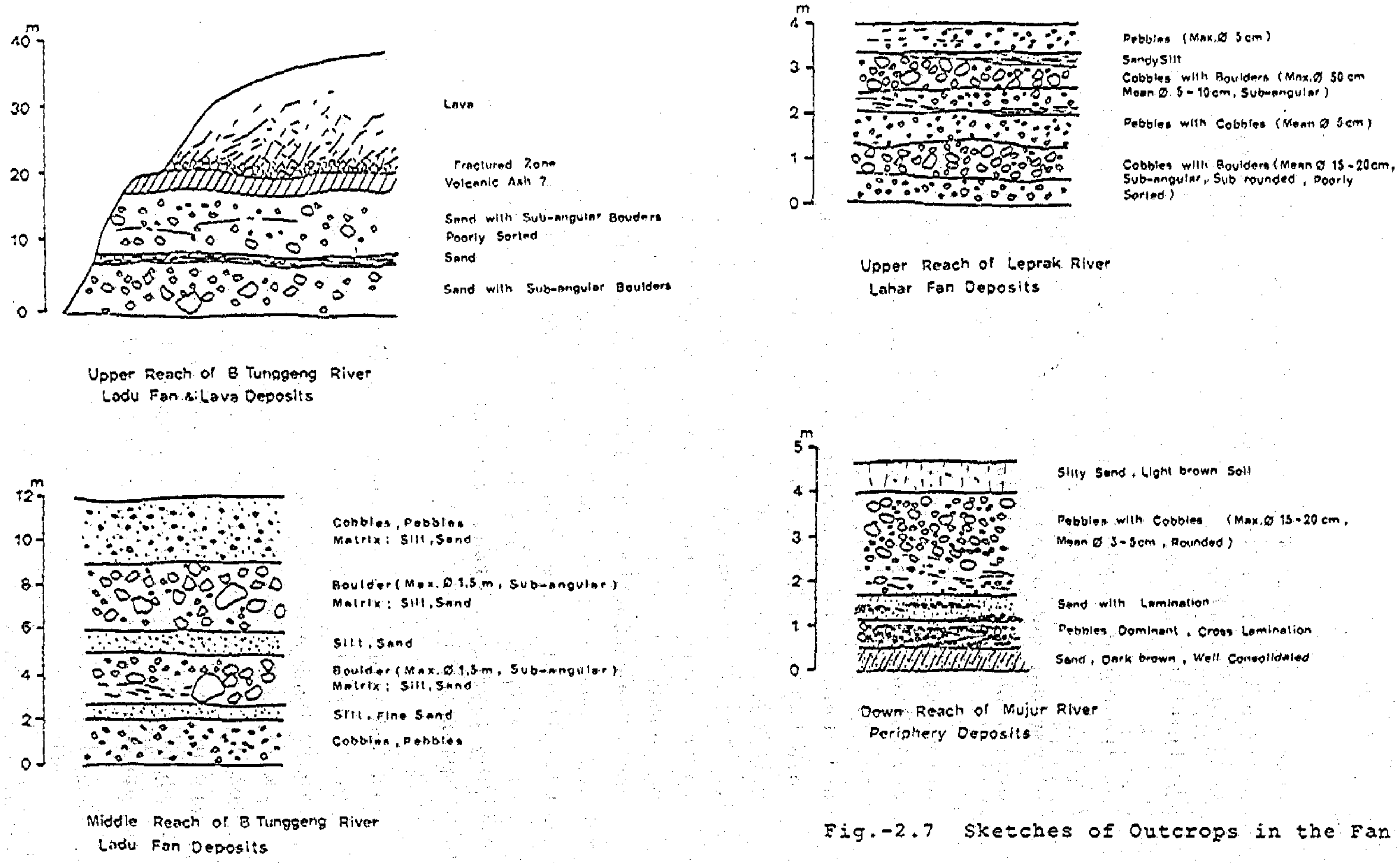

Fig.-2.7 Sketches of Outcrops in the Fan Area

This huge volcanic skirt consists mainly of sand gravel layers possessing various grain diameters and accumulation patterns and, therefore, may be considered to be made up of alluvial fans.

The presence of deposits of lava flow and pyroclastic flow in the segment at EL. 800 m - 1,500 m indicates that the segment retains topography consisting of primary deposits to a greater degree than the segment below. In the light of this, this segment, for the purpose of the present studies, will be called a ladu fan, while the segment at EL. 150 m - 800 m will be called a lahar fan in respect of the frequency of lahar disasters to which the area is subject.

Fig.-2.5 indicates that the lahar fan has a line of change in slope in the neighborhood of EL. 250 m and, from the configuration of the contour lines, forms a secondary fan. in respect of such factors, the lahar fan is further divided into two areas in this report, and the upper area is called lahar fan with a steep slope and the lower area, lahar fan with a gentle slope.

The longitudinal division of the volcanic skirt is as follows:

1) Ladu fan (EL. 800 m - 1,500 m)

Lahar fan
- 2) Lahar fan with a steep slope (EL. 250 m - 800 m)
- 3) Lahar fan with a gentle slope (EL. 150 m - 250 m)

It is noted from the irregularity of the contour lines in Fig.-2.1 and also from aerial photographs that the fan possesses different topographical units laterally, i.e. according to the principal valleys which form the fan.

It is, however, difficult to confirm the valleys which might have formed the ladu fan because of the settling lava and the presence of parasitic volcanoes.

Longitudinal division, together with lateral division, is shown in Table-2.3.

Table-2.3 Fans

Longitudinal / Lateral	Ladu Fan	Lahar Fan	
		Lahar Fan with a steep slope	Lahar Fan with a gentle slope
B. Sat fan	-	Formation of B. Sat; fan top is near Leces.	Formation of B. Sat.
K. Roh fan	Area near B. Tunggeng is Center of fan; formaton river not known; partially covered with lava.	Found in between B. Sat and B. Semut fans; no topography for fan end; assumed to be old from valley conditions.	-
B. Semut fan	-	Greatest fan divided into 2 units, i.e., one along present B. Semut and the other, along old B. Semut	Formation of B. Semut, K. Pancing, etc.; several units remain, although not clear.
B. Kobo'an fan	Formation valley not known; terraced; partially covered with lava.	Continues onto ladu fan; terraced; fan formed before formation of Cura Kobo'an.	-
K. Rejali fan	-	Fan top at Cura Kobo'an valley; formation of K. Rejali.	Divided roughly into 2 fan unit units, i.e., K. Rejali and K. Leprak
K. Lengkong fan	Formation valley not known; partially covered with lava.	Formation of B. Sarat and B. Kembar rs.	-

Among these fans, those at present still receiving debris to a considerable degree include the B. Sat, K. Rejali and K. Lengkong fans. In the case of the K. Pho fan, the valley which is considered to have formed to fan remains only as an old river course here and there, due to the coverage by lava at the upper portion of the ladu fan, and the fan is stable. Although the B. Kobo'an fan is terraced by the erosion of the Curah Kobo'an valley, it is likely to be affected by eruptions as the ladu fan is formed in the direction of the crater. The K. Lengkong fan is at present directly connected to the crater so that it receives debris frequently. The B. Semut fan, which possesses a vast area, lost its valley at its river's upper reaches and, as a result, is a stable fan at present and is less subject to disasters.

A great number of shallow yet wide valleys and valleys in the form of a gully are seen in the fans. The former were formed owing to the frequent changes in the course of the rivers inside the fans and the latter are valleys formed in the lahar deposits accumulated in the form of a tongue by a single flood. This formation results from the rapid accumulation of mud flow with coarse particles carried by lahar at a point of abrupt change in slope. The change in the river courses which has occurred in the past is discussed in Section 2.5.

(c) Landslide

Many landslides can be seen along the valleys which dissect the volcanic mountain in all directions or at their valley heads. The areas along the valleys appear to have occurred as a result of lateral erosion and many of these areas are seen on the slopes subject to such erosion.

Further, the heads of the principal valleys have formations of large-scale landslide areas. Such areas are likely to be found in the vegetation boundary, i.e. a forest line near EL 2,500 m. Some of these are considered to have been caused by volcanic activity, as in the case of huge valleys connected to the present crater; however, in general, they are the result of valley head corrosion.

The collapse of May, 1981, at the valley head of the B. Tunggeng river, inside the forest belt, caused mud to flow into the B. Sat and B. Tunggeng and resulted in disasters in areas along the K. Mujur. Moreover, new collapse which occurred inside the large-scale landslide area at the valley head of the Cura Lengkong resulted in disasters in areas along the K. Rejali.

(d) Periphery of Volcanic Piedmont

Noticeably flat topography with a slope of about 0.5 is seen outside the lahar fan below EL. 150 m. This topographical unit has no clear topographical boundary in respect of the adjacent fan having a gentle slope. The K. Mujur, K. Pancing, K. Rejali and some other rivers cut through the geomorphic surface at a depth of 5 m to 10 m. The southern end of the periphery is formed into district scarps 5 m to 10 m in height and is assimilated into the coastal plain. The eastern edge is, on the other hand, assimilated into the plain of the K. Bondoyudo without a clear boundary. In contrast to the gently undulating surface of the periphery, the plain of the K. Bondoyudo is like paddy lands and is nearly flat.

The deposits of the area are formed into alternating layers of sand with considerable laminas and granules with pebbles; topographically, the area possesses features commmon among alluvial plains. Sand layers containing silt compacted to an appreciable degree can be found at the lower level of these sand/gravel layers; these layers may be considered to be the very deposits which form the former geomorphic surface of the present geomorphic surface.

(e) Other Topography

i) Alluvial Plain

The alluvial plain can be divided into four topographical units; they are the alluvial plain formed by the K. Bondoyudo system and the coastal plain, the valley-bottom plain along the K. Glidik and the alluvial plain along the K. Rawan running through Tempur Sari.

The city districts of Lumajang are situated in the plain of the K. Bondoyudo and sustained considerable damage by the banjir of 1909.

ii) River Terraces

River terraces are formed on the inner banks of principal rivers; in particular, large-scale river terraces are found at the lower reaches of the K. Pancing. The terraces were formed due to the decrease in the amount of debris which had been taking place after the 1940s and were formed in the very recent past and are regional, unlike terraces formed by changes in climate or sea level.

2.3 HISTORICAL OUTLINE OF THE DEVELOPMENT OF TOPOGRAPHY

A historical outline of the development of the topography seen in the study area is shown in Fig.-2.8. Mt. Semeru is a very young volcano and the dissection of the mountain is not conspicuous as yet. The earth supplied by Mt. Semeru volcano is found limited to the areas lying to the east and the south of the mountain.

Mt. Semeru was formed upon the Jamgangan volcano, which served as to former geomorphic surface. Mt. Semeru has been supplying its piedmont with earth and sand as it developed its own mountain; this has resulted in the burying of the topography of the Jambangan volcano. The debris supplied to the piedmont poured out downstream from the low areas found between Mt. Sawur and the left bank of the B. Sat and gradually buried the low areas found between the Tertiary mountains and the Jambangan volcano. It is considered, during this period, that the Rejali fan was not in existence. The river terraces found in the Curah Kobo'an valley continues to the B. Kobo'an fan and, therefore, it is more likely that the debris being supplied to the B. Kobo'an flowed into the B. Semut and K. Lengkong before the formation of the Cura Kobo'an valley.

Tertiary / Quaternary — Formation of Jambangan Volcano Complex's base topography

Formation of The Jambangan Volcano Complex

- Dissection
- Formation of piedmont slopes (planeze)
- Formation of mudflow hills?

Formation of Tenggat Mountain Range (Volcano)

- Dissection
- Formation of piedmont slopes

Pleistcene / Holocene — Beginning of Semeru Volcano's activity

- Valleys in the Jambanga Volcano Complex being buried
- Lava flow deposition
- Pyroclastic flow deposition (Accumulation of essential materials)

Formation of main part of the cone

- Formation of peripheral morphology
- Dissection, Erosion
- Formation of older volcanic fan, B. Semut Fan and B. Sat Fan

Deepening of Curah Kobo'an

- Formation of K. Rejali Fan

Shifting of relative sea level or change in volume of sediment supply?

- Deepening of K. Rejali & K. Mujur in lower reaches

Present

Fig.-2.8 Summary of Historical Development of Topography in the Study Area

The advancement downstream of the Curah Kobo'an valley started at the time of the corrosion of the valley head of the present K. Rejali, i.e., the K. Leprak, reached the B. Kobo'an fan or when the earth and sand of the B. Kobo'an started to pour out into the Rejali fan over the Tertiary mountains. As a result, the B. Kobo'an fan was terraced and the debris buried the low areas between the B. Semut fan and the Tertiary mountains to form the Rejali fan.

The southern ends of the volcanic periphery are formed into cliffs with an elevation of 5 m to 10 m. These are sea cliffs and the periphery is considered to have had a southward extension in the past. The formation of the cliffs can either have been triggered by changes in the relative sea level, such as ground movement (upthrust) and change in sea surface conditions, or by rapid decrease in the amount of debris supplied. The presence of mudflow hills seen widely from the southern part of Pasirian to the Indian Ocean strongly suggests the possibility of the latter.

2.4 TOPOGRAPHICAL FEATURES OF PRINCIPAL RIVERS

(1) K. Mujur

The K. Mujur has many tributaries and river basins considerable in area. The principal tributaries include the B. Sat, B. Tompe, B. Tuggeng and K. Poh. The K. Mujur flows along the boundary between the B. Sat and B. Semut fans. The river is supplied with water by Sumber Mujar and is a stable river which flows through the K. Poh fan, and old fan; however, it joins the B. Tunggeng near Kuropo Sawit and grows into a devastating river.

Before the disaster of 1909, the B. Sat flowed along the course of the B. Sat Lama (old B. Sat), which runs near the center of the B. Sat fan. After the disaster, however, the B. Sat was artificially diverted to the B. Tunggeng in order to prevent the floods from reaching the Lumajang area. As a result, the B. Sat Lama has stabilized as an under-fit river, a term given by Davis, and the K. Mujur came to take on to itself the lower reaches of the B. Sat, including those of the B. Tompe. The rivers possesssing a source of great amounts of debris at their upper reaches and flowing into the K. Mujur include the B. Sat and the B. Tompe.

The upper reaches of the K. Mujur flow through an old fan (K. Poh fan), and the lower reaches flow through the B. Sat fan. Upstream of the point between the junction of the B. Sat and B. Tompe (EL. 750 m) and Sumber Mujur is a ladu fan. The lahar fan of the K. Poh starts at the periphery and extends as far as the junction of the K. Mujur and the B. Tunggeng. The K. Poh fan is presently stable due to the absence of valleys which supply debris. The B. Sat flowing on the northern periphery of the K. Poh fan forms the B. Sat fan, whose top is found near elevation 550 m. The point of diversion of the B. Sat to the B. Tunggeng is found near the top of the fan.

In 1909, lahar started to flood at this fan top and spread over the B. Sat fan; a part thereof even reached as far as points beyond the railroads along the B. Sat lama. Some has, on the other hand, flowed into the K. Lateng and brought about damage to Lumajang. The lahar of 1981 destroyed the embankment in Leces and some flowed into the B. Sat Lama. Floods occurring at the top of the B. Sat fan can cause disasters to wide areas, including Lumajang.

The lower reaches of the K. Mujur are less subject to, in terms of frequency, direct effects of eruptions, as the crater of the jonggring Seloko volcano faces the B. Sarat. Although the disaster of 1981 was caused by the landslide inside the forest belt found at the valley head of the B. Tunggeng, that of 1909, according to some documents, was caused by secondary movement of the deposits after eruption.

The K. Mujur, downstream of the village of Kert Sari, advances eroding the general surface and grows larger in width, which makes flooding of lahar and banjir difficult.

(2) B. Semut and K. Pancing

The B. Semut and K. Pancing are two of the biggest tributaries of the K. Mujur and are typical misfit rivers.

In 1941 and 1942, lava flow poured into the B. Semut as low as EL. 800 m and completely buried the valley, changing the river basin as a result. The B. Semut lost its upper reaches which correspond to the present upper reaches of the Cura Lengkong, and the basin of the K. Rejali, in turn, gained them. The Cura Lengkong has a large-scale landslide at its valley head; the crater faced the valley head in the past. From this fact, it is considered that the B. Semut fan was subjected to disasters brought about by lahar from time to time. Even now, devastated land and forests spread in the B. Semut fan and microtopography made of lahar deposits remains. The B. Semut and K. Pancing, which have grown to be under-fit rivers as termed by Davis, are stable at present; however, considerable changes in their course before the 1940s are evident from various documents.

Huge terraces are formed at the lower reaches of the K. Pancing; the presence of such terraces indicates a considerable outflow of debris in the past, including that which occurred in the 1940s.

The fan of the B. Semut consists of two fans, i.e., the fan found towards the left bank of the present river course and the one whose center is found in the K. Krumbang, a tributary of the K. Rejali from the Gn. Sawur eastern piedmont, or in the B. Semut Lama river (old B. Semut), which used to flow into the K. Siluman. Topography made of lava flow exists on the western periphery of the fan belonging to the B. Semut Lama and the topography reaches an elevation of as great as 450 m.

(3) Rejali River

The basin of the K. Rejali is divided into upper reaches and lower reaches by the presence of the Cura Kobo'an valley. The river is called the B. Kobo'an upstream of the Cura Kobo'an valley. The B. Kobo'an flows eroding the B. Kobo'an fan, an old fan, and lahar flowing down the B. Kobo'an is less likely to flood the B. Kobo'an fan.

After passing through the Cura Kobo'an valley, the K. Rejali starts to form a fan, which is the Rejali fan. The frequency of disasters in the Rejali fan in recent years was high and, as a result, changes in the river course were accordingly considerable. At present, the river, downstream of the Cura Kobo'an valley, has its main course, i.e., the K. Leprak and K. Regoyo on the west periphery of the K. Rejali fan; however, the course was along the K. Rejali, now the former river course, before 1976.

The high frequency of disasters by lahar at the Rejali fan can be attributed to two reasons. Firstly, the debris brought about by eruptions and which now flow into the B. Sarat flowed mainly into the K. Rejali (B. Kobo'an) before 1976. Secondly, owing to the changes in the basin caused by the accumulation of lava in the B. Semut which occurred in 1941 and 1942, the upper reaches of the B. Semut joined B. Kobo'an by way of the Cura Lengkong. The increase in water and debris due to a rapid increase in the area of the basin overpowered the transport capacity of the river course and resulted in a state of geomorphological "over-fit" in the K. Rejali.

The Rejali fan has a boundary between a fan with a steep slope and fan with a gentle slope near Jugo Hill, standing isolated within the fan. Main changes in the river course took place mostly near the top of these two fans.

(4) Glidik River

The area of the basin of the K. Glidik is the greatest among those of the rivers within the study area and has topographical features different from those of three other rivers. The main K. Glidik originates at Mt. Semeru and it empties into the sea, being joined by the K. Lengkong and K. Manjng on the way. The K. Lengkong, which is a principal tributary of the K. Glidik, has, in turn, such tributaries as the B. Sarat, B. Kembar, B. Bang and B. Cukit. The K. Lengkong has a gentle slope upstream of the Pronojiwo waterfall and meanders, as can be expected of an alluvial river; however, the river forms a V-shaped valley and joins the K. Glidik downstream of the waterwall. The B. Sarat, B. Kembar and B. Bang are still subject to disasters frequently brought about by lahar and are torrents which form fans toward the K. Lengkong.

The knickpoint consisting of andestic lava (Pronojiwo waterfall) of the Lengkong is a result of hindered deepening of the river, and similar points also exist in the K. Bening and the B. Cukit, which joins the Lengkong below EL. 600 m. The K. Glidik, as well, forms a waterfall exceeding 100 m in height near EL. 550 m and the downstream thereof is a V-shaped deep valley.

Valleys other than those of the B. Sarat and B. Kembar, which form the Lengkong fan, run corroding the piedmont of the Jambangan volcano at EL. 500 m - 750 m and the deposits of the materials being supplied by Mt. Semeru are limited to areas along the valleys.

Valley-bottom plains with a limited width are formed at the middle and lower reaches of the K. Glidik; the relative height of the valley-bottom plains in respect of their present river bed is limited so that overflows of debris are likely. The hills to the west of the village of Umbur Sari form the boundary between the plain of Tempur sari and the valley-bottom plain of the K. Glidik and is only several meters, while that of the hills on the side of Tempur Sari exceeds 30 m. This suggests that the bed of the Glidik valley is covered up by lahar deposits in thick layers.

2.5 CHANGE IN THE COURSE OF RIVERS

As mentioned from time to time, many old river courses are still in existence in the piedmont of Mt. Semeru. The old river courses comprise those that occurred as a result of the accumulation of lava flow and pyroclastic flow (mainly found in ladu fans) and those caused by the accumulation of lahar (mainly found in lahar fans). Further, changes in the river courses due to the burying of valleys by lava can also take a place on a volcanic mountain as a whole.

Fig.-2.9 shows old river courses whose age has been determined based upon various records and field investigations.

The B. Semut can be cited as an example of change in river courses due to lava, 1941 and 1942. Moreover, the inflow of lava into the B. Kobo'an around 1976 also changed the river's course. Since changes in river courses due to accumulation of lava flow accompany considerably change in the area of basins, including sources of debris, their effect on the downstream fans is appreciable; the outflow and accumulation of lava of 1941 and 1942 drastically affected the condition of the disasters in the B. Semut fan. As indicated in Fig.-2.2, changes in river courses due to such lava flows and pryclastic flow took place at 12 locations in ladu fans and one location in lahar fans.

Change in river courses in lahar fans started to take place frequently in the K. Rejali fan after 1940. Moreover, it is learned that such changes had occurred also in the B. Semut fan until around 1920. The absence of change in the B. Semut fan after 1940, on the other hand, suggests that the river became an under-fit river and stabilized. In contrast, the frequent change in the river courses in the K. Rejali fan after 1940 appears to have much to do with the fact that the river became an over-fit river; the absence of data prior to 1940 seems in significant in arriving at such a conclusion. The changes in the course of the K. Rejali after 1940 encompass the entire area of the Rejali fan.

Such changes were also conspicuous in the case of the B. Semut. Although it is difficult to judge whether the changes

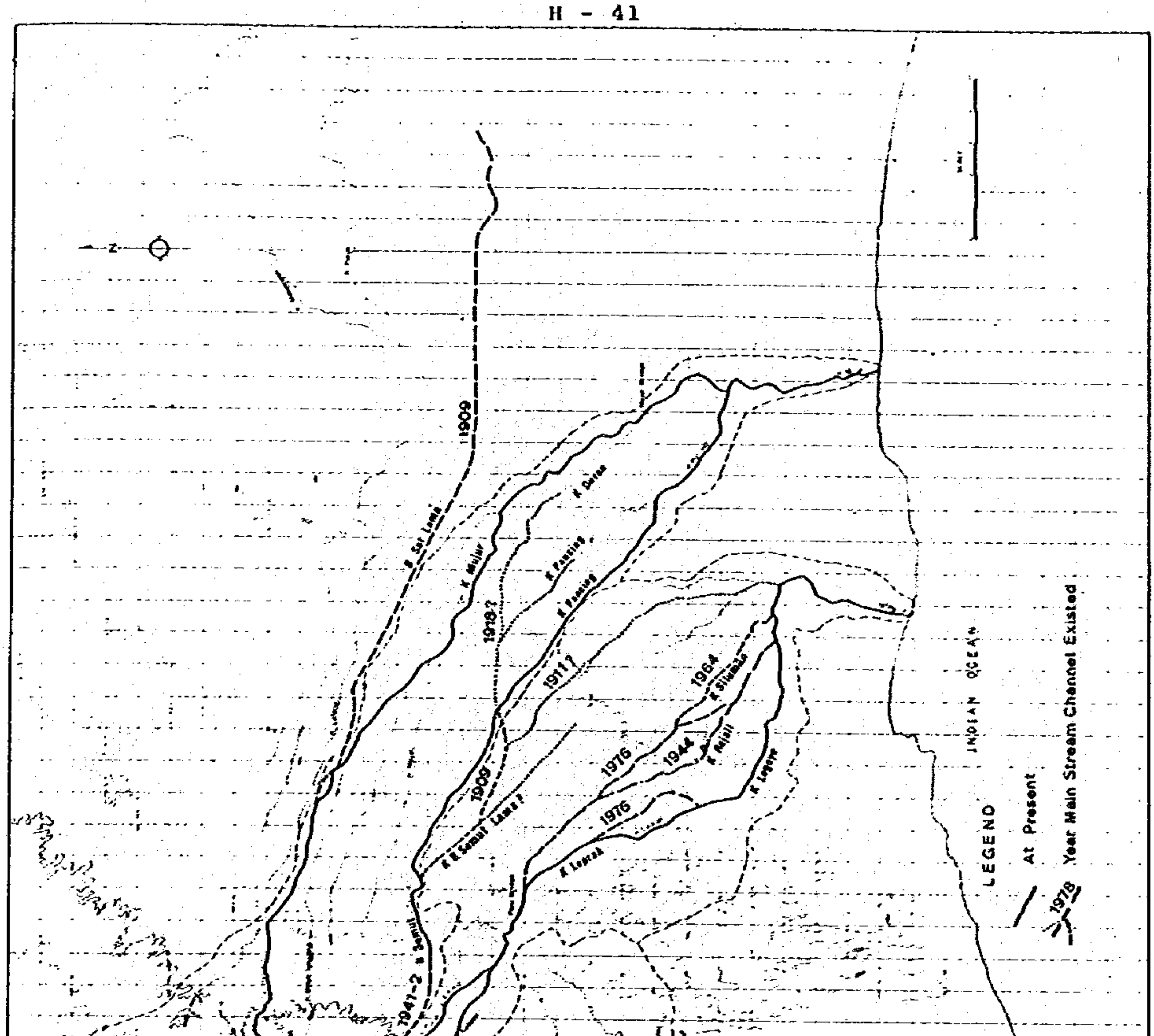

Fig.-2.9 Map of Channel Shifting

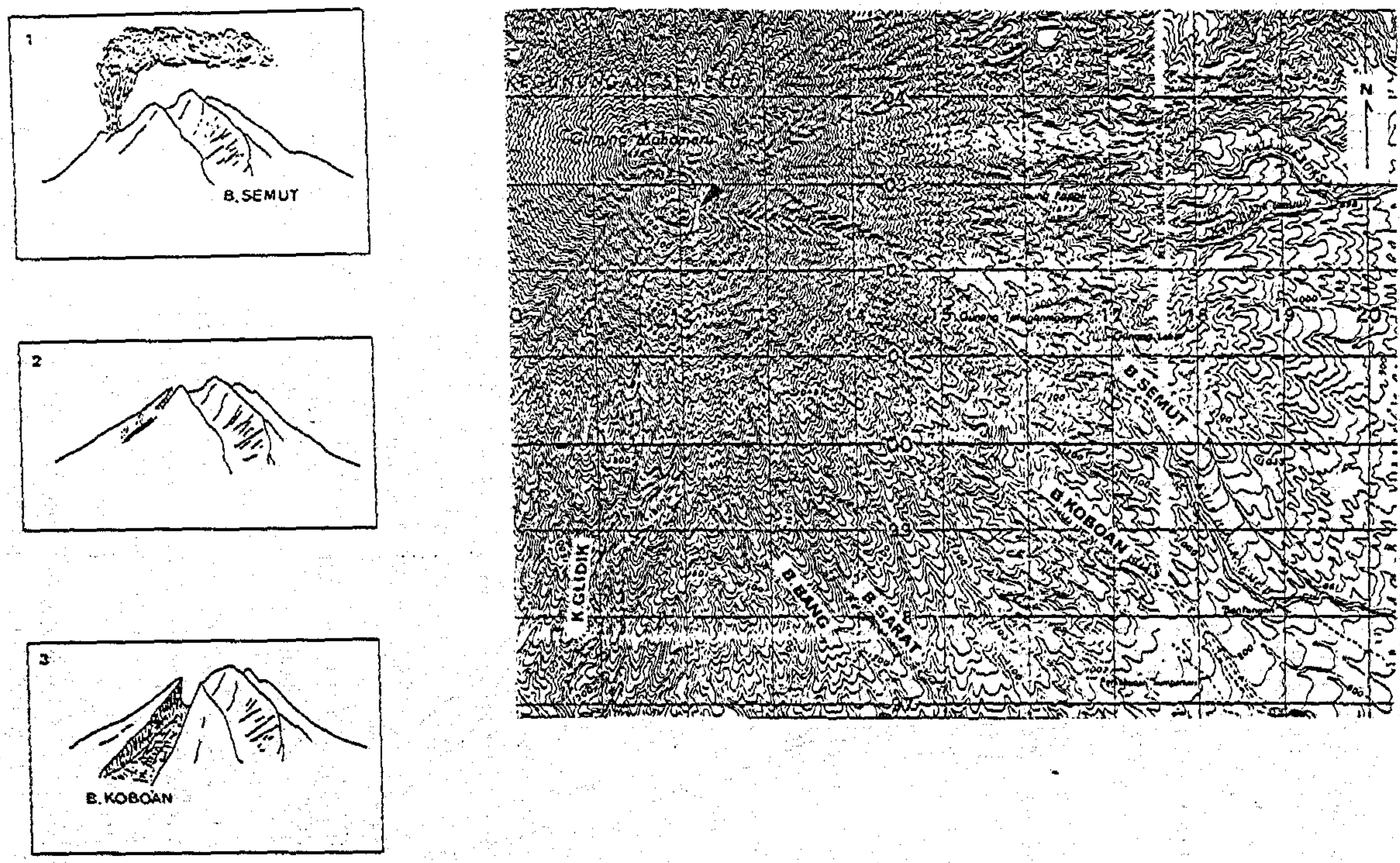

Fig.-2.10 Shifts in Craters