CHAPTER 5

MAPPING OF CONSTRUCTION SAND

5.1 Introduction

Study on geomorphology and Quaternary geology is to provide the knowledge on environment of deposition of sand deposits and in delimiting the boundary of grading of the deposits. These data together with the data on engineering property of sand, the sand deposits can be properly classified.

This study is to find and presents the methodology to specify and map sand deposits according to the specification and standard for concrete aggregate.

5.2 The Method of Mapping Fine Aggregate for Concrete.

The boundary of the area of sand deposits that have many gradations with in the specification of Grading Zones I, II, III,and IV for concrete aggregate (Table 3.4) can be done by using percentage contour line and cumulative curve methods. These methods are described in the following paragraphs.

5.2.1 Grading Zones by Percentage Contour line method

Contour line is a line on a map connecting all points the same distance above (or below) a specific datum, loosely termed "sea level".

Sand percentage contour is used as the base for differentiating the grading zone of sand according to the specification of fine aggregate for concrete.

In the same way the lines that compare amongs the different values from field investigation and testing by geophysics or geochemistry have qualification as the assumed line that passed the equal values.

From the principle of drawing the assumed isoline, Nutalaya, Rau and Sodsee (1984) took the results of grain size distribution from 999 soil samples by Selvakumar (1977). The particle size of sand (2.0 to 0.5 mm.), silt(0.05 to 0.002 mm.) and clay (less than 0.002 mm.) is plotted as a percentage on the sand-silt-clay maps. These maps are percentages contour map. For example the following sand percentage were contoured : 15, 25 and 35.Patterns were used to show the areas bounded by the following isopercent lines :0 to 15, 15 to 25, 25 to 35 and greater than 35.

The above methodology is applied to this study. The sand percentage contours are drawn by considering specifically percentage pass sieves size of 4.75 mm., 2.36 mm., 1.18 mm., 600 microns and 300 microns. After the sand percentage contour map is done, the sand percentage contours will be used as a base map for differentiating the different types of grading zones of sand.

5.2.1.1 Percentage Contour Mapping technique

In order to map Grading Zones I, II, III, IV of sand deposits, the following procedures are followed.

A. Grading of fine aggregate for concrete, TIS system.

The grading of fine aggregate shall be within the limits given in Table 3.4 and shall be described as fine aggregates, Grading Zones I, II, III and IV. The grading of aggregates shall be determined by the methods for sieve analysis following sieve size 9.5 mm., 4.75 mm., 2.36 mm., 1.18 mm., 600 microns, 300 microns and 150 microns. Where the grading falls outside the limits of any particular Grading Zone of sieves other than 600 microns by a total amount of not exceeding 5 percent, it shall be regarded as falling within that grading zone. This tolerance shall not be applied to percentage passing the 600 microns or to percentage passing any other sieve size on the coarse limit of Grading Zone I or the finer limit of Grading Zone IV.

The texture of sand is coarser to finer from Grading Zone I, II, III, and IV respectively (Table 5.1).

Table 5.1 Grading Zone of fine aggregate (Take as sample of Table 3.4)

Sieve Designation	Percentage by weight passing			
	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV
1.18 mm.	30 to 70	55 to 90	75 to 100	90 to 100
600 micrometer	15 to 34	35 to 59	60 to 79	80 to 100

From the Table it is found that the value of percentage by weight pass all sieve sizes except sieve size 600 microns. The lowest value of Grading Zone II 55% will have value in limit between the highest to the lowest point that is 30 to 70% of Grading Zone I and the lowest values in Grading Zones III and IV are between limit the highest to the lowest values of Grading Zones II and III respectively.

For sieve designation 600 microns the lowest value in Grading Zone II, 35% will have value more than the lowest value in Grading Zone I and in the same way the highest point in Grading Zone II and III the values are less than the lowest values in Grading Zones III and IV.

From the lowest and the highest limit values of percentage by weight passing in each Grading Zone, the percentage by weight of each sieve size will be mapped as

the sand percentage contour.

B. Grouping of weight percentage passing

In T.I.S.system, determined sieve sizes are 9.5 mm., 4.75 mm., 2.36 mm., 1.18 mm., 600 microns, 300 microns and 150 microns that correspond with the US. sieve number 3/8 , 4 , 8 , 16 , 30 , 50 and 100 .

But in this testing the US. sieve number 1, 3/4,1/2 , 3/8 , 4 , 10 , 16 , 40 , 100 and 200 were used. The weight percentage retained in sieve will be plotted on semilogarithmic paper.

When the weight percentage passing T.I.S sieve size is needed the values can be recieved by reading from the curve on semilogarithmic paper. The weight percentage from each hole will be divided into seven groups that have percentage passed sieve number 9.5 mm., 4.75 mm., 2.36 mm., 1.18 mm., 600 microns, 300 microns and 150 microns.

The weight percentages of different groups will be ploted on different maps, one group is one map.

5.2.1.2 Techniques for Producing Grading Zone Map

Techniques for mapping the area of gradation of sand according to Grading Zones I, II, III and IV are as follows:

a. Setting of sand percentage contours.The sand percentage contour of each sieve of Grading Zones I to IV shall have percentage contour and contour interval as the following .

- No sand percentage contour map for sieve size 9.5 mm. because the weight percentage is 100 % for all grading zones.

- The percentage contours of 4.75 mm. sieve size are 90, 95 and 100 (Figure 5.1).

- The percentage contours 2.36 mm. sieve size are 75, 85, 95 and 100 (Figure 5.2).

- The percentage contours of 1.18 mm. sieve size are 50, 60, 70, 80, 90 and 100 (Figure 5.3).

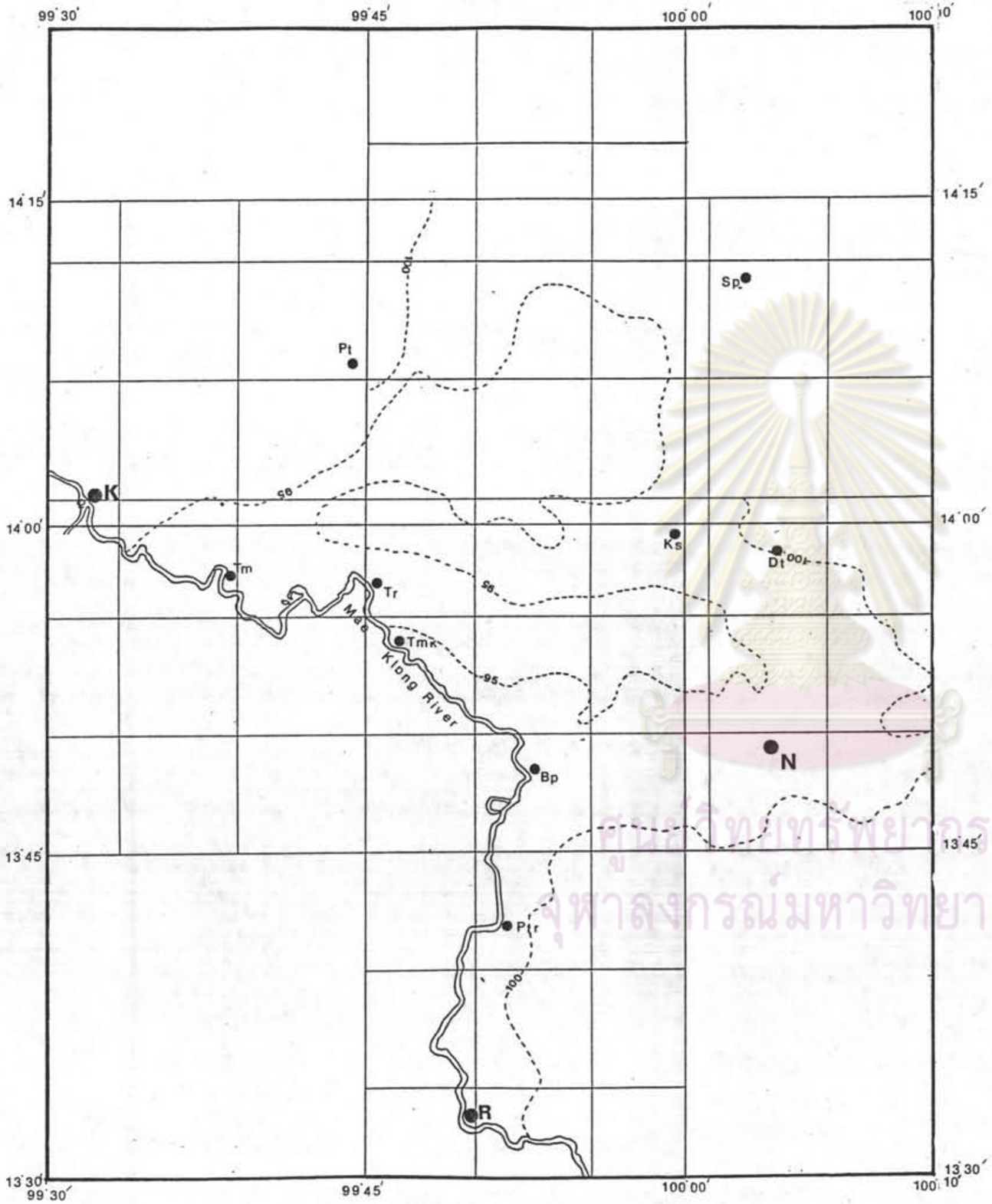
- The percentage contours of 600 microns sieve size are 35, 60 and 80 (Figure 5.4).

- The percentage contours of 300 microns sieve size are 10, 20, 30 and 40 (Figure 5.5).

- The percentage contours of 150 microns sieve size are 5, 10 and 15 (Figure 5.6).

b. Bring percentage values which pass sieve sizes as in (B) and plots the percentage values of each pit on the sand percentage contour map.

c. The percentage contour line will be drawn following section (a.) and the contour will be controlled by drainages of the study area.



EXPLANATION

88 Sand Percentage Contour

● Changwat

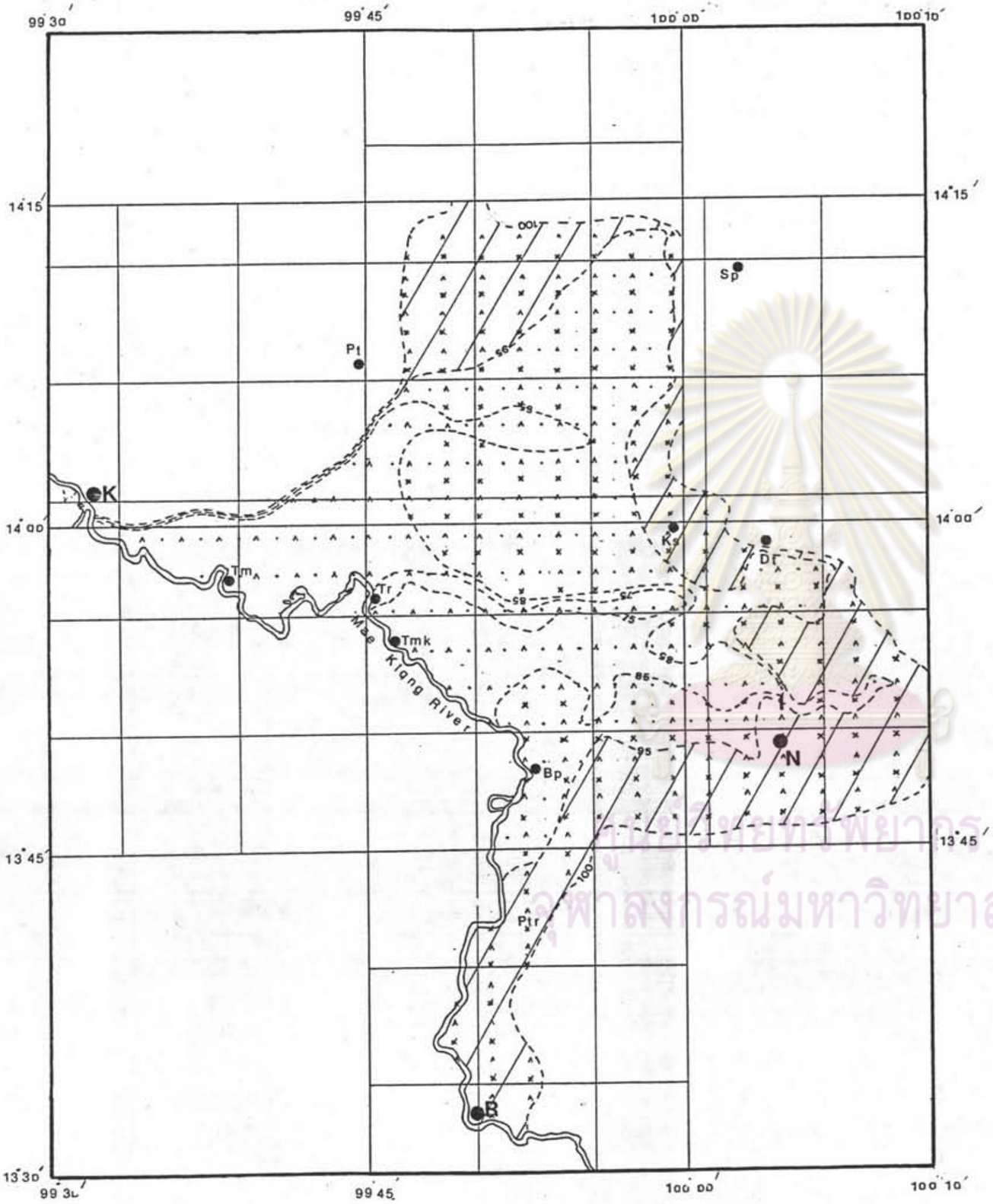
K Kanchanaburi
N Nakhon Pathom
R Ratchaburi

● Amphoe

Sp Song Phi Nong
Pt Phanom Thuan
Tm Tha Muang
Tr Tha Rau
Tmk Tha Maka
Ks Kamphaeng Saen
Dt Don Tum
Ptr Photharam
Bp Ban Pong

Scale 1:400,000

Figure 5.1 Percentage contour map passing sieve size 4.75 millimeters



EXPLANATION

28 Sand Percentage Contour

60 - 90 Sand Percentage in Grading Zone I

75 - 100 Sand Percentage in Grading Zone II

85 - 100 Sand Percentage in Grading Zone III

95 - 100 Sand Percentage in Grading Zone IV

● Changwat

K Kanchanaburi N Nakhon Pathom

R Ratchburi

● Amphoe

Sp Song Phi Nong Pt Phanom Thuan

Tm Tha Muang Tr Tha Rau

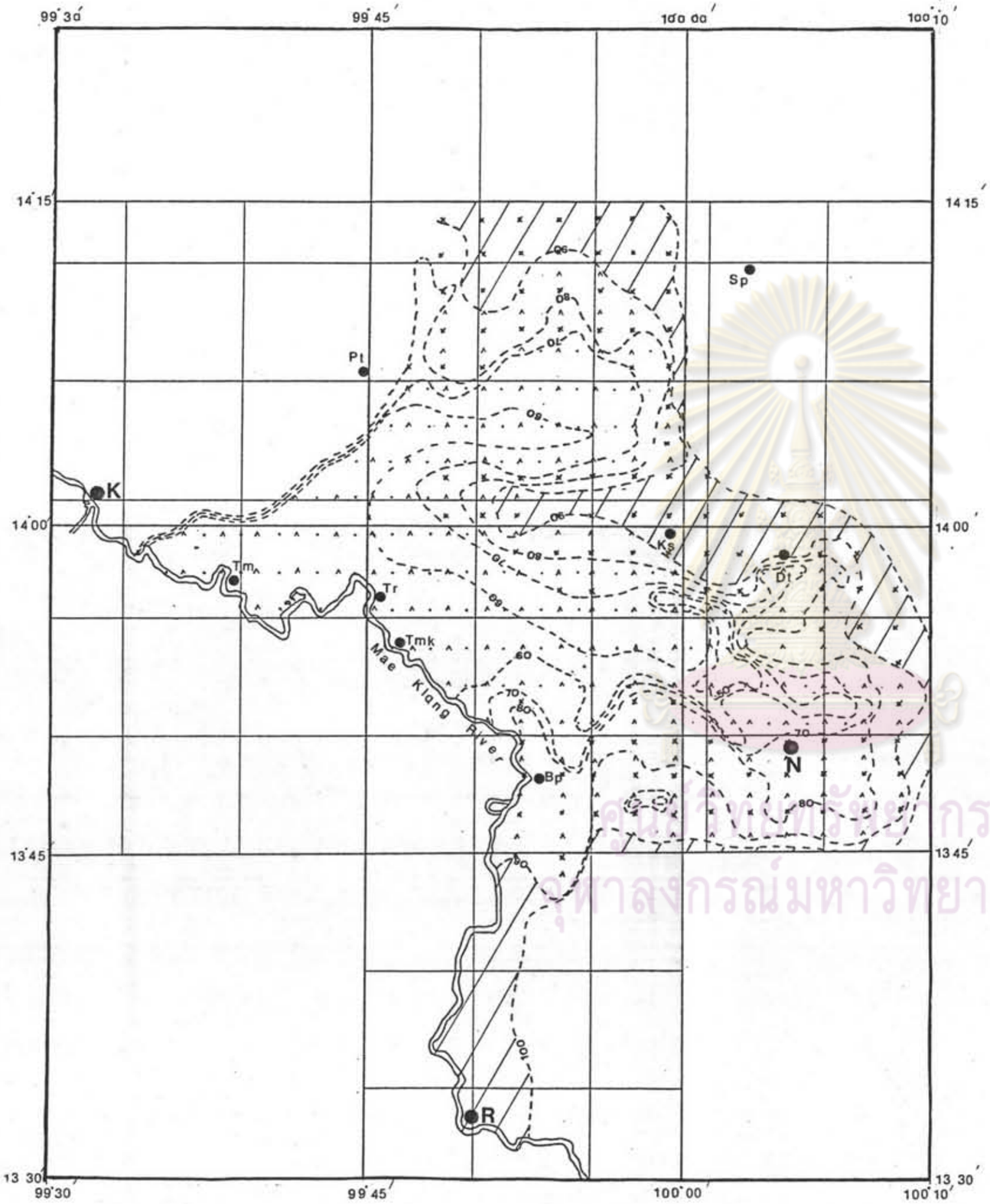
Tmk Tha Maka Ks Kamphaeng Saen

Dt Don Tum Ptr Photharam

Bp Ban Pong

Scale 1:400,000

Figure 5.2 Percentage contour map passing sieve size 2.36 millimeter.



EXPLANATION

22 Sand Percentage Contour

30 - 70 Sand Percentage in Grading Zone I

55 - 90 Sand Percentage in Grading Zone II

75 - 100 Sand Percentage in Grading Zone III

90 - 100 Sand Percentage in Grading Zone IV

● Changwat

K Kanchanaburi N Nakhon Pathom

R Ratchaburi

• Amphoe

Sp Song Phi Nong Pt Phanom Thuan

Tm Tha Muang Tr Tha Rau

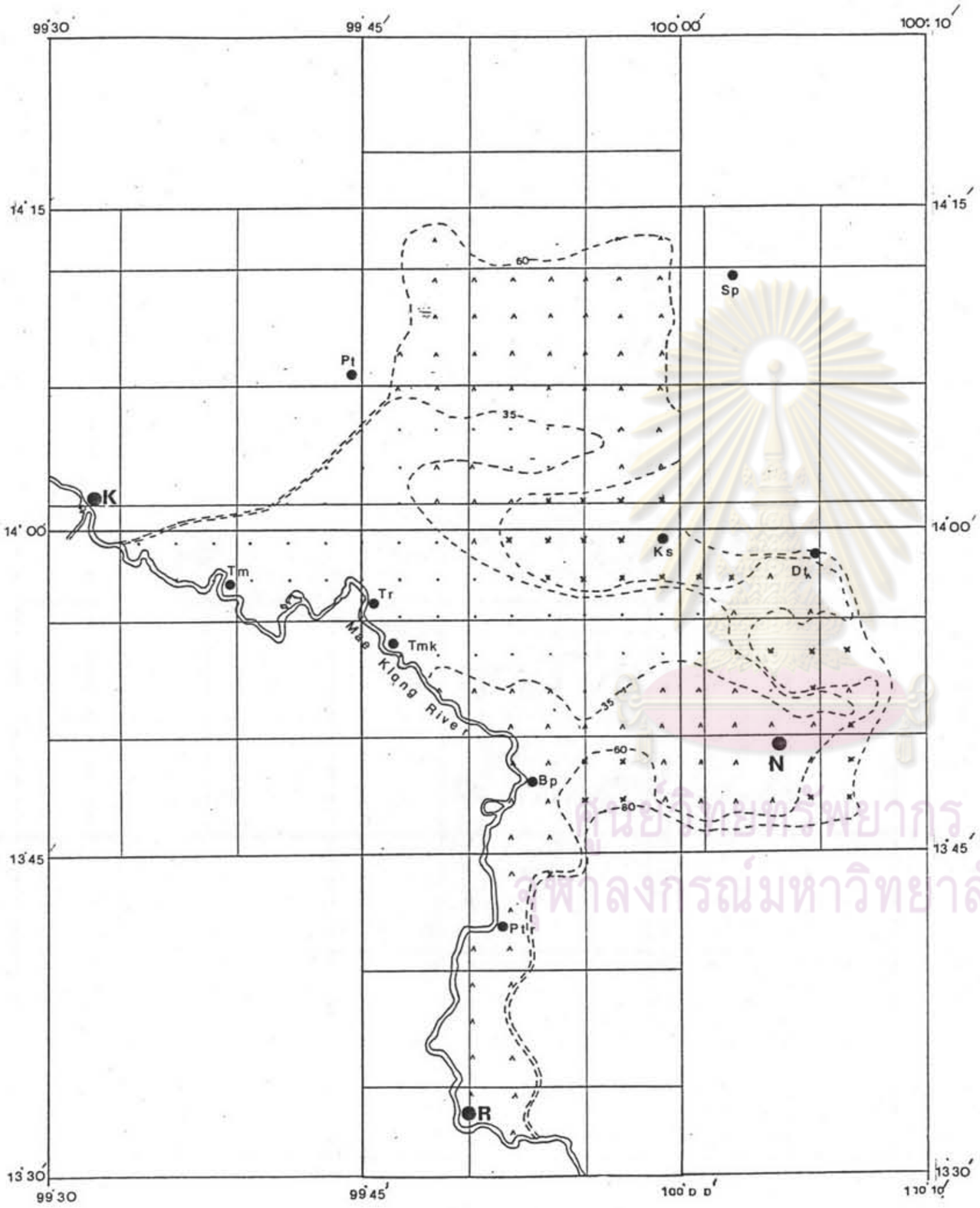
Tmk Tha Maka Ks Kamphaeng Saen

Dt Don Tum Ptr Photharam

Bp Ban Pong

Scale 1:400,000

Figure 5.3 Percentage contour map passing sieve size 1.18 millimeter.



EXPLANATION

67 Sand Percentage Contour

15 - 35 Sand Percentage in Grading Zone I

35 - 60 Sand Percentage in Grading Zone II

60 - 80 Sand Percentage in Grading Zone III

80 - 100 Sand Percentage in Grading Zone IV

● Changwat

K Kanchanaburi
N Nakhon Pathom
R Ratchaburi

● Amphoe

Sp Song Phi Nong
Pt Phanom Thuan
Tm Tha Muang
Tr Tha Rau
Tmk Tha Maka
Ks Kamphaeng Saen
Dt Don Tum
Ptr Photharam

Bp Ban Pong

Scale 1:400,000

Figure 5.4 Percentage contour map passing sieve size 600 microns

EXPLANATION

87 Sand Percentage Contour

● Changwat

K Kanchanaburi
N Nakhon Pathom
R Ratchaburi

● Amphoe

Sp Song Phi Nong
Tm Tha Muang
Tmk Tha Maka
Dt Don Tum
Pt Phanom Thuan
Tr Tha Rau
Ks Kamphaeng Saen
Ptr Photharam

Bp Ban Pong

Scale 1:400,000

Figure 5.6 Percentage contour map passing sieve size 150 microns

d.In each percentage contour map put symbol of the lowest and the higest contours which are equivalent to the highest and lowest values of each grading zone. The lowest and highest contour lines are boundaries of each grading zone which overlaps to the others (Figures 5.2 to 5.5).

e. Overlay percentage contour maps together then draws boundaries of the area of the same symbol for all four maps.

By this method, The Grading Zones I, II, III and IV are mapped as shown in Figure 5.7.

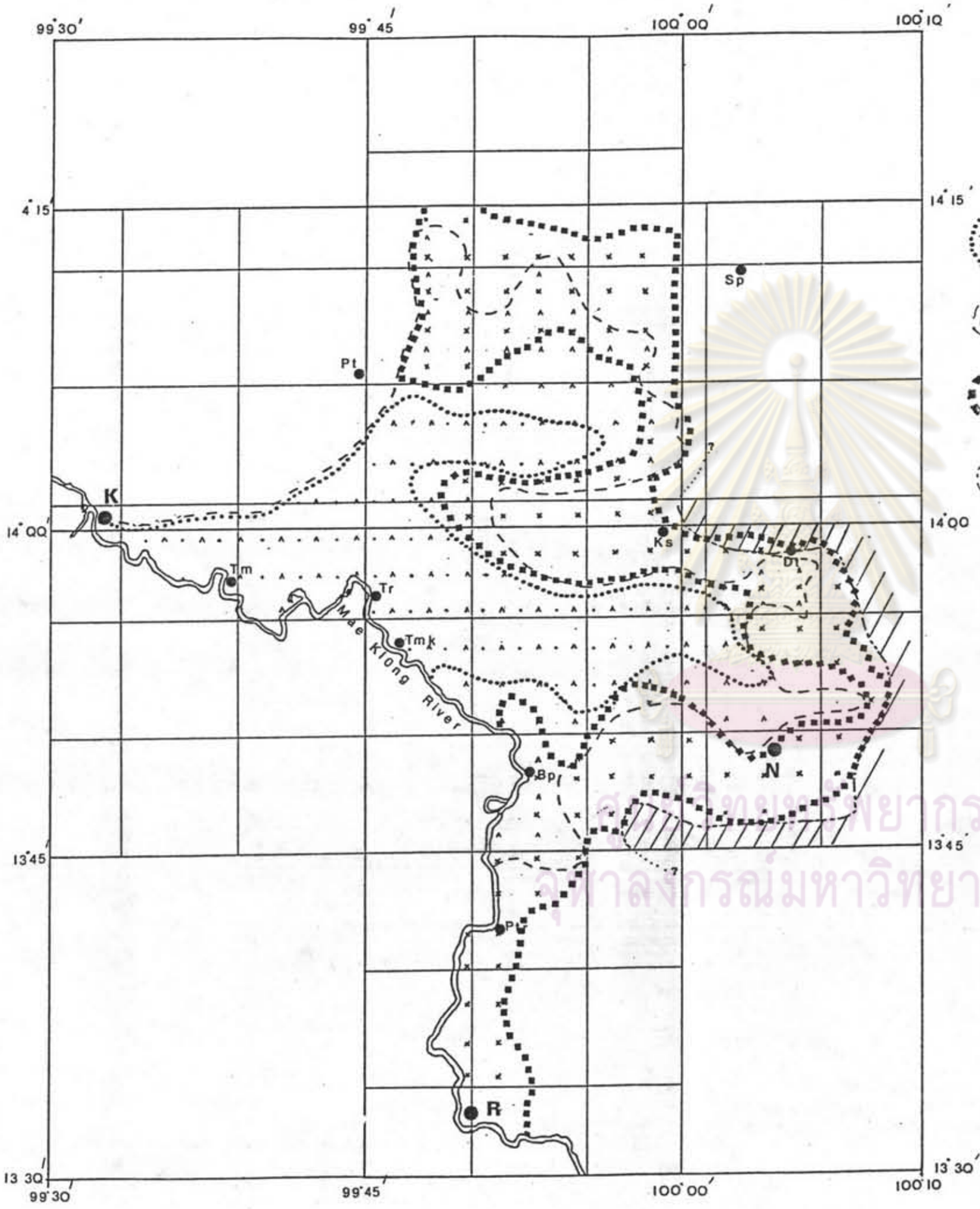
Note : The percentage contour maps of 4.75 mm. and 150 microns sieve size were not overlayed with the others because the lowest and the highest contours cover all grading zones.

5.2.2 Grading Zones by Cumulative Frequency Curve Method

By this method, fine aggregate for concrete can be mapped into Grading Zones I, II, III and IV by using cumulative frequency curve specified in BS 882 (Figure 5.8) which is the same as TIS - 566 - 2528.

5.2.2.1 Cumulative frequency curve mapping Technique

a) Preparing the standard curve from gradation of grading zone I, II, III, and IV in T.I.S system. From



EXPLANATION

- Boundary of Grading Zone I
- Boundary of Grading Zone II
- Boundary of Grading Zone III
- Boundary of Grading Zone IV
- Symbols of Grading Zone I overlap Grading Zone II
- Symbols of Grading Zone II overlap Grading Zone III
- Symbols of Grading Zone III overlap Grading Zone IV

● Changwat

K Kanchanaburi N Nakhon Pathom

R Ratchaburi

● Amphoe

Sp Song Phi Nong Pt Phanom Thuan

Tm Tha Muang Tr Tha Rau

Tmk Tha Maka Ks Kamphaeng Saen

Dt Don Tum Ptr Photharam

Bp Ban Pong

Scale 1:400,000

Figure 5.7 Grading Zone map by overlaying percentage contour

Table 3.4 grading zone I, II, III and IV have gradation values of each grading zone, plot the areas on the semilograritermic paper (transparent paper).

The curves show on semilogarithmic paper (Figure 5.8) are the gradation of grading zones. Each curve series have low limit on left hand and high limit on right hand of percentage by weight passing.

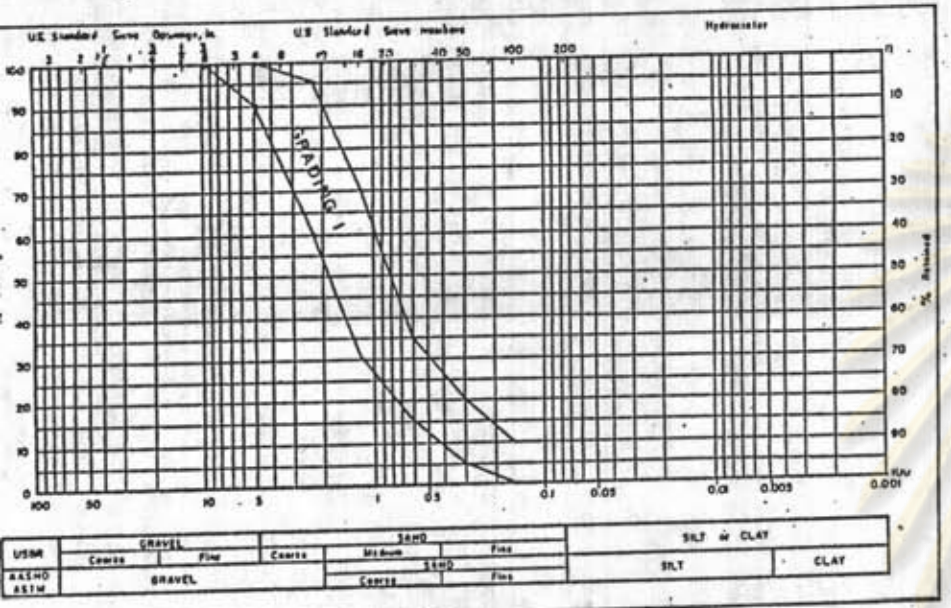
b) Take the transparent paper of standard curve and overlay the percentage by weight passing curve of each sample compare with curve of the samples. By this method the lines of grading zone is obtained. Plot the number of that grading zone. If the cumulative frequency curves of the samples fall in many grading zones, give the numbers of those grading zones.

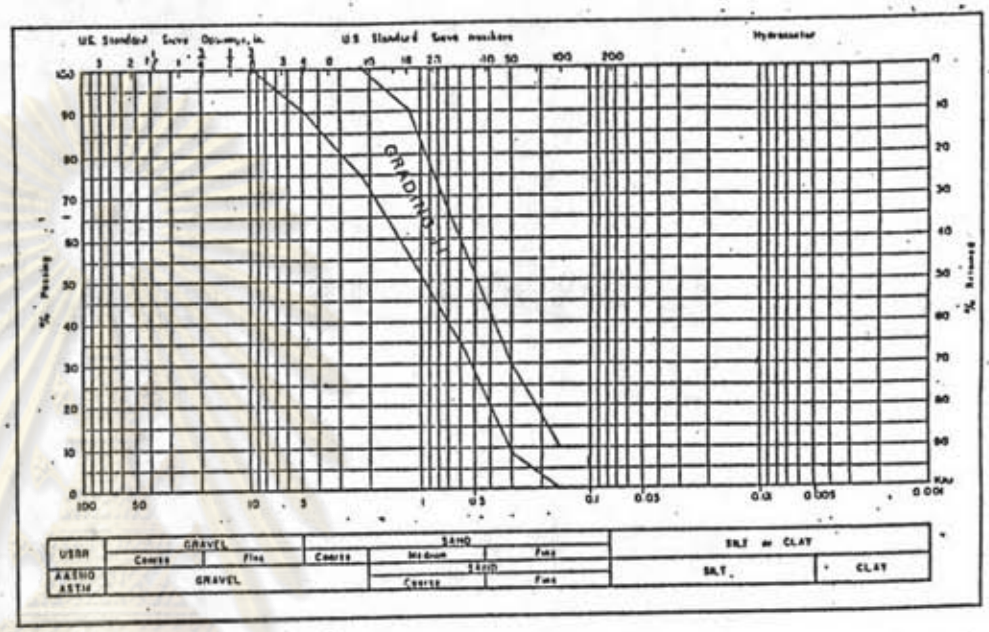
By this method the cumulative frequency curves of samples can be grouped into Grading Zones I,II,III and IV.

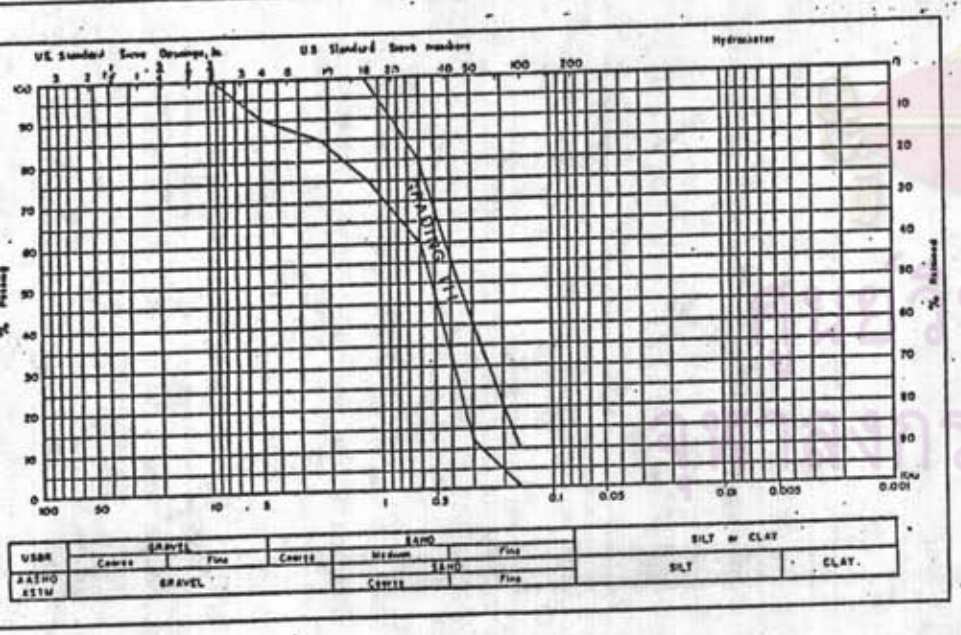
5.2.2.2 Technique for Producing Grading Zone Map

This technique is as the following .

a) Put symbols of the areas in the grading zone (Figure 5.9). In the map the circle symbol is divided into four parts that represent grading zones I, II, III and IV. Plot the circle symbols on the location of drill holes. In this way the locations of samples of the







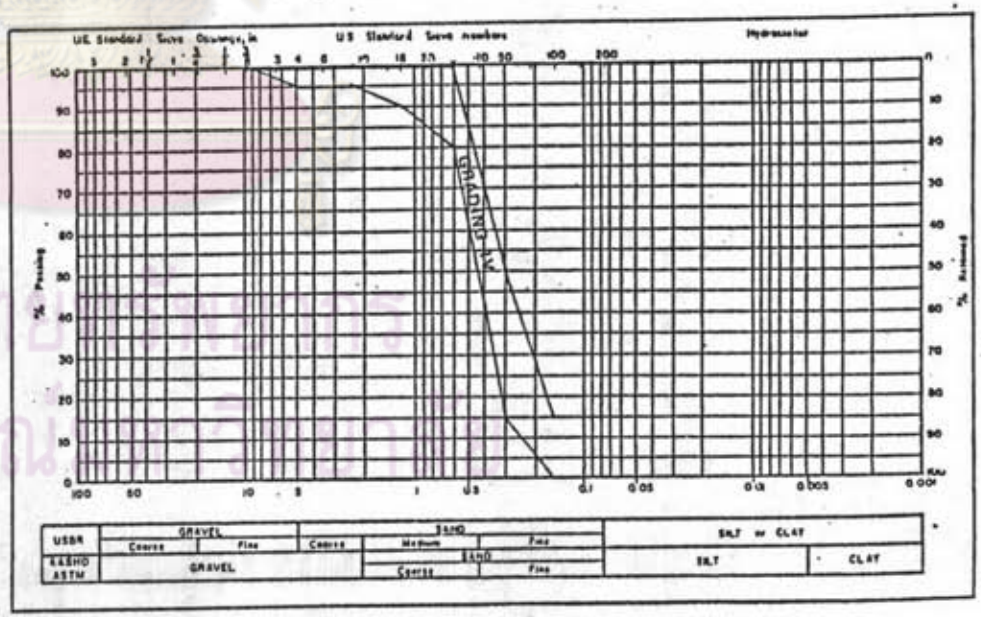


Figure 5.8 Limits of the Grading Zone in B.S. 882 1954
same TIS. 566-2528 (After BRS Digest 108,1958)

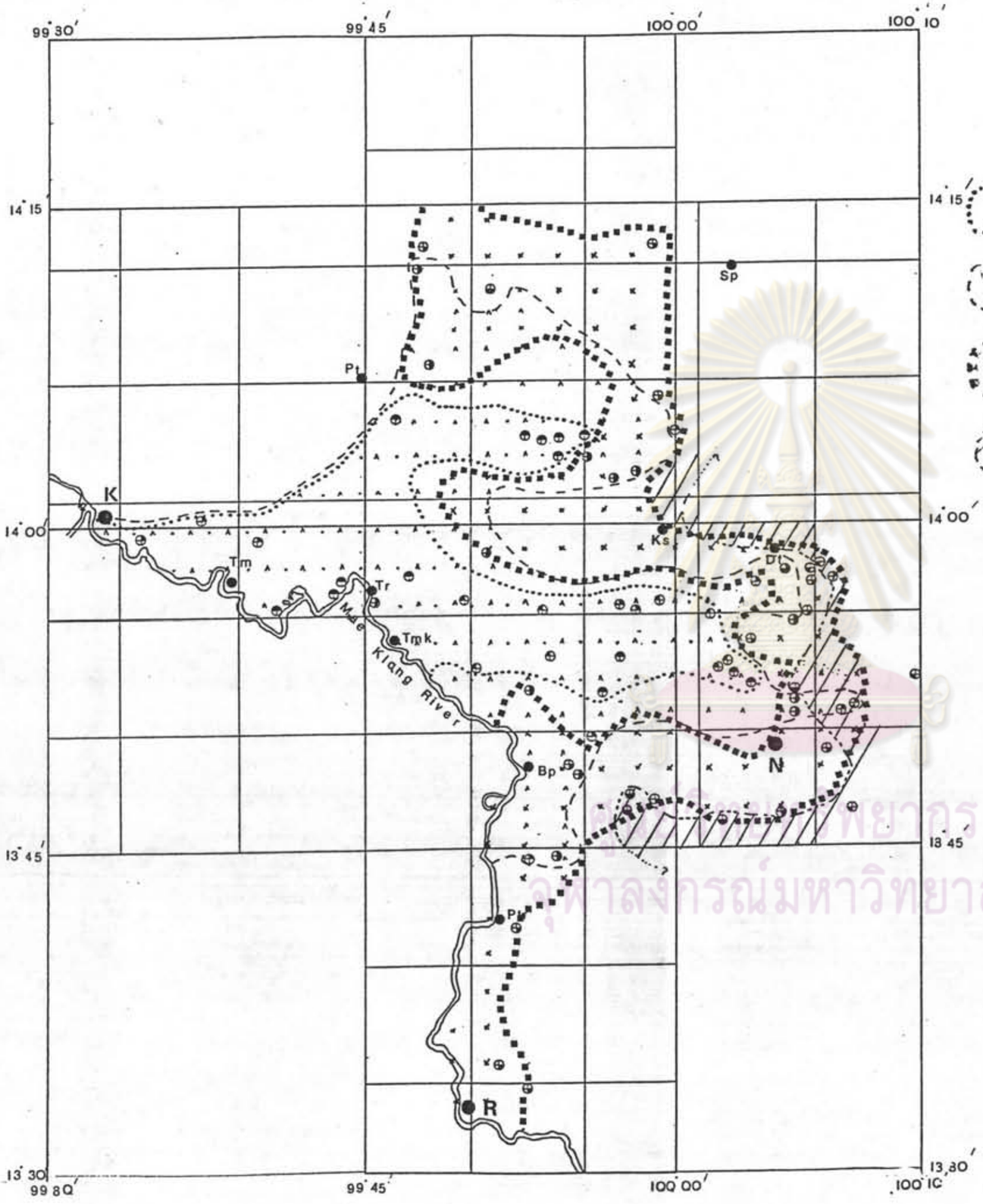
deposits and types of grading zone are obtained.

b) Draw the boundary of the same grading zone of the deposits by using drainages and locations of samples (drill holes).

Finally the grading zones I, II, III and IV of fine aggregate are mapped (Figure 5.9).

5.3 Comparison of Grading zone map by percentage contourline method and by cumulative frequency curve method

The grading zone maps of fine aggregate produce by standard cumulative frequency curve and produce by percentage contourline (Figure 5.7 and 5.9), the boundaries of each Grading Zone are found to be nearly identical.



EXPLANATION

Boundary of Grading Zone I

Boundary of Grading Zone II

Boundary of Grading Zone III

Boundary of Grading Zone IV

Symbols of Grading Zone I overlap Grading Zone II

Symbols of Grading Zone II overlap Grading Zone III

Symbols of Grading Zone III overlap Grading Zone IV

Bore hole Location in Grading Zone I

Bore hole Location In Grading Zone II

Bore hole Location in Grading Zone III

Bore hole Location in Grading Zone IV

Changwat

K Kanchanaburi N Nakhon Pathom

R Ratchaburi

Amphoe

Sp Song Phi Nong Pt Phanom Thuan

Tm Tha Muang Tr Tha Rae

Tmk Tha Maka Ks Kamphaeng Saen

Dt Don Tum Ptr Photharam

Bp Ban Pong

Scale 1:400,000

Figure 5.9 Grading Zone map follows the grading zones specified by B.S. 882: 1954. The map also shows the grading zones bore hole locations

CHAPTER VI

GRAINS SIZE DISTRIBUTION

6.1 Methods of Investigation

For 105 samples the sieve method was used. The fraction 25 to 0.075 mm. was determined by sieve method. The samples are sieved in the Ro-Tap automatic shaking apparatus, containing 9 sieves with Woven wire meshes, with the exception of the coures size sieve which is sheet screen. The diameters used are 25 mm., 19 mm., 12.5 mm., 9.5 mm., 4.45 mm., 2.0 mm., 0.425 mm., 0.15 mm. and 0.075 mm. In this way a general ided of the grain size distribution is obtained.

6.2 Graphical Representation and Statistical Values

For persenting the grain size distribution of the various sediments found in the investigated area cumulative frequency curves have been mostly used; histograms have only been applied in some special cases. The height of the bars, and not the surfaces represent the respective weight percentages of each size class.

The graps chosen for the cumulative curves are those having along their Y-axis and the weight percentages on an arithmetical scale.

The following statistical values were determined: Md(median or 50 percentile), Q3 (25 percentile of the cumulative curve), Q1 (75 percentile), So (coefficient of sorting :$\sqrt{Q3/Q1}$) and Sk (coefficient of skewness, symmetry $Q3Q1 / Md^2$) in its form 10logSk. Following Trask(1932), sediments with a So - value of 2.5 and smaller have been called well sorted, of 3.0 to 4.0 normally sorted, and of 4.5 and greater poorly sorted. When using the value 10 logSk for the symmetry, 0 (zero) means a perfect symmetry; positive values indicate a skewness whereby coarse admixtures exceed the fine, negative values indicate the converse.

6.2.1 Grain Size Distribution in Grading Zone I Area.

In this area, sand deposits are concentrated along the Mae Klong, Huai Krot and Huai Laeng of fanhead and midfan of Kanchanaburi Alluvial Fan. These drainages lie 28 to 8 m. above mean sea level.

Sand is the main percentage content of the particle size fraction in sample. The size greater than coarse sand (>2.0 mm.) fraction varies from 5% to 41% and with a mean value of 23%. The coarse sand (2.0 to 0.5 mm.) varies from about 37% to 61% and with a mean value of 53%. The median sand (0.5 to 0.25 mm.) varies from about 7% to 32% and with a mean value of 15% . The fine sand (0.25 to 0.0625 mm.) varies from about 4% to 17% and with a mean

value of 11%

Grain size distribution of samples are presented as frequency histograms in Figure 6.1 The histograms show unimodal and bimodal characters and the maximum size class is coarse sand.

Statistical values of samples from cumulative frequency curves are presented in Table 6.1 From the Table 6.1 Q1-first quartile varies from 0.37 mm. to 0.7 mm., and with a mean value of 0.48 mm. Md-median varies from 0.76 mm to 1.6 mm., and with a mean value of 0.95 mm. Q3-third quartile varies from 1.4 mm. to 3.6 mm., with a mean value of 1.96 mm. The degree of So-sorting varies from 1.737 to 3.873, that is sorting is well sorted(<2.5) to normally sorted (2.5 to 4.5). The skewness (log10 Sk near Zero)in the distribution indicated that coarse sand is predominant.

6.2.2 Grain Size Distribution in Grading Zone II Area

In Grading Zone II area, it covers Grading Zone I area and part of Grading Zone III area. Sand deposits concentrated along drainage lines of fanhead, midfan and lower fan of Kanchanaburi Alluvial Fan. These drainages lie 28 to 6 meters above mean sea level of the Mae Klong ,Huai Krot and Huai Laeng .

Sand is the main percentage content of the

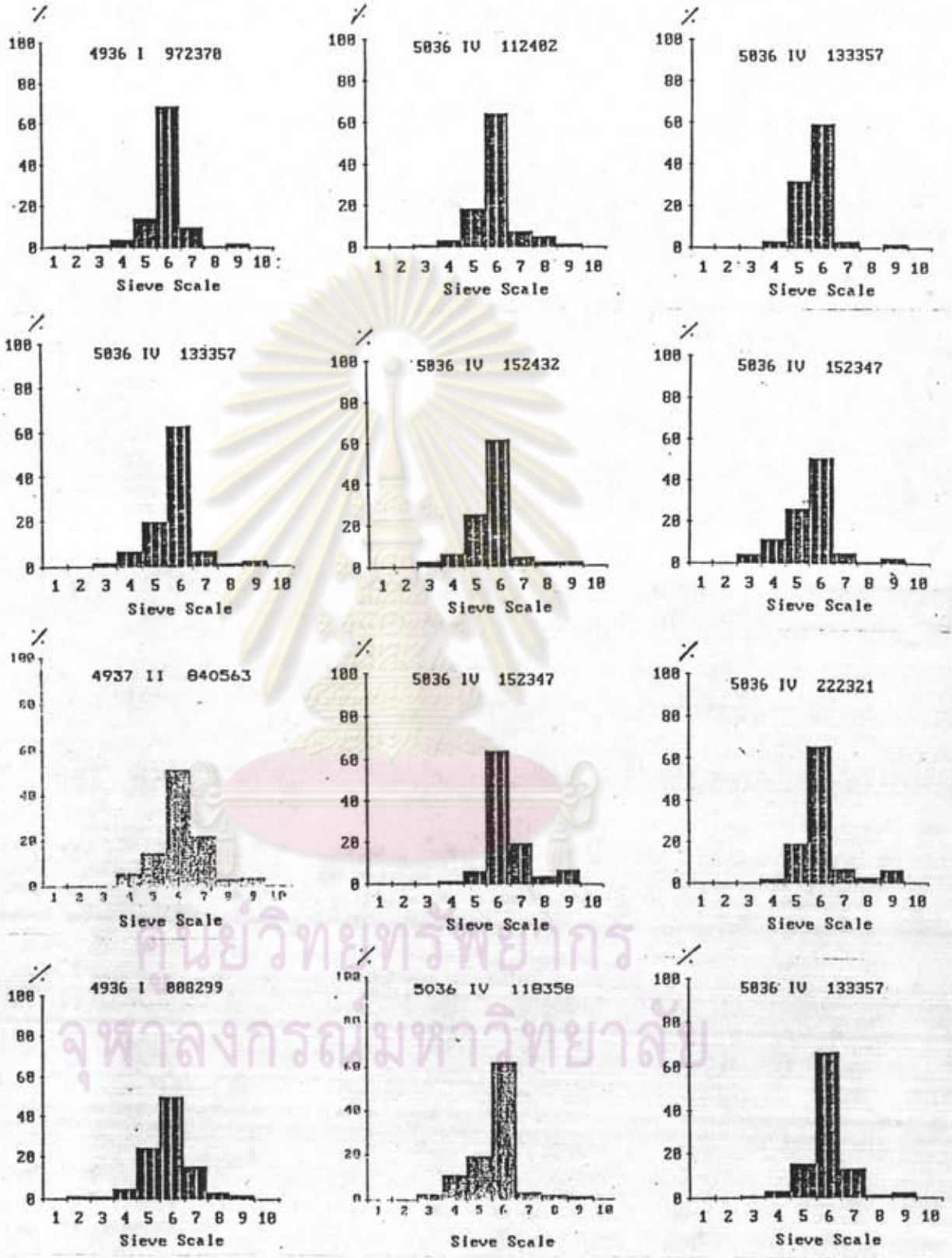


Figure 6.1 Size frequency distribution of sediments froms Grading Zone I No.1 to 10 are sieve scale 1",3/4",1/2",3/8",4#,10#,50#,100#, 200# and less than 200#

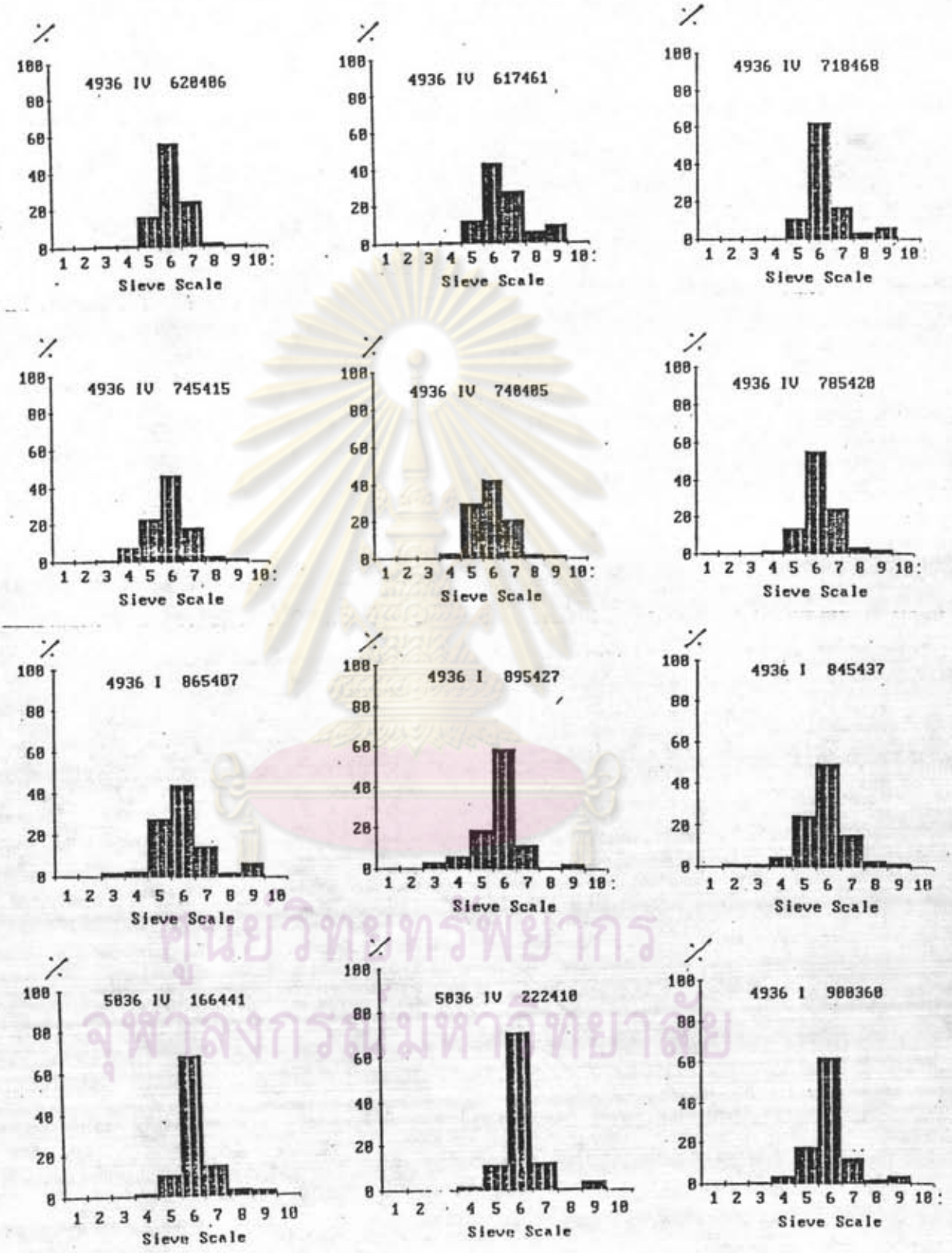


Figure 6.1 Cont.

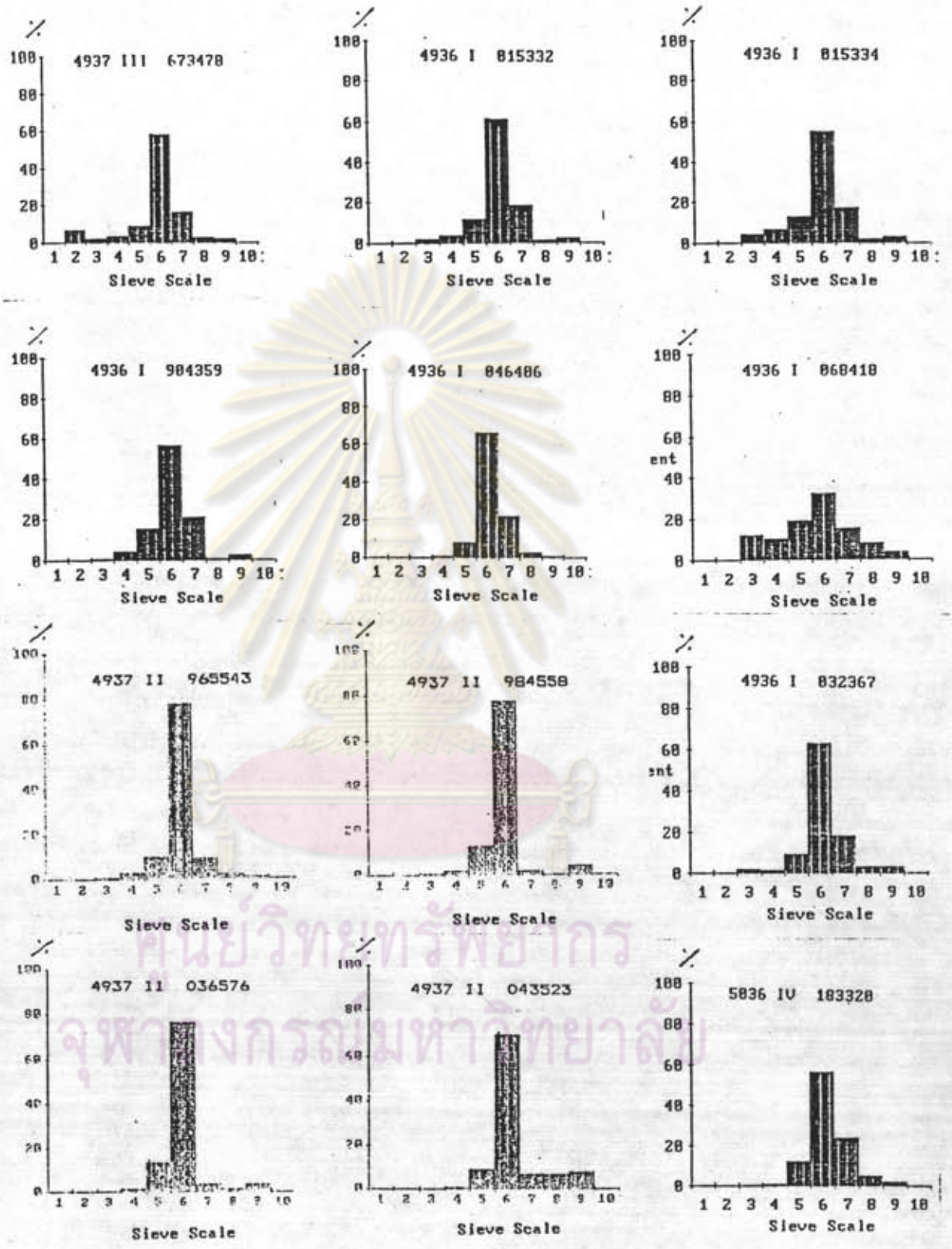


Figure 6.1 Cont.

Table 6.1 Statistical values of sediments in Grading Zone I

Topographic Map	Grid Reference	Q1	Md	Q3	So	Sk
Elevation 27 to 18 metres above mean sea level						
4936 IV	620460	0.39	0.80	1.70	2.0878	1.0178
	625460	0.48	0.92	1.90	1.9896	1.0380
	740405	0.41	1.00	2.60	2.5182	1.0325
	745415	0.47	1.10	2.70	2.3968	1.1536
	718468	0.42	0.76	1.50	1.8898	1.0444
4937 III	673478	0.48	0.90	1.80	1.9365	1.0328
Elevation 18 to 11 metres above mean sea level						
4936 I	845437	0.47	1.25	2.70	2.3968	0.9012
	846435	0.55	1.20	2.40	2.0889	0.9574
	865407	0.42	1.10	2.60	2.4880	0.9500
	895427	0.56	0.97	1.80	1.7928	1.0350
	913457	0.50	0.91	1.70	1.8439	1.0131
Elevation 11 to 8 metres above mean sea level						
4936 I	015332	0.45	0.84	1.70	1.9437	1.0294
	016336	0.45	0.91	1.95	2.0817	1.0294
	032369	0.42	0.78	1.50	1.8898	1.0179
	046406	0.44	0.76	1.50	1.8464	1.0689
	904359	0.42	0.83	1.70	2.0119	1.0181
	972369	0.55	0.97	1.80	1.8091	1.0258

Table 6.1 Continue

Topographic Map	Grid Reference	Q1	Md	Q3	So	Sk
4937 II	043523	0.59	0.96	1.52	1.6051	0.9865
	973478	0.48	0.90	1.80	1.9365	1.0328
	998554	0.46	0.80	1.65	1.8939	1.0890
	999558	0.37	0.98	1.70	2.1435	0.8093
Elevation 8 to 6 metres above mean sea level						
5036 IV	112402	0.52	0.93	1.80	1.8605	1.0403
	118358	0.66	1.30	2.90	2.0962	1.0642
	131359	0.59	1.30	2.30	1.9744	1.0438
	133347	0.53	0.80	1.60	1.7375	1.1511
	133357	0.70	1.40	2.80	2.00	1.0000
	152347	0.68	1.60	3.60	2.3009	0.9779
	152432	0.66	1.30	2.70	2.0226	1.0268
	153440	0.44	0.78	1.40	1.7838	1.0062
	166441	0.48	0.85	1.60	1.8257	1.0310
Average		0.48	0.95	1.96	2.0250	1.0215

particle size fraction of samples. The greater than coarse sand (>2.0 mm.) fraction varies from about 0% to 33% and with a mean value 11%. The coarse sand (2.0 to 0.5 mm) varies from about 37% to 68% and with a mean value 52%. The median sand (0.5 to 0.25mm.) varies from about 11% to 32% and with a mean value of 19%. The fine sand (0.25 to 0.0625 mm.) varies from about 4% to 27% and with a mean value of 16%.

Grain size distribution of samples are presented as frequency histograms in Figure 6.2. The histograms show bimodal and few of unimodal characters and the maximun size class are coarse sand. Bimodal characters indicate fluviatile deposits.

Statistical values of samples from cumulative frequency curves are presented in Table 6.2 From the Table 6.2 Q1-first quartile varies from 0.22 mm. to 0.55 mm, and with a mean value of 0.36 mm. Md-median varies from 0.39 to 0.98 mm., and with a mean value of 0.70 mm. Q3-third quartile varies from 0.76 to 2.1 mm., with a mean value of 1.40 mm. The degree of So-sorting varies from 1.4868 to 2.699, that is sorting is well sorted (<2.5). The Sk-skewness (log10 Sk near Zero) in the distribution indicated that coarse sand is predominant.

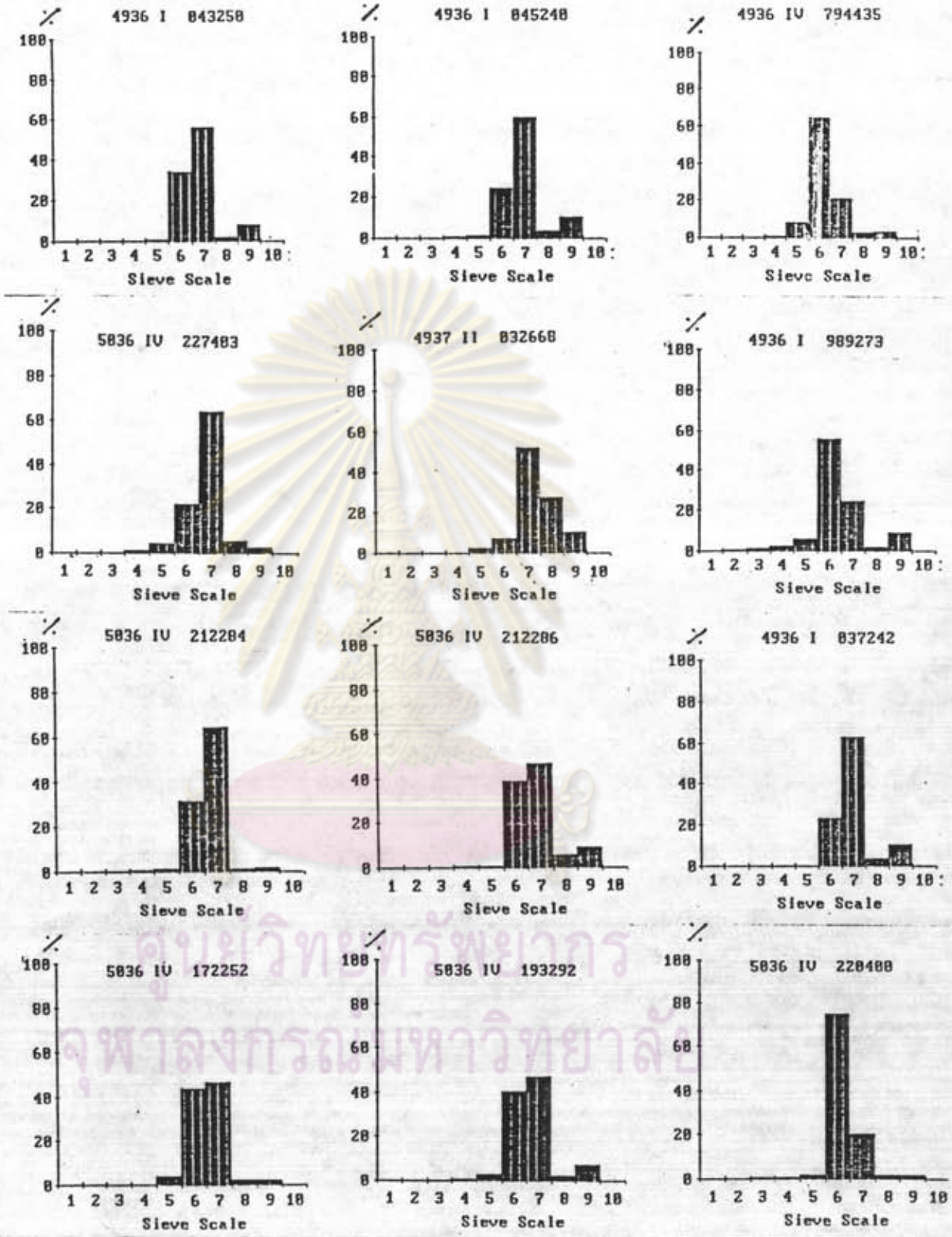


Figure 6.2 Size frequency distribution of sediments froms Grading Zone II No.1 to 10 are sieve scale 1",3/4",1/2",3/8",4#,10#,50#,100#, 200# and less than 200#

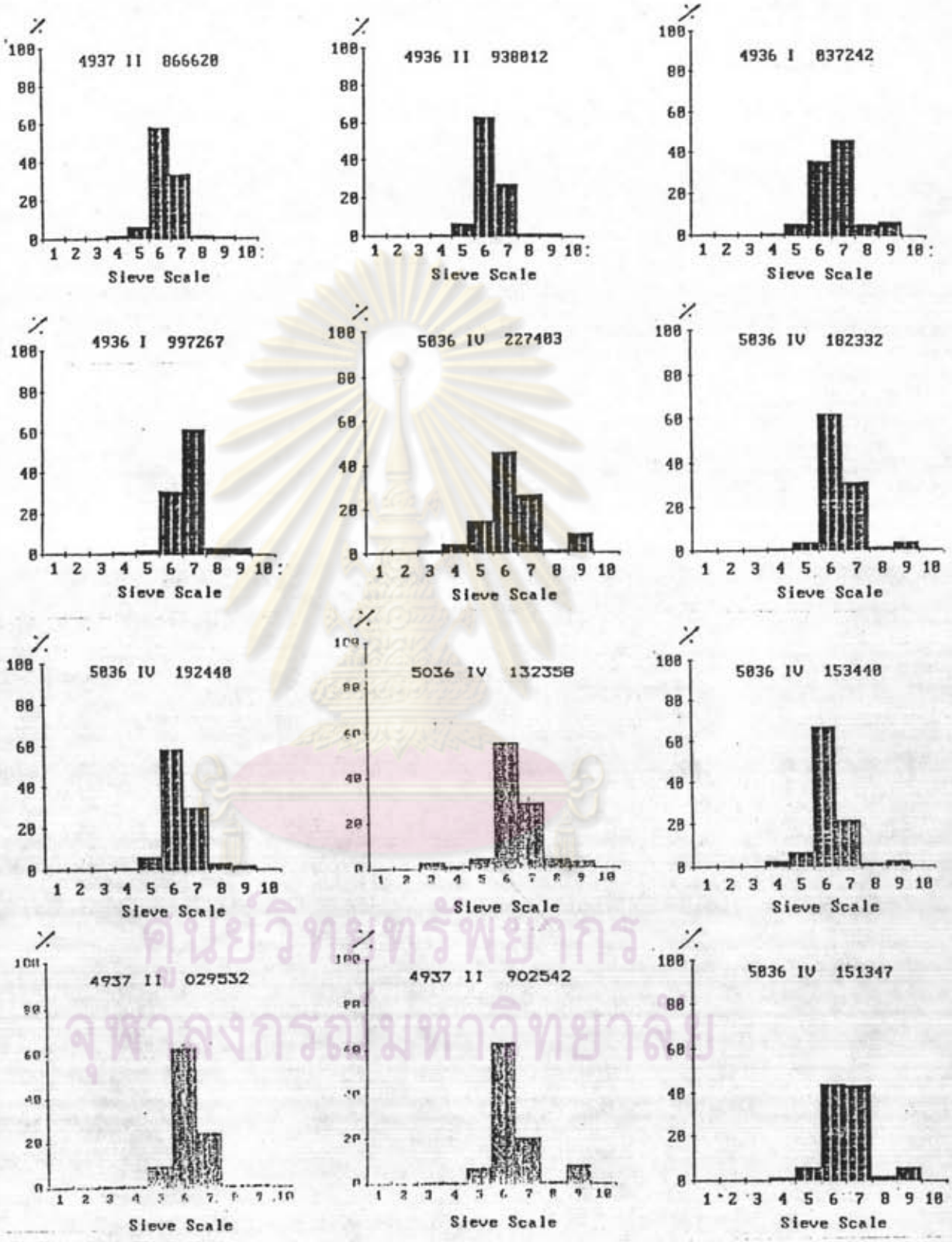


Figure 6.2 Cont.

Table 6.2 Statistical values of sediments in Grading Zone II

Topographic Map	Grid Reference	Q1	Md	Q3	So	Sk
Elevation 28 to 18 metres above mean sea level						
4936 IV	718468	0.42	0.76	1.50	1.8898	1.0444
	785420	0.33	0.75	2.00	2.4618	1.0832
	794435	0.39	0.74	1.40	1.8947	0.9985
4937 II	834573	0.38	0.77	1.50	1.9868	0.9805
	866620	0.30	0.60	1.30	2.0817	1.0408
Elevation 18 to 11 metres above mean sea level						
4936 I	895437	0.56	0.97	1.80	1.7928	1.0351
	913457	0.50	0.91	1.70	1.8439	1.0131
	873503	0.22	0.58	1.30	2.4309	0.9221
Elevation 11 to 8 metres above mean sea level						
4936 I	015332	0.45	0.84	1.70	1.9437	1.0294
	016336	0.45	0.91	1.95	2.0817	1.0294
	032369	0.42	0.78	1.50	1.8898	1.0179
	034413	0.26	0.53	1.30	2.2361	1.0969
	046406	0.44	0.76	1.50	1.8464	1.0689
	904359	0.42	0.83	1.70	2.0119	1.0181
	972369	0.55	0.97	1.80	1.8091	1.0258
4937 II	003539	0.40	0.64	0.76	1.5657	1.0786
	005566	0.32	0.56	0.97	1.7410	0.9949

Table 6.2 Continue

Topographic Map	Grid Reference	Q1	Md	Q3	So	Sk
4937 II	022542	0.31	0.55	1.05	1.8404	1.0373
	029532	0.42	0.66	1.09	1.6109	1.0252
	852704	0.29	0.65	1.30	2.1173	0.9446
	882730	0.28	0.63	1.30	2.1547	0.9577
4937 II	973478	0.48	0.90	1.80	1.9365	1.0328
	982547	0.39	0.62	0.96	1.5689	0.9869
	995559	0.38	0.62	0.84	1.4868	0.9110
	998554	0.46	0.80	1.65	1.8939	1.0890
Elevation 8 to 6 metres above mean sea level						
4936 I	008299	0.33	0.68	1.40	2.0597	0.9996
	034290	0.32	0.68	1.40	2.0917	0.9843
	990273	0.28	0.60	1.40	2.2361	0.9938
	918033	0.34	0.68	1.30	1.9554	0.9777
	938012	0.43	0.69	1.40	1.8044	1.1245
	954197	0.34	0.69	1.40	2.0292	0.9999
	112402	0.52	0.93	1.80	1.8605	1.0403
	132358	0.28	0.63	1.30	2.1547	0.9577
	152397	0.33	0.68	1.40	2.0597	0.9996
	153440	0.44	0.78	1.40	1.7838	1.0062
	153434	0.29	0.78	2.10	2.6909	1.0055
	166441	0.48	0.85	1.60	1.8257	1.0310
	222410	0.49	0.86	1.70	1.8626	1.0613
	227403	0.29	0.68	1.10	2.1409	1.2845

Table 6.2 Continue

Topographic Map	Grid Reference	Q1	Md	Q3	So	Sk
Elevation 5 to 4 metres above mean sea level						
4936 II	953995	0.39	0.68	1.30	1.8257	1.0471
	061728	0.28	0.63	1.30	2.1547	1.0055
	061725	0.29	0.60	1.20	2.0342	0.9832
	919689	0.30	0.57	1.10	1.9149	1.0078
	169255	0.29	0.59	1.20	2.0342	0.9999
	171253	0.24	0.39	0.93	1.9685	1.2119
	180330	0.46	0.67	1.30	1.6811	1.1542
	192440	0.30	0.63	1.30	2.0817	0.9913
Average		0.36	0.70	1.39	2.0420	1.0234

6.3.3 Grain Size Distribution in Grading Zone III Area

The grading Zone III area is overlapped with Grading Zone II and Grading Zone IV areas. Some samples of Grading Zone III are the same samples of Grading Zone II and Grading Zone IV. Sand deposits are concentrated along distributaries of main drainage lies of lower fan of Kanchanaburi Alluvial Fan and tidal flat of brackish clay. These distributaries of Huai Krot, Huai Laeng, Khlong Don Krabuang and Khlong Bang Pa lie 8 to 5 meters above mean sea level.

Sand is the main percentage content of the particle size fraction in sample. The size greater than coarse sand (>2.0mm.) varies from about 0 to 25% and with a mean value of 6%. The coarse sand (2.0 to 0.5 mm.) varies from about 33% to 65% and with a mean value of 44%. The medium sand (0.5 to 0.25mm.) varies from about 11% to 32% and with a mean value of 20%. The fine sand (0.25 to 0.0625 mm.) varies from about 4% to 33% and with a mean value of 17%.

Grain size distribution of samples are presented as frequency histograms in Figure 6.3. The histograms show unimodal and bimodal characters and maximum size class is coarse sand.

Statistical values of samples from cumulative frequency curves are presented in Table 6.3. From the Table 6.3 Q1-first quartile varies from about 0.21 to 0.42 mm., and with a mean value of 0.30 mm. Md-median varies from about 0.36 to 0.97 mm., and with a mean value of 1.21 mm. The degree of sorting (So) varies from 1.4152 to 2.6909 that is sorting is well sorted(<2.5). The Sk-skewness (log10 Sk near Zero) in the distribution indicated that coarse to medium sand is predominant.

6.2.4 Grain Size Distribution in Grading Zone IV Area.

The Grading Zone IV covers a small area and the zone is partly overlapped with Grading Zone III area. Some samples of Grading Zone IV are the same samples of Grading Zone III. Sand deposits concentrate along distributaries of drainage lies of tidal flat of brackish clay. The distributaries of Huai Krot, Huai Laeng, Khlong Don Krabuang and Khlong Bang Pa lie between 5 to 2 meters above mean sea level.

Sand is the main percentage content of the particle size fraction in sample. The coarse sand (2.0 to 0.5mm) fraction varies from about 9% to 29% and with a mean value 19%. The medium sand (0.5 to0.25 mm.) varies from about 29% to 48% and with a mean value of 40%. The fine sand (0.25 to 0.0625 mm.) varies from about 33% to 46% and with a mean value of 40%.

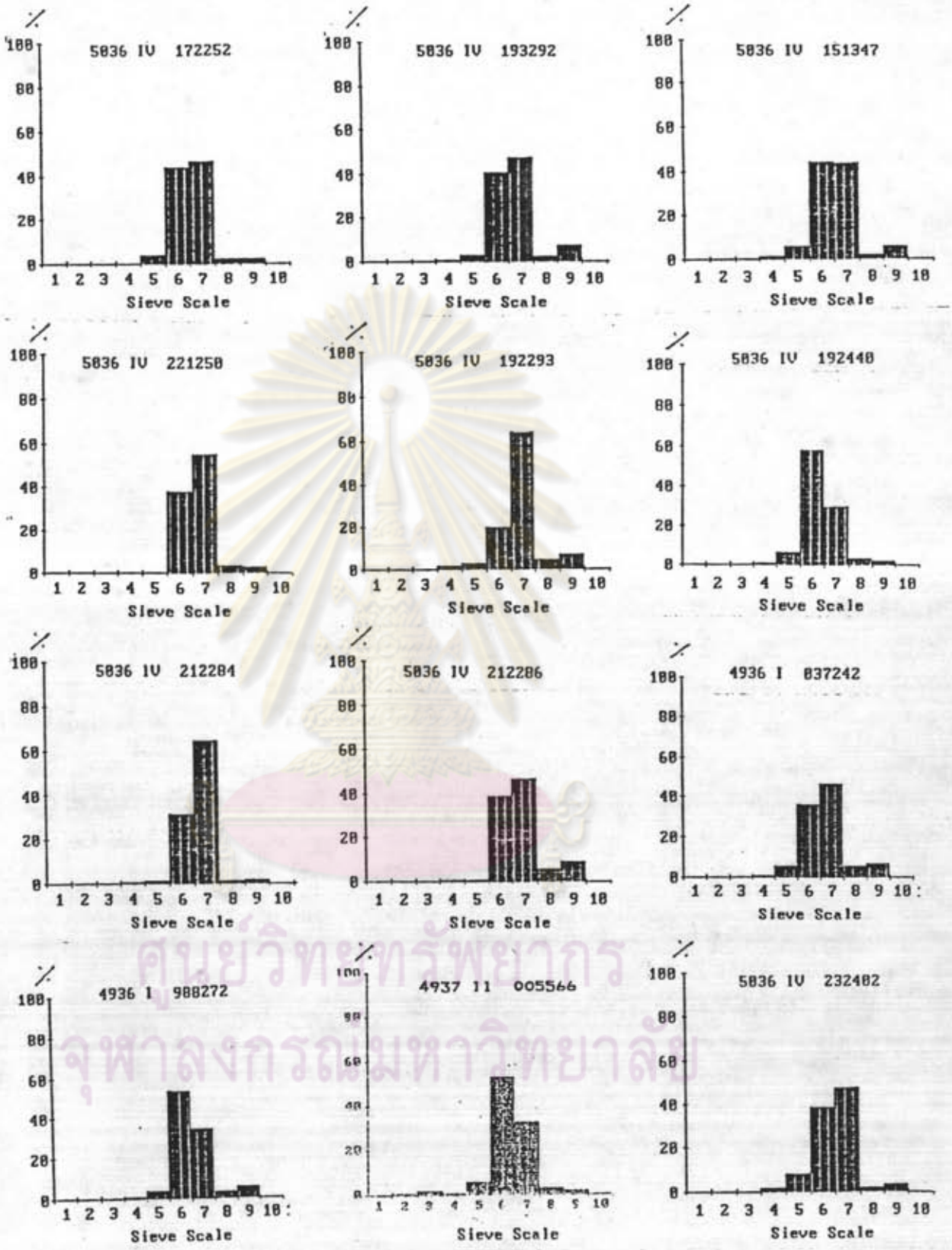


Figure 6.3 Size frequency distribution of sediments froms Grading Zone III No.1 to 10 are sieve scale 1",3/4",1/2",3/8", 4#,10#,50#,100#, 200# and less than 200#

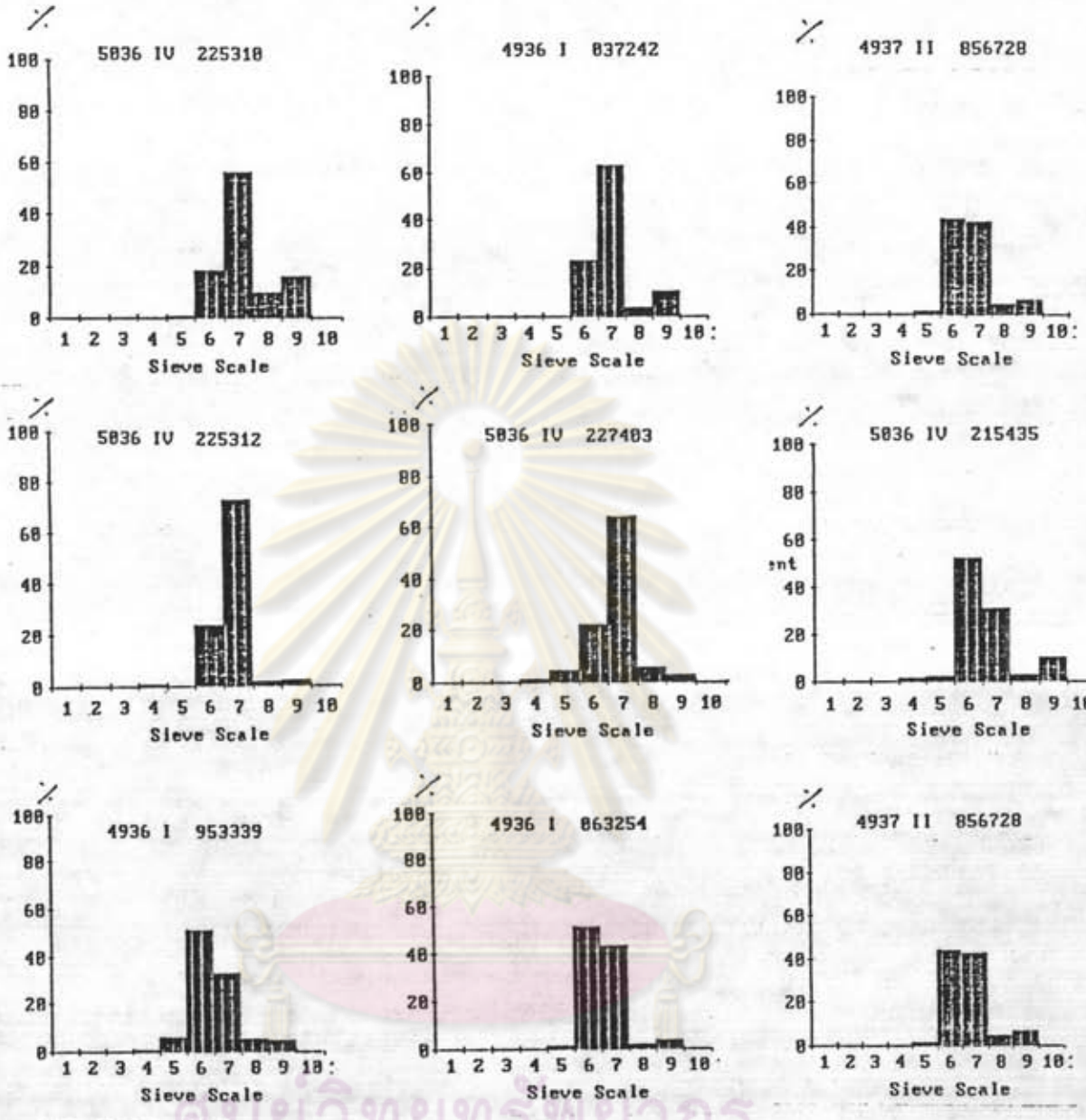


Figure 6.3 Cont.

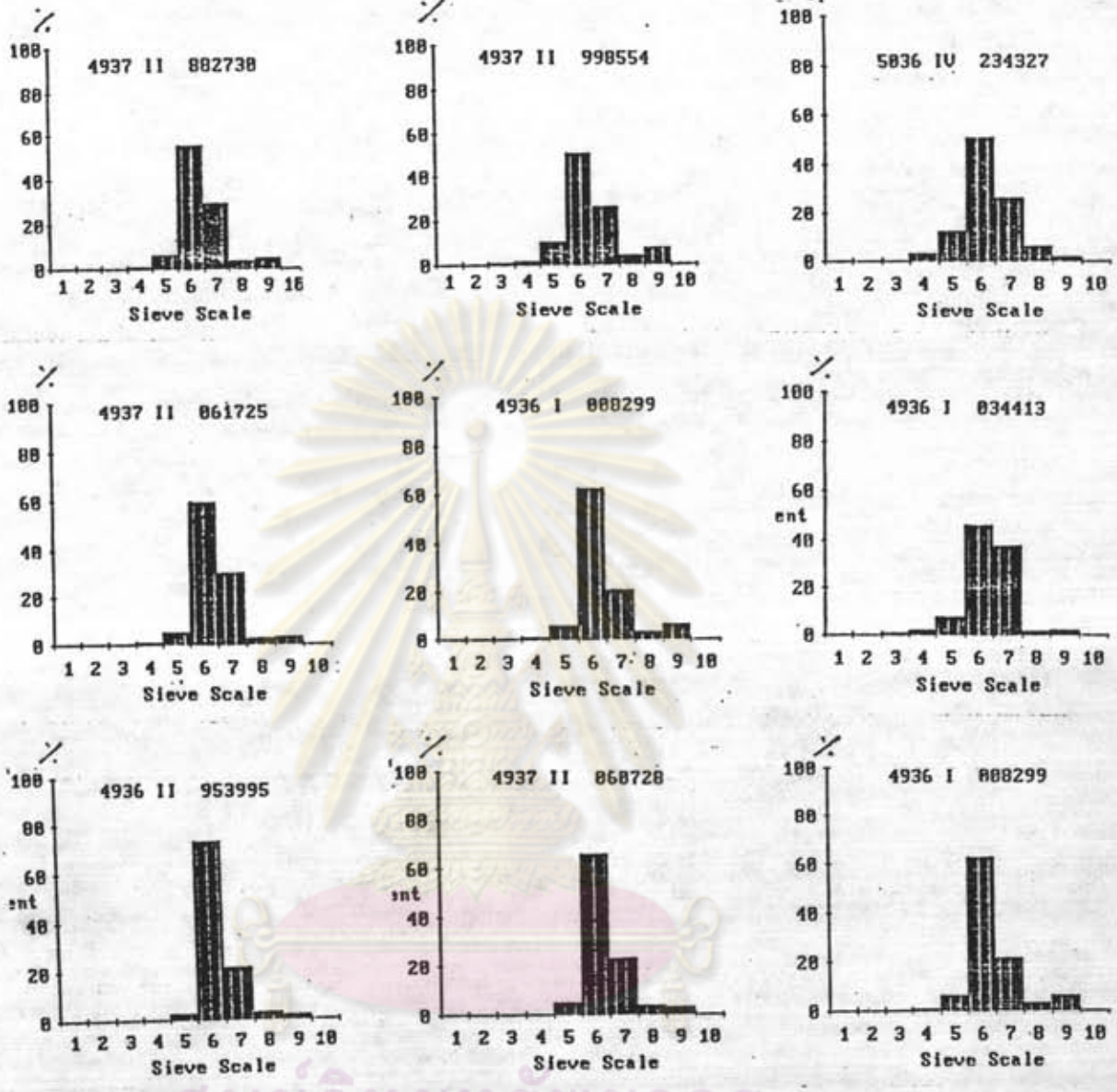


Figure 6.3 Cont.

Table 6.3 Statistical values of sediments in Grading Zone III

Topographic Map	Grid Reference	Q1	Md	Q3	So	Sk
Elevation 11 to 8 metres above mean sea level						
4936 I	034414	0.26	0.53	1.30	2.2361	1.0969
	952338	0.23	0.50	1.10	2.1869	1.0060
4937 II	003539	0.40	0.64	0.76	1.5657	1.0786
	005566	0.32	0.56	0.97	1.7410	0.9949
	022542	0.31	0.55	1.05	1.8404	1.0375
	029532	0.42	0.66	1.09	1.6109	1.0252
	852709	0.29	0.65	1.30	2.1173	0.9446
	856728	0.22	0.38	0.89	2.0113	1.1644
	882730	0.28	0.63	1.30	2.1547	0.9477
	982547	0.39	0.62	0.96	1.5689	0.9869
	995559	0.38	0.62	0.84	1.4868	0.9113
Elevation 8 to 6 metres above mean sea level						
4936 I	008299	0.33	0.68	1.40	2.0597	0.9996
	034240	0.32	0.68	1.40	2.0917	0.0943
	989271	0.21	0.38	0.97	2.1492	1.1877
	990273	0.28	0.63	1.40	2.2361	0.9938
	918033	0.34	0.68	1.30	1.9554	0.9777
	938012	0.43	0.69	1.40	1.8044	1.1245
	954197	0.34	0.69	1.40	2.0292	0.9999
5036 IV	132358	0.28	0.63	1.30	2.1547	0.9577
	148382	0.22	0.36	0.80	1.9069	1.1653

Table 6.3 Continue

Topographic Map	Grid Reference	Q1	Md	Q3	So	Sk
5036 IV	152347	0.33	0.68	1.40	2.0597	0.9996
	155434	0.29	0.78	2.10	2.6909	1.0005
	227403	0.29	0.68	1.70	2.4214	1.0326
	232402	0.24	0.40	1.10	2.1409	1.2845
Elevation 5 to 4 metres above mean sea level						
4936 I	063255	0.22	0.44	0.94	2.0671	1.0335
	064247	0.23	0.53	1.10	2.1869	0.9490
4936 II	953995	0.39	0.68	1.30	1.8257	1.0471
4934 II	061728	0.28	0.63	1.30	2.1547	1.0055
	061725	0.29	0.60	1.20	2.0342	0.9832
	919689	0.30	0.57	1.10	1.9149	1.0078
5036 IV	169255	0.29	0.59	1.20	2.0342	0.9499
	171253	0.24	0.39	0.93	1.9685	1.2119
	192440	0.30	0.63	1.30	2.0817	0.9913
	215435	0.22	0.50	1.10	2.2361	0.9839
Average.		0.30	0.58	1.21	1.9735	1.0360

Grain size distribution of samples are presented as frequency histograms in Figure 6.4 . The histograms show unimodal and bimodal characters and the maximum size classes are medium to fine sand.

Statisical values of samples from cumulative frequency curves are presented in Table 6.4. Q1-first quartile varies from about 0.17 to 0.22 mm. and with a mean value of 0.19 mm. Md-median varies from about 0.27 to 0.33 mm. and with a mean value of 0.29 mm. Q3-third quartile varies from about 0.37 to 0.68 mm. with a mean value of 0.47 mm. The degree of sorting (So) varies from 1.3955 to 1.7581 that is sorting is well sorted (<2.5). The skewness (log10 Sk near Zero) in the distribution indicated that medium to fine sand is predominant.

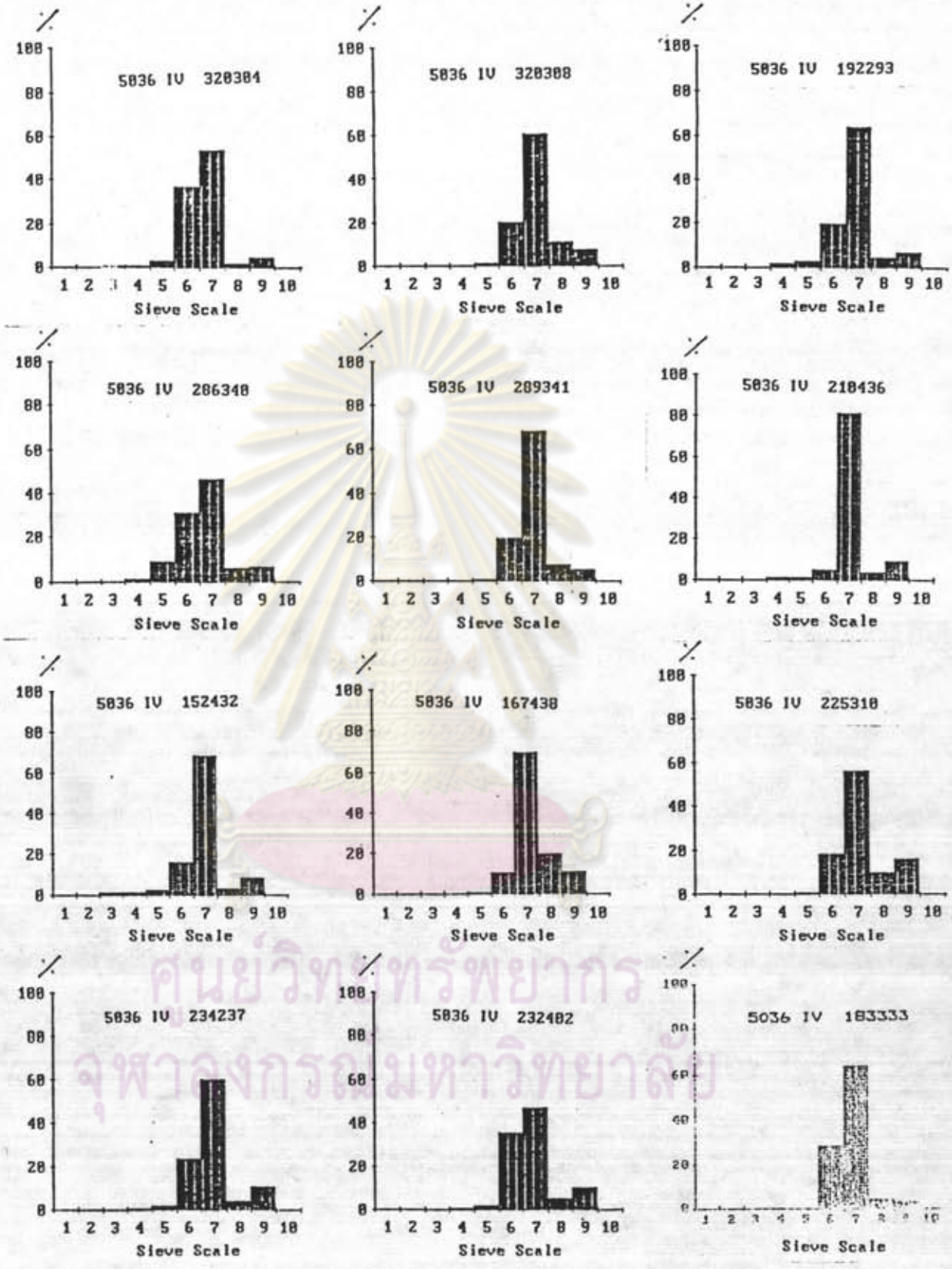


Figure 6.4 Size frequency distribution of sediments froms Grading Zone IV No.1 to 10 are sieve scale 1",3/4",1/2",3/8",4#,10#,50#,100#, 200# and less than 200#

Table 6.4 Statistical values of sediments in Grading Zone IV

Topographic Map	Grid Reference	Q1	Md	Q3	So	Sk
Elevation 5 to 4 metres above mean sea level						
5036 IV	096474	0.19	0.28	0.42	1.4868	1.0089
	110293	0.19	0.28	0.37	1.3955	0.9469
Elevation 3 to 2 metres above mean sea level						
5036 IV	231258	0.22	0.33	0.68	1.7581	1.7121
	275335	0.18	0.30	0.45	1.5811	0.9487
	320308	0.17	0.27	0.49	1.6977	1.0681
Average		0.19	0.29	0.47	1.5775	1.0292

CHAPTER VII

CONCLUSION

To select areas for construction sand, several parameters must be considered. These parameters include the size of area, the thickness of sand layer, and overburden and engineering properties of materials. The results of this study are useful for the selection of suitable area for construction sand. The method can also be applied to other areas.

Form the results of this study some conclusions could be made as follows :

a) The gradation of Grading Zones I, II, III and IV of fine aggregate for concrete are correlated well with landforms of the study area.

- The Grading Zone I consists predominantly of coarse sand and lies between 8 to 23 meters above MSL of the Mae Klong Flood Plain and upper and middle parts of the Mae Klong Alluvial Fan.

- The Grading Zone II is composed predominantly of coarse to medium sand and this area lies between 5 to 23 meters above MSL. This Grading Zone covers the Mae Klong Alluvial Fan, Mae Klong Flood Plain and part of Tidal Flat of Brackish clay.

- The Grading Zone III consist predominantly of medium sand. The Grading Zone III area lies between 5 to 8 meters above MSL. This area occupies the lower part of Alluvial Fan, and the lower part of Mae Klong Flood Plain and Tidal Flat of Brackish Clay.

- The Grading Zone IV is composed mainly of medium to fine sand. This Grading Zone area lies between 3 to 5 meters above MSL. This area covers the Tidal Flat of Brackish Clay.

b) The morphologic features of the study area can be used to evaluate the size of sand deposition. Three class of area sizes, large medium and small are correlated will with the elevation above 18 meters., between 8 and 18 meters and below 8 meters above MSL, respectively.

c) Construction sand deposits are normally occurred at point bar, sand bar, oxbow lake and along the channel of the Mae Klong and its distributaries.

With the exclusion of limitation of time and money for the study of very large area, several problems were encountered in this study.

a) Location of borings specified in the aerial photograph had to be changed when field study was commenced. Several reasons are, no access, dense sugar cane plantation and change of land use.

b) Only results from sieve analysis are used in this study. There are other properties which must be considered for examples, roundness, impurities , etc.

c) There are limitaions of constructing the boundary of Grading Zone area. The percentage contour lines were drawn by using the location of borings and directed by the channels which sand were accumulated.

d) The Grading Zone maps are represent of gradation of sand (sand deposits) below the depth of 5 meters of sand body. The results might not represent all of the sand bodies.

It is recommended that the techniques and problems can be solve by increasing drilling and sampling in the study area. In addition other tests, e.g., organic matter content and degree of roundness, have to be added. The geophysics could help to receive more data on the depth and shape of sand body. The Grading Zone map in every depth can be drilling and sampling, and testing, and mapping in new Grading Zone map in every depth. It will be good maps for using in construction sand.